City of PIQUA

DEVELOPMENT DEPARTMENT

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Date: March 9, 2023

To: MVRPC Board of Directors, Technical Advisory Committee, and Area Water Quality Planning Subcommittee Members

Re: Piqua Facility Planning Area (FPA) Boundary

Directors and Committee Members:

We submit for your consideration a request to amend the Piqua FPA boundary.

The City of Piqua has long planned for the expansion of water and sewer utilities to allow for the continued growth and expansion of the community. The recent annexation of nearly 700 acres into the municipal corporation limits has prompted the need to adjust the FPA boundary. The proposed boundary adjustment will encompass the annexation area and land identified for future growth and development opportunities.

With the recent construction of a new water treatment plant and an expansion of the wastewater treatment plant, the City of Piqua is well positioned to serve the proposed FPA boundary expansion area with water and gravity sewer mains.

Currently the FPA boundary of the neighboring jurisdiction extends north into the area recently annexed into the City of Piqua. It appears that Farrington Road was previously used as a placeholder for the FPA boundary between the two abutting jurisdictions. The topography in this area indicates a more natural boundary line would be the waterway south of Farrington Road and the township line. Adjusting the Piqua FPA boundary to follow the township line will bring the entire annexation area into the Piqua FPA. Conversation between City of Piqua and City of Troy representatives resulted in both parties acknowledging the township line as a logical shared boundary line for the abutting FPA's.

The expansion of the FPA to the west extends to a natural break in the watershed and the proposed boundary line follows local roadway alignments. This area too can be served with water and gravity sewer mains.

Included with this submittal are the materials requested by the MVRPC Facility Planning Area Update Proposals Guidelines. Please let us know if there are any questions pertaining to this request.

Sincerely,

Chris Schmiesing
Community and Economic Development Director

c: Paul Oberdorfer, City Manager
Keving Krejny, Underground Utilities Director

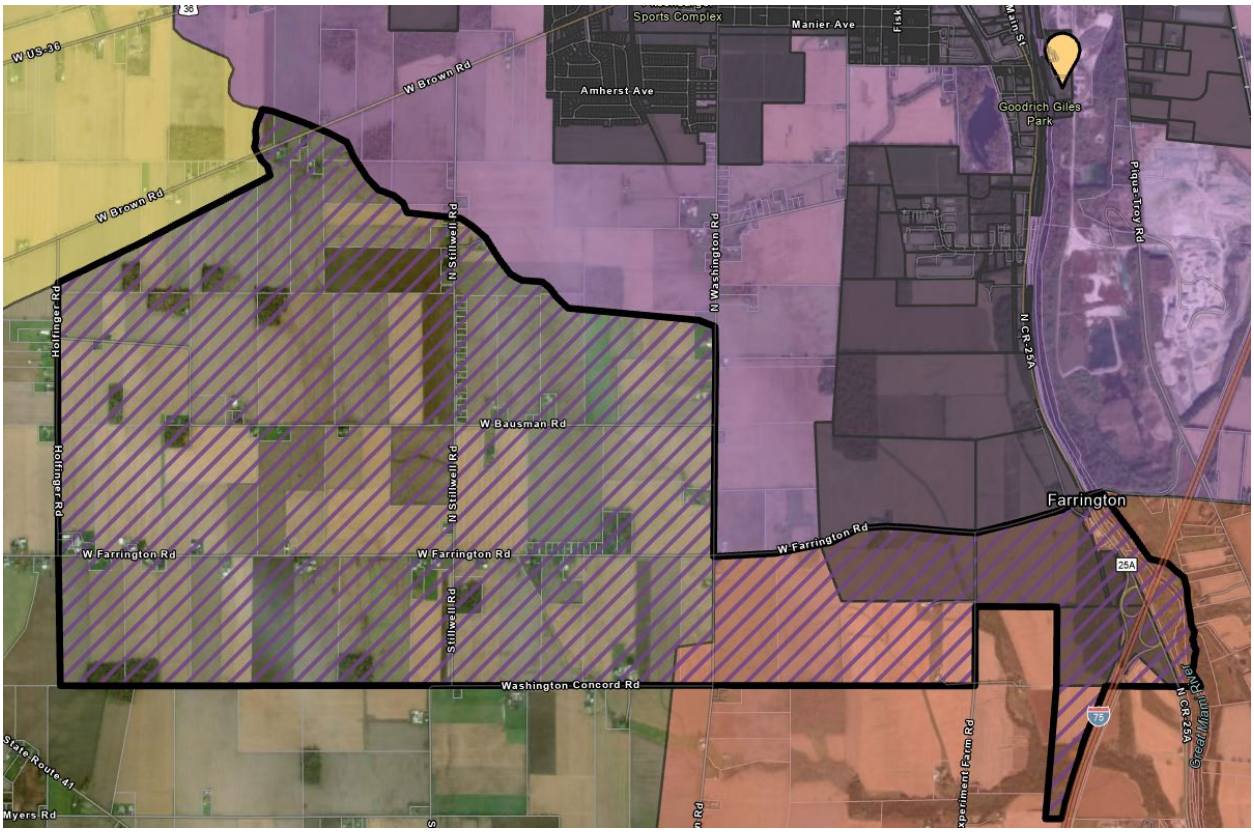
City of PIQUA

FPA Update Request Report

FPA Update Request

A layout of proposed boundary change has been included, as well as its shapefile. The map includes:

a. Piqua wastewater treatment plant, located at 121 Bridge Street
b. Piqua current FPA boundary, shown in solid purple
c. Troy current FPA boundary, showing in solid orange
d. Covington current FPA boundary, shown in solid yellow
e. Piqua proposed FPA addition, shown in hatched purple
f. Piqua current jurisdiction, shown shaded gray



Piqua Past and Future Projected Population

According to decennial Census data, the City of Piqua population has remained relatively unchanged since 1990. Population projections from MVRPC projects that Miami County may grow by 14% from 2010 population numbers by 2050.

Piqua, Ohio (Decennial Census Data)	
2020	20,354
2010	20,522
2000	20,738

Total 20-year population loss of 1.8%

Miami County, Ohio (Census Decennial Data)	
2020	108,744
2010	102,506
2000	98,868

Total 20-year population gain of 9.9%

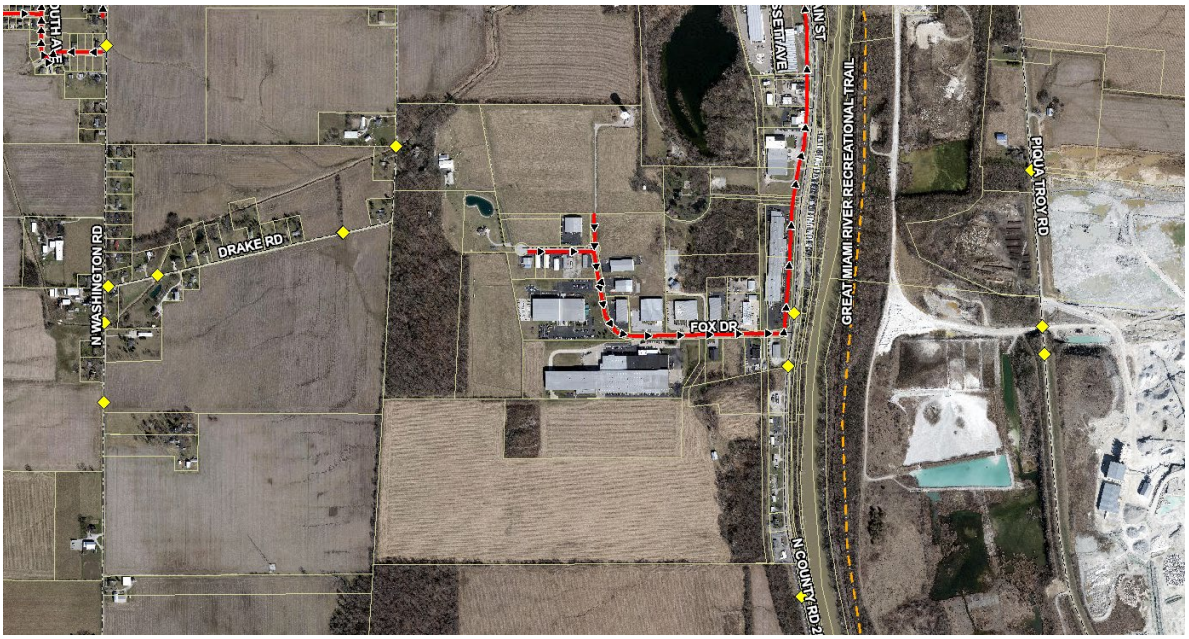
MVRPC (2050 Population and Employment Projections for Long Range Transportation Planning) projects additional population growth of an additional 8,500 people for Miami County by 2050. Recently, securing national supply chain interests and reshoring manufacturing to the states has resulted in a substantial uptick in economic expansion opportunities. Ohio is well positioned to benefit from this trend. Sidney's Semcorp announcement of an estimated 1,200 jobs is a good example of additional growth happening in our region.

Piqua is well positioned to capture a significant share of the anticipated population growth projected for the county. Piqua has plans in place to meet the population growth housing needs through subdivision development activity and on infill sites within the community.

Planning for Development

The Plan It Piqua Comprehensive Plan (2007) describes the southwestern area surrounding the city as being well suited for strategic growth. A recent highest and best use analysis commissioned by Grow Piqua Now shows that advanced manufacturing and possibly logistics and distribution are an excellent fit for the land. The proximity of Exit 78 along I-75, the availability of large tracts of undeveloped land, and the proximity to Piqua's utility services make this an attractive location for development. The nearly 700 acres recently annexed was assigned an "I2 – Heavy Industrial" zoning by the City Commission.

The buildout of industrial development within the newly annexed territory is likely to occur over the next 5-10 years. As this take place Farrington Road west of County Road 25-A will transform into an industrial corridor with convenient access to Interstate 75.



Treatment within the Proposed FPA

Piqua upgraded its wastewater treatment plant in 2018, and the plant is now fully modernized and can treat up to 8.7 MGD. 2021 and 2022 use averaged 3.88 MGD, meaning that the plant is at less than half of its maximum capacity. The City's preferred method of treatment for new manufacturing development in the area is to gravity-feed all wastewater to the existing plant.

Excess capacity is available and the existing WWTP is more than capable of handling the projected needs. On the residential side, if average daily water usage is 100 gallons per person, and Piqua grew by 10% as the County as a whole did over the past 20 years, an additional need for about 200,000 gallons of treatment would be required. A large end user could perhaps prompt the City to consider adding additional capacity in the future, but for now there is a large amount of excess capacity to work with.

Public Involvement

Public involvement included public meetings conducted by the Piqua Planning Commission on September 13, 2023, and the City Commission on October 4, 2023, and October 18, 2023.

Water Quality

Piqua is a water quality-focused jurisdiction. The City does not allow new septic systems, with an aim to protect the region's fresh water assets to the extent possible. Failing septic systems may not be rebuilt if a connection to the wastewater system is feasible.

Stormwater quality is increasingly a focus as well, and the City will be implementing recommended riparian buffers and allowing native prairie species to be planted on industrial sites to take the place of mowed grass, to decrease the quantity and increase the quality of stormwater runoff on industrial sites within Piqua. Any wetlands within the boundary will be both avoided by development and protected by a setback buffer to reduce impacts.

Piqua's imminent elimination of minimum parking requirements, and encouragement of shared parking along with Low Impact Development techniques for parking lot construction all combine to make Piqua for a best-case regulatory environment for large site development to occur in terms of protection of water resources.

Regional Coordination

Piqua and Troy have traditionally had a professional and open relationship when it comes to governmental coordination and cooperation. Competition always has some presence in the world of economic development and job recruitment, but Piqua is quite happy to celebrate wins for the region, as they reflect on increased choices for housing and employers for the community and a better quality of life. Piqua is very excited to see the trends turning for Ohio and the Midwest as a whole, and positioning ourselves to compete with other states and regions means close coordination with our neighbors.

The City of Piqua views Farrington Road as an arbitrary placeholder for the FPA boundaries between the two jurisdictions, and with the recent annexation it is apparent that is not the appropriate boundary. Rather, the boundary line between Washington and Concord Townships seems to be the most appropriate boundary line location for the FPA limits south of Piqua.

The expansion of the FPA to the west is based upon the natural break in the topography and Piqua ability to serve the area. The expansion has no impact on the existing Covington FPA boundary or any other established boundary area.

TECHNICAL JUSTIFICATION OF INDUSTRIAL LOCAL LIMITS

PIQUA WASTEWATER TREATMENT PLANT

Prepared for:

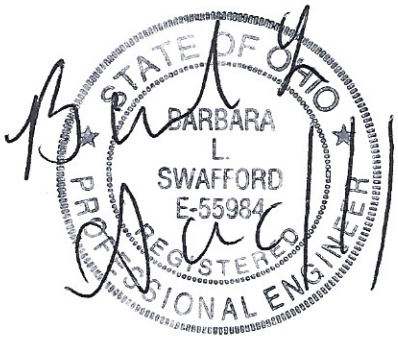
City of Piqua, Ohio

By:

Gerken Swafford Engineering Solutions, LLC

GERKENSWAFFORD
Engineering Solutions, LLC

February 2023



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Tables

Appendices

Definitions

Local Limits Technical Justification Report, City of Piqua WWTP. Prepared by the City of Piqua, 2016.

AHL – Allowable Headworks Loading

BMP – Best Management Practices

DMR – Discharge Monitoring Report

MAHL – Maximum Allowable Headworks Loading

MDL – Method Detection Limit

NPDES – National Pollutant Discharge Elimination System

Ohio EPA – Ohio Environmental Protection Agency

POTW – Publicly Owned Treatment Works

USEPA Guidelines – Local Limits Development Guidance Document and Appendices, USEPA 8933-R-04-002B

WQB – Water Quality Based

WWTP – Wastewater Treatment Plant

SECTION 1 – INTRODUCTION

Background

The City of Piqua owns and operates a Wastewater Treatment Plant (WWTP) located at 121 Bridge Street, Piqua, Ohio, that treats domestic, commercial, and industrial wastewater from the City of Piqua and the Village of Fletcher. As a publicly owned treatment works (POTW), its discharge to the Great Miami River is regulated by the Ohio Environmental Protection Agency (Ohio EPA) under the National Pollutant Discharge Elimination System (NPDES) Permit No. 1PD00008*WD. The Ohio EPA issued a new NPDES Permit effective September 1, 2022, that requires the evaluation of the "adequacy of local industrial user limitations to prevent the introduction of pollutants into the POTW which will interfere with the operation of the POTW, pass through the POTW, be incompatible with the POTW, or limit the wastewater or sludge use options." Technical justification is required to be submitted to Ohio EPA no later than six months after the effective date of the permit or March 1, 2023.

The WWTP was upgraded in 2020 and is now designed for an average daily flow of 8.7 MGD and a peak hourly flow of 22.5 MGD. The liquid process at the WWTP includes flow equalization, influent pumping, influent screening, grit removal, extended aeration oxidation ditches with biological nutrient removal (BNR), secondary clarification, ultraviolet disinfection, post aeration, and effluent pumping. Sludge is processed by rotary drum thickening, aerobic digestion, and centrifuge dewatering. Biosolids are considered Class B and biosolids are land applied. Appendix A contains a process flow diagram of the Piqua WWTP.

Process of Local Limit Calculations

The purpose of establishing local limits is to avoid passthrough of pollutants to the final effluent and the biosolids and prevent inhibition of the treatment plant processes. The initial step in developing local limits is identifying the criteria used to accomplish the goal of protecting the WWTP. The criteria sources are as follows:

- Water quality-based criteria are set in the NPDES Permit to establish allowable effluent discharge levels to protect the receiving stream.
- Sludge criteria for land applied biosolids are established in the 503 Sludge Regulations.
- Process inhibition thresholds for the activated sludge, nitrification, and anaerobic digestion processes are based on literature values tempered by actual plant performance.

Once the criteria are developed, removal rates are determined through the WWTP and used to develop allowable headworks loadings (AHL) for each set of criteria. The AHL are compared to

determine the maximum allowable headworks loadings (MAHL) for each of the parameters. Non-industrial contributions (background) and a safety factor are subtracted from the MAHL to establish the amount available for distribution to industry. The distribution can either be through uniform concentrations (mg/L) or mass allocation (lbs/day).

Current Local Limits

Piqua's current local limits are the same as the daily maximum limits in 40 CFR 433.17 Metal Finishing Categorical Pretreatment Standards for New Sources. The limits are in shown in Table 1.

Table 1
Current Local Limits

Parameter	Current Local Limit (mg/L)
Arsenic	--
Cadmium	0.11
Chromium, Total	2.77
Chromium, Hex	--
Copper	3.38
Cyanide, Total	1.2
Cyanide, Free	--
Lead	0.69
Mercury	0.03
Molybdenum	--
Nickel	3.98
Selenium	--
Silver	0.43
Zinc	2.61

Categorical Standards apply to the end of the regulated process while local limits apply at the discharge to the POTW's collection system. Using Categorical Standards as local limits may result in more stringent local limits than may be necessary to protect water quality, sludge quality, and the WWTP. Piqua would like to calculate new local limits that are based on water quality criteria, sludge disposal criteria, and inhibition of treatment processes instead of using metal finishing standards as the local limits. This would better reflect actual conditions for the POTW and be applicable to potential new industries that are not metal finishers. The existing metal finishing industries would still be required to comply with Categorical Standards at the end of the regulated process.

Pollutants of Concern

Part I, Section C.A of the NPDES Permit requires that technical justification of local limits include arsenic, cadmium, total chromium, dissolved hexavalent chromium, copper, free cyanide, lead, mercury, molybdenum, nickel, selenium, silver, and zinc.

Parameters included in the NPDES Permit water quality based (WQB) effluent criteria, sludge disposal criteria, process inhibition levels and current local limits were reviewed. The sources of these criteria are as follows:

- WQB Effluent Criteria – Part II, Section Y.5 of the NPDES Permit establishes effluent waste load allocation values. The Permit does not include final effluent limitations for metals.
- Sludge Disposal Criteria – USEPA Part 503 Sludge Regulations, Section 503.13, Table 3. As Table 3 does not contain an allowable concentration for molybdenum, the value from Table 1 is used.
- Process Inhibition Levels – EPA Local Limits Development Guidance Appendices EPA 833-R-04-002b, dated July 2004, Appendix G. Inhibition levels for activated sludge and nitrification are relevant to the Piqua WWTP.
- Current Local Limits – Provided by the City.

Table 2 summarizes the results of the review indicating whether the parameter is included in the specified source.

Table 2
Pollutants of Concern

Parameter	NPDES Permit WQB	Sludge Disposal	Activated Sludge Process Inhibition	Nitrification Process Inhibition	Current Local Limit
Arsenic	X	X	X	X	--
Cadmium	X	X	X	X	X
Chromium, Total	X	--	X	X	X
Chromium, Hex	X	--	X	X	--
Copper	X	X	X	X	X
Cyanide, Total	--	--	X	X	X
Cyanide, Free	X	--	--	--	--
Lead	X	X	X	X	X
Mercury	X	X	X	--	X
Molybdenum	X	X	--	--	--
Nickel	X	X	X	X	X
Selenium	X	X	--	--	--
Silver	X	--	--	--	X
Zinc	X	X	X	X	X

Local limits for all the parameters are calculated in this Local Limit Justification Report.

SECTION 2 – BACKGROUND INFORMATION

Basis of Allowable Headworks Loading Calculation

Local limits are calculated to prevent pass through of pollutants to the effluent to protect water quality, prevent pass through of pollutants to land applied sludge and prevent inhibition of the wastewater treatment plant biological processes. Calculation of allowable headworks loadings are based on numerical limits for the effluent, land applied sludge, and process inhibition levels.

Receiving stream waste load allocation values for pollutants without final effluent limitations are included in Part II, Section Y.5 of the NPDES Permit. Sludge limitations are based on "Part 503 Standards for the Use or Disposal of Sewage Sludge as Amended 08/04/99". Table 3 of the 503 Standards provided monthly average concentrations to determine sludge based AHLs. Table 3 below provides a summary of these limits.

Table 3
Effluent and Sludge Limitations

Parameter	Water Quality Limitations (ug/L)	Sludge Limitations (mg/kg dry)
Arsenic	299	41
Cadmium	11.4	39
Chromium, Total	418	--
Chromium, Hex	22	--
Copper	44	1,500
Cyanide, Total	--	--
Cyanide, Free	24	--
Lead	48.9	300
Mercury	0.012	17
Molybdenum	40,017	75*
Nickel	257	420
Selenium	9.8	100
Silver	2.6	--
Zinc	545	2,800
*As there is no molybdenum limit in Table 3 of 503.13, the ceiling concentration limit from Table 1 of 503.13 is used.		

Process inhibition levels are based on threshold inhibition concentrations for activated sludge and nitrification provided in Appendix G of the U.S. EPA Local Limits Development Guidance, EPA-833-R-01-002B, July 2004.

Table 4 includes the activated sludge and nitrification inhibition levels used to establish AHLs for each parameter. The concentrations included in Table 4 are the most stringent inhibition concentration of the ranges included in the USEPA Guidelines.

Table 4
Process Inhibition Concentrations

Parameter	Activated Sludge (mg/L)	Nitrification (mg/L)
Arsenic	0.1	1.5
Cadmium	1.0	5.2
Chromium, Total	1.0	0.25
Chromium, Hex	1.0	1.0
Copper	1.0	0.05
Cyanide, Total	0.1	0.34
Cyanide, Free	--	--
Lead	1.0	0.5
Mercury	0.1	--
Molybdenum	--	--
Nickel	1.0	0.25
Selenium	--	--
Silver	--	--
Zinc	0.3	0.08

The criteria in Tables 3 and 4 are used to calculate allowable headworks loadings for the Piqua WWTP. The Guidance does not provide inhibition levels for aerobic digestion. As Piqua has not experienced inhibition of the aerobic digesters due to any of the parameters included in this justification, additional research into aerobic digestion inhibition levels is not warranted.

Wastewater Treatment Plant Data

The Piqua WWTP influent and effluent concentrations and effluent flows were analyzed based on analytical data obtained through review of Discharge Monitoring Reports (DMRs) between October 2019 and September 2022. Effluent flows are recorded daily. Influent and effluent concentration data are collected on a monthly or quarterly basis as required by the NPDES Permit. Table 5 summarizes this data.

A seven-day sampling program of the WWTP influent and effluent was completed by the City November 16 through November 22, 2022. The averages of the analytical results are also included in Table 5.

Table 5
WWTP Influent and Effluent Data Summary

Parameter	Influent (ug/L)		Effluent (ug/L)	
	DMR Data	Sampling Data	DMR Data	Sampling Data
Arsenic	<10.0	<5.0	<10.0	<5.0
Cadmium	<2.0	<3.0	<2.0	<3.0
Chromium, Total	3.3	10.5	<5.0	<7.0
Chromium, Hex	2.6	<10.0	2.2	<10.0
Copper	16.2	32.4	3.7	<8.0
Cyanide, Total	--	--	--	--
Cyanide, Free	2.8	<3	2.9	<3.0
Lead	<5.0	6.0	<5.0	<10.0
Mercury	0.0082	0.0179	0.0011	0.0011
Molybdenum	6.2	11.6	5.9	<20.0
Nickel	<5.0	<8.0	<5.0	<8.0
Selenium	5.2	<4.0	<10.0	<4.0
Silver	<2.0	<5.0	<2.0	<5.0
Zinc	60.7	119.1	29.1	26.1

The data used to develop these averages is included in Appendix B. The less than number in Table 5 indicates that all values were below the method detection level. If there was a detected value, the average of the values detected and one half of the detection level for the below detection numbers were averaged and included in the table.

WWTP daily flow records collected between October 1, 2019, and September 14, 2022, were analyzed. The average daily flow for this period was 3.928 MGD.

Biosolids produced at the Piqua WWTP are currently land applied Class B. Volume and percent solids are recorded for each load of biosolids hauled off-site. Data collected from January 24, 2019, to September 8, 2022 were analyzed. During this period, an average of 3.38 dry tons/day were hauled with an average of 18.8% solids providing an average of 18.0 wet tons/day. The following formula was used to convert wet tons/day to MGD.

$$Q_{sludge}\ (gpd) = \frac{\text{wet tons/day X 2,000 lbs}}{8.34} = 4{,}316 \text{ gpd or } 0.0043 \text{ MGD}$$

Removal Rates

Removal Through WWTP

Removal efficiencies through the WWTP are required to calculate allowable headwork loadings. Removal rates of pollutants in the influent through all treatment processes prior to final discharge are needed to determine AHLs based on water quality criteria and sludge quality standards.

Table 6 summarized the removal rates through the WWTP based on DMR data, the WWTP November 2022 sampling event, from the 2016 Local Limit Justification Report, and from USEPA guidelines for activated sludge removal (Appendix R).

Table 6
Removal Rates Through WWTP

Parameter	WWTP Sampling	WWTP DMR Data	2016 Report	USEPA Guidance	Used in Calculations
Arsenic	ID*	ID	--	45%	**45%**
Cadmium	ID	ID	67%	67%	**67%**
Chromium, Total	67%	ID	88%	82%	**67%**
Chromium, Hex	ID	ID	--	--	**50%****
Copper	88%	77%	69%	86%	**88%**
Cyanide, Total	--	--	--	69%	**69%**
Cyanide, Free	ID	ID	--	--	**69%*****
Lead	ID	ID	--	61%	**61%**
Mercury	94%	87%	83%	60%	**94%**
Molybdenum	ID	ID	--	--	**20%****
Nickel	ID	ID	--	42%	**42%**
Selenium	ID	ID	--	50%	**50%**
Silver	ID	ID	--	75%	**75%**
Zinc	78%	52%	35%	79%	**78%**

*ID – Insufficient Data. Data sets used to calculate the removal through the WWTP contained a preponderance of data that was below the method detection level.
**No information is available for removal of hex chromium and molybdenum through the WWTP, so values were assumed.
***No information was available for removal of free cyanide through the WWTP, so it was assumed to equal the total cyanide removal rate.

The removal rates in Table 6 were calculated using the average influent and effluent concentration for each parameter. Appendix B contains the data used to calculate removal rates based on DMR data and the WWTP sampling event.

The removal rate sources included in Table 6 are in order of preference from left to right. The WWTP underwent an upgrade in 2020 and processes have been changed. One of the major changes is replacing anaerobic digestion with aerobic digestion. Therefore, the November 2022 sampling event better reflects removals based on the current processes at the WWTP. The WWTP data-based removal rates are from the largest data set but do include data from prior to the WWTP upgrade. The USEPA Guidance removal rates are used when there is insufficient data to determine removal rates from the WWTP information. Due to lack of data, removal rates for hex chrome and molybdenum are assumed based on engineering judgement.

The removal rates in the last column of Table 6 are used to calculate the allowable headworks loading based on water quality and sludge disposal quality limitations.

With the upgrade, primary treatment was eliminated. Therefore, removal rates through primary treatment do not need to be calculated. For determination of the allowable headworks loadings based on process inhibition, a 0% removal through primary treatment was used.

Industrial Data

The Piqua WWTP has two industries discharging to the POTW that are subject to local limits. They are as follows:

Allied Coating – Cleans and coats metal inserts for rubber to metal bonding process and is subject to the categorical standards in 40 CFR, Part 433.17.

Hartzell Propeller – Manufactures aircraft propeller parts and systems and is subject to the categorical standards in 40 CFR, Part 433.15 and Part 433.17.

The City previously permitted D&D Brightworks as a significant industrial discharger, but they have since moved from the City.

Table 7 summarizes the average flow and discharge concentrations for these industries based on review of data collected in 2018, 2019, 2020, and 2021. Discharge flows are from water use records and discharge concentrations were collected for industrial monitoring purposes.

Table 7
Industrial Data Summary

Parameter	Allied Coatings	Hartzell Propeller
Flow (gpd)	439	22,105
Arsenic (ug/L)	--	--
Cadmium (ug/L)	<2.0	85.3
Chromium, Total (ug/L)	7.6	549.1
Chromium, Hex (ug/L)	--	--
Copper (ug/L)	9.9	53.1
Cyanide, Total (ug/L)	5.4	9.2
Cyanide, Free (ug/L)	--	--
Lead (ug/L)	38.2	5.7
Mercury (ug/L)	<0.2	<0.2
Molybdenum (ug/L)	--	--
Nickel (ug/L)	673.4	11.6
Selenium (ug/L)	--	--
Silver (ug/L)	<2.0	1.2
Zinc (ug/L)	5.4	41.2

Appendix C contains the raw data used in this analysis. If an analysis result was below detection level, an asterisk was inserted by the result and the result reflects one half of the detection level.

The total industrial flow used in the calculation of local limits for the Piqua WWTP is 0.0225 MGD.

Background Data

Three locations were selected in residential areas and sampled to reflect domestic and commercial background concentrations from non-industrial sources. The samples were collected from the Candlewood Pump Station, the Orchard Pump Station, and the Stratford Pump Station over a five-day period from November 16, 2022, and November 20, 2022.

The data from the 2022 sample analysis for the background sources is included in Appendix D. Table 8 summarizes the average concentrations at each location and the average of the three locations. Also included are the background concentrations used in the 2016 Justification for reference.

Table 8
Background Data Summary

Parameter	Candlewood PS	Orchard PS	Stratford PS	Average	2016 Justification	Used in Calc.
Arsenic (ug/L)	<5.0	<5.0	<5.0	<5.0	2.8	**2.5**
Cadmium (ug/L)	2.7	<3.0	<3.0	1.9	1.0	**1.9**
Chromium, Total (ug/L)	7.8	<7.0	7.0	6.1	2.5	**6.1**
Chromium, Hex (ug/L)	<10.0	<10.0	<10.0	<10.0	--	**5.0**
Copper (ug/L)	197.8	39.6	260.2	165.9	28.41	**28.41***
Cyanide, Total (ug/L)	--	--	--	--	--	**5.0**
Cyanide, Free (ug/l)	<3.0	<3.0	<3.0	<3.0	25	**1.5**
Lead (ug/L)	9.0	<10.0	12.0	8.7	2.5	**8.7**
Mercury (ng/L)	113.4	14.6	12.9	47.0	41.0	**47.0**
Molybdenum (ug/L)	16.8	<20.0	<20.0	12.3	8.48	**12.3**
Nickel (ug/L)	8.0	<8.0	<8.0	5.3	2.69	**5.3**
Selenium (ug/L)	<4.0	<4.0	<4.0	<4.0	5.00	**2.0**
Silver (ug/L)	<5.0	<5.0	<5.0	<5.0	1.00	**2.5**
Zinc (ug/L)	439.2	96.2	256.0	263.8	86.19	**86.19***

The last column (bolded) is the background concentration used to calculate local limits for this Justification Report. Generally, these numbers are the average from the 2022 sampling. For copper and zinc, the analysis results from the Candlewood PS and the Stratford PS resulted in unusually high concentrations. Therefore, the background levels used in the 2016 Report are used. One half of the MDL was used for parameters not detected in the sample analysis.

Background flow is calculated by subtracting the total industrial flow (0.0225 MGD) from the average wastewater treatment plant flow (3.928 MGD). The resulting background flow is 3.91 MGD.

Table 9 shows the calculation of loadings from background sources using the last column in Table 8 and a background flow rate of 3.91 MGD.

Table 9
Background Loading Summary

Parameter	Background Concentration (ug/L)	Background Loading (lbs/day)
Arsenic	2.5	0.081
Cadmium	1.9	0.062
Chromium, Total	6.1	0.199
Chromium, Hex	5.0	0.163
Copper	28.4	0.925
Cyanide, Total	5.0	0.163
Cyanide, Free	1.5	0.049
Lead	8.7	0.283
Mercury	0.047	0.0015
Molybdenum	12.3	0.401
Nickel	5.3	0.173
Selenium	2.0	0.065
Silver	2.5	0.081
Zinc	86.2	2.807

SECTION 3 – CALCULATION OF MAXIMUM ALLOWABLE HEADWORKS LOADINGS

Allowable Headworks Loadings

Allowable headworks loadings are calculated based on water quality criteria, sludge quality standards, activated sludge process inhibition, nitrification process inhibition, and anaerobic digestion process inhibition. The following sections present the calculation of allowable headworks loadings for the five sets of criteria.

Water Quality Criteria

The formula is used to calculate the allowable headworks loadings to limit the amount of pollutants discharged into the receiving stream is as follows:

$$AHL = \frac{(8.34) \times (C_{npdes}) \times (Q_{WWTP})}{(1-R_{WWTP})}$$

Where:

AHL = Allowable Headworks Loading (lbs/day)
C_{npdes} = Water Quality Criteria (mg/L) from Table 2
Q_{WWTP} = WWTP Average Flow Rate (3.928 MGD)
R_{WWTP} = Removal Rate Across WWTP as a Decimal from Table 5
8.34 = Conversion Factor

Table 10 summarizes the AHL calculation based on water quality criteria.

Table 10
Water Quality Criteria Allowable Headworks Loadings

Parameter	Water Quality Criteria (ug/L)	Removal Rate (%)	AHL (lbs/day)
Arsenic	299	45%	17.809
Cadmium	11.4	67%	1.132
Chromium, Total	418	67%	41.495
Chromium, Hex	22	50%	1.441
Copper	44	88%	12.012
Cyanide, Total	--	69%	--
Cyanide, Free	24	69%	2.536
Lead	48.9	61%	4.1008
Mercury	0.012	94%	0.007
Molybdenum	40,017	20%	1,638.672
Nickel	257	42%	14.516
Selenium	9.8	50%	0.642
Silver	2.6	75%	0.341
Zinc	545	78%	81.154

Sludge Quality Criteria

The formula used to calculate the allowable headworks loadings based on sludge quality criteria is as follows:

$$AHL = \frac{(8.34) \times (C_{slgstd}) \times (PS/100) \times (Q_{sludge}) \times (G_{sldg})}{R_{WWTP}}$$

Where:

AHL = Allowable Headworks Loading (lbs/day)
C_{slgstd} = 503 Sludge Criteria (mg/kg dry) from Table 2
Q_{sludge} = Sludge Flow to Disposal (0.0043 MGD)
R_{WWTP} = Removal Rate Across WWTP as a Decimal from Table 5
PS = Percent solids of Sludge to Disposal (18.8%)
G_{sldg} = Specific Gravity of Sludge (kg/L), assumed to be 1 kg/L
8.34 = Conversion Factor

Table 11 summarizes the AHL calculation based on sludge quality criteria.

Table 11
Sludge Quality Criteria Allowable Headworks Loadings

Parameter	Sludge Quality Criteria (mg/kg dry)	Removal Rate (%)	AHL (lbs/day)
Arsenic	41	45%	0.614
Cadmium	39	67%	0.392
Chromium, Total	--	67%	--
Chromium, Hex	--	50%	--
Copper	1,500	88%	11.492
Cyanide, Total	--	69%	--
Cyanide, Free	--	69%	--
Lead	300	61%	3.316
Mercury	17	94%	0.122
Molybdenum	75	20%	2.528
Nickel	420	42%	6.742
Selenium	100	50%	1.348
Silver	--	75%	--
Zinc	2,800	78%	24.202

Activated Sludge Process Inhibition

Inhibition based limits are calculated to protect the POTW's treatment processes from being inhibited by excessive pollutant concentrations. The following formula is used to calculate AHLs based on activated sludge inhibition.

$$AHL = \frac{(8.34)\ X\ (C_{inhib})\ X\ (Q_{WWTP})}{(1-R_{prim})}$$

Where:

AHL = Allowable Headworks Loading (lbs/day)
C_{inhib} = Activated Sludge Inhibition (mg/L) from Table 3
Q_{WWTP} = WWTP Average Flow Rate (3.928 MGD)
R_{prim} = Removal Rate Through Primary Treatment as a Decimal (0%)
8.34 = Conversion Factor

Table 12 summarizes the AHL calculation based on activated sludge inhibition criteria.

Table 12
Activated Sludge Inhibition Criteria Allowable Headworks Loadings

Parameter	Activated Sludge Inhibition Criteria (mg/L)	Removal Rate (%)	AHL (lbs/day)
Arsenic	0.1	0%	3.276
Cadmium	1.0	0%	32.760
Chromium, Total	1.0	0%	32.760
Chromium, Hex	1.0	0%	32.760
Copper	1.0	0%	32.760
Cyanide, Total	0.1	0%	3.276
Cyanide, Free	--	0%	--
Lead	1.0	0%	32.760
Mercury	0.1	0%	3.276
Molybdenum	--	0%	--
Nickel	1.0	0%	32.760
Selenium	--	0%	--
Silver	--	0%	--
Zinc	0.3	0%	9.828

Nitrification Process Inhibition Formula

The following formula determines the pollutant loading limit to ensure inhibition of the nitrification process at the WWTP does not occur.

$$AHL = \frac{(8.34) \times (C_{inhib}) \times (Q_{WWTP})}{(1-R_{prim})}$$

Where:

AHL = Allowable Headworks Loading (lbs/day)
C_{inhib} = Nitrification Inhibition (mg/L) from Table 3
Q_{WWTP} = WWTP Average Flow Rate (3.928 MGD)
R_{prim} = Removal Rate Through Primary Treatment as a Decimal (0%)
8.34 = Conversion Factor

Table 13 summarizes the AHL calculation based on nitrification inhibition criteria.

Table 13
Nitrification Inhibition Criteria Allowable Headworks Loadings

Parameter	Nitrification Inhibition Criteria (mg/L)	Removal Rate (%)	AHL (lbs/day)
Arsenic	1.5	0%	49.139
Cadmium	5.2	0%	170.350
Chromium, Total	0.25	0%	8.190
Chromium, Hex	1.0	0%	32.760
Copper	0.05	0%	1.638
Cyanide, Total	0.34	0%	11.138
Cyanide, Free	--	0%	--
Lead	0.5	0%	16.380
Mercury	--	0%	--
Molybdenum	--	0%	--
Nickel	0.25	0%	8.190
Selenium	--	0%	--
Silver	--	0%	--
Zinc	0.08	0%	2.621

Maximum Allowable Headworks Loadings

The maximum allowable headworks loading (MAHL) is the most stringent AHL from Tables 10 through 13. Table 14 summarizes these AHL with the most restrictive criteria bolded.

Table 14
Allowable Headworks Loadings Summary

Parameter	Water Quality Criteria (lbs/day)	Sludge Quality Criteria (lbs/day)	Activated Sludge Inhibition Criteria (lbs/day)	Nitrification Inhibition Criteria (lbs/day)
Arsenic	17.809	**0.614**	3.276	49.139
Cadmium	1.132	**0.392**	32.760	170.350
Chromium, Total	41.195	--	32.760	**8.190**
Chromium, Hex	**1.441**	--	32.760	32.760
Copper	12.012	11.492	32.760	**1.638**
Cyanide, Total	--	--	**3.276**	11.138
Cyanide, Free	**2.536**	--	--	--
Lead	4.1008	**3.316**	32.760	16.380
Mercury	**0.007**	0.122	3.276	--
Molybdenum	1,638.672	**2.528**	--	--
Nickel	14.516	**6.742**	32.760	8.190
Selenium	**0.642**	1.348	--	--
Silver	**0.341**	--	--	--
Zinc	81.154	24.202	9.828	**2.621**

The calculation of the local limit based on the nitrification inhibition based MAHL for copper and zinc resulted in a limit that was lower than the current limit. The WWTP has not experienced inhibition of the nitrification process, therefore the next lowest MAHL will be used in the calculations.

Table 15 summarizes the MAHLs and the controlling criterion.

Table 15
Maximum Allowable Headworks Loadings

Parameter	MAHL (lbs/day)	Controlling Criterion
Arsenic	0.614	Sludge
Cadmium	0.392	Sludge
Chromium, Total	8.190	Nitrification Inhibition
Chromium, Hex	1.441	Water Quality
Copper	11.492	Sludge
Cyanide, Total	3.276	Activated Sludge Inhibition
Cyanide, Free	2.536	Water Quality
Lead	3.316	Sludge
Mercury	0.007	Water Quality
Molybdenum	2.528	Sludge
Nickel	6.742	Sludge
Selenium	0.642	Water Quality
Silver	0.341	Water Quality
Zinc	9.828	Activated Sludge Inhibition

The information in Table 15 is used in the discussion of industrial local limit technical justification in Section 4 – Calculation of Industrial Local Limits.

SECTION 4 – CALCULATION OF INDUSTRIAL LOCAL LIMITS

Total Allowable Industrial Loadings

The USEPA local limit calculation spreadsheets are included in Appendix E. These provide the calculation and comparison of local limits based on the criteria discussed in Section 2.

Industrial local limits are calculated based on the MAHLs from Table 15. To determine the total allowable industrial loadings, a safety/growth factor of 10% and background loadings (Table 9) are subtracted from the MAHL. Table 16 summarizes this calculation.

Table 16
Total Allowable Industrial Loadings

Parameter	MAHL (lbs/day)	10% Safety/Growth Factor (lbs/day)	Background Loading (lbs/day)	Allowable Industrial Loading (lbs/day)
Arsenic	0.614	0.061	0.081	0.471
Cadmium	0.392	0.039	0.062	0.291
Chromium, Total	8.190	0.819	0.199	7.172
Chromium, Hex	1.441	0.144	0.163	1.134
Copper	11.492	1.149	0.925	9.418
Cyanide, Total	3.276	0.328	0.163	2.785
Cyanide, Free	2.536	0.254	0.049	2.234
Lead	3.316	0.332	0.283	2.701
Mercury	0.007	0.001	0.0015	0.004
Molybdenum	2.528	0.253	0.401	1.875
Nickel	6.742	0.674	0.173	5.895
Selenium	0.642	0.064	0.065	0.513
Silver	0.341	0.034	0.081	0.225
Zinc	9.828	0.983	2.807	6.038

Uniform Concentration Based Local Limits

The most common method of assigning discharge limits to industrial users is to calculate uniform concentration limits. These limits apply equally to all industrial users identified as having pollutant concentrations in their process wastewater discharged to the collection system. The following formula is used for this calculation:

$$C_{lim} = \frac{L_{all}}{8.34 \times Q_{contd}}$$

Where:

C_{lim} = Uniform concentration limit for contributing industries (mg/L)
L_{all} = Allowable industrial loading (lbs/day) from Table 15
Q_{contd} = Industrial contributory flow (0.0225 MGD)
8.34 = Conversion Factor

Table 17 shows the calculation of uniform concentration limits based on the allowable industrial loadings in Table 16 and the current local limits.

Table 17
Uniform Concentration Local Limit Calculation

Parameter	Allowable Industrial Loading (lbs/day)	Controlling Criterion	Calculated Local Limits (mg/L)	Current Local Limits (mg/L)
Arsenic	0.471	Sludge Disposal	2.5	--
Cadmium	0.291	Sludge Disposal	1.5	0.11
Chromium, Total	7.172	Nitrification Inhibition	38.2	2.77
Chromium, Hex	1.134	Water Quality	6.0	--
Copper	9.418	Sludge Disposal	50.2	3.38
Cyanide, Total	2.785	Activated Sludge Inhibition	14.8	1.2
Cyanide, Free	2.234	Water Quality	11.9	--
Lead	2.701	Sludge Disposal	14.4	0.69
Mercury	0.004	Water Quality	**0.023**	0.03
Molybdenum	1.875	Sludge Disposal	10.0	--
Nickel	5.895	Sludge Disposal	31.4	3.98
Selenium	0.513	Water Quality	2.7	--
Silver	0.225	Water Quality	1.2	0.43
Zinc	6.038	Activated Sludge Inhibition	32.2	2.61

Piqua's current local limits are based on the categorical standards for metal finishers as promulgated in 40 CFR 433.17 for new sources. The City would like to establish local limits for potential new industry that may not be a metal finisher subject to 40 CFR 433.17. The calculated local limits in the above table would serve this purpose. The industries would still be subject to the applicable Categorical Standard at the end of process.

As shown in the above table, the mercury calculated local limit is more restrictive than the current Categorical based local limits. This is discussed further in the Recommended Local Limits.

Mass Based Local Limits

Mass based local limits are established by allocating the total allowable industrial discharge loads to industries based on the industry's relative flows to the WWTP. This method of load allocation is generally applicable when one or more industries contribute significantly more than other industries and would have issues meeting calculated uniform concentration local limits.

Currently, the industries discharging to the Piqua WWTP can meet the current local limits. Therefore, Piqua does not wish to pursue development of mass based local limits.

Recommended Local Limits

As shown in Table 17, the calculated local limit for mercury is more restrictive than the current local limits. The following discusses each of the parameters and provides additional justification for the recommended local limit for each.

Arsenic – The calculated local limit for arsenic is 2.5 mg/L based on sludge disposal criteria. Currently, there is no local limit for arsenic. It is recommended that a local limit of 2.5 mg/L be established to protect sludge quality.

Cadmium – The calculated local limit for cadmium is 1.6 mg/L based on sludge disposal criteria and is less restrictive than the current local limit of 0.11 mg/L. As mentioned, the current local limits are based on categorical standards and the City would like to establish non-categorical based local limits. Therefore, the recommended local limit is the calculated local limit of 1.6 mg/L.

Chromium, Total – The calculated local limit for total chromium is 38.2 mg/L based on nitrification inhibition and less restrictive than the current local limit of 2.77 mg/L. As mentioned, the current local limits are based on categorical standards and the City would like to establish non-categorical based local limits. Therefore, the recommended local limit is the calculated local limit of 38.2 mg/L.

Chromium, Hexavalent – The calculated local limit for hexavalent chromium is 6.0 mg/L based on water quality criteria. Currently, there is no local limit for hexavalent chromium. It is recommended that a local limit of 6.0 mg/L be established.

Copper – The calculated local limit for copper is 50.2 mg/L based on sludge disposal criteria and is less restrictive than the current local limit of 3.38 mg/L. The most restrictive calculated limit is based on nitrification inhibition. However, this would result in a more restrictive local limit than the current Categorical based local limit. As the WWTP has not experienced issues with nitrification due to copper levels, it is recommended that a local limit of 50.2 mg/L be established.

Cyanide, Total – The calculated limit for total cyanide is 14.8 mg/L based on activated sludge inhibition. Neither water quality criteria nor sludge criteria have established standards for total cyanide and the only basis for establishing a total cyanide limit is inhibition of treatment processes. The WWTP has not experienced issues with treatment process inhibition due to total cyanide levels. In addition, the Categorical based limit of 1.2 mg/L is more restrictive than the calculated local and metal finishers will

still be required to meet this limit. Therefore, it is recommended that no local limit be established for total cyanide.

Cyanide, Free – The calculated local limit for free cyanide is 11.9 mg/L based on water quality criteria. Currently, there is no local limit for free cyanide. It is recommended that a local limit of 11.9 mg/L be established to protect water quality.

Lead – The calculated local limit for lead is 14.4 mg/L based on sludge disposal criteria and is less restrictive than the current local limit of 0.69 mg/L. As mentioned, the current local limits are based on categorical standards and the City would like to establish non-categorical based local limits. Therefore, the recommended local limit is the calculated local limit of 14.4 mg/L.

Mercury – The calculated local limit for mercury is 0.023 mg/L based on water quality criteria which is more restrictive than the current local limit of 0.03 mg/L. The recommended local limit for mercury is the calculated limit of 0.023 mg/L.

Molybdenum – The calculated local limit for molybdenum is 10.0 mg/L based on sludge disposal criteria. Currently, there is no local limit for molybdenum. It is recommended that a local limit of 10.0 mg/L be established.

Nickel – The calculated local limit for nickel is 31.4 mg/L based on sludge disposal criteria and is less restrictive than the current Categorical based local limit of 3.98 mg/L. As mentioned, the current local limits are based on categorical standards and the City would like to establish non-categorical based local limits. Therefore, the recommended local limit is the calculated local limit of 31.4 mg/L.

Selenium – The calculated local limit for selenium is 2.7 mg/L based on water quality criteria. Currently there is no local limit for selenium. It is recommended that a local limit of 2.7 mg/L be established for selenium.

Silver – The calculated local limit for silver is 1.2 mg/L based on water quality criteria and is less restrictive than the current Categorical based local limit of 0.43 mg/L. As mentioned, the current local limits are based on categorical standards and the City would like to establish non-categorical based local limits. Therefore, the recommended local limit is the calculated local limit of 1.2 mg/L.

Zinc – The calculated local limit for zinc is 32.2 mg/L based on activated sludge inhibition and is less restrictive than the current Categorical based local limit of 2.61 mg/L. The most restrictive calculated limit is based on nitrification inhibition. However, this would result in a more restrictive local limit than the current Categorical based local limit. As the WWTP has not experienced issues with nitrification due to copper levels, it is recommended that a local limit of 32.2 mg/L be established.

Table 18 summarizes the recommended local limits.

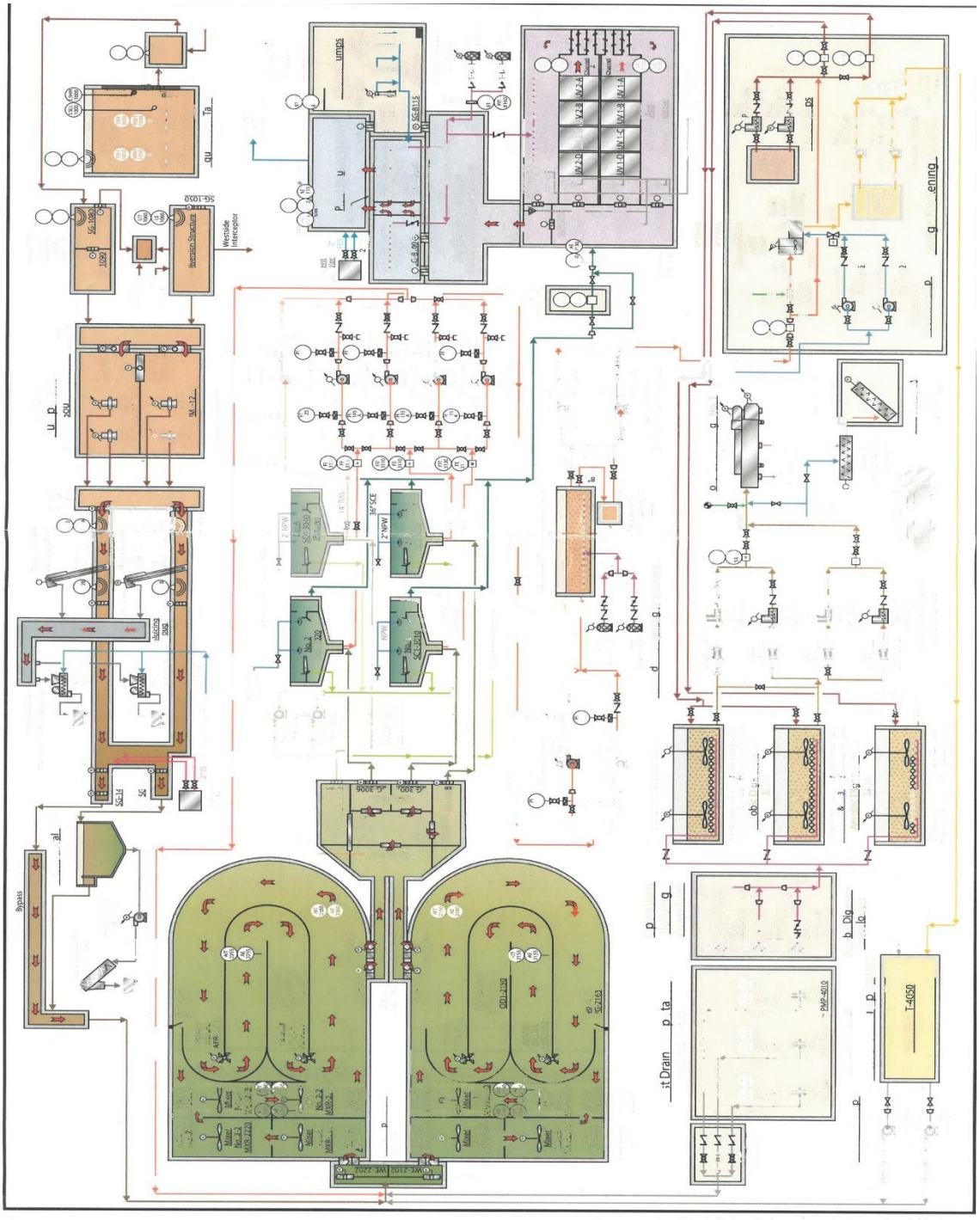
Table 18
Recommended Local Limits

Parameter	Recommended Local Limits (mg/L)
Arsenic	2.5
Cadmium	1.5
Chromium, Total	38.2
Chromium, Hex	6.0
Copper	50.2
Cyanide, Total	14.8
Cyanide, Free	11.9
Lead	14.4
Mercury	**0.023**
Molybdenum	10.0
Nickel	31.4
Selenium	2.7
Silver	1.2
Zinc	32.2

All recommended local limits are based on calculations in this Local Limit Justification Report. All limits are less restrictive than the Categorical based limits except for mercury. The recommended local limit for mercury is less than the current limit.

APPENDIX A

PROCESS FLOW DIAGRAM



APPENDIX B

WWTP DATA ANALYSIS

Piqua, Ohio
Local Limit Justification
Influent, Effluent, and Removal Rates from DMRs

	Arsenic (ug/l)		Cadmium (ug/L)		Chromium, T (ug/L)		Chromium, Hex (ug/L)		Copper (ug/L)		Cyanide, F (ug/L)		Lead (ug/L)	
Date	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD
Oct-19														
Nov-19														
Dec-19	2.5 *	2.5 *	1.5 *	1.5 *	3.5 *	3.5 *	1.5 *	1.5 *	13.0	4 *	1.5 *	1.5 *	5 *	5 *
Jan-20														
Feb-20														
Mar-20	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	11.3	5.9	1 *	1 *	2.5 *	2.5 *
Apr-20														
May-20														
Jun-20	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	15.0	5.7	2.9	1 *	2.5 *	2.5 *
Jul-20														
Aug-20	5 *	5 *	1 *	1 *	5.9	2.5 *	2 *	2 *	18.4	9.6	6.3	5.5	2.5 *	2.5 *
Sep-20														
Oct-20														
Nov-20														
Dec-20	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	13.2	2.5 *	5 *	5 *	2.5 *	2.5 *
Jan-21														
Feb-21														
Mar-21	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	11.0	2.5 *	1 *	1 *	2.5 *	2.5 *
Apr-21	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	15.9	2.5 *	1 *	1 *	2.5 *	2.5 *
May-21														
Jun-21	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	23.0	2.5 *	5 *	5 *	2.5 *	2.5 *
Jul-21														
Aug-21	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	20.1	2.5 *	1 *	1 *	2.5 *	2.5 *
Sep-21														
Oct-21														
Nov-21														
Dec-21	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	15.4	2.5 *	5 *	5 *	2.5 *	2.5 *
Jan-22														
Feb-22														
Mar-22	5 *	5 *	1 *	1 *	2.5 *	2.5 *	2 *	2 *	17.7	2.5 *	5 *	5 *	2.5 *	2.5 *
Apr-22														
May-22														
Jun-22	5 *	5 *	1 *	1 *	5.2	2.5 *	2 *	2 *	17.7	2.5 *	1 *	1 *	2.5 *	2.5 *
Jul-22														
Aug-22	5 *	5 *	1 *	1 *	5.8	2.5 *	10.0	5.6	18.4	2.5 *	1 *	5 *	2.5 *	2.5 *
Average	4.8 **	4.8 **	1.0 **	1.0 **	3.3	2.6 **	2.6	2.2	16.2	3.7	2.8	2.9	2.7 **	2.7 **
Removal Rates		**		**		***		***		77.3%		***		**

	Mercury (ng/L)		Molybdenum (ug/L)		Nickel (ug/L)		Selenium (ug/l)		Silver (ug/L)		Zinc (ug/L)	
Date	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD	Influent BD	Effluent BD
Oct-19	11.70	1.19										
Nov-19	86.90	2.97										
Dec-19	7.76	0.56	10 *	10 *	4 *	4 *	2 *	2 *	2.5 *	2.5 *	53.0	22.0
Jan-20	6.99	1.33										
Feb-20	5.00	1.62										
Mar-20	4.69	0.87	10 *	5 *	2.5 *	2.5 *	10.3	5 *	1 *	1 *	45.9	7.5 *
Apr-20	4.49	2.37										
May-20	3.41	0.64										
Jun-20	20.90	0.25 *	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	49.2	25.2
Jul-20	5.57	1.38										
Aug-20	6.40	0.77	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	62.5	39.7
Sep-20	1.30	0.30										
Oct-20	2.28	2.77										
Nov-20	1.89	0.81										
Dec-20	4.52	0.68	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	50.5	36.4
Jan-21	1.14	0.25 *										
Feb-21	8.20	8.81										
Mar-21	4.32	0.25 *	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	35.8	24.8
Apr-21	3.34	4.09	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	62.5	31.4
May-21	3.31	0.25 *										
Jun-21	1.04	0.25 *	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	83.5	33.5
Jul-21	5.09	0.25 *										
Aug-21	5.14	0.25 *	10.7	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	80.4	35.1
Sep-21	2.46	0.25 *										
Oct-21	1.40	0.40										
Nov-21	2.07	0.25 *										
Dec-21	41.40	0.25 *	5 *	11.3	2.5 *	2.5 *	5 *	5 *	1 *	1 *	57.8	41.5
Jan-22	2.61	0.25 *										
Feb-22	5.04	0.25 *										
Mar-22	5.69	0.67	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	63.8	24.6
Apr-22	2.66	0.25 *										
May-22	2.15	0.52										
Jun-22	2.31	0.25 *	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	60.5	27.0
Jul-22	9.35	0.64										
Aug-22	4.85	0.82	5 *	5 *	2.5 *	2.5 *	5 *	5 *	1 *	1 *	83.3	29.7
Average	8.21	1.08	6.2	5.9	2.6 **	2.6 **	5.2	5 **	1.1 **	1.1 **	60.7	29.1
Removal Rates		86.9%		***		**		***		**		52.0%

* Number is 1/2 the detection limit
** All results below the detection limit
*** Insufficient Data

Piqua, Ohio
Local Limit Justification
Influent, Effluent and Removal Rates from November 2022 Sampling

Date	Arsenic (ug/l)				Cadmium (ug/l)				Chromium (ug/l)				Chromium, Hex (ug/l)				Copper (ug/l)				Lead (ug/l)				Mercury (ng/l)			
	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD
11/16/2022	2.5	*	2.5	*	1.5	*	1.5	*	9.0		3.5	*	5	*	5	*	41		4	*	12		5	*	22.50		0.74	
11/17/2022	2.5	*	2.5	*	1.5	*	1.5	*	11.0		3.5	*	5	*	5	*	37		4	*	5	*	5	*	20.50		1.00	
11/18/2022	2.5	*	2.5	*	1.5	*	1.5	*	9.0		3.5	*	5	*	5	*	38		4	*	5	*	5	*	27.70		0.74	
11/19/2022	2.5	*	2.5	*	1.5	*	1.5	*	14.0		3.5	*	5	*	5	*	36		4	*	5	*	5	*	16.10		1.00	
11/20/2022	2.5	*	2.5	*	1.5	*	1.5	*	3.5	*	3.5	*	5	*	5	*	15		4	*	5	*	5	*	13.50		0.96	
11/21/2022	2.5	*	2.5	*	1.5	*	1.5	*	15.0		3.5	*	5	*	5	*	26		4	*	5	*	5	*	17.20		2.16	
11/22/2022	2.5	*	2.5	*	1.5	*	1.5	*	12.0		3.5	*	5	*	5	*	34		4	*	5	*	5	*	7.93		1.04	
Average	2.5	**	2.5	**	1.5	**	1.5	**	10.5		3.5	**	5	**	5	**	32.4		4.0	**	6.0		5.0	**	17.92		1.09	
Removal Rates	***				***				67%				***				88%				***				94%			

Date	Molybdenum (ug/l)				Nickel (ug/l)				Selenium (ug/l)				Silver (ug/l)				Zinc (ug/l)				Cyanide, Free (ug/l)			
	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD	Influent	BD	Effluent	BD
11/16/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	140		26		1.5	*	1.5	*
11/17/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	132		26		1.5	*	1.5	*
11/18/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	149		28		1.5	*	1.5	*
11/19/2022	21		10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	147		26		1.5	*	1.5	*
11/20/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	56		25		1.5	*	1.5	*
11/21/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	104		24		1.5	*	1.5	*
11/22/2022	10	*	10	*	4	*	4	*	2	*	2	*	2.5	*	2.5	*	106		28		1.5	*	1.5	*
Average	11.6		10.0	**	4	**	4	**	2	**	2	**	2.5	**	2.5	**	119.1		26.1		1.5	**	1.5	**
Removal Rates	***				***				***				***				78%				***			

* Number is 1/2 the detection limit
** All results below the detection limit
*** Insufficient Data

APPENDIX C

INDUSTRIAL DATA ANALYSIS

City of Piqua
Local Limit Justification
Industrial Sampling Data Analysis
Allied Coating

Date	Cadmium		Chromium		Copper		Lead		Mercury, LL		Nickel	Silver		Zinc	Cyanide, T	
	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	ug/l	BD	ug/l	ug/l	BD
6/6/19	1.0	*	20.0		13.0		20.0		0.1	*	1100.0	1.0	*	210	5.0	*
6/11/19	1.5	*	18.0		14.0		24.0		0.1	*	983.0	2.5	*	204	5.0	*
11/25/19	1.0	*	10.0		7.0		120.0		0.1	*	640.0	1.0	*	300	5.0	*
12/13/19	1.0	*	9.2		2.5	*	100.0		0.1	*	560.0	1.0	*	330	5.0	*
5/15/20	1.0	*	10.0		6.2		75.0		0.1	*	740.0	0.3	*	200	10.0	
6/15/20	1.0	*	2.5	*	2.5	*	11.0		0.1	*	240.0	1.0	*	100	5.0	*
11/13/20	1.0	*	2.5	*	33.0		2.5	*	0.1	*	52.0	1.0	*	48	5.0	*
12/22/20	1.0	*	2.5	*	8.9		100.0		0.1	*	100.0	1.0	*	140	5.0	*
6/3/21	1.0	*	2.5	*	19.0		2.5	*	0.1	*	250.0	1.0	*	58	5.0	*
5/15/21	1.0	*	7.1		9.8		27.0		0.1	*	1300.0	1.0	*	900	5.0	*
11/4/21	1.0	*	9.1		7.2		10.0		0.1	*	2600.0	1.0	*	990	5.0	*
6/1/22	1.0	*	2.5	*	2.5	*	2.5	*	0.1	*	170.0	1.0	*	42	5.0	*
6/6/22	1.0	*	2.5	*	2.5	*	2.5	*	0.1	*	19.0	1.0	*	210	5.0	*
Average	1.0	**	7.6		9.9		38.2		0.1	**	673.4	1.1	**	287.1	5.4	

* Analysis result is below detection and number is 1/2 the detection level.
** All analysis results are below detection

City of Piqua
Local Limit Justification
Industrial Sampling Data Analysis
Hartzell Propeller

	Cadmium		Chromium		Copper		Lead		Mercury, LL		Nickel		Silver		Zinc		Cyanide, T	
Date	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD
1/15/19	9.0		50.0		890.0		28.0				2.5	*	1.0	*	700		5.0	*
1/16/19	4.5		250.0		800.0		33.0				5.2		1.0	*	710		5.0	*
1/17/19	3.4		23.0		2.5	*	2.5	*	0.1	*	2.5	*	1.0	*	50		5.0	*
3/19/19	117.0		150.0		17.0		5.0	*			4	*	0.3	*	12		10.0	
3/20/19	53.0		50.0		4.0	*	5.0	*			4	*	0.3	*	5	*	17.0	
3/21/19	48.0		519.0		19.0		5.0	*	0.1	*	4	*	0.3	*	5	*	16.0	
5/7/19	24.4		126.0		825.0		31.3				7.9		1.0	*	483		5.0	*
5/8/19	17.2		17.2		596.0		24.8				8.4		1.0	*	616		5.0	*
5/9/19	25.2		25.2		28.0		2.5	*	0.1	*	7.1		1.0	*	23		5.0	*
6/4/19	53.0		175.0		21.0		5.0	*			22		13.0		12		5.0	*
6/5/19	16.0		94.0		28.0		5.0	*			4	*	0.3	*	5	*	5.0	*
6/6/19	104.0		1030.0		37.0		5.0	*	0.1	*	17		0.3	*	5	*	5.0	*
8/13/19	38.1		93.1		18.3		2.5	*			2.5	*	0.0		7.5	*	68.0	
8/14/19	14.4		673.0		18.2		6.9				2.5	*	1.0	*	7.5	*		
8/15/19	45.0		2430.0		39.2		6.6		0.1	*	2.5	*	1.0	*	7.5	*		
8/28/19																	6.8	
8/29/19																	2.5	*
8/30/19																	14.0	
8/31/19																	2.5	*
9/10/19	47.0		3090.0		22.0		5.0	*			4	*	2.5	*	5	*	5.0	*
9/11/19	35.0		8260.0		15.0		5.0	*			8		2.5	*	5	*	5.0	*
9/12/19	27.0		1560.0		13.0		5.0	*	0.1	*	4	*	2.5	*	5	*	10.0	
10/8/19	12.0		140.0		10.0						5.1		ND					
10/9/19	18.0		130.0		21.0						26		ND		30		16.0	
10/10/19	61.0		360.0		14.0		5.8				ND		ND					
11/12/19	13.0		289.0		103.0		14.0				15		0.3	*	15		5.0	*
11/13/19	6.0		130.0		9.0		5.0	*			4	*	0.3	*	5	*	5.0	*
11/14/19	19.0		70.0		4.0	*	5.0	*	0.1	*	4	*	0.3	*	5	*	5.0	*
2/4/20	18.0		58.0		13.0		17.0				12		1.0	*	7.5	*	5.0	*
2/5/20	7.1		65.0		9.7		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
2/6/20	17.0		68.0		25.0		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
3/3/20	1.0	*	56.0		7.3		56.0				2.5	*	1.0	*	7.5	*	10.0	
3/4/20	7.1		100.0		8.8		13.0				2.5	*	1.0	*	7.5	*	16.0	
3/5/20	25.0		150.0		11.0		2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	17.0	
5/6/20	3.7		21.0		10.0		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
5/7/20	7.3		11.0		9.8		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
5/8/20	17.0		110.0		8.2		18.0		0.1	*	2.5	*	1.0	*	7.5	*	5.0	*
6/9/20	114.0		1120.0		21.1		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
6/10/20	74.9		897.0		10.7		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
6/11/20	22.4		170.0		7.5		2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	5.0	*
7/14/20	27.0		210.0		7.8		2.5	*			44		1.0	*	7.5	*	5.0	*
7/15/20	23.0		88.0		9.4		2.5	*			44		1.0	*	7.5	*	5.0	*
7/16/20	23.0		60.0		2.5	*	2.5	*	0.1	*	45		1.0	*	7.5	*	5.0	*
9/2/20	28.0		110.0		26.0		2.5	*			13		1.0	*	7.5	*	5.0	*
9/3/20	29.0		190.0		12.0		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
9/4/20	5.7		180.0		7.2		2.5	*	0.1	*			1.0	*	7.5	*	5.0	*
10/13/20	9.1		150.0		14.0		2.5	*			63		1.0	*	49		5.0	*
10/14/20	16.0		170.0		14.0		2.5	*			39		1.0	*	2		5.0	*
10/15/20	30.0		350.0		11.0		2.5	*	0.1	*	10		1.0	*	7.5	*	5.0	*
11/9/20	5.2		62.0		8.7		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
11/10/20	14.0		790.0		17.0		2.5	*			2.5	*	1.0	*	7.5	*	5.0	*
11/11/20	34.0		2400.0		32.0		2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	52.0	
12/10/20																		
2/8/21	19.0		37.0		16.0		5.6				2.5	*	1.0	*	7.5	*	5.0	*
2/9/21	21.0		77.0		63.0		2.5	*			2.5	*	1.0	*	33		5.0	*
2/10/21																		
2/15/21	12.0		27.0		44.0		2.5	*			14		1.0	*	7.5	*	5.0	*
2/16/21	3.2		17.0		10.0		2.5	*			26		1.0	*	7.5	*	5.0	*
2/17/21	4.5		57.0		18.0		2.5	*	0.1	*	35		2.0		76		11.0	
5/3/21	40.0		1100.0		20.0		2.5	*			2.5	*			7.5	*	24.0	
5/4/21	88.0		2900.0		50.0		2.5	*			16				7.5	*	5.0	*
5/5/21	280.0		2900.0		50.0		2.5	*	0.1	*	38				7.5	*	5.0	*
5/19/21			650.0														10.0	
5/20/21			450.0														5.0	*
5/21/21			1300.0															
5/25/21	26.0		44.0		10.0		2.5	*			2.5	*	1.0	*	7.5	*	18.0	
5/26/21	27.0		150.0		6.8		2.5	*			5.1		1.0	*	7.5	*		
5/27/21	8.7		470.0		9.6		2.5	*	0.4	*	5.1		1.0	*	7.5	*		
8/4/21	7.0		92.0		2.5	*	2.5	*			2.5	*	1.0	*	7.5	*	34.0	
8/5/21	27.0		150.0		7.0		2.5	*			34		1.0	*	7.5	*	5.0	*
8/6/21	20.0		230.0		7.0		2.5	*			25		1.0	*	7.5	*	5.0	*
9/15/21	16.0		160.0		9.0		2.5	*			2.5	*	1.0	*	7.5	*	16.0	
9/16/21	230.0		430.0		58.0		10.0				34		1.0	*	120		5.0	*
9/17/21	33.0		160.0		13.0		6.9		0.1	*	5.5		1.0	*	20		5.0	*
10/12/21	24.0		230.0		7.4		2.5	*	0.1	*	6.3		1.0	*	15		5.0	*
10/13/21	77.0		220.0		11.0		2.5	*			6.9		1.0	*	7.5	*	22.0	
10/14/21	66.0		320.0		17.0		6.6		0.1	*	7.6		1.0	*	7.5	*	5.0	*
12/7/21	30.0		490.0		21.0		2.5	*			17		1.0	*	7.5	*	12.0	
12/8/21	150.0		730.0		28.0		2.5	*			36		1.0	*	7.5	*	5.0	*
12/9/21	210.0		880.0		32.0		2.5	*	0.1	*	44		1.0	*	7.5	*	11.0	
2/8/22	29.0		170.0		9.0		2.5	*			18		1.0	*	7.5	*	14.0	
2/9/22	4.6		98.0		2.5	*	2.5	*			2.5	*	1.0	*	7.5	*	18.0	
2/10/22	34.0		100.0		2.5	*	2.5	*	0.1	*	11		1.0	*	20		12.0	
3/29/22	16.0		630.0		5.6		2.5	*			2.5	*	1.0	*	7.5	*	27.0	
3/30/22	13.0		800.0		2.5	*	2.5	*			2.5	*	1.0	*	7.5	*	11.0	
3/31/22	11.0		1100.0		2.5	*	2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	11.0	
5/10/22	180.0		540.0		6.0		2.5	*			27		1.0	*	7.5	*	13.0	
5/11/22	280.0		570.0		10.0		2.5	*			18		1.0	*	7.5	*	5.0	*
5/12/22	230.0		450.0		2.5	*	2.5	*	0.1	*	16		1.0	*	7.5	*	5.0	*
8/9/22	2500.0		200.0		48.0		2.5	*			12		2.5		7.5	*	8.7	
8/10/22	940.0		820.0		41.0		2.5	*			5.2		1.0	*	7.5	*	2.5	*
8/11/22	51.0		660.0		22.0		2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	2.5	*
9/27/22	110.0		450.0		18.0		2.5	*			2.5	*	1.0	*	7.5	*	2.5	*
9/28/22	96.0		390.0		25.0		2.5	*			2.5	*	1.0	*	7.5	*	2.5	*
9/29/22	51.0		300.0		2.5	*	2.5	*	0.1	*	2.5	*	1.0	*	7.5	*	2.5	*
Average	85.3		549.1		53.1		5.7		0.1	*	11.6		1.2		41.2		9.2	

APPENDIX D

BACKGROUND DATA ANALYSIS

Piqua, Ohio
Local Limit Justification
Background Data Analysis
11/16/22 to 11/20/22

	Arsenic		Cadmium		Chromium, Total		Chromium, Hex		Copper		Lead		Mercury, LL		Molybdenum		Nickel		Selenium		Silver		Zinc		Cyanide, Free	
Candlewood	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ng/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD	ug/l	BD
11/16/2022	2.5	*	1.5	*	3.5	*	5	*	52		5	*	293.0		10	*	4	*	2	*	2.5	*	98		1.5	*
11/17/2022	2.5	*	1.5	*	11.0		5	*	266		12		26.2		20		11		2	*	2.5	*	558		1.5	*
11/18/2022	2.5	*	4.0		10.0		5	*	258		12		38.5		22		10		2	*	2.5	*	587		1.5	*
11/19/2022	2.5	*	5.0		11.0		5	*	283		11		90.3		22		11		2	*	2.5	*	585		1.5	*
11/20/2022	2.5	*	1.5	*	3.5	*	5	*	130		5	*	119.0		10	*	4	*	2	*	2.5	*	368		1.5	*
Average	2.5	*	2.7		7.8	*	5	*	197.8		9.0		113.4		16.8		8.0		2	*	2.5	*	439.2		1.5	*
Orchard																										
11/16/2022	2.5	*	1.5	*	3.5	*	5	*	82		5	*	7.8		10	*	4	*	2	*	2.5	*	82		1.5	*
11/17/2022	2.5	*	1.5	*	3.5	*	5	*	33		5	*	22.6		10	*	4	*	2	*	2.5	*	92		1.5	*
11/18/2022	2.5	*	1.5	*	3.5	*	5	*	32		5	*	21.2		10	*	4	*	2	*	2.5	*	156		1.5	*
11/19/2022	2.5	*	1.5	*	3.5	*	5	*	32		5	*	9.3		10	*	4	*	2	*	2.5	*	93		1.5	*
11/20/2022	2.5	*	1.5	*	3.5	*	5	*	19		5	*	12.3		10	*	4	*	2	*	2.5	*	58		1.5	*
Average	2.5	*	1.5	*	3.5	*	5	*	39.6		5	*	14.6		10.0	*	4.0	*	2	*	2.5	*	96.2		1.5	*
Stratford																										
11/16/2022	2.5	*	1.5	*	9.0		5	*	293		18		13.2		10	*	4	*	2	*	2.5	*	280		1.5	*
11/17/2022	2.5	*	1.5	*	11.0		5	*	440		22		13.4		10	*	4	*	2	*	2.5	*	468		1.5	*
11/18/2022	2.5	*	1.5	*	3.5	*	5	*	161		5	*	13.5		10	*	4	*	2	*	2.5	*	176		1.5	*
11/19/2022	2.5	*	1.5	*	8.0		5	*	273		10		15.2		10	*	4	*	2	*	2.5	*	282		1.5	*
11/20/2022	2.5	*	1.5	*	3.5	*	5	*	134		5	*	9.3		10	*	4	*	2	*	2.5	*	74		1.5	*
Average	2.5	*	1.5	*	7.0		5	*	260.2		12.0		12.9		10	*	4	*	2	*	2.5	*	256.0		1.5	*
Total Average	2.5	*	1.9		6.1		5	*	165.9		8.7		47.0		12.3		5.3		2.0	*	2.5	*	263.8		1.5	*

* Analysis result is below detection and number is 1/2 the Method Detection Level.

APPENDIX E

USEPA LOCAL LIMIT CALCULATION SPREADSHEETS

TABLE 1
Local Limits Determination Based on Water Quality (NPDES Permit)

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE				Domestic & Commercial		MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rpotw)	NPDES Limits (mg/l) (Ccrit)	Conc. (mg/l) (Cdom)	Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.0225	3.928	45	0.299	0.0025	3.9055	17.809	0.0814	15.947	84.982	10
Cadmium	0.0225	3.928	67	0.0114	0.0019	3.9055	1.132	0.0619	0.957	5.098	10
Chromium (total)	0.0225	3.928	67	0.418	0.0061	3.9055	41.495	0.1987	37.147	197.960	10
Chromium (hex)	0.0225	3.928	50	0.022	0.005	3.9055	1.441	0.1629	1.134	6.045	10
Copper	0.0225	3.928	88	0.044	0.02841	3.9055	12.012	0.9254	9.885	52.679	10
Cyanide, Total	0.0225	3.928	69		0.005	3.9055	-	0.1629	-	-	10
Cyanide, Free	0.0225	3.928	69	0.024	0.0015	3.9055	2.536	0.0489	2.234	11.904	10
Lead	0.0225	3.928	61	0.0489	0.0087	3.9055	4.108	0.2834	3.413	18.190	10
Mercury	0.0225	3.928	94	0.000012	0.000047	3.9055	0.007	0.0015	0.004	0.023	10
Molybdenum	0.0225	3.928	20	40.017	0.0123	3.9055	1638.672	0.4006	1474.404	7857.204	10
Nickel	0.0225	3.928	42	0.257	0.0053	3.9055	14.516	0.1726	12.892	68.700	10
Selenium	0.0225	3.928	50	0.0098	0.002	3.9055	0.642	0.0651	0.513	2.732	10
Silver	0.0225	3.928	75	0.0026	0.0025	3.9055	0.341	0.0814	0.225	1.200	10
Zinc	0.0225	3.928	78	0.545	0.08619	3.9055	81.154	2.8074	70.231	374.268	10

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.
(Qpotw) POTW's average influent flow in MGD.
(Rpotw) Removal efficiency across POTW as percent.
(Ccrit) NPDES daily maximum permit limit for a particular pollutant in mg/l.
(Qdom) Domestic/commercial background flow in MGD.
(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.
(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).
(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).
(Lind) Maximum allowable industrial loading to the POTW in pounds per day.
(Cind) Industrial allowable local limit for a given pollutant in mg/l.
(SF) Safety factor as a percent.
8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rpotw}$$

TABLE 2

Local Limits Determination Based on Activated Sludge Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rprim)	Activated Sluc Inhibition Lev (mg/l) (Ccrit)	Domestic a Commercial Conc. (mg/l) (Cdom)	Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.0225	3.928	0	0.1	0.0025	3.9055	3.276	0.0814	2.867	15.3	10
Cadmium	0.0225	3.928	0	1	0.0019	3.9055	32.760	0.0619	29.422	156.8	10
Chromium (total)	0.0225	3.928	0	1	0.0061	3.9055	32.760	0.1987	29.285	156.1	10
Chromium (hex)	0.0225	3.928	0	1	0.005	3.9055	32.760	0.1629	29.321	156.3	10
Copper	0.0225	3.928	0	1	0.02841	3.9055	32.760	0.9254	28.558	152.2	10
Cyanide, Total	0.0225	3.928	0	0.1	0.005	3.9055	3.276	0.1629	2.785	14.8	10
Cyanide, Free	0.0225	3.928	0		0.0015	3.9055	-	0.0489	-	-	10
Lead	0.0225	3.928	0	1	0.0087	3.9055	32.760	0.2834	29.200	155.6	10
Mercury	0.0225	3.928	0	0.1	0.000047	3.9055	3.276	0.0015	2.947	15.7	10
Molybdenum	0.0225	3.928	0		0.0123	3.9055	-	0.4006	-	-	10
Nickel	0.0225	3.928	0	1	0.0053	3.9055	32.760	0.1726	29.311	156.2	10
Selenium	0.0225	3.928	0		0.002	3.9055	-	0.0651	-	-	10
Silver	0.0225	3.928	0		0.0025	3.9055	-	0.0814	-	-	10
Zinc	0.0225	3.928	0	0.3	0.08619	3.9055	9.828	2.8074	6.038	32.2	10

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.
(Qpotw) POTW's average influent flow in MGD.
(Rprim) Removal efficiency across primary treatment as percent.
(Ccrit) Activated sludge threshold inhibition level, mg/l.
(Qdom) Domestic/commercial background flow in MGD.
(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.
(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).
(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).
(Lind) Maximum allowable industrial loading to the POTW in pounds per day.
(Cind) Industrial allowable local limit for a given pollutant in mg/l.
(SF) Safety factor as a percent.
8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rprim}$$

TABLE 3

Local Limits Determination Based on Nitrification Inhibition Level

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE						MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Removal Efficiency (%) (Rsec)	Nitrification Inhibition Lev (mg/l) (Ccrit)	Domestic and Commercial Conc. (mg/l) (Cdom)	Domestic and Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.0225	3.928	0	1.5	0.0025	3.9055	49.139	0.0814	44.144	235.2	10
Cadmium	0.0225	3.928	0	5.2	0.0019	3.9055	170.350	0.0619	153.253	816.7	10
Chromium (total)	0.0225	3.928	0	0.25	0.0061	3.9055	8.190	0.1987	7.172	38.2	10
Chromium (hex)	0.0225	3.928	0	1	0.005	3.9055	32.760	0.1629	29.321	156.3	10
Copper	0.0225	3.928	0	0.05	0.02841	3.9055	1.638	0.9254	0.549	2.9	10
Cyanide, Total	0.0225	3.928	0	0.34	0.005	3.9055	11.138	0.1629	9.862	52.6	10
Cyanide, Free	0.0225	3.928	0		0.0015	3.9055	-	0.0489	-	-	10
Lead	0.0225	3.928	0	0.5	0.0087	3.9055	16.380	0.2834	14.458	77.0	10
Mercury	0.0225	3.928	0		0.000047	3.9055	-	0.0015	-	-	10
Molybdenum	0.0225	3.928	0		0.0123	3.9055	-	0.4006	-	-	10
Nickel	0.0225	3.928	0	0.25	0.0053	3.9055	8.190	0.1726	7.198	38.4	10
Selenium	0.0225	3.928	0		0.002	3.9055	-	0.0651	-	-	10
Silver	0.0225	3.928	0		0.0025	3.9055	-	0.0814	-	-	10
Zinc	0.0225	3.928	0	0.08	0.08619	3.9055	2.621	2.8074	-0.449	-2.4	10

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.
(Qpotw) POTW's average influent flow in MGD.
(Rsec) Removal efficiency across primary treatment and secodary treatment as percent.
(Ccrit) Nitrification threshold inhibition level, mg/l.
(Qdom) Domestic/commercial background flow in MGD.
(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.
(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).
(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).
(Lind) Maximum allowable industrial loading to the POTW in pounds per day.
(Cind) Industrial allowable local limit for a given pollutant in mg/l.
(SF) Safety factor as a percent.
8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Ccrit * Qpotw}{1 - Rsec}$$

TABLE 4

Local Limits Determination Based on Sludge Regulations

Pollutant	ENVIRONMENTAL CRITERIA AND PROCESS DATA BASE								MAXIMUM LOADING		INDUSTRIAL		
	IU Pollut. Flow (MGD) (Qind)	POTW Flow (MGD) (Qpotw)	Sludge Flow (MGD) (Qsldg)	Percent Solids (%) (PS)	Removal Efficiency (%) (Rpotw)	503 Sludge Criteria (mg/kg) (Cslcrit)	Domestic and Commercial Conc. (mg/l) (Cdom)	Domestic and Commercial Flow (MGD) (Qdom)	Allowable Headworks (lbs/day) (Lhw)	Domestic/ Commercial (lbs/day) (Ldom)	Allowable Loading (lbs/day) (Lind)	Local Limit (mg/l) (Cind)	Safety Factor (%) (SF)
Arsenic	0.0225	3.928	0.0043	18.8	45	41	0.0025	3.9055	0.614	0.0814	0.4714	2.51	10
Cadmium	0.0225	3.928	0.0043	18.8	67	39	0.0019	3.9055	0.392	0.0619	0.2913	1.55	10
Chromium (total)	0.0225	3.928	0.0043	18.8	67		0.0061	3.9055	-	0.1987	-	-	10
Chromium (hex)	0.0225	3.928	0.0043	18.8	50		0.005	3.9055	-	0.1629	-	-	10
Copper	0.0225	3.928	0.0043	18.8	88	1500	0.02841	3.9055	11.492	0.9254	9.4176	50.19	10
Cyanide, Total	0.0225	3.928	0.0043	18.8	69		0.005	3.9055	-	0.1629	-	-	10
Cyanide, Free	0.0225	3.928	0.0043	18.8	69		0.0015	3.9055	-	0.0489	-	-	10
Lead	0.0225	3.928	0.0043	18.8	61	300	0.0087	3.9055	3.316	0.2834	2.7008	14.39	10
Mercury	0.0225	3.928	0.0043	18.8	94	17	0.000047	3.9055	0.122	0.0015	0.1082	0.58	10
Molybdenum	0.0225	3.928	0.0043	18.8	20	75	0.0123	3.9055	2.528	0.4006	1.8748	9.99	10
Nickel	0.0225	3.928	0.0043	18.8	42	420	0.0053	3.9055	6.742	0.1726	5.8952	31.42	10
Selenium	0.0225	3.928	0.0043	18.8	50	100	0.002	3.9055	1.348	0.0651	1.1484	6.12	10
Silver	0.0225	3.928	0.0043	18.8	75		0.0025	3.9055	-	0.0814	-	-	10
Zinc	0.0225	3.928	0.0043	18.8	78	2800	0.08619	3.9055	24.202	2.8074	18.9747	101.12	10

(Qind) Industrial User total plant discharge flow in Million Gallons per Day (MGD) that contains a particular pollutant.
(Qpotw) POTW's average influent flow in MGD.
(Qsldg) Sludge flow to disposal in MGD.
(PS) Percent solids of sludge to disposal.
(Rpotw) Removal efficiency across POTW as a percent.
(Cslcrit) 503 sludge criteria in mg/kg dry sludge.
(Qdom) Domestic/commercial background flow in MGD.
(Cdom) Domestic/commercial background concentration for a particular pollutant in mg/l.
(Lhw) Maximum allowable headworks pollutant loading to the POTW in pounds per day (lbs/day).
(Ldom) Domestic/commercial background loading to the POTW for a particular pollutant in pounds per day (lbs/day).
(Lind) Maximum allowable industrial loading to the POTW in pounds per day.
(Cind) Industrial allowable local limit for a given pollutant in mg/l.
(SF) Safety factor as a percent.
8.34 Unit conversion factor

$$Lhw = \frac{8.34 * Cslcrit * (PS/100) * Qsldg}{Rpotw}$$