City of
St. Joseph
Missouri

Water Protection
3500 State Route 759
St. Joseph, Missouri 64504
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October 1, 2021

OFFICIAL COPY VIA EMAIL

Mr. Todd Blanc
State of Missouri Pretreatment Coordinator
Water Protection Program
Missouri Department of Natural Resources
PO Box 176
Jefferson City, MO 65102

Re: MO-0023043 Updated Technically Based Local Limits Study

Dear Mr. Blanc:

Included with this letter is the City of St. Joseph's Updated Technically Based Local Limits (TBLL) report required by State Operating Permit MO-0023043, effective December 1, 2020. These updates are in response to the Evaluation of the TBLL conducted by the Missouri Department of Natural Resources (MDNR), received June 30, 2021. This study has been conducted by Black and Veatch Corporation with data provided by the City of St. Joseph Water Protection Division. The included report describes the methods used for and the results of the study.

Following approval from the MDNR, the City of St. Joseph will pursue all necessary Industrial Pretreatment Program and City Code updates based on the recommendations in the report. If there are any questions concerning this report, please contact Katie Bruegge of my staff at (816) 596-8008.

Sincerely,

Edward Leaverton
Superintendent of Water Protection

EL/kb

Enclosures

FINAL

EVALUATION OF TECHNICALLY-BASED LOCAL LIMITS

Industrial Pretreatment Program

B&V PROJECT NO. 405519
B&V FILE NO. 40.000

PREPARED FOR

City of St. Joseph, Missouri

1 OCTOBER 2021

BLACK & VEATCH

Table of Contents

Abbreviations and Definitions **1**
Executive Summary **ES-1**
1.0 Purpose of Study **1-1**
1.1 Background 1-1
1.2 Purpose 1-1
1.3 EPA Procedures 1-2
2.0 Wastewater Treatment Facilities and Operations **2-1**
2.1 Treatment Facilities 2-1
2.2 Significant Industrial Users 2-2
2.3 Pollutants of Concern 2-4
2.3.1 Conventional and Non-Metal Pollutants 2-5
2.3.2 Metals 2-7
2.3.3 WPF Removal Efficiencies 2-10
3.0 Modeling Data Acquisition and Requirements **3-1**
3.1 Overview of the MAHL Approach 3-1
3.2 Effluent Quality-Based AHL 3-1
3.3 Sludge Quality-Based AHL 3-2
3.4 Treatment Process Inhibition-Based AHLs 3-3
4.0 Development of Local Limits for Conventional and Non-Metal Pollutants **4-1**
4.1 BOD and TSS 4-3
4.2 Ammonia 4-3
4.3 FOG 4-4
4.4 Sulfide 4-4
5.0 Development of Local Limits for Metals **5-1**
5.1 MAHLs 5-1
5.1.1 Effluent Quality Criteria 5-1
5.1.2 Sludge Quality Criteria 5-1
5.1.3 Inhibition Criteria 5-1
5.2 Maximum Allowable Industrial Loadings 5-2
5.2.1 Domestic Loadings 5-2
5.2.2 Factor of Safety 5-2
5.3 MAIL Allocation Approaches 5-3
5.3.1 Uniform Allocation 5-3
5.3.2 Contributory Flow Allocation 5-3
5.3.3 Mass Proportional Allocation 5-4
5.3.4 Allocation by Permit 5-4
5.4 Recommended Local Loadings 5-4

6.0 Organic Pollutants Control Strategy 6-1
6.1 Control Methods 6-1
6.2 Recommended Approach to Organic Compounds Control 6-1
6.2.1 Identification of Industrial Users (IU) 6-2
6.2.2 Development of Specific Limits/Best Management Practices 6-2
7.0 References 7-1

LIST OF APPENDICES

Appendix A – NPDES and Fertilizer Permit
Appendix B - Chapter 29 – Local Code
Appendix C - Monitoring Data
Appendix D - Local Limits Calculations Modeling Runs
Appendix E – Conventional Pollutant Analysis

LIST OF TABLES

Table ES-1 Final Pollutants of Concern (POC) List ES-2
Table ES-2 Recommended Local Limits for Conventional and Non-Metal Pollutants ES-3
Table ES-3 Recommended Local Limits for Metal Pollutants ES-4
Table 2-1 WPF Design and Historical Flows (mgd) 2-2
Table 2-2 Significant Industrial Users (SIU) 2-3
Table 2-3 Pollutants of Concern (POC) List 2-5
Table 2-4 Influent (Treatment Train 1)and Total Effluent Concentrations for Conventional and Non-Metal Pollutants (for Domestic Influent only) 2-7
Table 2-5 Domestic Concentrations (Mark Twain Location) for Conventional and Non-Metal Pollutants 2-7
Table 2-6 Influent (Treatment Train 1) and Effluent Concentrations for Metal Pollutants 2-8
Table 2-7 Influent (Treatment Train 2) and Effluent Concentrations for Metal Pollutants 2-8
Table 2-8 Domestic (Mark Twain Location) Concentrations for Metal Pollutants 2-10
Table 2-9 Site-Specific Removal Efficiencies for Conventional and Non-Metal Pollutants 2-11
Table 2-10 Site-Specific Removal Efficiencies for Metals 2-11
Table 4-1 Design Loading (lbs/day) for WPF 4-2
Table 5-1 Inhibition Concentrations from Literature 5-1
Table 5-2 Recommended Local Loadings for Metals 5-5
Table 6-1 Summary of Organic Compounds Control Approaches 6-1

LIST OF FIGURES

Figure 2-1 Influent and Effluent Flow and Monitoring Locations (Map from Google Earth) 2-6
Figure 2-2 Domestic Sampling location MH 109.64 (West Mark Twain) 2-6
Figure 4-1 Industrial User Data October-November 2020 4-5
Figure 4-2 City of St. Joseph WPF Data April 2021 4-6

Abbreviations and Definitions

AA.1. Abbreviations and Acronyms

Abbreviation/Acronym	Description
AAR	annual application loading rate
ASCE	American Society of Civil Engineers
A/V	animal/vegetable
BOD	5-day biochemical oxygen demand
C	(degrees) Celsius
CAR	cumulative application loading rate
CFR	Code of Federal Regulations
City	City of St. Joseph
EPA	U.S. Environmental Protection Agency
F	(degrees) Fahrenheit
FOG	Fats, oils, and grease (also known as Hexane Extractable Material)
HEM	Hexane Extractable Material
IPP	industrial pretreatment program
IU	industrial user
lb/acre	pounds per acre
MAHL	maximum allowable headworks load
MAIL	maximum allowable industrial loading
MDNR	Missouri Department of Natural Resources
mgd	million gallons per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NIOSH	National Institute of Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
POC	pollutant of concern
POTW	publicly owned treatment work
SSJISD	South St. Joseph Industrial Sewer District

Abbreviation/Acronym	Description
TBLL	technically based local limit
TSS	total suspended solids
TTO	total toxic organics
WPF	Water Protection Facility (City's POTW)

AA.2. Definitions

Word	Definition
5-day Biochemical Oxygen Demand (BOD)	The quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure, 5 days at 200 C, expressed in terms of weight and concentration (mg/L).
Director – Director of Public Works	The person who supervises the operation of the municipal wastewater collection and treatment system or his duly authorized representative.
Industrial User	An industrial source of indirect discharge that does not necessarily constitute a "discharge of pollutants" under regulations issued pursuant to the Clean Water Act.
Rate of Service	Rate of service only applies to Wholesale industrial users in that they pay for each pound of pollutant that is treated at the WPF. Rate of service includes both a capital charge and operational charge to establish the rate at which the IU is billed.
Safety Factor	A factor used to adjust the headworks allocation in response to future growth in the community.
Surcharge Program	A program where fees are charged for high strength wastewater. Typically, there is a threshold value that establishes when the additional charges are applied
Total Suspended Solids	The total solids that float on the surface of, and are suspended in, water, wastewater, or other liquids, and which are removable by laboratory filtering.
Total Toxic Organics (TTO)	The sum of the mass or the concentration of specific organic compounds, as defined in 40 CFR Part 433, found in industrial users' process discharge at a concentration higher than 0.01 mg/L.
Wholesale (dedicated) Industrial User	An industrial user that connects directly via a force main to the Industrial Primary Clarifier and Industrial Aeration Basins at the City's Water Protection Facility. Wholesale Industrial Users include National Beef Leathers, Triumph Foods, and South St. Joseph Industrial Sewer District.

Executive Summary

ES.1. Scope of Work

The City of St. Joseph (City) retained Black & Veatch (BV) to assist with re-evaluating the technically-based local limits (TBLL) that have been adopted and used in its industrial pretreatment program (IPP). The City developed its current TBLL in 2014 using the maximum allowable headworks loading (MAHL) approach and a spreadsheet-based model developed by the U.S. Environmental Protection Agency (EPA).

For this update, the City used historical monitoring data from both domestic and wholesale industrial users well as results of supplemental sampling conducted during October, November, and December 2020. Sampling locations included the WPF primary influent (both at the domestic primary clarifiers and industrial primary clarifier that receives discharges from wholesale industrial users) and final effluent and a location in the collection system receiving only domestic wastewater. BV used the results from sampling to calculate updated pollutant of concern (POC) loads to the WPF and site-specific removal efficiencies, characterize the domestic contributions to the WPF, and recommend updated local limits. This report summarizes the findings of this evaluation and recommends local limits for the City to adopt for use in its IPP.

ES.2. Findings

ES.2.1 Pollutants of Concern

The previous TBLL identified 12 metal and 5 conventional POCs based on a POC analysis. The analysis included a scan of the 125 priority pollutants and 15 potential POCs identified by EPA and additional pollutants identified in the WPF's NPDES discharge permit. A POC is defined as *any pollutant that might reasonably be expected to be discharged to the POTW in sufficient amounts to cause pass through or interference, cause problems in its collection system, or jeopardize its workers* (EPA, 2004).

In addition to the POCs identified in the previous TBLL, the City evaluated barium, boron, and cobalt as potential metal POCs with this update based on the parameters' inclusion in the monitoring requirements in the final NPDES permit issued by MDNR in December 2020 (**Appendix A - NPDES and** Fertilizer Permit**).** MDNR ultimately did not include limits for these parameters in the final discharge permit issued to the City effective December 2020; however, the City decided to move ahead with the collection of data on these pollutants. The final POCs are summarized in **Table ES-1.**

Table ES-1 Final Pollutants of Concern (POC) List

Pollutant – Metals and Salts	Pollutant - Conventional and Other
Arsenic	BOD(1)
Barium	TSS
Boron	Ammonia
Cadmium	FOG
Chloride	Sulfide
Chromium	
Cobalt	
Copper	
Cyanide	
Fluoride	
Glyphosate	
Iron	
Lead	
Manganese	
Mercury	
Molybdenum	
Nickel	
Selenium	
Silver	
Sulfate	
Zinc	

Note: While the plant is regulated by cBOD as an NPDES permit requirement, all the existing surcharge and ordinance requirements are based on BOD. Therefore, BOD was established as a POC.

ES.2.2 Development of Local Limits

BV referenced EPA's *Local Limits Development Guidance* (2004) in the development of the local limits. The preliminary local limits for metals were established using the Maximum Allowable Headworks Loading (MAHL) approach recommended by EPA, which incorporates applicable environmental criteria, including National Pollutant Discharge Elimination System (NPDES) permit limits, state water quality standards, and biosolids disposal requirements.

ES.3. Conclusions and Recommendations

The evaluation led to the following conclusions and recommendations.

ES.3.1 Conventional Pollutants and Non-Metal Pollutants

It is recommended that the City continue to implement its rate of service (surcharge) program as a means of controlling 5-day biochemical oxygen demand (BOD), ammonia, FOG, and total suspended solids (TSS) loads discharged to the WPF. BV also recommends that the City maintain the daily maximum local limits for BOD, TSS, ammonia, FOG, and sulfide identified in Section 29-157 of the City of St. Joseph

Code of Ordinances (**Appendix B - Chapter 29 – Local Code**) and **Table ES-2**. The City should continue to monitor for sulfide and examine corrosion impacts on the materials of construction over time. Mass based limits should be considered for various sulfide dischargers based on the location of the connection to the wastewater collection system. The permit limit for conventional pollutants will be established higher than the rate of service (surcharge) conventional pollutant levels. This means that if monitoring results from an IU exceed 300 mg/L for BOD, 350 mg/L for TSS, 30 mg/L for Ammonia, or 100 mg/L for FOG, the fee for surcharge would be calculated. As long as the results of monitoring stay below the permit limit, the IU would be charged within the surcharge program. Permit compliance would only apply if the results of sampling exceeded the permitted levels.

Table ES-2 Recommended Local Limits for Conventional and Non-Metal Pollutants

Pollutant	Surcharge levels, mg/L (Daily Maximum)	Existing Local Limit, mg/L (Daily Maximum)	Model Result, mg/L (Based on Capacity Evaluation)	Recommended Local Limit, mg/L
BOD	300	1,000	1,000	Site Specific
TSS	350	1,200	1,200	Site Specific
Ammonia	30	100	100	Site Specific
FOG	100	200	200	200
Sulfide	-	0.5	0.5	0.5

ES.3.2 Metals

The results of local limits modeling conducted as part of this study and a comparison with the existing limits are shown on **Table ES-3**. BV recommends that the City establish the local limits for metals as listed in **Table ES-3**. Because the WPF permit requires monitoring for Barium, Boron and Cobalt it is recommended that these metal pollutants be established as "monitoring only" to collect additional data. It is also recommended that iron and manganese also be established as monitoring only as a means to collect data relative to current residuals disposal practices.

ES.3.3 Organic Compounds

As part of this analysis, the discharge of organic compounds to the WPF were examined. The results of the analysis did not indicate that system-wide limits should be established at this time. In Section 29-157 of the City's Code of Ordinances, the City reserves the right to establish limits for organic compounds for specific industrial users.

ES.3.4 Fats, Oils and Grease

The City has established a very successful program for reducing fats, oils and grease (FOG) discharged to the wastewater collection system based on its existing cost recovery program. Due to the program's

success and recommendations of EPA, BV recommends that the City continue the program and retain its existing daily maximum limit of 200 mg/L FOG and 100 mg/L FOG surcharge level.

Table ES-3 Recommended Local Limits for Metal Pollutants

Pollutant	Existing Local Limit, mg/L (Daily Maximum)	TBLL MAHL Model Result, ppd	Recommended MAIL, ppd
Arsenic, mg/L	0.62	1.89	1.56
Barium, mg/L	NL	NL	Monitoring only
Boron, mg/L	NL	NL	Monitoring only
Cadmium, mg/L	0.07	0.86	0.76
Chloride, mg/L	NL	NL	Monitoring only
Chromium, Total, mg/L	4.57	18.25	16.0
Cobalt, mg/L	NL	NL	Monitoring only
Copper, mg/L	1.64	43.38	36.03
Cyanide, mg/L	0.38	16.53	14.04
Fluoride, mg/L	NL	NL	Monitoring only
Glyphosate	NL	NL	Monitoring only
Iron, mg/L	NL	NL	Monitoring only
Lead, mg/L	0.53	6.91	5.97
Manganese, mg/L	NL	NL	Monitoring only
Mercury, mg/L	0.14	0.42	0.37
Molybdenum, mg/L	0.45	2.57	2.08
Nickel, mg/L	0.99	16.74	14.47
Selenium, mg/L	0.75	1.06	0.91
Silver, mg/L	1.75	49.44	44.33
Sulfate, mg/L	NL	NL	Monitoring only
Zinc, mg/L	3.00	84.28	68.94
Note: NL = No existing limit and no TBLL analysis conducted at this time			

1.0 Purpose of Study

1.1 Background

In 1972, the United States Congress enacted the Clean Water Act (Public Law 92-500), which amended the Water Pollution Control Act of 1952. As stated in the preamble to the Clean Water Act, the principal objective of that legislation was to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Although the Clean Water Act has been amended several times since 1972, it is the 1972 legislation, specifically Title III, Section 307(b) that serves as the basis for the nation's current Industrial Pretreatment Program.

To achieve the objectives of the Clean Water Act, the goals of the current Industrial Pretreatment Program, as outlined by the EPA in 40 CFR (Code of Federal Regulations) Part 403, are as follows:

- To prevent the introduction of pollutants into publicly owned treatment works (POTWs) that will interfere with the operation of a POTW, including interference with the use or disposal of municipal sludge;
- To prevent the introduction of pollutants into a POTW which will pass through the treatment works or otherwise be incompatible with such works;
- To improve opportunities to recycle and reclaim municipal and industrial wastewaters and residuals; and
- To protect the health and safety of City staff working in the collection system.

The General Pretreatment Regulations establish general and specific prohibitions and require approved programs to develop specific local limits or industrial discharge limits (numerical standards) under 40 CFR Part 403.5(c)

As stated in the *Local Limits Development Guidance* (2004): EPA regulations require that POTWs with approved programs “must provide a written technical evaluation of the need to revise local limits under 40 CFR 403.5(c)(1), following permit issuance or reissuance” [40 CFR 122.44(j)(2)(ii)], which typically occurs every five years. Local limits should also be reviewed and revised in response to changes in Federal or State regulations, environmental protection criteria, WPF design and operational criteria, or the nature of industrial contributions to the POTW influent. This local limits study has been completed to comply with the requirements of 40 CFR Part 403.5(c)(1) and 122.44(j)(2)(ii) consistent with the recommended procedures in the *Local Limits Development Guidance*.

1.2 Purpose

The Clean Water Act transferred the responsibility for developing and implementing industrial pretreatment standards from the federal government to state and local agencies. Computer

spreadsheet models for the WPF are based on equations recommended by EPA. These spreadsheets and the required inputs are found in **Appendix C - Monitoring Data** and **Appendix D - Local Limits Calculations Modeling Runs**.

1.3 EPA Procedures

EPA procedures for the development of technically based local limits include the following:

- Scanning for the 125 toxic pollutants plus any other pollutant identified in state water quality standards. The scan should be completed preceding the submittal of local limits to EPA associated with the NPDES permit renewal process.
- Sampling to determine the domestic and commercial concentrations and loadings. Daily sampling is conducted for BOD, TSS, and Ammonia at each wholesale industrial user (Triumph Foods, National Beef Leathers, and South St. Joseph). TKN is sampled only at Triumph Foods and South St. Joseph. All permitted industries are sampled for metals on an annual basis with the permitted users conducting semiannual monitoring activities. Total toxic organics sampling frequency is established in the discharge permit. Domestic/commercial sampling locations are sampled annually to verify the domestic loadings. Historical sampling data collected by the WPF was used to establish these loadings.
- Determining applicable environmental criteria from which local limits will be derived. These criteria include water quality standards, NPDES permit limits, and biosolids disposal requirements. Removal efficiencies for each major treatment process were determined using actual sampling data, where possible.
- Calculating allowable headworks loadings and concentrations from environmental criteria considering the removal of pollutants through the POTW.
- Selecting the lowest (most restrictive) of the allowable headworks loadings and concentrations. This value is called the critical headworks loading or concentration.
- Determining allowable industrial concentrations from critical headworks loading, considering the contributions from domestic sources and applying a safety factor.
- Selecting appropriate limits based on treatability and protection of the environment.

2.0 Wastewater Treatment Facilities and Operations

2.1 Treatment Facilities

The City operates a WPF rated for a permitted flow of 27.0 million gallons per day (mgd) with peak daily flows of 54.0 mgd, as shown in Table 2-1. The facility is divided into two treatment trains; Treatment Train 1 is considered "domestic" although it receives industrial waste from the collection system and enters the facility at the "headworks." This wastewater is screened, grit is removed, and treated with primary treatment and biological nutrient removal. Treatment Train 2 is considered "industrial" and receives the waste from the Wholesale Industrial Users (National Beef Leathers, Triumph Foods, and South St. Joseph Industrial Sewer District (SSJ)). Wastewater generated from the three wholesale industrial users is pretreated before being discharged to the WPF. At the WPF, the flow from the wholesale industrial users is treated with primary clarification followed by an activated sludge system. Both treatment trains undergo final clarification before being combined, disinfected, and discharged to the Missouri River. Primary and waste activated sludge generated in the treatment process are thickened and undergo both thermophilic and mesophilic anaerobic digestion and drying prior to use as either fertilizer, unrestricted use as a soil conditioner or landfilled. Flows for wholesale industrial users shown in **Table 2-1** were established as part of the design requirements in 2012. **Table 2-1** also provides the historical average flows over the past 12 months.

It should be noted that the WPF is seeing a reduction in the domestic influent flow discharged to the WPF due to the completion of the Blacksnake and Whitehead diversion projects. These projects separated existing creek flow from sanitary flow resulting in a decrease of flow to the WPF. Currently the NPDES permit allows for 27 mgd to be accepted through the domestic influent portion of the treatment plant. Historically the flow from National Beef Leathers (NBL) has averaged closer to 0.9 mgd. This industry had a major reduction in flow due to the COVID pandemic with flow over the past 12 months averaging 0.685 mgd. Discussions with NBL indicates that over the next 12 months production and flows will increase back to pre-pandemic levels; while historical flow in **Table 2-1** shows the impacts due to the pandemic for NBL, flows were adjusted to the pre-pandemic levels in the TBLL analysis.

Table 2-1 WPF Design and Historical Flows (mgd)

Parameter	Design Average Daily	Design Maximum Month	Design Peak Daily	Historical Average Daily
Domestic Influent	15.6	27.9	42.8	14.911
South St. Joseph Sanitary District	2.3	3.5	5.0	1.8
Triumph Foods	2.5	2.6	3.7	2.3
National Beef and Leathers	1.0	1.2	2.5	0.685
Total	21.4	35.2	54.0	19.696

Note: NBL flow used in the flow balance represents the reduction in flow due to COVID. For modeling efforts, the flow was increased to 0.9 mgd to represent more typical values. Discussion with NBL indicates that they are in the process of increasing production.

2.2 Significant Industrial Users

All of the City's industries discharge to the WPF. Significant industrial users (SIUs) discharging wastewater to the City's collection system and WPF are listed in **Table 2-2.** A list of industrial users (IUs) was developed based on a survey of industrial and commercial users in the City's service area. A SIU is defined as an IU meeting one or more of the following criteria in 40 CFR 403.3(v):

- Discharges more than 25,000 gpd of wastewater;
- Is subject to EPA categorical standards (40 CFR Parts 404-471);
- Contributes five percent of the organic or hydraulic load to the POTW; or
- Has the potential to discharge pollutants that could cause interference or pass-through at the WPF as determined by the City's Public Works Director.

The industrial flows were developed based on information from existing industrial/manufacturing facilities which are currently permitted by the City. Every 5 years, the industrial survey is conducted to identify other potential IUs.

South St. Joseph Industrial Sewer District (SSJISD) receives flow from IUs who are located within the boundaries of the district and discharges that flow to the WPF. The total flow from SSJISD was used instead of flows from WPF permitted industrial users to account for all the industrial flow from the District. These users have been designated in the **Table 2-2.** Flows for these users were included in the flow for SSJISD and therefore were not included in the flows used in the TBLL analysis to avoid double counting.

The plant allows for the acceptance of hauled industrial wastes from permitted facilities after completion and review of the Conditional Discharge Application. Applications/sample results are reviewed before the waste is accepted. Between 2017 and 2020, the plant has only received 22 loads of industrial hauled waste, Therefore, this waste stream will not be considered as part of this study.

Table 2-2 Significant Industrial Users (SIU)

Industrial User	Discharge Location	Average Process Flow, kgpd	Average Total Flow, kgpd
Ag Processing	WPF	376	400
Albaugh LLC	SSJISD	Note 1	Note 1
Albaugh North	WPF	0	0.06
Altec Industries, Inc	WPF	118	118
BASF Corporation	WPF	4.4	4.4
BHJ USA	SSJISD	Note 1	Note 1
Boehringer Ingelheim	WPF	110	110
Cintas Corporation	WPF	51	52
Clarios DC	WPF	8.5	8.5
Clarios DAP	WPF	24	24
Daily Premium Meats	SSJISD	Note 1	Note 1
Gray Manufacturing	WPF	250	250
Hillshire Brands	WPF	600	600
Hillyard Industries	WPF	10	10
HPI Products	WPF	0	1
HPI Products	WPF	0	1
ICM	WPF	138	141.7
International Paper Company	WPF	54	57
I&M Machine	WPF	1	3
Mosaic Life Care	WPF	58.3	58.3
Mosaic Life Care Laundry	WPF	7.8	7.8
National Beef Leathers (Note 3)	WPF	900	900
Nestle Purina Petcare	SSJISD	Note 1	Note 1

Industrial User	Discharge Location	Average Process Flow, kgpd	Average Total Flow, kgpd
Nestle Purina Product Technology Center	WPF	Note 1	Note 1
Omnium LLC	SSJISD	Note 1	Note 1
Purina Animal Nutrition	WPF	20.6	20.6
Seaboard Energy Missouri	WPF	106	106
Silgan Containers	SSJISD	Note 1	Note 1
St. Joe Express	SSJISD	Note 1	Note 1
St Joseph Plastics	WPF	3	9
Triumph Foods	WPF	2300	2300
SSJISD	WPF	1800	1800
Ventura Foods	SSJISD	44	45

Notes:
1. The individual IU flows discharges to SSJISD are accounted for in the flow total for SSJISD within the model. This ensures that users that discharge industrial flows within SSJISD are only counted once relative to an flow balance into the City's treatment facility.
2. General Note: WPF means either discharging directly to the wastewater treatment facility or collection system.
3. National Beef Leathers flow used in the flow balance represents the reduction in flow due to COVID. For modeling efforts, the flow was increased to 0.9 mgd to represent more typical values. Discussion with NBL indicates that they are in the process of increasing production.

2.3 Pollutants of Concern

The previous TBLL identified 12 metal and 5 conventional and non-metals POCs based on a POC analysis. The analysis included a scan of the 125 priority pollutants and 15 potential POCs identified by EPA and additional pollutants identified in the WPF's NPDES discharge permit. A POC is defined as *any pollutant that might reasonably be expected to be discharged to the POTW in sufficient amounts to cause pass through or interference, cause problems in its collection system, or jeopardize its workers* (EPA, 2004).

The list of POCs included the 15 potential POCs identified by EPA, FOG, and sulfide. FOG was included as a POC on the basis that the WPF has an effluent limitation for oil & grease in its NPDES permit. Sulfide was included as a POC due to the risk of corrosion of concrete piping in the collection system. In addition to the POCs identified in the previous TBLL, the City evaluated barium, boron, and cobalt as potential POCs with this update based on the parameters' inclusion in the monitoring requirements in the NPDES permit issued by MDNR in December 2020. MDNR ultimately did not include these parameters in the final discharge permit issued to the City; however, the City choose to retain these pollutants as pollutants of concern. The final list of POCs is identified in **Table 2-3.**

Table 2-3 Pollutants of Concern (POC) List

Pollutant – Metals and Salts	Pollutant - Conventional and Other
Arsenic	BOD(1)
Barium	TSS
Boron	Ammonia
Cadmium	FOG
Chloride	Sulfide
Chromium	
Cobalt	
Copper	
Cyanide	
Fluoride	
Glyphosate	
Iron	
Lead	
Manganese	
Mercury	
Molybdenum	
Nickel	
Selenium	
Silver	
Sulfate	
Zinc	

Notes:

1. While the plant is regulated by cBOD as an NPDES permit requirement, all the existing surcharge and ordinance requirements are based on BOD. Therefore, BOD was established as a POC.
2. While Barium, Boron, Cobalt, Iron, and Manganese are listed as POC they are pollutants the WPF is continuing to evaluate through monitoring and will not be considered as part of the TBLL analysis. These pollutants will be designated as monitoring only.

2.3.1 Conventional and Non-Metal Pollutants

The City used historical data as well as conducted sampling in October, November, and December 2020 for conventional and non-metal pollutants. Sampling locations included the WPF primary influent (influent), wholesale customer discharge locations, a location in the collection system receiving only domestic flow, and final effluent at the plant. Influent and effluent average concentrations and ranges for conventional and non-metal POCs are listed in **Table 2-4**. Concentrations and ranges in domestic flows are listed in **Table 2-5**. Averages are the mathematical mean of the reported values. Wholesale industrial users are sampled daily for conventional pollutants and permitted pollutants quarterly as these discharges are received at the City's treatment facility. These locations are shown on **Figure 2-1**.

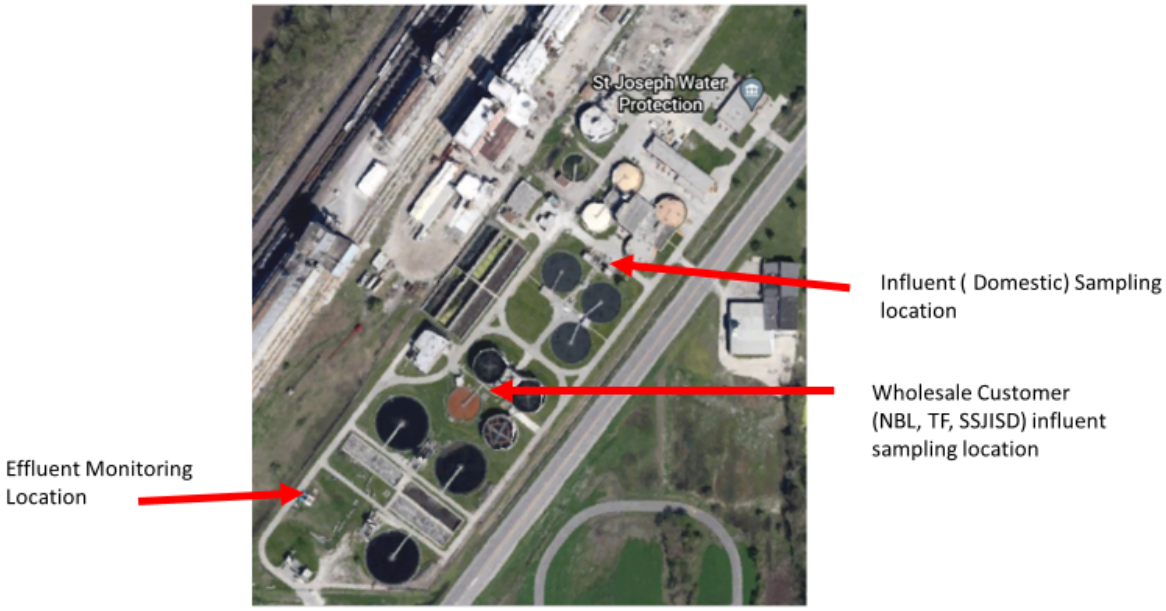

Figure 2-1 Influent and Effluent Flow and Monitoring Locations (Map from Google Earth)

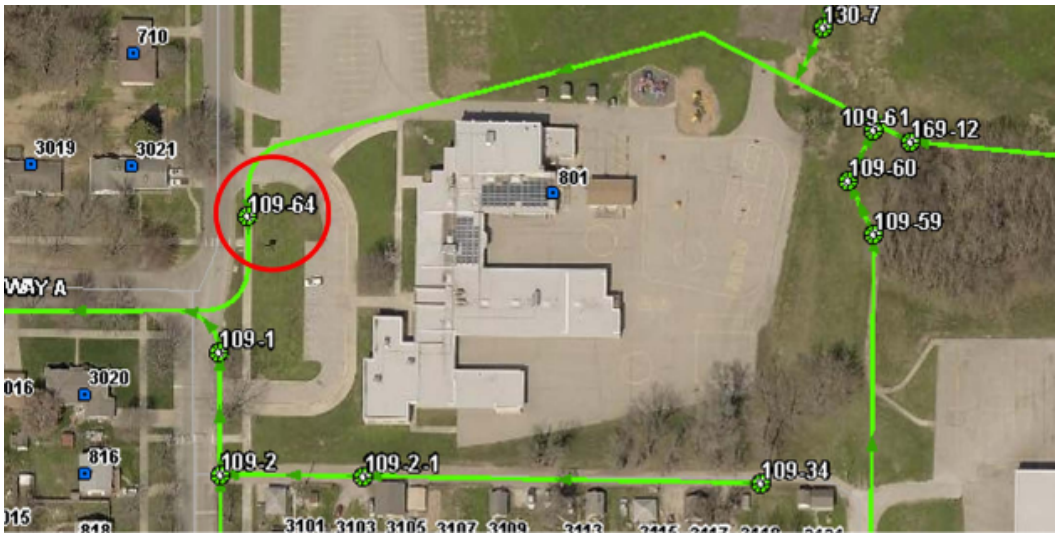

Figure 2-2 Domestic Sampling location MH 109.64 (West Mark Twain)

Table 2-4 Influent (Treatment Train 1)and Total Effluent Concentrations for Conventional and Non-Metal Pollutants (for Domestic Influent only)

Pollutant	Units	Influent			Effluent		
		Average	Minimum	Maximum	Average	Minimum	Maximum
BOD	mg/L	214.0	34.7	824	4.77	< 2.0	16.2
TSS	mg/L	291.0	16.0	2,347	10.9	1.0	88.5
Ammonia	mg/L	6.05	0.55	35.1	1.81	0.50	14.92
FOG	mg/L	20.86	19.67	26.46	2.88	1.925	18.7
Sulfide	mg/L	0.20	0.13	0.34	0.01	0.004	0.02

Table 2-5 Domestic Concentrations (Mark Twain Sampling Location) for Conventional and Non-Metal Pollutants

Pollutant	Units	Domestic Average
BOD	mg/L	144.0
TSS	mg/L	224.75
Ammonia	mg/L	13.66
FOG	mg/L	34.53
Sulfide	mg/L	0.41

2.3.2 Metals

The City reviewed historical data (from locations at the treatment plant and wholesale industrial users) and conducted additional sampling in October, November, and December 2020 for metal pollutants. Sampling locations included the WPF primary influent (Treatment Train 1), wholesale industrial users, and final effluent (Figure 2-1) and a location in the collection system receiving only domestic flow (Figure 2-2). Influent and effluent average concentrations and ranges for metal POCs are listed in **Table 2-6**. Concentrations and ranges in domestic flows are listed in **Table 2-8**. Averages are the mathematical mean of the reported values. When laboratory results from some of the data collected by City staff were reported as below detection limit, half the detection limit value was used in the calculated average consistent with EPA recommendations. If all data collected were reported as below detection limit, non-detect (ND) is listed.

Table 2-6 Influent (Treatment Train 1) and Effluent Concentrations for Metal Pollutants

Pollutant	Units	Influent			Effluent		
		Average	Minimum	Maximum	Average	Minimum	Maximum
Arsenic, Total	ug/L	ND	ND	ND	2.20	ND	3.42
Cadmium, Total	ug/L	0.26	ND	1.01	ND	ND	ND
Chromium, Total	ug/L	4.33	2.36	8.25	1.32	ND	5.00
Copper, Total	ug/L	30.87	18.80	44.00	2.98	ND	5.00
Cyanide, Total	ug/L	Note 2					
Lead, Total	ug/L	5.96	3.52	12.00	0.69	0.40	1.20
Mercury, Total	ug/L	0.23	ND	0.68	ND	ND	ND
Molybdenum, Total	ug/L	ND	ND	ND	ND	ND	ND
Nickel, Total	ug/L	6.48	4.72	7.88	6.59	5.50	7.90
Selenium, Total	ug/L	ND	ND	ND	ND	ND	ND
Silver, Total	ug/L	ND	ND	ND	ND	ND	ND
Zinc, Total	ug/L	82.71	53.30	120.00	ND	ND	ND

Notes:

1. ND = Non-detect (below detection limit)
2. Not sampled – previous historical sampling indicated average CN concentration of 0.0086 mg/L so that value used in this evaluation.

Table 2-7 Influent (Treatment Train 2) and Effluent Concentrations for Metal Pollutants

Pollutant	Units	Influent			Effluent		
		Average	Minimum	Maximum	Average	Minimum	Maximum
Arsenic, Total	ug/L	ND	ND	ND	2.20	ND	3.42
Cadmium, Total	ug/L	ND	ND	ND	ND	ND	ND
Chromium, Total	ug/L	17.1	ND	339	1.32	ND	5.00

Pollutant	Units	Influent			Effluent		
		Average	Minimum	Maximum	Average	Minimum	Maximum
Copper, Total	ug/L	26.38	ND	52.6	2.98	ND	5.00
Cyanide, Total	ug/L	Note 2					
Lead, Total	ug/L	ND	ND	1.13	0.69	0.40	1.20
Mercury, Total	ug/L	ND	ND	ND	ND	ND	ND
Molybdenum, Total	ug/L	ND	ND	ND	ND	ND	ND
Nickel, Total	ug/L	12.73	ND	7.88	6.59	5.50	7.90
Selenium, Total	ug/L	ND	ND	ND	ND	ND	ND
Silver, Total	ug/L	ND	ND	ND	ND	ND	ND
Zinc, Total	ug/L	79.2	ND	246	ND	ND	ND

Notes:
1. ND = Non-detect (below detection limit).
2. Not sampled – previous historical sampling indicated average CN concentration of 0.0086 mg/L so that value used in this evaluation.

Note, the data from Treatment Train 1 provides the most conservative estimate of the removal efficiency at the WPF.

Table 2-8 Domestic (Mark Twain Location) Concentrations for Metal Pollutants

Pollutant	Units	Domestic		
		Average	Minimum	Maximum
Arsenic	ug/L	ND	ND	ND
Cadmium	ug/L	ND	ND	ND
Chromium	ug/L	4.30	3.50	5.42
Copper	ug/L	28.63	0.00	37.10
Cyanide	ug/L	8.6	8.6	8.6
Lead	ug/L	2.59	1.93	3.12
Mercury	ug/L	ND	ND	ND
Molybdenum	ug/L	ND	ND	ND
Nickel	ug/L	6.07	5.72	6.91
Selenium	ug/L	ND	ND	ND
Silver	ug/L	ND	ND	ND
Zinc	ug/L	70.33	54.30	92.00

Notes:
1. ND = Non-detect (below detection limit): Detection limit for Arsenic <3.41 ug/L, Cadmium <0.365 ug/L, Mercury <0.361 ug/L, Molybdenum <4.79 ug/L, Selenium <10. Ug/L8, Silver <3.3 ug/L
2. Not sampled

2.3.3 WPF Removal Efficiencies

Historical data influent (Treatment Trains 1 and 2) and effluent data were evaluated to calculate specific WPF removal efficiencies for the POCs. Where possible, site-specific average daily removal efficiencies were selected as representative of the WPF operation; however, where data were not sufficient to determine meaningful mean averages, typical literature median removal values were used to represent typical removal efficiencies. **Table 2-9** provides a summary of the removal efficiencies or the literature values used in calculating the local limits for conventional, non-metal, and metal pollutants.

In its *Local Limits Development Guidance* (2004), EPA indicates that if most of the values reported (above 50 percent) are at or near the detection limit, the data set should not be used in calculating local limits. Therefore, treatment or removal efficiencies are based on the literature values from the *Local Limits Development Guidance* (default values in the spreadsheet-based model developed by the EPA). These values are based on surveys made by the EPA of numerous wastewater treatment plants

throughout the United States. Site Specific removal efficiencies were adjusted based on a review of both liquid and solids sampling data collected by the WPF. Where liquid data set contained non detects the "calculated influent" was matched to the measured influent to determine the removal efficiency.

Removal efficiencies for metals were examined based on monitoring data from the wholesale industrial users. Since these customers are required to meet metal discharge standards based on permit requirements, the conservative approach is to develop removal efficiencies based on the sampling data from the domestic influent monitoring locations. A review of data in **Table 2-9** indicates site specific removal efficiencies were established based on residuals data for copper, lead, nickel, and zinc. Site specific percentile removals were also developed based on based on the residual's concentration mass balance in the MDNR Local Limits model.

Table 2-9 Site-Specific Removal Efficiencies for Conventional and Non-Metal Pollutants

Pollutant	Site-Specific Removal Efficiency
BOD	98%
TSS	96%
NH3-N	98%
FOG	91%
Sulfide	97%

Table 2-10 Site-Specific Removal Efficiencies for Metals

Pollutant	Number of Influent Samples	Number of ND Influent/ Effluent Samples	% ND Samples	Site-Specific Removal Efficiency Adjustment	Medium Removal from Model	Removal Efficiency [Literature Value]	Removal Efficiency In model
Arsenic	11	11	100%	32%	32%	45%	32%
Cadmium	11	10	91%	67%	67%	67%	67%
Chromium	11	11	0%	70%	70%	82%	70%
Copper	11	0	0%	51%	90%	-	51%
Cyanide	0	0	-	67%	69%	69%	67%
Lead	11	0	0%	64%	88%	-	64%
Mercury	11	10	91%	59%	59%	60%	59%
Molybdenum	11	11	100%	43%	43%	43%	43%
Nickel	11	0	0%	37%	37%	-	37%

Pollutant	Number of Influent Samples	Number of ND Influent/ Effluent Samples	% ND Samples	Site-Specific Removal Efficiency Adjustment	Medium Removal from Model	Removal Efficiency [Literature Value]	Removal Efficiency In model
Selenium	11	11	100%	50%	50%	50%	50%
Silver	11	11	100%	75%	75%	75%	75%
Zinc	11	0	0%	49%	81%	-	49%

Note: Site specific removal efficiencies were developed utilizing the residuals data collected by the WPF.

3.0 Modeling Data Acquisition and Requirements

3.1 Overview of the MAHL Approach

The proposed industrial discharge limits for the WPF are derived using the MAHL approach developed by EPA and summarized in its *Local Limits Development Guidance* (2004).

The MAHL approach is used to evaluate local limits for POCs based on WPF data and environmental criteria specific to the WPF. This approach ensures that critical headworks loadings are not exceeded, and the environment and treatment facility are protected from excessive discharges of conventional, metal, and organic pollutants.

The allowable headworks loading (AHL) for each POC is calculated based on three criteria:

- Effluent quality standards,
- Sludge quality standards, and
- Treatment process inhibition

The lowest AHL is the MAHL for that POC and ultimately becomes the basis for developing local limits.

3.2 Effluent Quality-Based AHL

POTWs are required to prohibit industrial discharges in amounts that result in violations of their NPDES permit limits. Discharge permit limits typically consist of specific numeric values for conventional pollutants and, in some cases, toxic pollutants. Where a POTW's permit contains specific limits for a POC, the POTW must calculate uniform limits for industrial discharges (local limits) which ensure that the permit limits are not exceeded.

In this determination, the POTW must account for in-WPF removals and domestic contributions for each pollutant to be regulated. The equation for deriving an AHL based on NPDES permit limits is as follows:

$$AHL_{NPDES} = \frac{8.34\ (C_{NPDES})(Q_{POTW})}{(1 - R_{POTW})} \qquad (Equation\ 3.2(a))$$

where:

$AHL_{NPDES} = Allowable\ headworks\ loading\ in\ mg/L$

$C_{NPDES} = NPDES\ permit\ effluent\ limitation\ in\ mg/L$

$Q_{POTW} = Average\ WDF\ flow\ rate\ in\ mgd$

$R_{POTW} = Plant\ removal\ efficiency\ expressed\ as\ decimal$

For POCs that are not regulated by the POTW's NPDES permit, an AHL is still calculated based on the state water quality standard (WQS), if applicable. The equation for deriving an AHL based on a WQS is as follows:

$$AHL_{WQ} = \frac{8.34\ [(C_{WQ})(Q_{STR} + Q_{POTW}) - (C_{STR})\ (Q_{STR})]}{(1 - R_{POTW})} \qquad (Equation\ 3.2(b))$$

where:

$AHL_{WQ} = Allowable\ headworks\ loading\ in\ mg/L$

$C_{STR} = Receiving\ stream\ background\ concentration\ in\ mg/L$

$C_{WQ} = State\ WQS\ or\ EPA\ WQC\ in\ mg/L$

$Q_{STR} = Receiving\ stream\ flow\ rate\ in\ mgd$

$Q_{POTW} = Average\ WDF\ flow\ rate\ in\ mgd$

$R_{POTW} = Plant\ removal\ efficiency\ expressed\ as\ decimal$

3.3 Sludge Quality-Based AHL

POTWs must prohibit nondomestic discharges which cause violation of applicable sludge disposal/use regulations or restrict the POTW from using its chosen biosolids disposal/use option. EPA encourages POTWs to develop local limits based on beneficial reuse of biosolids regardless of the current disposal practice. It is highly recommended that the discharge limits be established to enable the POTW biosolids to comply with 40 CFR Part 503 Annual Application Loading Rate (AAR) limits and Cumulative Application Loading Rate (CAR) limits. The strictest biosolids criteria and application rates are used to meet the 40

CFR Part 503 Alternate Pollutant Limitations. While the WPF has used land application in the past it has moved to disposal the disposal of the residuals as either a fertilizer or unrestricted use as a soil conditioner. As a backup plan, the ultimate disposal of residuals will be in the City owned landfill. The City will not re-establish its land application program therefore the residuals analysis was completed using the exceptional quality criteria from 40 CFR part 503. Equation 3.3 provided the approach that residuals were evaluated to establish the headworks loading due to residuals quality.

$$AHL_{SLDG} = \frac{8.34\ (C_{SLDG})(Q_{SLDG})\left(\frac{PS}{100}\right)}{(R_{POTW})} \qquad (Equation\ 3.3(a))$$

where:

$PS = Percent\ solids\ of\ sludge\ to\ disposal\ area$

$Q_{SLDG} = Sludge\ flow\ to\ disposal$

$R_{POTW} = Plant\ removal\ efficiency\ expressed\ as\ decimal$

$C_{SLDG,CEIL} = Ceiling\ concentration\ in\ mg/kg$

$C_{SLDG} = Controlling\ equivalent\ sludge\ standard\ in\ mg/kg$

$AHL_{SLDG} = Allowable\ headworks\ loading\ in\ mg/L$

3.4 Treatment Process Inhibition-Based AHLs

POTWs are required to protect themselves against industrial discharges that inhibit their treatment processes. EPA guidelines require POTWs to develop local limits based on known or estimated inhibitory concentrations of toxic pollutants that may be discharged to the POTW. Discharge limits must be evaluated to ensure that these inhibitory concentrations are not exceeded in the WPF influent. In this derivation, the WPF must account for in-process removals and domestic contributions for each limited pollutant.

The AHL to prevent inhibition of the secondary treatment process is calculated as follows:

$$AHL_{SEC} = \frac{8.34\ (C_{INHIB2})(Q_{POTW})}{(1 - R_{PRIM})} \qquad (Equation\ 3.4(a))$$

where:

$AHL_{SEC} = Allowable\ headworks\ loading\ in\ mg/L$

$C_{INHIB2} = Inhibition\ concentration\ for\ secondary\ treatment\ in\ mg/L$

$Q_{POTW} = Average\ WPF\ flow\ rate\ in\ mgd$

$R_{PRIM} = Primary\ treatment\ removal\ efficiency\ expressed\ as\ decimal$

The AHL to prevent inhibition of sludge digestion for conservative pollutants like metals is calculated as follows:

$$AHL_{DGSTR} = \frac{8.34\ (C_{DGSTRINHIB})(Q_{DGSTR})}{(R_{POTW})} \qquad (Equation\ 3.4(b))$$

where:

$AHL_{DGSTR} = Allowable\ headworks\ loading\ in\ mg/L$

$C_{DGSTRINHIB} = Inhibition\ concentration\ for\ secondary\ treatment\ in\ mg/L$

$Q_{DGSTR} = Sludge\ flow\ rate\ to\ digester\ in\ mgd$

$R_{POTW} = Plant\ removal\ efficiency\ expressed\ as\ decimal$

4.0 Development of Local Limits for Conventional and Non-Metal Pollutants

EPA requires POTWs to evaluate BOD, TSS, and ammonia as conventional and non-metal pollutants for the establishment of local limits. As part of the 2012 design BOD, TSS, and ammonia loading criteria were established and are in **Table 4-1**. **Appendix E – Conventional Pollutant Analysis** indicates the reserve capacity the WPF has for conventional pollutants and metals. Data for **Appendix E – Conventional Pollutant Analysis** was completed examining the permitted allocation, historical use, and design capacity for both the domestic influent and the wholesale users.

Table 4-1 Design Loading (lbs/day) for WPF

Parameter	Unit	Average Daily	Maximum Month	Peak Daily
Domestic Influent				
TSS Load	lb/d	25,000	38,200	348,000
BOD Load	lb/d	25,000	38,200	68,000
NH_4-N Load	lb/d	2,620	4,000	7,130
TKN Load	lb/d	3,970	6,070	10,790
South St Joseph Sanitary District				
TSS Load	lb/d	4,900	11,605	34,815
BOD Load	lb/d	8,950	17,150	51,450
NH_4-N Load	lb/d	1,030	1,600	2,000
TKN Load	lb/d	1,450	2,250	2,813
Triumph Foods				
TSS Load	lb/d	1,800	3,800	8,027
BOD Load	lb/d	3,000	6,400	6.881
NH_4-N Load	lb/d	1,900	2,800	3,600
TKN Load	lb/d	2,210	3,250	4,014
National Beef Leather				
TSS Load	lb/d	600	1,900	4,000
BOD Load	lb/d	200	800	2,600
NH_4-N Load	lb/d	2,400	3,100	8,000
TKN Load	lb/d	2,530	3,270	8,430
Combined Final Design Criteria				
TSS Load	lb/d	32,300	52,210	388,520
BOD Load	lb/d	37,150	58,550	126,650
NH_4-N Load	lb/d	7,950	9,900	15,030
TKN Load	lb/d	10,160	13,060	20,123

The maximum month loadings will serve as the design loadings used within this analysis. It should be noted that from a design standpoint has facilities to meet the peak day loadings. Since the establishment of the peak day loadings, the City has undertaken significant projects to minimize the quantity and quality of combined sewer overflows that are discharged to the Missouri River, therefore the plant has significant BOD and TSS capacity at the WPF.

4.1 BOD and TSS

Two levels of protection will be provided for BOD and TSS within the WPF program. The WPF has established average day and peak day loading requirements for BOD and TSS for its wholesale industrial users as part of the upgrade project completed 2015. Site specific limits have been developed for each of the wholesale industrial users based on loadings. These limits are established for monthly average, maximum month, and peak day conditions to correspond with user specific established limits.

For retail industrial users, first the surcharge program will continue to be implemented. This program assesses fees for treatment of wastewater that exceeds domestic strength (300 mg/L BOD and 350 mg/L TSS). Therefore, if an industrial user is in surcharge it is limited within its permit to the surcharge levels. In addition, peak day limits of 1,000 mg/L BOD and 1,200 mg/L TSS have been established to protect the WPF from slug discharges from non-surcharge industrial users. In addition, the WPF on a site-specific basis has the ability with its ordinance to consider the development of peak hour limits for select industrial users in order to prevent impacts of peak slug loads on the WPF. **Appendix E – Conventional Pollutant Analysis** indicates the reserve ammonia capacity. It is recommended that the WPF continue to implement its existing approach to control BOD and TSS.

4.2 Ammonia

Two levels of protection will be provided within this program for ammonia/TKN. The City has established average day and peak day loading requirements for ammonia for its wholesale industrial users and TKN specifically for Triumph Foods and SSJ as part of the upgrade project completed 2015. Site specific ammonia loading limits have been developed each of the wholesale industrial users.

For retail industrial users, first the surcharge program will continue to be implemented. This program assesses fees for treatment of wastewater that exceeds domestic strength (30 mg/L ammonia). This is established as a permit requirement. In addition, peak day limits of 100 mg/L ammonia have been established to protect the WPF from slug discharges. Also, the WPF on a site-specific basis should consider peak hour limits for select industrial users in order to prevent impacts of peak slug loads on the WPF. **Appendix E – Conventional Pollutant Analysis** indicates the reserve ammonia capacity. It is recommended that the WPF continue to implement this approach for control of ammonia discharges in the system.

4.3 FOG

The City currently utilizes two approaches for the control of FOG discharges to the wastewater collection system. First the City has implemented a FOG program with its food service establishments. This program utilizes best management practices and regulated outside the traditional IPP program. Second the City has established surcharge value of 100 mg/L. If an IU discharges greater than 100 mg/L FOG, they are charged a fee for treatment of FOG. The City also has a daily maximum limit of 200 mg/L FOG which is based on a maximum not to exceed number on a grab sampling basis. So there is a two-step process for the control of FOG. The method of sampling FOG, based on 40 CFR 136, is to use a grab method. Historical effluent monitoring data has achieved NPDES permit requirements. Currently, the City's WPF staff has noticed maintenance issues at the influent bar screens due to FOG issues; therefore, it is recommended that the City retain its current FOG limit of 200 mg/L and monitor influent characteristics to determine if additional modifications to FOG limits are necessary.

FOG or hexane extractable material (HEM) is defined as any material that extracts into hexane or freon. The functional definition, solubility in hexane or freon, is often the only characteristic common to the many diverse forms of FOG discharged by industrial users. To understand control strategies and treatment schemes for FOG, it is important to realize that there are two general types of FOG: those of animal/vegetable (A/V) origins and those of petroleum/mineral origins. Other types of materials, such as surfactants and wax, also extract as FOG.

Animal/vegetable FOG typically consists of materials discharged from commercial establishments (e.g., restaurants), food processing facilities (e.g., soybean processors, meat packing houses, frozen food processors) and chemical products manufacturing facilities (e.g., makers of soaps and cosmetics). FOG that solidifies or congeals at a temperature of 60 to 80°F can obstruct sewers and interfere with primary clarification and sludge digestion in POTWs.

Petroleum FOG includes such materials as gasoline, kerosene, fuel oils, and motor oils. These compounds can be either floatable or settleable and are usually only slightly soluble in water. Federal regulations prohibit the discharge of petroleum FOG that could interfere with the POTW or cause an explosion. The approach to controlling FOG discharges varies from community to community. Black & Veatch recently completed a survey of communities that have established a local limit to regulate discharges of oil and grease.

4.4 Sulfide

WPF staff have indicated that hydrogen sulfide has caused problems in the past. As part of this study, a site-specific study was conducted to examine the liquid and vapor phase sulfide levels at a specific location in the collection system. During the site-specific study, an IU collected effluent flow, liquid

stream sulfide, pH data and Acrulogger (Vapor phase odor logger) data for gas phase H_2S concentration was also provided during November 2020. Figure 4-1 presents the data collected by IU.

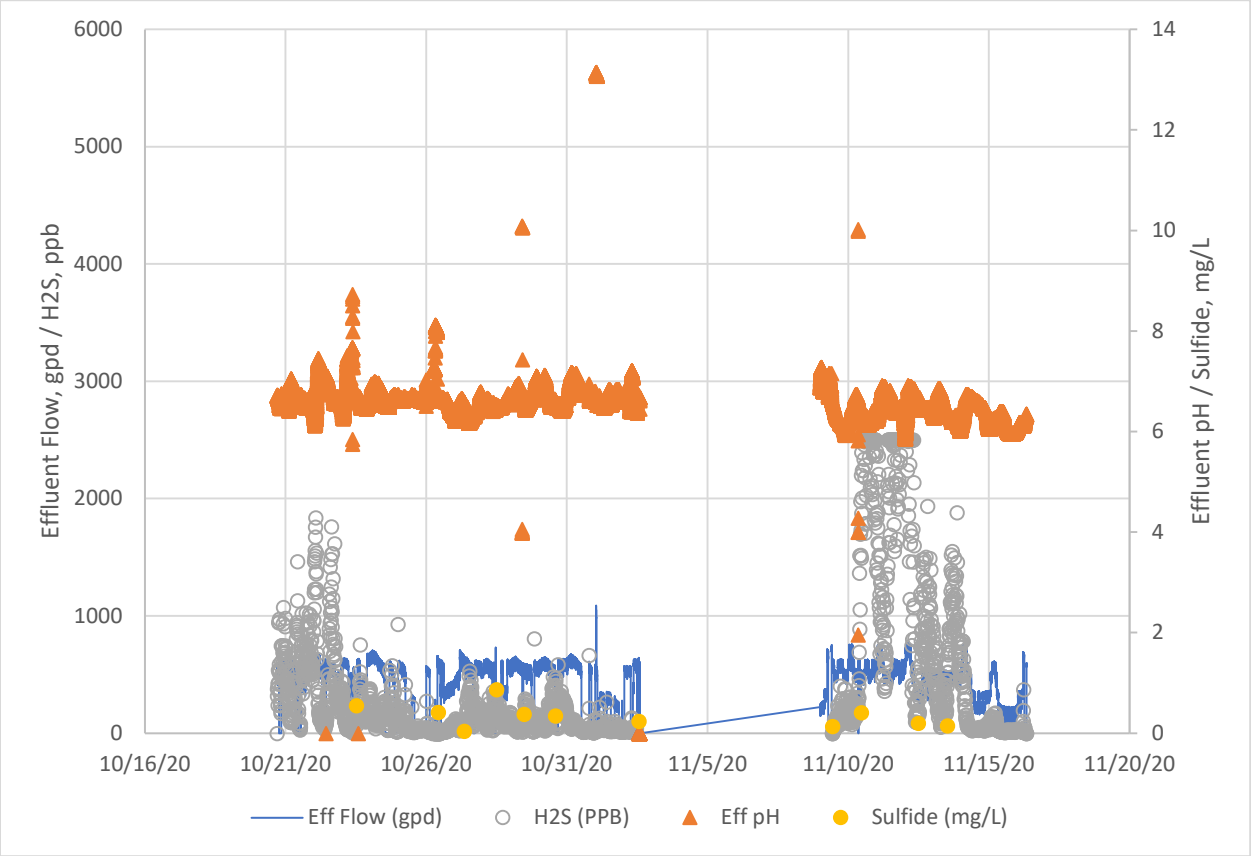

Figure 4-1 Industrial User Data October-November 2020

This data tended to show a maximum vapor phase concentration of 2.5 mg/L and maximum liquid phase concentration of 0.87 mg/L which was provided by the IU. The Acrulogger (Vapor phase odor logger) had a maximum set point of 2.5 mg/l; therefore, it was unable to measure spikes above that level.

The WPF conducted a follow-up study during April 2021 including the same parameters as the IU study: including effluent flow, liquid stream sulfide and pH data, and Acrulogger (Odorlogger) data for gas phase H_2S concentration. The maximum sulfide concentration was measured at 5 mg/L and the maximum liquid phase concentration of 1.3 mg/L. **Figure 4-2** presents the St. Joseph WPF data. It should be noted, the WPF flow data is in mgd while the IU flow data is in gpd.

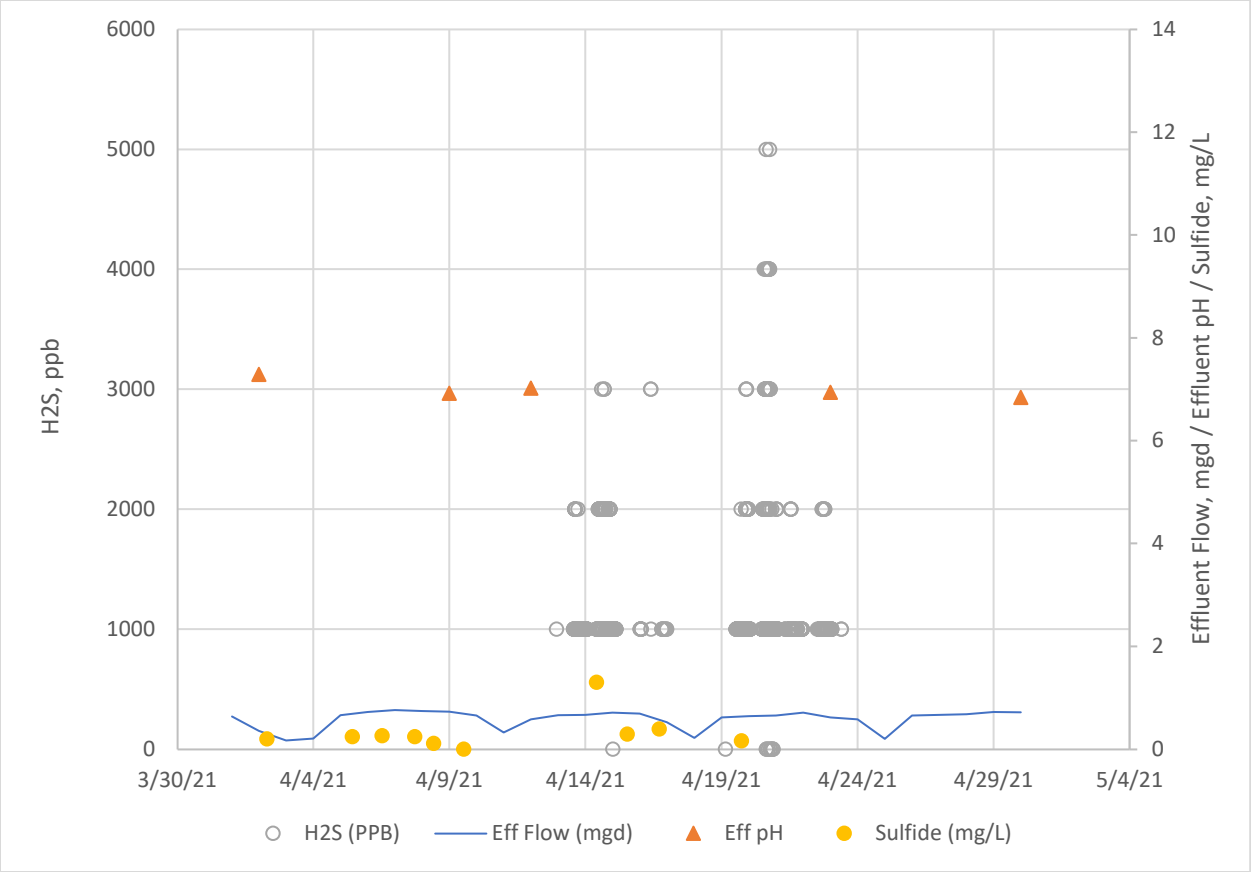

Figure 4-2 City of St. Joseph WPF Data April 2021

The overall goal of these studies was to correlate liquid phase hydrogen sulfide with vapor phase concentrations to provide an online approach for confirming compliance with the existing hydrogen sulfide limit.

The procedures described in **Chapter 6.0** were used to establish a sulfide screening concentration of 0.04 mg/L liquid phase based on protection of WPF worker health and safety. Since procedures exist based on use of personal protective equipment at this limit, this approach serves as a screening value confirming the need for a limit. A literature review of hydrogen sulfide impacts on concrete indicated that at sulfide concentrations of over 0.5 mg/L the possibility of increased corrosion in the sewers can occur. (American Society of Civil Engineers (ASCE), 1982). Therefore, it is recommended that the WPF maintain its daily maximum limit of 0.5 mg/L for hydrogen sulfide based on protection of concrete in the collection system and consider conversion of the limit to a mass-based approach on a site-specific basis. Clarification may need to be provided within the permit to ensure that discharge is occurring during the collection of samples for sulfide analysis.

5.0 Development of Local Limits for Metals

5.1 MAHLs

Following the MAHL approach outlined in **Chapter 3.0**, BV calculated AHLs based on effluent quality, sludge quality, and treatment process inhibition for each metal POC using updated site-specific data. Influent and effluent concentrations and calculated plant removal efficiencies are presented in **Section 2.3**. Other site-specific data incorporated in the calculations are summarized below.

5.1.1 Effluent Quality Criteria

The WPF's NPDES permit (Appendix A) does not specify effluent limitations for any of the metal POCs. The effluent quality based AHL is therefore calculated using Missouri WQS. The receiving water flow is based on the 7Q10 flow identified in the WPF's NPDES permit. The data used is shown in the local limits model.

5.1.2 Sludge Quality Criteria

Sludge generated at the WPF is currently dried prior to use as either fertilizer, unrestricted use as a soil conditioner or landfill. Land Application is no longer practiced at the WPF however this method of residuals disposal is still allowed within the permit. Since the WPF desired to move its residuals program to an unrestricted use as a soil conditioner the analysis was completed assuming exceptional solids criteria from 40 CFR part 503. The WPF recently received a permit from the Missouri Fertilizer Control Board which has been included in Appendix A.

5.1.3 Inhibition Criteria

Within a wastewater treatment facility, the processes most susceptible to upset are those that rely on biological activity. **Table 5-1** presents the inhibitory concentrations that were considered in the development of local limits for metal pollutants. These data were obtained from the EPA's *Local Limits Development Guidance* (2004). The EPA manual contains no information on inhibitory concentrations for molybdenum and selenium. Therefore, it was assumed in the local limit calculations that these metals would not affect sludge disposal.

Table 5-1 Inhibition Concentrations from Literature

Pollutant	Maximum Influent Concentration, mg/L	Activated Sludge Inhibition Concentration, mg/L	Anaerobic Digestion Inhibition Concentration, mg/L
Arsenic	0.0017	0.1	1.6
Cadmium	0.0010	1	20
Chromium, Total	0.0083	1	100
Copper	0.044	1	40

Pollutant	Maximum Influent Concentration, mg/L	Activated Sludge Inhibition Concentration, mg/L	Anaerobic Digestion Inhibition Concentration, mg/L
Cyanide		0.1	4
Lead	0.012	0.1	340
Mercury	0.0007	0.1	NA
Molybdenum	0.0024	NA	NA
Nickel	0.0079	1.0	10
Selenium	0.0054	NA	NA
Silver	0.0017	0.25	13
Zinc	0.120	1	400

5.2 Maximum Allowable Industrial Loadings

The maximum allowable industrial loading (MAIL) is calculated from the MAHL using the following equation:

$$MAIL = MAHL * (1 - SF) - L_{UNC} \qquad (Equation\ 5.2)$$

where:

$MAIL = Maximum\ allowable\ industrial\ loading\ in\ lbs/day$

$MAHL = Maximum\ allowable\ headworks\ loading\ in\ lbs/day$

$SF = Factor\ of\ safety$

$L_{UNC} = Domestic\ (uncontrolled)\ loading\ in\ lbs/day$

5.2.1 Domestic Loadings

Domestic loadings of metal POCs are based on the domestic concentrations identified in **Section 2.3**.

5.2.2 Factor of Safety

Local Limits Development Guidance (2004) indicates the following regarding the establishment of safety factors: POTWs should consider allocating only a portion of the maximum allowable headworks loading for each pollutant to the POTW's current industrial and domestic users. The remaining portion of the maximum allowable headworks loading for each pollutant is held in reserve as a safety factor.
A safety factor is typically established to consider the following:

- Potential future industrial growth resulting in new and/or increased industrial discharges to the POTW,
- Potential slug loadings, and
- Variability and measurement error associated with POTW design/performance parameters used in deriving local limits.

EPA has stated that a minimum safety factor of 10 percent of the MAHL is usually adequate and therefore was used for all pollutants in this study.

5.3 MAIL Allocation Approaches

The final step in the development of local limits using the MAHL approach is the conversion or allocation of the MAIL into industrial concentration-based limits (local limits). Local limits for a POC are derived as part of this allocation. The following three methods identified by EPA should be considered for the allocation of MAILs:

- Uniform allocation,
- Contributory flow allocation, and
- Mass proportional allocation.
- Allocation by Permit

5.3.1 Uniform Allocation

Uniform allocation results in the most restrictive local limit for each POC. This method distributes the MAIL among all permitted SIUs in the service area on a flow-weighted basis.
The method of determining concentration-based limits of the maximum allowable industrial allocation is as follows:

$$C_{LIM} = \frac{MAIL}{Q_{IU}\ x\ 8.34} \qquad (Equation\ 5.3.1)$$

where:

$C_{LIM} = Uniform\ concentration\ limit\ in\ mg/L$

$MAIL = Maximum\ allowable\ industrial\ loading\ in\ lbs/day$

$Q_{CONT} = Total\ flow\ from\ industrial\ users\ (controlled) in\ mgd$

This allocation method is not recommended for implementation by the City.

5.3.2 Contributory Flow Allocation

The contributory flow method distributes the MAIL for each POC to only those SIUs who have been identified as having the potential to discharge the POC. Those industries that have been identified as

having no potential to discharge the POC above background concentrations are classified as noncontributory industrial discharges for that POC. BV recommends that the City develop contributory-flow local limits at this time. Limits for each permitted user are presented in Appendix E.

5.3.3 Mass Proportional Allocation

The third option for development of local limits is the mass proportion method. With this method, SIUs are assigned the maximum allowable industrial allocation based on mass. This method would be the most complicated and difficult for the City, but it would be the most equitable for industrial users. BV also recommends that mass based allocation be used to develop local limits at this time.

5.3.4 Allocation by Permit

A fourth option for development of permit limits is to allocate the MAIL based on the information provided by the industrial users within the permit application. This method of allocation allows for the City to consider the industrial users ability to meet the permitted limits. It is recommended that the City use this method to establish industrial permit limits. These limits could be established as concentration or mass based on request of the various industrial users. This is the approach that it is recommended that the WPF adopt.

5.4 Recommended Local Loadings

Recommended pollutant loading for each metal POC based are listed in **Table 5-2**. These loads are conservative to provide protection to the treatment facilities, to the receiving water quality, and to the WPF biosolids under current and future conditions. As calculated, these limits will prevent interference and pass-through at the WPF of pollutants from the current industrial discharges. These loads were developed for a maximum not to exceed condition. The USEPA Local Limits Development Guidance (EPA 833-R-04-002A, 2004) indicates that "a POTW can apply to its controllable sources concentration based or mass based limits or both". The WPF has decided to implement mass based limits for all its permitted users. USEPA (2004) also indicates that "If a POTW allocates its MAILs on a case-by-case basis depending on an IU's need for certain loading allocation, the POTW may find it easier to apply mass-based limits (in individual permits) that allow for the needed loading at the IU." The POTW needs to consider the ability to determine and enforce compliance. EPA recommends that the POTW consider the IUs sampling capabilities when determining the type of limits that apply to an IU." If flow meters are not available, EPA recommends that both concentration and mass limits are incorporated into the IU discharger permit. In addition USEPA indicates that "mass based limits have the added benefits of allowing IUs to reduce their water consumption through conservation or recycling without affecting their ability to meet local limits. The output from the EPA spreadsheet used to calculate these limits is in **Appendix D - Local Limits Calculations Modeling Runs**. It is recommended that these limits be published in the City's Ordinance to allow users to know the loadings in the community.

Table 5-2 Recommended Local Loadings for Metals

Pollutant	Existing Local Limit, mg/L (Daily Maximum)	TBLL MAHL Model Result, ppd	Recommended MAIL, ppd
Arsenic, mg/L	0.62	1.89	1.56
Barium, mg/L	NL	NL	Monitoring only
Boron, mg/L	NL	NL	Monitoring only
Cadmium, mg/L	0.07	0.86	0.76
Chloride, mg/L	NL	NL	Monitoring only
Chromium, Total, mg/L	4.57	18.25	16.0
Cobalt, mg/L	NL	NL	Monitoring only
Copper, mg/L	1.64	43.38	36.03
Cyanide, mg/L	0.38	16.53	14.04
Fluoride, mg/L	NL	NL	Monitoring only
Glyphosate	NL	NL	Monitoring only
Iron, mg/L	NL	NL	Monitoring only
Lead, mg/L	0.53	6.91	5.97
Manganese, mg/L	NL	NL	Monitoring only
Mercury, mg/L	0.14	0.42	0.37
Molybdenum, mg/L	0.45	2.57	2.08
Nickel, mg/L	0.99	16.74	14.47
Selenium, mg/L	0.75	1.06	0.91
Silver, mg/L	1.75	49.44	44.33
Sulfate, mg/L	NL	NL	Monitoring only
Zinc, mg/L	3.00	84.28	68.94

Note: NL = No existing limit and no TBLL analysis conducted at this time

6.0 Organic Pollutants Control Strategy

Controlling discharges of toxic organic/ organic compounds is a critical component of IPP. Unregulated discharges of toxic organic compounds can inhibit the treatment process or pass through untreated into the receiving stream and can also cause explosions in the wastewater collection system or create other safety hazards to workers.

6.1 Control Methods

BV conducted a nationwide survey of the methods used by other communities to control and regulate discharges of toxic organic compounds. A total of 30 communities representing all EPA regions were surveyed about the procedures they used to control and regulate toxic organic compounds in their wastewater systems.

The results of this survey (**Table 6-1**) indicate a variety of approaches, including establishing a local limit for total toxic organics (TTO) based on 40 CFR 433.11(e), establishing local limits for individual toxic organic compounds, and establishing no local limits. The survey also disclosed that communities that had established a local limit based on 433.11(e) were reevaluating these limits. Limits for individual organic compounds were typically developed by communities that practice effluent reuse. Communities that reported having no limits for toxic organic compounds stated that monitoring and data collection indicated there was no need for a limit. Two communities based toxic organics control on vapor headspace monitoring, which involves collection and analysis of information on both liquid and gaseous phase pollutants.

Table 6-1 Summary of Organic Compounds Control Approaches

Approach	Number of Communities
Local Limit for TTO	7
Local Limits for Individual Organic Compounds	7
No Local Limits	8
Local Limit based on Vapor Headspace	2
Screening Limit Based on Henry's Law	2
General Prohibition	4
TOTAL	**30**

6.2 Recommended Approach to Organic Compounds Control

The results of the nationwide survey and the establishment of the organic pollutants of concern list indicate the need for a flexible approach to controlling both toxic and nontoxic organic compounds. Organics control is also addressed by the general and specific prohibitions in the City's SUO 29-281. All

federally regulated industries must continue meeting TTO limits at the categorical monitoring point. The following operating procedures are recommended:

- Identification of IUs that discharge toxic organic compounds through use of existing City survey forms.
- Establishment of procedures for development of specific limits or best management practices for control of organic pollutants of concern, if it found that the specific IU is causing issues at the point of discharge. It is noted that if site specific organic limits are established in an IU permit then the permit would have to be public noticed. Procedures would be incorporated into the sewer use ordinance to allow for the City to implement these requirements.
- If site specific IU TTO limits were developed then that permit may need to be public noticed before it is finalized.

This approach will provide flexibility to regulate all types of organic compounds and should enable the pretreatment coordinator to adjust the pretreatment limits depending on the source of the pollutants and the physical/chemical conditions at the point of discharge.

6.2.1 Identification of Industrial Users (IU)

The City should continue to evaluate IUs that may discharge toxic organic compounds to the collection system. It is recommended that the City require once-a-permit cycle monitoring for organic compounds. Data compiled by this monitoring will enable the City to assess the impacts of this approach on the IUs.

6.2.2 Development of Specific Limits/Best Management Practices

If it found that the specific IU is causing issues relative to TTOs at the point of discharge, the City should consider the development of specific limits or best management practices for control of organic pollutants of concern. It is noted that if site specific organic limits are established in an IU permit then the permit would have to be public noticed. The limits will be based on protecting the WPF, the wastewater collection system, and worker safety and health.

7.0 References

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- U.S. Environmental Protection Agency, Quality Criteria for Water. Washington, DC: EPA, 1986
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- U.S. Environmental Protection Agency, Guidance to Protect POTW Workers from Toxic and Reactive Gases and Vapors, Washington DC, EPA, June 1992.
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1987-1988. National Institute of Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards, September 1985
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- Yaws, Carl; li-C Yang; and X. Pan, Henry's Law Constants for 360 Organic Compounds in Water, Chemical Engineering, November 1991.
- U.S. Environmental Protection Agency, Local Limit Development Guidance, EPA 833-R-04- 002A, Washington, DC; EPA, July 2004.