National Pollutant Discharge Elimination System (NPDES) Permit Program

FACT SHEET

Regarding an NPDES Permit to Discharge to Waters of the State of Ohio
for **City of Warren Water Pollution Control Facility (WPCF)**

Public Notice No.: 187152
Public Notice Date: August 9, 2023
Comment Period Ends: September 8, 2023

Ohio EPA Permit No.: **3PE00008*RD**
Application No.: **OH0027987**

Name and Address of Applicant:
City of Warren
2323 Main Avenue
Warren, OH 44481

Name and Address of Facility Where Discharge Occurs:
Warren WPCF
2323 Main Avenue
Warren, OH 44481
Trumbull County

Receiving Water: **Mahoning River**

Subsequent Stream Network: **Beaver River (Pennsylvania), Ohio River**

INTRODUCTION

Development of a Fact Sheet for NPDES permits is mandated by Title 40 of the Code of Federal Regulations (CFR), Section 124.8 and 124.56. This document fulfills the requirements established in those regulations by providing the information necessary to inform the public of actions proposed by the Ohio Environmental Protection Agency (Ohio EPA), as well as the methods by which the public can participate in the process of finalizing those actions.

This Fact Sheet is prepared in order to document the technical basis and risk management decisions that are considered in the determination of water quality based NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, instream biological, chemical and physical conditions, and the relative risk of alternative effluent limitations. This Fact Sheet details the discretionary decision-making process empowered to the Director by the Clean Water Act (CWA) and Ohio Water Pollution Control Law (Ohio Revised Code [ORC] 6111). Decisions to award variances to Water Quality Standards (WQS) or promulgated effluent guidelines for economic or technological reasons will also be justified in the Fact Sheet where necessary.

Antidegradation provisions in Ohio Administrative Code (OAC) Chapter 3745-1 describe the conditions under which water quality may be lowered in surface waters. No antidegradation review was necessary.

Effluent limits based on available treatment technologies are required by Section 301(b) of the CWA. Many of these have already been established by the United States Environmental Protection Agency (U.S. EPA) in the effluent guideline regulations (a.k.a. categorical regulations) for industry categories in 40 CFR Parts 405-499. Technology-based regulations for publicly-owned treatment works are listed in the Secondary Treatment Regulations (40 CFR Part 133). If regulations have not been established for a category of dischargers, the director may establish technology-based limits based on best professional judgment (BPJ).

Ohio EPA reviews the need for water-quality-based limits on a pollutant-by-pollutant basis. Wasteload allocations (WLAs) are used to develop these limits based on the pollutants that have been detected in the discharge, and the receiving water's assimilative capacity. The assimilative capacity depends on the flow in the water receiving the discharge, and the concentration of the pollutant upstream. The greater the upstream flow, and the lower the upstream concentration, the greater the assimilative capacity is. Assimilative capacity may represent dilution (as in allocations for metals), or it may also incorporate the break-down of pollutants in the receiving water (as in allocations for oxygen-demanding materials).

The need for water-quality-based limits is determined by comparing the WLA for a pollutant to a measure of the effluent quality. The measure of effluent quality is called Projected Effluent Quality (PEQ). This is a statistical measure of the average and maximum effluent values for a pollutant. As with any statistical method, the more data that exists for a given pollutant, the more likely that PEQ will match the actual observed data. If there is a small data set for a given pollutant, the highest measured value is multiplied by a statistical factor to obtain a PEQ; for example if only one sample exists, the factor is 6.2, for two samples - 3.8, for three samples - 3.0. The factors continue to decline as samples sizes increase. These factors are intended to account for effluent variability, but if the pollutant concentrations are fairly constant, these factors may make PEQ appear larger than it would be shown to be if more sample results existed.

SUMMARY OF PERMIT CONDITIONS

The effluent limits and/or monitoring requirements proposed for all parameters are the same as in the current permit, except those listed below.

New effluent limits are proposed for mercury due to reasonable potential to exceed the wasteload allocation. A 36-month compliance schedule to attain compliance with the new limits is proposed.

New monitoring for chloroform is proposed based results of the reasonable potential analysis.

Limits and monitoring are proposed to be removed for barium due to a lack of reasonable potential to exceed the wasteload allocation.

Monitoring is proposed to be removed for bromodichloromethane, dibromochloromethane, chloride, iron, selenium, strontium, and sulfate due to a lack of reasonable potential to exceed the wasteload allocation.

Annual chronic toxicity monitoring with the determination of acute endpoints is proposed for the life of the permit. This satisfies the minimum testing requirements of Ohio Administrative Code (OAC) 3754-33-07(B)(11) and will adequately characterize toxicity in the plant's effluent.

Monitoring at influent station 601 for barium and selenium is proposed to be removed due to a lack of reasonable potential to exceed the wasteload allocation at Outfall 3PE00008001.

Monitoring at upstream monitoring station 3PE00008801 and downstream monitoring station 3PE00008901 for *E. coli* is proposed to change to once per two weeks for the months of June through August. The increased frequency over a shorter duration will facility impairment assessment in the receiving stream.

Monitoring at station 3PE00008901 for cadmium, chromium, copper, dissolved hexavalent chromium, free cyanide, lead, nickel, selenium, total filterable residue, and zinc is proposed to be removed due to a lack of reasonable potential to exceed the wasteload allocation at Outfall 3PE00008001.

A schedule of compliance for collection system improvements to address sanitary sewer overflows and inflow & infiltration in the collection system is proposed in Part I,C of the permit.

Currently, there are three approved methods for free cyanide. The permittee shall use ASTM D7237-10, OIA-1677-09, or ASTM D4282-02. (Note: The use of ASTM D4282-02 requires supporting documentation that it meets the requirement of a "sufficiently sensitive" test procedure as defined in 40 CFR 122.44(i)(1)(iv)).

In Part II of the permit, special conditions are included that address sanitary sewer overflow (SSO) reporting; operator certification, minimum staffing and operator of record; whole effluent toxicity (WET) testing; tracking of group 4 parameters; pretreatment program requirements; minimum detection limits, carcinogenic additivity; and outfall signage.

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PROCEDURES FOR PARTICIPATION IN THE FORMULATION OF FINAL DETERMINATIONS

The draft action shall be issued as a final action unless the Director revises the draft after consideration of the record of a public meeting or written comments, or upon disapproval by the Administrator of the U.S. Environmental Protection Agency.

Within thirty days of the date of the Public Notice, any person may request or petition for a public meeting for presentation of evidence, statements or opinions. The purpose of the public meeting is to obtain additional evidence. Statements concerning the issues raised by the party requesting the meeting are invited. Evidence may be presented by the applicant, the state, and other parties, and following presentation of such evidence other interested persons may present testimony of facts or statements of opinion.

Requests for public meetings shall be in writing and shall state the action of the Director objected to, the questions to be considered, and the reasons the action is contested. Such requests should be emailed to HClerk@epa.ohio.gov or mailed to:

Legal Records Section
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Interested persons are invited to submit written comments upon the discharge permit. Comments should be submitted by email to epa.dswcomments@epa.ohio.gov (preferred method) or delivered in person or by mail no later than 30 days after the date of this Public Notice. Deliver or mail all comments to:

Ohio Environmental Protection Agency
Attention: Division of Surface Water
Permits Processing Unit
P.O. Box 1049
Columbus, Ohio 43216-1049

The Ohio EPA permit number and Public Notice numbers should appear on each page of any submitted comments. All comments received no later than 30 days after the date of the Public Notice will be considered.

Citizens may conduct file reviews regarding specific companies or sites. Appointments are necessary to conduct file reviews, because requests to review files have increased dramatically in recent years. The first 250 pages copied are free. For requests to copy more than 250 pages, there is a five-cent charge for each page copied. Payment is required by check or money order, made payable to Treasurer State of Ohio.

For additional information about this fact sheet or the draft permit, contact David Brumbaugh at (614) 644-2138 or david.brumbaugh@epa.ohio.gov.

INFORMATION REGARDING CERTAIN WATER QUALITY BASED EFFLUENT LIMITS

This draft permit may contain proposed water-quality-based effluent limits (WQBELs) for parameters that **are not** priority pollutants. (See the following link for a list of the priority pollutants: https://epa.ohio.gov/static/Portals/35/pretreatment/Pretreatment_Program_Priority_Pollutant_Detection_Limits.pdf.) In accordance with ORC 6111.03(J)(3), the Director established these WQBELs after considering, to the extent consistent with the Federal Water Pollution Control Act, evidence relating to the technical feasibility and economic reasonableness of removing the polluting properties from those wastes and to evidence relating to conditions calculated to result from that action and their relation to benefits to the people of the state and to

accomplishment of the purposes of this chapter. This determination was made based on data and information available at the time the permit was drafted, which included the contents of the timely submitted NPDES permit renewal application, along with any and all pertinent information available to the Director.

This public notice allows the permittee to provide to the Director for consideration during this public comment period additional site-specific pertinent and factual information with respect to the technical feasibility and economic reasonableness for achieving compliance with the proposed final effluent limitations for these parameters. The permittee shall email to epa.dswcomments@epa.ohio.gov (preferred method) or deliver or mail this information to:

Ohio Environmental Protection Agency
Attention: Division of Surface Water
Permits Processing Unit
P.O. Box 1049
Columbus, Ohio 43216-1049

Should the applicant need additional time to review, obtain or develop site-specific pertinent and factual information with respect to the technical feasibility and economic reasonableness of achieving compliance with these limitations, a written request for any additional time shall be sent to the above address no later than 30 days after the Public Notice Date on Page 1.

Should the applicant determine that compliance with the proposed WQBELs for parameters other than the priority pollutants is technically and/or economically unattainable, the permittee may submit an application for a variance to the applicable WQS used to develop the proposed effluent limitation in accordance with the terms and conditions set forth in OAC 3745-33-07(D). The permittee shall submit this application to the above address no later than 30 days after the Public Notice Date.

Alternately, the applicant may propose the development of site-specific WQS pursuant to OAC 3745-1-39. The permittee shall submit written notification regarding their intent to develop site specific WQS for parameters that are not priority pollutants to the above address no later than 30 days after the Public Notice Date.

LOCATION OF DISCHARGE/RECEIVING WATER USE CLASSIFICATION

Warren WPCF discharges to the Mahoning River at River Mile 35.2. Figure 1 shows the approximate location of the facility.

This segment of the Mahoning River is described by Ohio EPA River Code: 18-000, Hydrologic Unit Code: 05030103-06-03, County: Trumbull, Ecoregion: Erie/Ontario Lake Hills & Plains. The Mahoning River is designated for the following uses under Ohio's WQS (OAC 3745-1-25): Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply, Primary Contact Recreation. Mahoning River flows into Pennsylvania, which has applicable criteria that must be protected.

Use designations define the goals and expectations of a waterbody. These goals are set for aquatic life protection, recreation use and water supply use, and are defined in the Ohio WQS (OAC 3745-1-07). The use designations for individual waterbodies are listed in rules -08 through -32 of the Ohio WQS. Once the goals are set, numeric WQS are developed to protect these uses. Different uses have different water quality criteria.

Use designations for aquatic life protection include habitats for coldwater fish and macroinvertebrates, warmwater aquatic life and waters with exceptional communities of warmwater organisms. These uses all meet the goals of the federal CWA. Ohio WQS also include aquatic life use designations for waterbodies which cannot meet the CWA goals because of human-caused conditions that cannot be remedied without causing fundamental changes to land use and widespread economic impact. The dredging and clearing of some small streams to support agricultural or urban drainage is the most common of these conditions. These streams are given Modified Warmwater or Limited Resource Water designations.

Recreation uses are defined by the depth of the waterbody and the potential for wading or swimming. Uses are defined for bathing waters, swimming/canoeing (Primary Contact Recreation) and wading only (Secondary Contact which are generally waters too shallow for swimming or canoeing).

Water supply uses are defined by the actual or potential use of the waterbody. Public Water Supply designations apply near existing water intakes so that waters are safe to drink with standard treatment. Most other waters are designated for agricultural water supply and industrial water supply.

FACILITY DESCRIPTION

Warren WPCF was constructed in 1962 and last upgraded in 1997. The average design flow is 16.0 million gallons per day (MGD) with a peak hydraulic capacity of 40 MGD. Warren WPCF serves a total population of approximately 54,000 in the City of Warren, Champion Township, Howland Township, Warren Township, and Village of Lordstown. The primary provider of potable water for the service area is the City of Warren Water Treatment Plant; the source water is Mosquito Creek Reservoir.

Warren WPCF has the following treatment processes (Figure 2):

- Perforated plates
- Grit/Scum removal
- Septage Receiving
- Primary sedimentation
- Activated sludge (conventional)
- Secondary clarification
- Chlorination/dechlorination
- Post-aeration

The City of Warren is subject to Directors Final Findings and Orders, entered November 22, 2019, which require the City to design and implement the projects associated with Phase 1 (of 4) of its *Capital Improvement Plan* (CIP). Implementation of the CIP will provide updated equipment for the facility, reduce operations and maintenance costs, improve operations and monitoring controls, and ultimately increase the design flow to 20 MGD and peak hydraulic capacity to 60 MGD. Design of Phase 2 is expected to begin during this permit cycle.

The City of Warren has 100% separate sanitary sewers in the collection system. However, significant inflow and infiltration (I/I) and limited capacity in portions of the system result in a considerable amount of sanitary sewer overflows (SSOs) and water in basement (WIB) issues. The City submitted its *Expanded I/I Study Report* on January 8, 2021, which identified projects to reduce I/I, eliminate collection system bottlenecks, and provide conveyance capacity to alleviate these issues. A compliance schedule requiring implementation of these projects is proposed in Part I, C of the permit.

The City of Warren implements an Ohio EPA-approved industrial pretreatment program, which regulates ten significant categorical users that discharge approximately 1.509 MGD of flow and two significant non-categorical users that discharge approximately 0.118 MGD of flow.

Warren WPCF utilizes the following sewage sludge treatment processes (Figure 3):

- Dissolved Air Flotation (thickening)
- Disk Thickening
- Sludge Holding
- Dewatering (filter press)
- Lime Stabilization (RDP Envessel Lime Pasteurization™ system)

Table 1 shows the last five years of sludge removed from Warren WPCF. The Exceptional Quality Biosolids (Station 3PE00008584) are distributed by the City to farmers and landscapers under the trade name, Nature's Blend. Additional sludge handling options include land application of Class B Biosolids (Station 3PE00008581), disposal in a licensed solid waste landfill (Station 3PE00008586), or transfer to another NPDES permit holder (Station 3PE00008588).

DESCRIPTION OF EXISTING DISCHARGE

Table 2 presents the effluent violations for Warren WPCF during the previous five years. Control of total suspended solids has been a persistent issue for Warren WPCF. Improvements associated with the CIP and DFFOs are expected to improve performance.

Table 3 presents the average annual effluent flow rate for Warren WPCF for the previous five years. Warren WPCF estimates there is an infiltration/inflow (I/I) rate to the collection system of 8.5 MGD.

Table 4 presents the number of SSOs reported by Warren WPCF for the previous five years. SSOs are reported at station 3PE00008300.

Table 5 presents data characterizing the annual total phosphorus load from Warren WPCF during the previous five years.

Table 6 presents chemical specific data compiled from data reported in annual pretreatment reports. Because this data is substantially identical to the application requirements in CFR 122.21(j), the Director has waived the requirement for submittal of supplemental effluent testing data as part of the NPDES renewal application.

Table 7 presents a summary of unaltered Discharge Monitoring Report (DMR). Data are presented for the period January 2017 through May 2022, and current permit limits are provided for comparison.

Table 8 summarizes the chemical specific data for outfall 001 by presenting the average and maximum PEQ values.

Table 9 summarizes the results of acute and chronic Whole Effluent Toxicity (WET) tests of the final effluent, using the water flea (*Ceriodaphnia dubia*) and fathead minnow (*Pimephales promelas*) as test organisms.

ASSESSMENT OF IMPACT ON RECEIVING WATERS

Pursuant to Section 303(d) of the Clean Water Act, each state is required to develop and submit a list to US EPA of its impaired and threatened waters (e.g. stream/river segments, lakes). For each water on the list, the state identifies the pollutant(s) causing the impairment, when known. The Warren-Mahoning River watershed assessment unit, which includes the Mahoning River in the vicinity of Warren WPCF, is listed as impaired for aquatic life and recreation use on Ohio's 303(d) list.

The Total Maximum Daily Load (TMDL) program focuses on identifying and restoring polluted rivers, streams, lakes and other surface water bodies. A TMDL is a written, quantitative assessment of water quality problems in a water body and contributing sources of pollution. It specifies the amount a pollutant needs to be reduced to meet water quality standards (WQS), allocates pollutant load reductions, and provides the basis for taking actions needed to restore a water body. A Total Daily Maximum Load (TMDL) report was approved for the Mahoning River in September 2011.

An assessment of the impact of a permitted point source on the immediate receiving waters includes an evaluation of the available chemical/physical, biological, and habitat data which have been collected by Ohio EPA pursuant to the Five-Year Basin Approach for Monitoring and NPDES Reissuance. Other data may be used provided it was collected in accordance with Ohio EPA methods and protocols as specified by the Ohio WQS and Ohio EPA guidance documents. Other information which may be evaluated includes, but is not limited to: NPDES permittee self-monitoring data; effluent and mixing zone bioassays conducted by Ohio EPA, the permittee, or U.S. EPA.

In evaluating this data, Ohio EPA attempts to link environmental stresses and measured pollutant exposure to the health and diversity of biological communities. Stresses can include pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. Indicators of exposure to these stresses include whole effluent toxicity tests, fish tissue chemical data, and fish health biomarkers (for example, fish blood tests).

Use attainment is a term which describes the degree to which environmental indicators are either above or below criteria specified by the Ohio WQS (OAC 3745-1). Assessing use attainment status for aquatic life uses primarily relies on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-1). These criteria apply to rivers and streams outside of mixing zones. Numerical biological criteria are based on measuring several characteristics of the fish and macroinvertebrate communities; these characteristics are combined into multimetric biological indices including the Index of Biotic Integrity and modified Index of Well-Being, which indicate the response of the fish community, and the Invertebrate Community Index, which indicates the response of the macroinvertebrate community. Numerical criteria are broken down by ecoregion, use designation, and stream or river size. Ohio has five ecoregions defined by common topography, land use, potential vegetation and soil type.

Three attainment status results are possible at each sampling location -full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the biocriteria. Partial attainment means that one or

more of the applicable indices fails meet the biocriteria. Nonattainment means that either none of the applicable indices meet the biocriteria or one of the organism groups indicates poor or very poor performance. An aquatic life use attainment table (see Table 10) is constructed based on the sampling results and is arranged from upstream to downstream and includes the sampling locations indicated by river mile, the applicable biological indices, the use attainment status (i.e., full, partial, or non), the Qualitative Habitat Evaluation Index, and comments and observations for each sampling location.

The 2004 TMDL addressed only the recreation use impairment. Since then, reassessment of the watershed in 2013 indicated that the Mahoning River in the vicinity of Warren WPCF remains impaired due to high bacteria levels from the following sources: sewer overflows, urban runoff, and point source discharges. Warren WPCF continues to experience high numbers of SSOs and has reported several violations of the *E. coli* effluent limits over the last five years, indicating that the facility is contributing to the impairment.

The 2013 survey also determined that this reach of the Mahoning River is also impaired for aquatic life use due to habitat alterations, flow regime alterations, and sedimentation/siltation attributed to dams in the river and are not attributable to Warren WPCF.

The *2022 Ohio Integrated Water Quality Monitoring and Assessment Report* is available through the Ohio EPA, Division of Surface Water website at:
https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/ohio-integrated-water-quality-monitoring-and-assessment-report

The TMDL is available through the Ohio EPA, Division of Surface Water website at:
https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/mahoning-river-watershed

The *Biological and Water Quality Report for the Lower Mahoning River Watershed, 2011 and 2013* is available through the Ohio EPA, Division of Surface Water website at:
https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/biological-and-water-quality-reports

DEVELOPMENT OF WATER-QUALITY-BASED EFFLUENT LIMITS

Determining appropriate effluent concentrations is a multiple-step process in which parameters are identified as likely to be discharged by a facility, evaluated with respect to Ohio water quality criteria, and examined to determine the likelihood that the existing effluent could violate the calculated limits.

Parameter Selection

Effluent data for the Warren WPCF were used to determine what parameters should undergo WLA. The parameters discharged are identified by the data available to Ohio EPA, DMR data submitted by the permittee, compliance sampling data collected by Ohio EPA, and any other data submitted by the permittee, such as priority pollutant scans required by the NPDES application or by pretreatment, or other special conditions in the NPDES permit. The sources of effluent data used in this evaluation are as follows:

Self-monitoring data (DMR)	January 2017 through May 2022
Pretreatment data	2017-2021

Statistical Outliers and Other Non-representative Data

The data were examined and the following values were removed from the evaluation as non-representative data:

- Barium – 610 µg/l, 6/20/17; high value, excluded to improve R^2 and data fit.
- Mercury – 145 ng/L, 5/4/21; removed as outlier, more than four times higher than next highest value.

- Bromodichloromethane, chlorodibromomethane, and chloroform – all data prior to January 2019 – these trihalomethanes were identified as disinfection byproducts from the City of Warren Water Filtration Plant. In 2019, the City implemented a powder activated carbon treatment to address these parameters.

This data is evaluated statistically, and PEQ values are calculated for each pollutant. Average PEQ (PEQ_{avg}) values represent the 95th percentile of monthly average data, and maximum PEQ (PEQ_{max}) values represent the 95th percentile of all data points (see Table 8). See Modeling Guidance #1 for more information on PEQ calculations, available through the Ohio EPA, Division of Surface Water website at: https://www.epa.ohio.gov/portals/35/guidance/model1.pdf

The PEQ values are used according to Ohio rules to compare to applicable WQS and allowable WLA values for each pollutant evaluated. Initially, PEQ values are compared to the applicable average and maximum WQS. If both PEQ values are less than 25 percent of the applicable WQS, the pollutant does not have the reasonable potential to cause or contribute to exceedances of WQS, and no WLA is done for that parameter. If either PEQ_{avg} or PEQ_{max} is greater than 25 percent of the applicable WQS, a WLA is conducted to determine whether the parameter exhibits reasonable potential and needs to have a limit or if monitoring is required (see Table 11).

Wasteload Allocation

For those parameters that require a WLA, the results are based on the uses assigned to the receiving waterbody in OAC 3745-1. Dischargers are allocated pollutant loadings/concentrations based on the Ohio WQS (OAC 3745-1). Most pollutants are allocated by a mass-balance method because they do not break down in the receiving water. For free flowing streams, WLAs using this method are calculated using the following general equation: Discharger WLA = (downstream flow x WQS) - (upstream flow x background concentration). Discharger WLAs are divided by the discharge flow so that the allocations are expressed as concentrations. The following dischargers in the Mahoning River were considered interactive (see Figure 4):

Municipal WWTPs	***Industrials***
Youngstown WWTP	Thomas Steel Strip
Warren WWTP	Cleveland Cliffs-Warren
Niles WWTP	RMI-Niles
Campbell WWTP	McDonald Steel
Struthers WWTP	
Lowellville WWTP	

Four dischargers located on tributaries are allocated separately from the mainstem discharges: Meander Creek WWTP (Meander Creek), Girard WWTP (Little Squaw Creek), Mosquito Creek WWTP (Mosquito Creek), and Boardman WWTP (Mill Creek). Travel time to and distance from the Mahoning River are considered large enough that, for modeling purposes, the effluents from the respective treatment plants are considered non-interactive with the direct dischargers to the Mahoning. Effluents from these four treatment plants were allocated to meet water quality standards for the conditions, habitat, and use designation for their particular receiving waters. Monitoring was conducted downstream of these dischargers or at the mouths of these tributaries, however, for inputs into the Mahoning River mainstem model.

Flows in the Mahoning River

Flows in the Mahoning River are contributed to by a series of reservoirs in the headwaters and on Mosquito Creek, controlled and mostly owned by the U.S. Army Corps of Engineers. Constructed several decades ago to provide adequate flow for the steel industry of the Mahoning River valley, the reservoirs are operated on a schedule to maintain specific seasonal flows at Leavittsburg and Youngstown. The operation of the reservoir system is discussed at length in earlier USEPA Mahoning River studies (Amendola et al., 1977; Schregardus and Amendola, 1984).

Modeling Approach and Wasteload Allocations
Appropriate effluent concentrations for dischargers to the Mahoning River were determined using two models: a Monte Carlo model for cadmium, chromium (total), copper, lead, nickel and zinc, selenium, and total filterable residue. The conventional Ohio EPA conservative parameter model (CONSWLA) was used for all other parameters. The exception was the ammonia-N WLA, which was done separately for each facility because ammonia-N is considered to be a non-conservative parameter. The models and their applications are discussed in the sections that follow and model inputs are presented.

The applicable waterbody uses for this facility's discharge and the associated stream design flows are as follows:

Aquatic life (Warmwater Habitat)		
Toxics (metals, organics, etc.)	Average	Annual 7Q10
	Maximum	Annual 1Q10
Ammonia	Average	Summer 30Q10
		Winter 30Q10
Agricultural Water Supply		Harmonic mean flow
Human Health (nondrinking)		Harmonic mean flow

The CONSWLA model was used to calculate wasteload allocations for all other conservative parameters not being allocated using the Monte Carlo model. The available assimilative capacity was distributed among them using the conservative substance wasteload allocation (CONSWLA) water quality model for conservative parameters. CONSWLA is the model Ohio EPA typically uses in multiple discharger situations. CONSWLA model inputs for flow are fixed at their critical low levels and inputs for effluent flow are fixed at their design or 50th percentile levels. Background concentrations are fixed at a representative value (generally a 50th percentile). A mass balancing method is then used to allocate effluent concentrations that maintain WQS under these conditions. This technique is appropriate when data bases are unavailable to generate statistical distributions for inputs and if the parameters modeled are conservative.

Allocations are developed using a percentage of stream design flow as specified in Table 12, and allocations cannot exceed the Inside Mixing Zone Maximum (IMZM) criteria. The data used in the CONSWLA model to calculate WLAs are listed in Table 11 and Table 12. The WLA results to maintain all applicable criteria are presented in Table 15.

Monte Carlo Model
The Monte Carlo method was applied to selenium, total filterable residue, cadmium, chromium (total), copper, lead, nickel, and zinc. Previous allocations for the metals, using the conventional Ohio EPA conservative parameter model, resulted in stringent limits for these parameters that have been difficult for dischargers to attain. As a result, the Ohio EPA was asked to consider other methods for determining effluent limits that would adequately protect the river while allowing the dischargers some relief. The Monte Carlo method addresses these concerns but does not guarantee more favorable discharge limits. This is the sixth permit cycle where a Monte Carlo method was used to determine the wasteload allocations for the six metals. (In the more recent permit cycles, TDS and selenium were added for reasons similar to the above.)

Conventional water quality modeling methods project the receiving water pollutant concentration which will occur under critical low-flow conditions. The Monte Carlo probabilistic method, as applied to water quality modeling, projects the year-round probability distribution for the pollutant. This allows a more accurate determination of the frequency at which water quality criteria are violated or maintained. Conventional modeling methods, when applied to systems with numerous dischargers, may be overly conservative because they model all dischargers at their maximum permitted concentration. The more dischargers modeled, the more unlikely it is that all will discharge at their maximum level at the same time and at critical low-flow

conditions. The Monte Carlo method accounts for the independent variability of discharges as well as other model inputs.

The Monte Carlo model for the Mahoning River was originally developed by Limno-Tech, Inc., for their 1993 study to determine alternative copper limits for Thomas Steel Strip. The model combines the Monte Carlo statistical method with a multi-discharge mass-balance model and allows upstream flow to be input from a historical gaging station flow record, in order to account for unusual flow fluctuations caused by the numerous upstream dams and reservoirs. Ohio EPA approved the alternative limits developed using this model and received permission to modify and apply the model in the future. The original model was written in 1992-1993 in Borland Pascal. The model has since been modified by the Ohio EPA and re-written in the 'C' programming language.

River Hardness and Water Quality Criteria

Water quality criteria for the six metals depends on instream hardness. Thus, hardness is a key element in determining effluent limits. A detailed analysis of the available hardness and flow data was conducted. This analysis revises and updates the Ohio EPA analysis previously performed in 2016. Stream hardness data was taken from the two main EA3 stations on the Mahoning River main stem, at Leavittsburg, Ohio (RM 45.51) and at Lowellville, Ohio (RM 12.42). The hardness data for the two stations was analyzed for the period March 2010 to September 2021.

A linear correlation between the Leavittsburg USGS gaging station flow and instream hardness was determined for both EA3 stations. These correlations were then used to calculate hardness as a function of river mile at the Leavittsburg 1Q10 low flow of 129 cfs and 7Q10 low flow of 136 cfs.

Acute Criteria, at 1Q10

river hardness (mg/L) = (-0.642)(river mile) + 172.078

Chronic Criteria, at 7Q10

river hardness (mg/L) = (-0.642)(river mile) + 171.955

Discharger hardness was calculated with these equations. This relationship established local river hardness for calculating both inside-mixing-zone and outside-mixing-zone, hardness-dependent criteria in the Monte Carlo model.

This Monte Carlo method uses a seven-day averaging period with a ten-year return period for meeting chronic (average) water quality criteria. A one-day averaging period with a ten-year return period is used for meeting the acute (maximum) water quality criteria. Agriculture and human health criteria are effectively long-term averages, rather than ten-year recurrence values, and the long-term average instream concentrations calculated by the Monte Carlo model are protective of the agriculture and human health criteria as well.

Federal rules require that a downstream state's water quality criteria be considered when calculating effluent limits. The Pennsylvania state line is at RM 11.43. Pennsylvania's standards are the same as Ohio's for total chromium, and zinc. However, Pennsylvania's standards for TDS, cadmium, copper, lead and nickel are more stringent than Ohio's and had to be considered. Since Pennsylvania uses, in effect, a one hundred-day return period, Ohio's acute criteria for the two metals, in combination with a ten-year return period, still meet Pennsylvania's water quality criteria. However, the same is not true for the chronic criteria. Table 13 contains the water quality criteria for the six metals, selenium and total filterable residue in the vicinity of the Warren WPCF.

Data Analysis for the Monte Carlo Model

The Monte Carlo method accounts for individual system component variability by generating probability distributions that predict a range of possible input conditions. These distributions are derived from the mean and the coefficient of variation (standard deviation / mean) input by the user and based on field data for each of these components. Table 14 lists the calculated mean and coefficient of variation for such system characteristics as background/ambient concentrations and discharger and tributary flows. The WLA results to maintain all applicable criteria are presented in Table 15.

When allocating multiple sources in a stream segment, the Director may distribute the loading among the discharges using any appropriate method, based on site-specific considerations [OAC 3745-2-05(A)(8)]. During the modeling process, Ohio EPA determined that allocating wasteloads for total filterable residue that differed among the interactive dischargers was appropriate. Several permittees discharge relatively small loads of total filterable residue, while others discharge large loads associated with industrial activity in the area. Wasteloads were allocated such that 1) no facility demonstrated reasonable potential to exceed their WLA and 2) water quality standards were protected throughout this reach of the Mahoning River.

Dissolved Metal Translators

In 2017, Ohio EPA stated that the dissolved metal translators (DMTs) used in previous modeling efforts for the lower Mahoning River would not be used again, as these data were based on sample data collected in 1998 and are considered to be unrepresentative of current conditions. No data to support updated DMTs were submitted, therefore these reasonable potential analyses do not include DMTs.

Whole Effluent Toxicity Wasteload Allocation

Whole effluent toxicity (WET) is the total toxic effect of an effluent on aquatic life measured directly with a toxicity test. Acute WET measures short term effects of the effluent while chronic WET measures longer term and potentially more subtle effects of the effluent.

WQS for WET are expressed in Ohio's narrative "free from" WQS rule [OAC 3745-1-04(D)]. These "free froms" are translated into toxicity units (i.e. TUa and TUc) by the associated WQS Implementation Rule (OAC 3745-2-09). The translation results in a numeric value of 0.3 TUa and 1.0 TUc. WLAs can then be calculated using these values as if they were water quality criteria.

There are two separate reasonable potential procedures in Ohio - one for the Lake Erie watershed and one for the Ohio River watershed. Dischargers in the Ohio River watershed are assessed using OAC 3745-33-07(B). Dischargers in the Lake Erie watershed are assessed in accordance with the "Great Lakes Water Quality Initiative Implementation Procedures" contained in 40 CFR Part 132, Appendix F, Procedure 6.

The WLA calculations for WET are similar to those for aquatic life criteria - using the chronic toxicity unit (TUc) and 7Q10 flow for the average and the acute toxicity unit (TUa) and 1Q10 flow for the maximum. These values are the levels of effluent toxicity that should not cause instream toxicity during critical low-flow conditions. For the purposes of establishing whole effluent toxicity limitations, the values of 1.0 TUa and 1.0 TUc are the most restrictive limitations that can be applied in NPDES permits [OAC 3745-33-07(B)(10)].

For Warren WPCF, the WLA values are 1.0 TU_a and 7.39 TU_c.

The chronic toxicity unit (TU_c) is defined as 100 divided by the estimate of the effluent concentration which causes a 25% reduction in growth or reproduction of test organisms (IC_{25}):

$$TU_c = 100/IC_{25}$$

This equation applies outside the mixing zone for warmwater, modified warmwater, exceptional warmwater, coldwater, and seasonal salmonid use designations except when the following equation is more restrictive (*Ceriodaphnia dubia* only):

TU_c = 100/geometric mean of No Observed Effect Concentration and Lowest Observed Effect Concentration

The acute toxicity unit (TU_a) is defined as 100 divided by the concentration in water having 50% chance of causing death to aquatic life (LC_{50}) for the most sensitive test species:

$$TU_a = 100/LC_{50}$$

This equation applies outside the mixing zone for all designated waters.

REASONABLE POTENTIAL/EFFLUENT LIMITS/MANAGEMENT DECISIONS

After appropriate effluent limits are calculated, the reasonable potential of the discharger to violate the WQS must be determined. Each parameter is examined and placed in a defined "group". Parameters that do not have a WQS or do not require a WLA based on the initial screening are assigned to either group 1 or 2. For the allocated parameters, the preliminary effluent limits (PEL) based on the most restrictive average and maximum WLAs are selected from Table 15. The average PEL (PEL_{avg}) is compared to the average PEQ (PEQ_{avg}) from Table 8, and the PEL_{max} is compared to the PEQ_{max}. Based on the calculated percentage of the allocated value [($PEQ_{avg} \div PEL_{avg}$) X 100, or ($PEQ_{max} \div PEL_{max}$) X 100)], the parameters are assigned to group 3, 4, or 5. The groupings are listed in Table 16.

The final effluent limits are determined by evaluating the groupings in conjunction with other applicable rules and regulations. Table 17 presents the final effluent limits and monitoring requirements proposed for Warren WPCF outfall 3PE00008001 and the basis for their recommendation. Unless otherwise indicated, the monitoring frequencies proposed in the permit are continued from the existing permit.

Ammonia, CBOD5, and TSS

The limits proposed for ammonia, 5-day carbonaceous biochemical oxygen demand (CBOD5), and total suspended solids (TSS) are all based on plant design criteria and have been effective since prior to the 1997 improvements. The TSS and CBOD5 limits are more stringent than the Secondary Treatment Standards in 40 CFR Part 133. The current ammonia limits have been evaluated using the WLA procedures and are protective of WQS for ammonia toxicity.

Total Residual Chlorine

The existing daily effluent limit for total residual chlorine is proposed to continue as a plant design value which is based on protection of the inside mixing zone maximum (IMZM) and outside mixing zone maximum (OMZM) PELs. The most stringent daily maximum criterion is applied and is to be met anytime chlorine is being utilized for effluent disinfection. The limit has been evaluated using the WLA procedures and determined to be protective of WQS for chlorine toxicity. The effluent limit for chlorine is less than the quantification level of 0.050 mg/L.

Although the current WLA would allow slightly higher limits for chlorine, anti-backsliding provisions in the OAC prevent the imposition of less stringent limits than those in the existing permit unless specific conditions have been satisfied. In the case of the Warren WPCF, none of those conditions have been satisfied, so the existing limits are proposed to continue. The anti-backsliding provisions of OAC 3745-33-05(F) require that an anti-degradation review must be completed before an existing permit limit can be made less stringent. The rule requires other conditions to be satisfied as well.

***E. coli*, Oil & Grease, and pH**
Limits proposed for oil and grease, pH, and *Escherichia coli* are based on WQS (OAC 3745-1-35 and 37). Primary contact recreation *E. coli* standards apply to the Mahoning River.

Mercury
The Ohio EPA risk assessment (Table 16) places mercury in group 5. This placement, as well as the data in Table 7 and Table 8, indicates that the reasonable potential to exceed WQS exists and limits are necessary to protect water quality. The PEQ is greater than 100 percent of the WLA and such pollutants must have permit limits under OAC 3745-33-07(A)(1). The thirty-day average concentration limit for mercury is based on human health criteria and the daily maximum concentration limit is based on the outside mixing zone maximum. A compliance schedule for meeting the new effluent limits is proposed. See Part I,C of the permit for details.

As Warren WPCF may have difficulty complying with the limits for mercury and because cost effective treatment measures for reducing mercury discharge concentrations may not be available, the permittee may consider applying for a variance by submitting a mercury variance application. Ohio EPA would then review the application, and if approved, proceed to modify the permit to incorporate variance-based mercury limits and conditions associated with the variance. Warren WPCF may submit a mercury variance application (if needed) no later than 12 months after the effective date of the permit. If the permit is not modified to include a variance-based limit, the WQBELs for mercury become effective 36 months after the effective date of this permit.

Copper and Free Cyanide
The Ohio EPA risk assessment (Table 16) places copper and free cyanide in group 4. This placement, as well as the data in Tables 10 and 11, support that these parameters do not have the reasonable potential to contribute to WQS exceedances, and limits are not necessary to protect water quality. Monitoring for Group 4 pollutants (where PEQ exceeds 50 percent of the WLA) is required by OAC 3745-33-07(A)(2). The monitoring frequency for copper is proposed to increase from monthly to once every two weeks.

In addition, the free cyanide effluent quality falls within 75 percent of the WLA. Under OAC 3745-33-07(A)(2), parameters in this range must have a tracking requirement in the permit that specifies reductions in pollutant concentrations if effluent concentrations exceed the WLA. The tracking/reduction requirements are included in Part II of the permit.

Cadmium, Chloroform, Chromium, Dissolved Hexavalent Chromium, Lead, Nickel, Total Filterable Residue, and Zinc
The Ohio EPA risk assessment (Table 16) places these parameters in groups 2 and 3. This placement, as well as the data in Tables 10 and 11, support that these parameters do not have the reasonable potential to contribute to WQS exceedances, and limits are not necessary to protect water quality. Monitoring for other parameters is proposed to document that these pollutants continue to remain at low levels.

Arsenic, Barium, Bromodichloromethane, Dibromochloromethane, Iron, Molybdenum, Selenium, Silver, and Strontium
The Ohio EPA risk assessment (Table 16) places these parameters in groups 2 and 3. This placement, as well as the data in Tables 10 and 11, support that these parameters do not have the reasonable potential to contribute to WQS exceedances, and limits are not necessary to protect water quality. Monitoring for iron, selenium, strontium is proposed to be removed. Annual monitoring of several of these parameters through pretreatment priority pollutant scans will provide data for future reasonable potential analyses.

Chloride and Sulfate
Monitoring for chloride and sulfate were included to obtain data on the level and variability of these total filterable residue constituents in the effluent. A review of these data suggests that the levels of both are typical and are not expected to pose a toxic impact. Monitoring for chloride and sulfate is proposed to be removed.

Flow Rate and Water Temperature
Monitoring for these parameters is proposed to continue in order to evaluate the performance of the treatment plant.

Nitrate plus Nitrite and Total Kjeldahl Nitrogen
The 2022 *Ohio Integrated Water Quality Monitoring and Assessment Report* (Ohio EPA) lists the Mahoning River watershed as impaired for aquatic life. Organic enrichment is listed as a cause and major municipal point sources are listed among the sources. Considering this information and the fact that municipal WWTPs discharge a nutrient load to the river, monthly monitoring for nitrate + nitrite and total Kjeldahl nitrogen is proposed based on best technical judgment. The purpose of the monitoring is to maintain a nutrient data set for use in the future studies.

Dissolved Orthophosphate and Total Phosphorus
Monitoring for dissolved orthophosphate (as P) and total phosphorus is required by ORC 6111.03. This monitoring will further develop nutrient datasets that are used in stream and watershed assessments and studies. Because Ohio EPA monitoring, as well as other in-stream monitoring, for dissolved orthophosphate is taken by grab sample, grab samples are proposed for orthophosphate to maintain consistent data. The grab samples must be filtered within 15 minutes of collection using a 0.45-micron filter. The filtered sample must be analyzed within 48 hours.

Whole Effluent Toxicity Reasonable Potential
Based on evaluating the WET data presented in Table 9, Attachment 1, and other pertinent data under the provisions of OAC 3745-33-07(B), the Warren WPCF is placed in Category 4 with respect to WET. While this indicates that the plant's effluent does not currently pose a toxicity problem, annual toxicity testing is proposed consistent with the minimum monitoring requirements at OAC 3754-33-07(B)(11). Annual chronic toxicity monitoring with the determination of acute endpoints is proposed for the life of the permit. The proposed monitoring will adequately characterize toxicity in the plant's effluent.

Additional Monitoring Requirements
Monitoring for *E. coli* at upstream monitoring station 3PE00008801 and downstream monitoring station 3PE00008901 is proposed to change to once per two weeks for the months of June through August. The increased frequency over a shorter duration will facilitate impairment assessment in the receiving stream.

Monitoring at station 3PE00008901 for cadmium, chromium, copper, dissolved hexavalent chromium, free cyanide, lead, nickel, selenium, total filterable residue, and zinc are proposed to be removed due to a lack of reasonable potential to exceed the wasteload allocation at Outfall 3PE00008001. Monitoring for chloride and sulfate stations 3PE00008801 and 3PE00008901 is proposed to be removed, as these constituents of total filterable residue are not expected to have a toxic impact.

Additional monitoring requirements proposed at the final effluent, influent and upstream/downstream stations are included for all facilities in Ohio and vary according to the type and size of the discharge. In addition to permit compliance, this data is used to assist in the evaluation of effluent quality and treatment plant performance and for designing plant improvements and conducting future stream studies.

Sludge
Limits and monitoring requirements proposed for the disposal of sewage sludge by the following management practices are based on OAC 3745-40: land application of class B biosolids (3PE00008581), distribution/sale of exceptional quality biosolids (3PE00008584), disposal in a licensed solid waste landfill (3PE00008586), and transfer to another NPDES permit holder (3PE00008588).

OTHER REQUIREMENTS

Compliance Schedule

Pretreatment Local Limits Review - A 24-month compliance schedule is proposed for the City to submit a technical justification for either revising its local industrial user limits or retaining its existing local limits. If revisions to local limits are required, the City must also submit a pretreatment program modification request. Details are in Part I,C of the permit.

New Limits for Mercury - A 36-month compliance schedule is proposed for the Warren WPCF to meet the new effluent limits for mercury. Details are in Part I,C of the permit.

I/I Reduction Schedule - A compliance schedule associated with the City's *Expanded I/I Study Report* is proposed. Details are in Part I,C of the permit.

Sanitary Sewer Overflow Reporting
Provisions for reporting SSOs are again proposed in this permit. These provisions include: the reporting of the system-wide number of SSO occurrences on monthly operating reports; telephone notification of Ohio EPA and the local health department, and 5-day follow up written reports for certain high risk SSOs; and preparation of an annual report that is submitted to Ohio EPA and made available to the public. Many of these provisions were already required under the "Noncompliance Notification", "Records Retention", and "Facility Operation and Quality Control" general conditions in Part III of Ohio NPDES permits.

Operator Certification and Operator of Record
Operator certification requirements have been included in Part II of the permit in accordance with OAC 3745-7. These rules require the Warren WPCF to have a Class IV wastewater treatment plant operator in charge of the sewage treatment plant operations discharging through outfall 3PE00008001. These rules also require the permittee to designate one or more operator of record to oversee the technical operation of the treatment works and sewerage system.

Low-Level Free Cyanide Testing
Currently there are three approved methods for free cyanide listed in 40 CFR 136 that have a quantification level lower than water quality-based effluent limits:

- ASTM D7237-10, OIA-1677-09, and ASTM D4282-02. (Note: The use of ASTM D4282-02 requires supporting documentation that it meets the requirement of a "sufficiently sensitive" test procedure as defined in 40 CFR 122.44(i)(1)(iv)).

These methods will allow Ohio EPA to make more reliable water quality-related decisions regarding free cyanide. Because the quantification levels are lower than any water quality-based effluent limits, it will also be possible to directly evaluate compliance with free cyanide limits.

Sufficiently Sensitive Method
Part II of the permit includes a condition requiring the Warren WPCF to use laboratory analytical methods with a sufficiently sensitive MDL.

Method Detection Limit Reporting
When submitting monitoring results in eDMR, the permittee must report all detected concentration values above the method detection limit (MDL), even if that value is below the quantification level, as indicated in Permit Guidance 9: *Limits below Quantification*. A detection above the MDL indicates the presence of a pollutant with strong confidence, which must be considered in reasonable potential analyses. Per OAC 3745-33-07(C)(2)(c),

for the purpose of assessing compliance, any value reported below the quantification level shall be considered in compliance with an effluent limit.

Outfall Signage
Part II of the permit includes requirements for the permittee to place and maintain a sign at each outfall to the Mahoning River providing information about the discharge. Signage at outfalls is required pursuant to OAC 3745-33-08(A).

Part III
Part III of the permit details standard conditions that include monitoring, reporting requirements, compliance responsibilities, and general requirements.

Storm Water Compliance
Parts IV, V, and VI have been included with the draft permit to ensure that any storm water flows from the facility site are properly regulated and managed. As an alternative to complying with Parts IV, V, and VI, the Warren WPCF may seek permit coverage under the general permit for industrial storm water (permit # OHR000007) or submit a "No Exposure Certification." Parts IV, V, and VI will be removed from the final permit if: 1) the Warren WPCF submits a Notice of Intent (NOI) for coverage under the general permit for industrial storm water or submits a No Exposure Certification, 2) Ohio EPA determines that the facility is eligible for coverage under the general permit or meets the requirements for a No Exposure Certification, and 3) the determination by Ohio EPA can be made prior to the issuance of the final permit.

Figure 1. Location of Warren WPCF

Figure 2. Diagram of Wastewater Treatment System

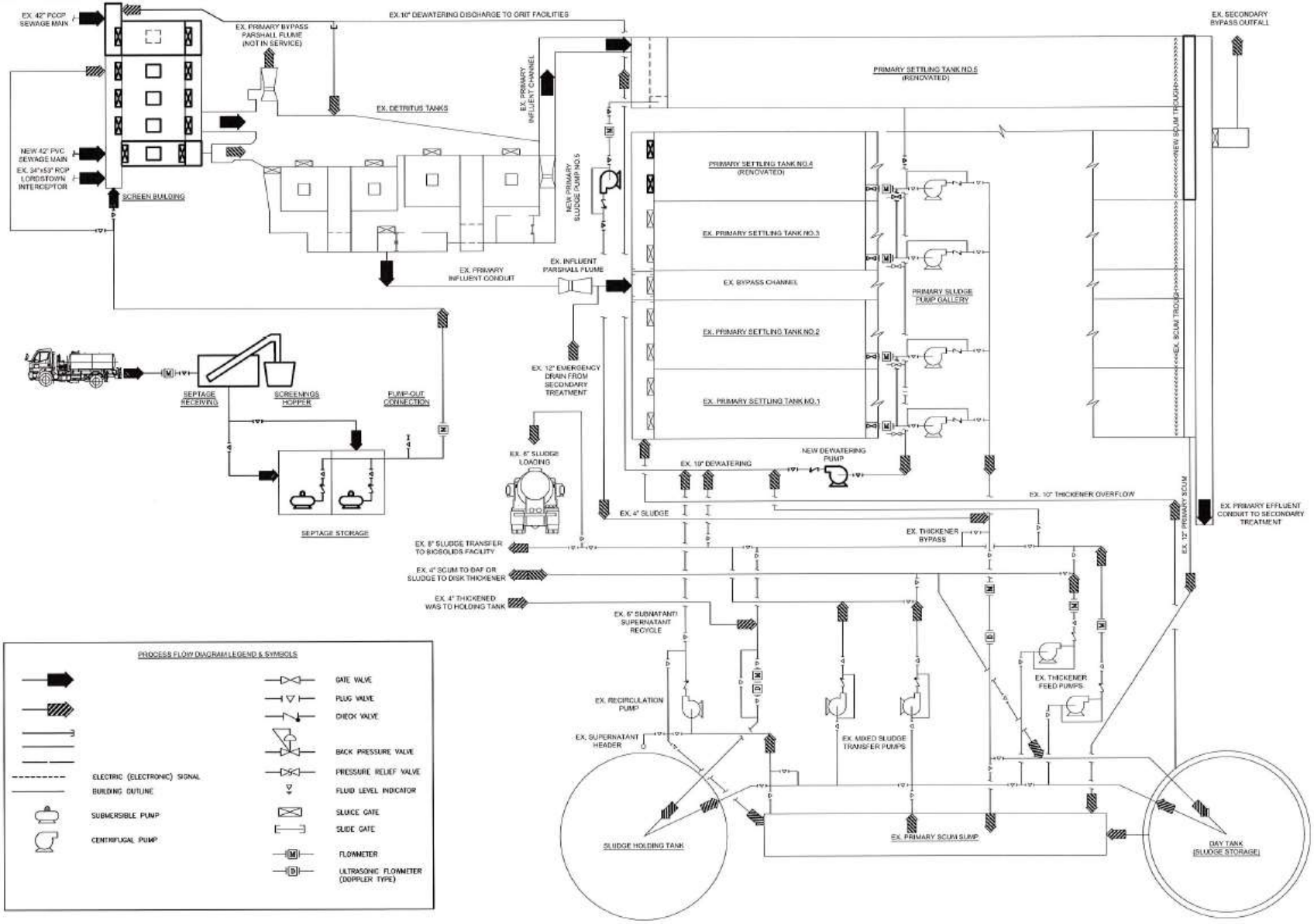


Figure 3. Diagram of Sludge Treatment System

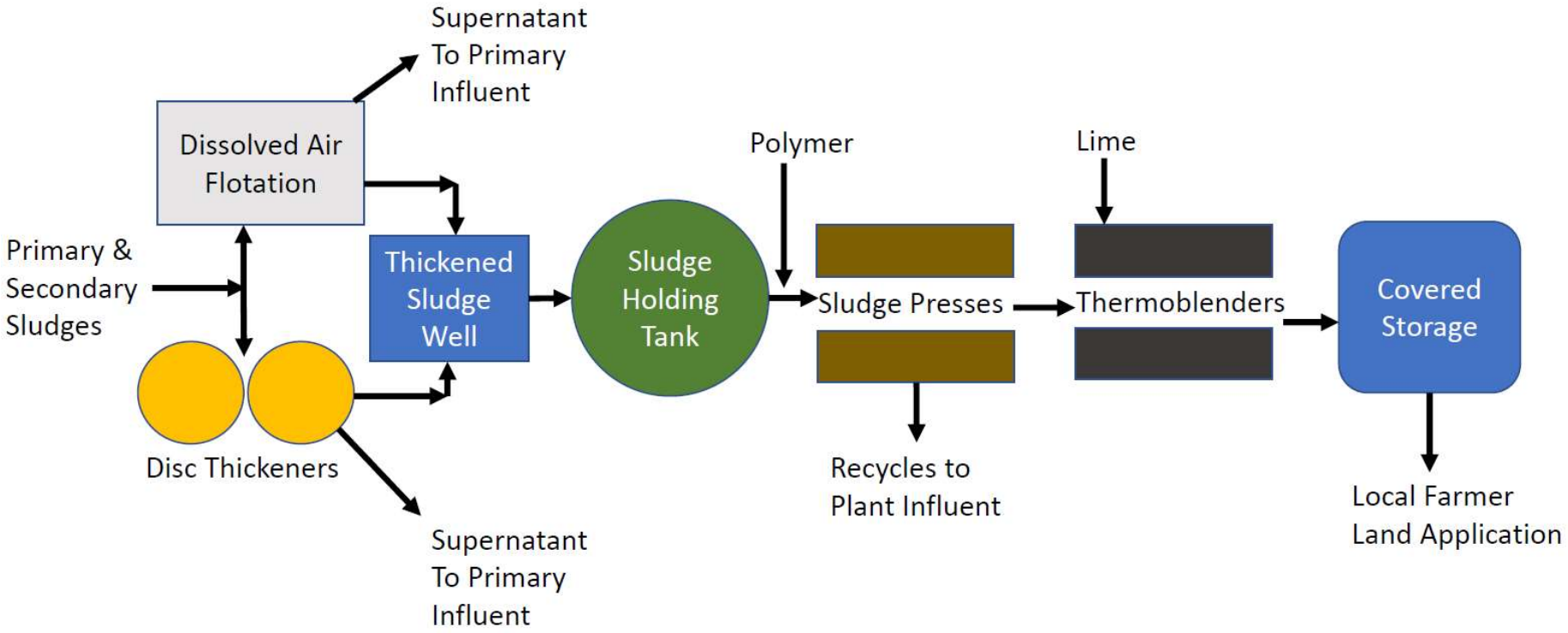
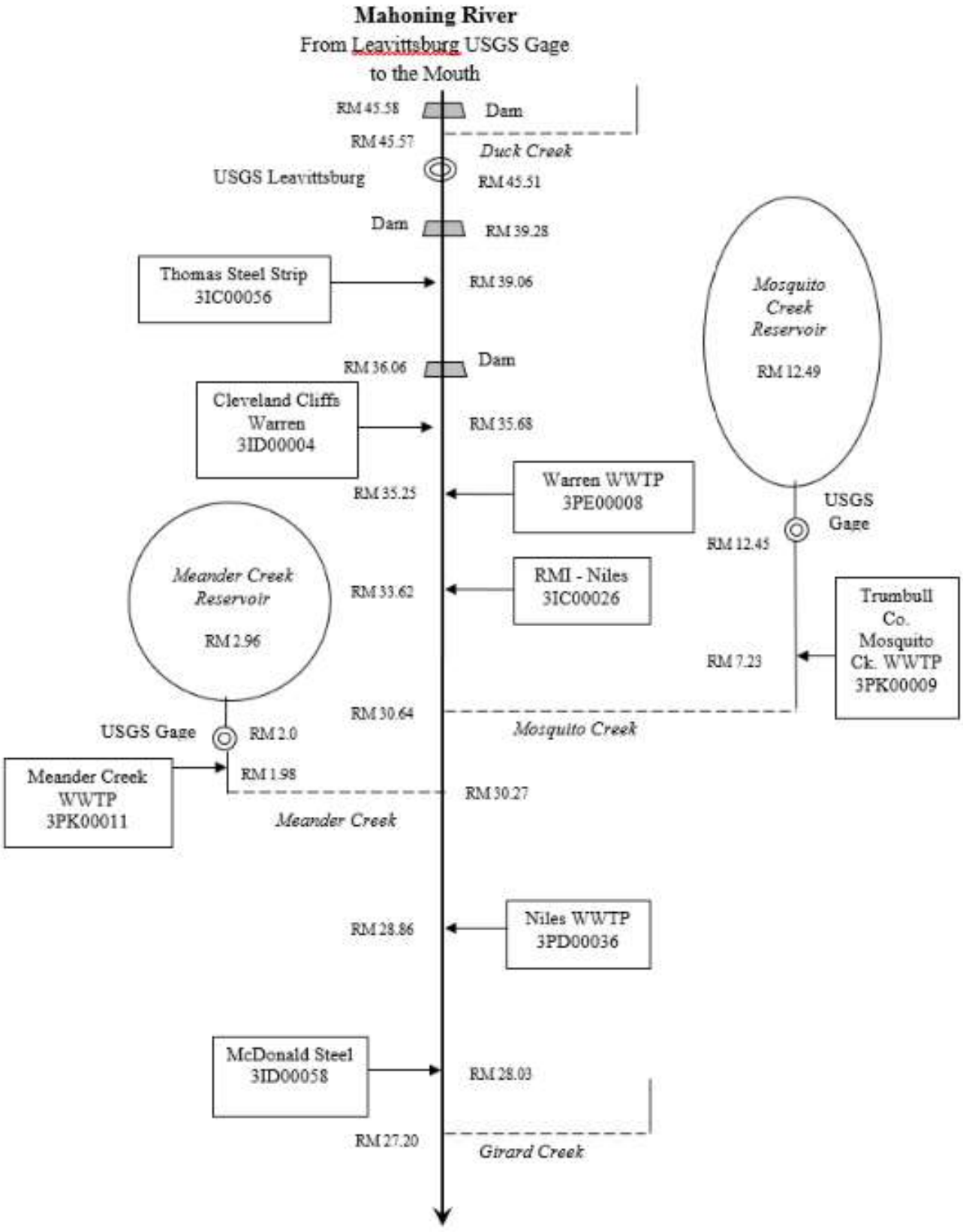


Figure 4. Mahoning River Study Area



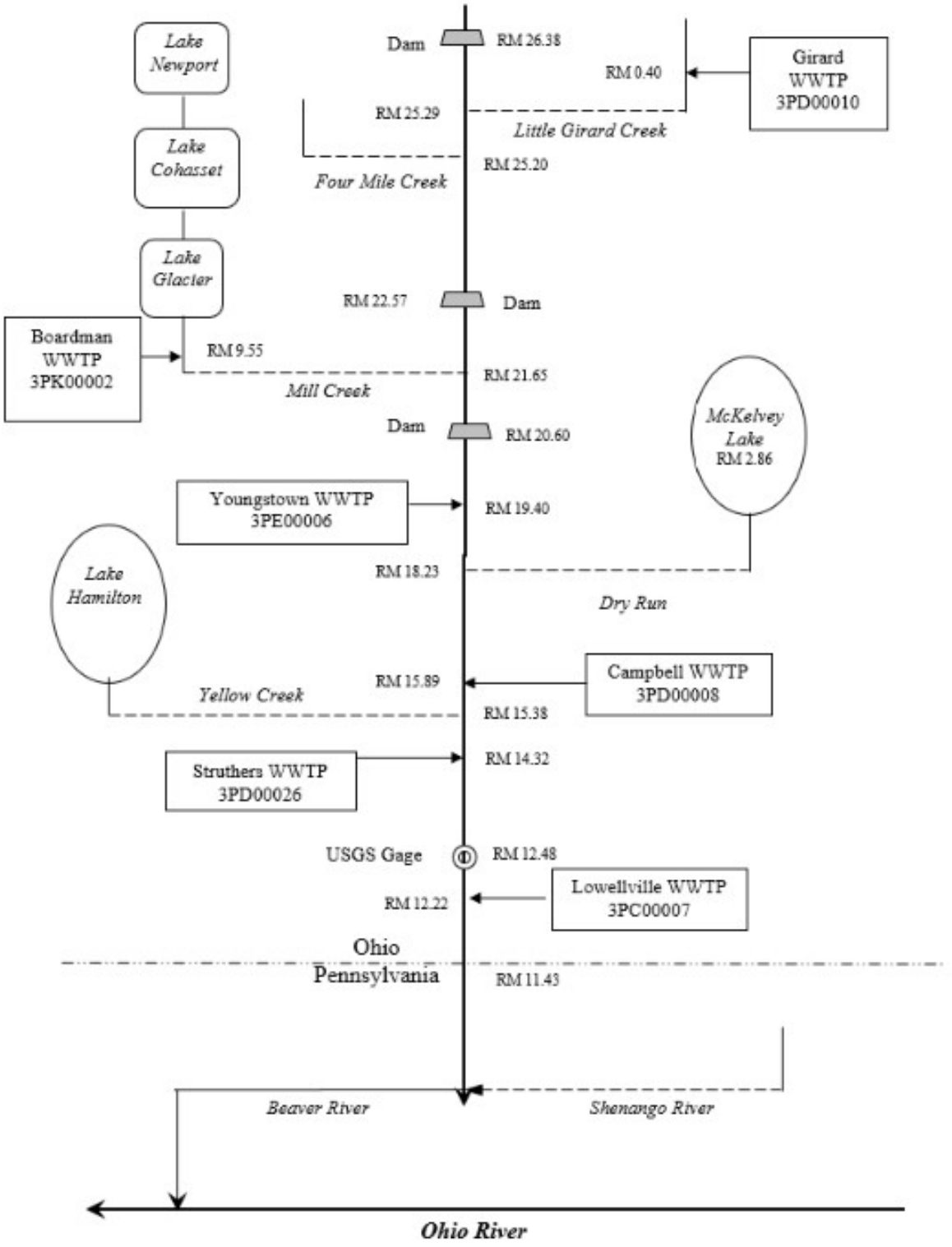

Lake Newport
Lake Cohasset
Lake Glacier
Boardman WWTP 3PK00002
Dam
RM 26.38
RM 0.40
Girard WWTP 3PD00010
RM 25.29
Little Girard Creek
Four Mile Creek
RM 25.20
RM 22.57
Dam
RM 9.55
RM 21.65
Mill Creek
Dam
RM 20.60
McKelvey Lake RM 2.86
Youngstown WWTP 3PE00006
RM 19.40
Lake Hamilton
RM 18.23
Dry Run
Yellow Creek
RM 15.89
Campbell WWTP 3PD00008
RM 15.38
Struthers WWTP 3PD00026
RM 14.32
USGS Gage
RM 12.48
RM 12.22
Lowellville WWTP 3PC00007
Ohio
Pennsylvania
RM 11.43
Beaver River
Shenango River
Ohio River

Table 1. Sewage Sludge Removal

Year	Dry Tons Removed*
2017	619
2018	711
2019	288
2020	854
2021	1420
2022 [a]	302

[a] = data set ends on 5/31/22
*All sludge reported via Station 584 (Exceptional Quality)

Table 2. Effluent Violations for Outfall 001

Parameter	2017	2018	2019	2020	2021	2022 [a]	Total
CBOD5	0	2	0	0	0	0	**2**
Dissolved Oxygen	0	0	0	0	0	5	**5**
E. coli	7	0	0	2	0	0	**9**
Ammonia	9	0	0	0	6	0	**15**
Total Suspended Solids	22	30	37	29	30	11	**159**
Total	**38**	**32**	**37**	**31**	**36**	**16**	**190**

[a] = data set ends on 5/31/22

Table 3. Average Annual Effluent Flow Rates

	Annual Flow (MGD)		
Year	50th Percentile	95th Percentile	Maximum
2017	9.37	20.53	41.18
2018	11.29	21.50	30.33
2019	13.32	27.67	40.82
2020	14.41	24.54	34.74
2021	13.75	22.12	39.83
2022 [a]	15.29	31.00	43.42

[a] = data set ends on 5/31/22
MGD = million gallons per day.

Table 4. Sanitary Sewer Overflows Discharges

Year	Occurrences
2017	33
2018	40
2019	24
2020	25
2021	14
2022 [a]	0

[a] = data set ends on 5/31/22

Table 5. Calculated Annual Total Phosphorus Loadings

Year	Median Phosphorus (mg/L)	Median Flow (MGD)	Median Loading (kg/day)
2017	1.36	9.37	48.23
2018	0.87	11.29	36.96
2019	0.54	13.32	27.22
2020	0.29	14.41	15.82
2021	0.28	13.75	14.57
2022 [a]	0.25	15.29	14.47

[a] = data set ends on 5/31/22

Table 6. Effluent Characterization Using Pretreatment Data

Parameter (µg/L)	PT 7/12/2017	PT 7/11/2018	PT 7/10/2019	PT 7/8/2020	PT 7/13/2021
Antimony	AA 15	AA 15	AA 15	AA 15	AA 15
Arsenic	AA 15	AA 15	AA 15	AA 15	AA 15
Beryllium	AA 1.5	AA 1.5	AA 1.5	AA 1.5	AA 1.5
Bromodichloromethane	4.28	5.52	2.8	AA 2.0	AA 2.0
Cadmium	AA 1.0	AA 1.0	AA 1.0	AA 1.0	AA 1.0
Chloroform	7.34	6.52	5.36	2.94	5.2
Chromium	AA 5.0	AA 2.0	AA 2.0	AA 2.0	2.75
Copper	8.99	7.23	5.26	AA 5.0	5.38
Dibromochloromethane	4.24	4.96	2.12	AA 2.0	AA 2.0
Lead	AA 7.0	AA 7.0	AA 7.0	AA 7.0	AA 7.0
Molybdenum	21.8	20.6	5.64	28.7	9.76
Nickel	7.28	17.4	AA 5.0	AA 5.0	AA 5.0
Selenium	AA 7.0	9.39	8.32	AA 7.0	AA 7.0
Silver	AA 2.0	AA 2.0	AA 2.0	AA 2.0	AA 2.0
Thallium	AA 5.0	AA 5.0	AA 5.0	AA 5.0	AA 5.0
Zinc	32.7	49.6	28.8	17.4	25.5

AA = not-detected (analytical method detection limit)
Units are µg/L

Table 7. Effluent Characterization Using Self-Monitoring Data

Parameter	Unit	Current Limits		# Obs	Percentile		Data Range
		30 Day	Daily		50th	95th	
Water Temperature	°C	- - - - Monitor - - - -		1946	15	23	6 - 25
Dissolved Oxygen	mg/L	--	5.0[m]	1946	8.9	7*	3.8 - 12.3
Total Suspended Solids	kg/day	1211	1817[w]	1372	355	6390	0 - 65300
Total Suspended Solids	mg/L	20	30[w]	1372	7	92	0 - 1040
Oil and Grease	mg/L	--	10	224	2.45	4.1	0 - 5.2
Ammonia (summer)	kg/day	182	273[w]	653	10.8	244	0 - 801
Ammonia (summer)	mg/L	3.0	4.5[w]	653	.22	4.79	0 - 14.3
Ammonia (winter)	kg/day	909	1332[w]	716	16.9	339	.929 - 879
Ammonia (winter)	mg/L	15	22[w]	716	.33	6.17	.01 - 15.7
Nitrogen Kjeldahl, Total	mg/L	- - - - Monitor - - - -		113	1.83	5.81	.648 - 12.8
Nitrite Plus Nitrate	mg/L	- - - - Monitor - - - -		112	6.62	13.7	.43 - 20.1
Phosphorus	mg/L	- - - - Monitor - - - -		457	.47	2.2	.03 - 3.62
Orthophosphate	mg/L	- - - - Monitor - - - -		66	.15	1.76	0 - 2.31
Free Cyanide	mg/L	- - - - Monitor - - - -		32	< .003	.00837	0 - .013
Chloride	mg/L	- - - - Monitor - - - -		22	147	192	105 - 242
Sulfate, (SO4)	mg/L	- - - - Monitor - - - -		22	85.1	103	46.1 - 104
Iron	µg/L	- - - - Monitor - - - -		17	242	1380	144 - 1420
Selenium	µg/L	- - - - Monitor - - - -		129	4.76	11.4	0 - 17.7
Barium	kg/day	32.4	242	101	.963	2.92	.292 - 8.48
Barium (2018-22)	µg/L	535	4000	101	19	46.1	10.7 - 131
Barium (2017-18)	µg/L	- - - - Monitor - - - -		32	25.9	134	15.9 - 610
Nickel	µg/L	- - - - Monitor - - - -		64	< 5	22.2	0 - 34.4
Strontium	µg/L	- - - - Monitor - - - -		20	201	258	167 - 292
Zinc	µg/L	- - - - Monitor - - - -		64	27.6	74.2	0 - 88.6
Cadmium	µg/L	- - - - Monitor - - - -		129	--	--	< 1
Lead	µg/L	- - - - Monitor - - - -		64	--	--	< 7
Chromium	µg/L	- - - - Monitor - - - -		64	< 2	2.99	0 - 8.42
Copper	µg/L	- - - - Monitor - - - -		64	6.95	22.5	0 - 33.1
Chromium, Dissolved Hexavalent	µg/L	- - - - Monitor - - - -		65	< 2	3.8	0 - 5.11
E. coli	#/100 mL	126	284[w]	515	20	252	0 - 41700
Dibromochloromethane	µg/L	- - - - Monitor - - - -		17	< 2	4.16	0 - 8.8
Flow Rate	MGD	- - - - Monitor - - - -		1946	13	23.8	5.44 - 43.4
Chlorine, Total Residual	mg/L	--	0.024	646	--	--	< .001
Mercury	ng/L	- - - - Monitor - - - -		65	7.41	22.3	.65 - 145
Free Cyanide (low-level)	µg/L	- - - - Monitor - - - -		97	5.53	9.96	0 - 21.5
Acute Toxicity, *Ceriodaphnia dubia*	TUa	- - - - Monitor - - - -		5	< .2	.32	0 - .4

Parameter	Unit	Current Limits		# Obs	Percentile		Data Range
		30 Day	Daily		50th	95th	
Chronic Toxicity, *Ceriodaphnia dubia*	TUc	- - - - Monitor - - - -		5	--	--	< 1
Acute Toxicity, *Pimephales promelas*	TUa	- - - - Monitor - - - -		5	--	--	< .2
Chronic Toxicity, *Pimephales promelas*	TUc	- - - - Monitor - - - -		5	< 1	.96	0 - 1.2
pH, Maximum	S.U.	--	9.0	1946	7.4	8.5	6.8 - 9
pH, Minimum	S.U.	--	6.5[m]	1946	7.3	7*	6.7 - 8.8
Total Filterable Residue	mg/L	- - - - Monitor - - - -		1370	578	774	204 - 1270
CBOD 5 day	kg/day	727	1090[w]	1344	129	541	22.4 - 10500
CBOD 5 day	mg/L	12	18[w]	1344	3	8	1 - 118

* = For minimum pH, 5th percentile shown in place of 50th percentile.
** = For dissolved oxygen, 5th percentile shown in place of 95th percentile.
[a] = weekly average
[m] = minimum limit

Table 8. Projected Effluent Quality for Outfall 001

Parameter	Units	Number of Samples	Number > MDL	PEQ Average	PEQ Maximum
Self-Monitoring (DMR) Data					
Ammonia (Summer)	mg/L	433	433	1.67	3.80
Ammonia (Winter)	mg/L	357	357	6.39	9.84
Barium	µg/L	134	134	46.7	67.4
Cadmium [A]	µg/L	136	0	--	--
Chlorides	mg/L	22	22	190	235
Chlorine, Total Residual	mg/L	668	0	--	--
Chromium [A]	µg/L	70	10	2.88	4.52
Chromium, Dissolved Hexavalent	µg/L	66	8	2.77	4.36
Copper [A]	µg/L	70	48	15.4	23.6
Cyanide, free	µg/L	99	92	8.64	11.9
Dibromochloromethane	µg/L	16	2	3.10	4.25
Iron	µg/L	17	17	858	1470
Lead [A]	µg/L	70	0	--	--
Mercury (BCC)	ng/L	65	65	16.61	25.9
Nickel [A]	µg/L	70	33	18.74	29.5
Nitrate + Nitrite	mg/L	114	114	12.19	17.8
Nitrogen Kjeldahl, Total	mg/L	115	115	4.14	6.05
Phosphorus	mg/L	465	465	1.35	2.32
Selenium [A]	µg/L	136	76	9.23	13.2
Strontium	µg/L	24	24	229	261
Sulfates	mg/L	22	22	99.7	121
Total Filterable Residue	mg/L	1392	1392	627	798
Zinc [A]	µg/L	70	68	47.5	67.0
Pretreatment Program data					
Arsenic	µg/L	5	0	--	--
Molybdenum	µg/L	5	5	48.2	66.0
Silver	µg/L	5	0	--	--
Bromodichloromethane	µg/L	3	1	6.13	8.40
Chloroform	µg/L	3	3	11.7	16.1

MDL = analytical method detection limit
PEQ = projected effluent quality
* Per OAC 3745-2-04(E)(3), ammonia PEQ is based on data collected during the following months:
Summer – June through September
Winter – December through February

Table 9. Summary of Acute and Chronic Toxicity Results

Date	*Ceriodaphnia Dubia*		*Pimephales promelas*	
	TU_a	**TU_c**	**TU_a**	**TU_c**
7/9/2017	AA (0.2)	AA (1.0)	AA (0.2)	AA (1.0)
7/10/2018	AA (0.2)	AA (1.0)	AA (0.2)	AA (1.0)
7/9/2019	0.4	AA (1.0)	AA (0.2)	AA (1.0)
7/7/2020	AA (0.2)	AA (1.0)	AA (0.2)	AA (1.0)
7/13/2021	AA (0.2)	AA (1.0)	AA (0.2)	1.2

AA = non-detection; analytical method detection limit of 0.2 TU_a, 1.0 TU_c
TU_a = acute toxicity unit
TU_c = chronic toxicity unit

Table 10. Use Attainment Table

Location	River Mile	Attainment Status	Causes of Impairment	Sources of Impairment
Mahoning River at Leavittsburg, upst. dam	45.73	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or Impoundment
Mahoning River near Leavittsburg, 1.0 mile upst U.S. 422	44.30	FULL		
Mahoning River at Warren at 3rd island dst Summit Street	39.10	FULL		
Mahoning River at Warren at West Market Street	38.26	FULL		
Mahoning River at LTV Warren, near substation	36.20	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or Impoundment
Mahoning River upst Warren WWTP, dst WC Industries	35.63	FULL		
Mahoning River dst Warren WWTP	35.03	PARTIAL	Organic enrichment, biological indicators	CSOs Municipal point source dischargers
Mahoning River at Niles at Belmont Avenue	29.98	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or Impoundment
Mahoning River dst Niles WWTP, upst McDonald Steel	28.63	NON	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or Impoundment
Mahoning River at Girard, dst Liberty Street Dam	26.36	FULL		
Mahoning River at Youngstown @ Division Street	23.43	PARTIAL	Direct habitat alterations, Other flow regime alterations, Sedimentation/ siltation	Dam or Impoundment
Mahoning River at Youngstown, upst Mill Creek	21.73	FULL		
Mahoning River at Youngstown at West Avenue	21.14	PARTIAL	Organic enrichment, biological indicators	CSOs
Mahoning River at Youngstown at Marshall Street	20.45	FULL		
Mahoning River dst Youngstown WWTP	19.20	PARTIAL	Organic enrichment, biological indicators	CSOs Municipal point source dischargers
Mahoning River at Campbell, near RR	17.63	PARTIAL	Organic enrichment, biological indicators	CSOs Municipal point source dischargers
Mahoning River at Struthers @ Bridge Street	15.53	FULL		
Mahoning River upst Struthers WWTP	14.38	FULL		
Mahoning River dst Struthers WWTP	13.60	FULL		
Mahoning River at Lowellville, upst dam	12.70	NON	Other	Upstream sources
Mahoning River at Lowellville, First Street	12.42	PARTIAL	Other	Upstream sources
Mahoning River at Ohio-Pennsylvania line	11.43	PARTIAL	Other	Upstream sources

Aquatic life designated use for the whole assessment area is Warmwater Habitat
Data from *"Biological and Water Quality Study of the Lower Mahoning River and Select Tributaries, 2011 and 2013"* (2018).
RM = River mile
upst = upstream
dst = downstream

Table 11. Water Quality Criteria in the Study Area for CONSWLA model

Parameter	Units	Outside Mixing Zone Criteria				Inside Mixing Zone Maximum [B]
		Average			Maximum	
		Human Health[A]	Agri-culture [A]	Aquatic Life [B]	Aquatic Life [B]	
Ammonia (Summer)	mg/L	--	--	1.3	--	--
Ammonia (Winter)	mg/L	--	--	3.3	--	--
Arsenic	µg/L	10 [B]	100	150	340	680
Barium	µg/L	2400 [B]	--	910	3900	7800
Bis(2-ethylhexyl) phthalate	µg/L	0.32 [B C]	--	8.4	1100	2100
Chlorides	mg/L	--	--	--	--	--
Chlorine, Total Residual	mg/L	--	--	0.011	0.019	0.038
Chloroform	µg/L	5.7 [B C]	--	140	1300	2600
Chromium, Dissolved Hexavalent	µg/L	--	--	11	16	31
Cyanide, Free	µg/L	4 [B]	--	5.2 [B]	22 [B]	92
Dibromochloromethane	µg/L	0.8 [B C]	--	--	--	--
Bromodichloromethane	µg/L	0.95 [B C]	--	--	--	--
Iron	µg/L	--	5000	1500 [B]	--	--
Mercury [A]	ng/L	12	10000	910	1700	3400
Molybdenum	µg/L	--	--	20000	190000	370000
Nitrate + Nitrite	mg/L	--	100	--	--	--
Nitrogen Kjeldahl, Total	mg/L	--	--	--	--	--
Phosphorus	mg/L	--	--	--	--	--
Silver	µg/L	--	--	1.3	3.2	6.4
Strontium	µg/L	--	--	35000	92000	190000
Sulfates	mg/L	--	--	--	--	--

[A] = Bioaccumulative Chemical of Concern (BCC)
[B] = Pennsylvania Water Quality Criteria; applied if more stringent than Ohio criteria (Mahoning River dischargers only)
[C] = This criterion is based on a carcinogenic endpoint.

Table 12. Instream Conditions and Discharger Flow for CONSWLA model

Parameter	Units	Season	Value	Basis
Upstream Flows - *Mahoning River at Leavittsburg USGS gage*				
7Q10	cfs	annual	136	USGS gage #03094000,1969-2021
1Q10	cfs	annual	129	USGS gage #03094000,1969-2021
30Q10	cfs	summer	189.6	USGS gage #03094000,1969-2021
30Q10	cfs	winter	196.5	USGS gage #03094000,1969-2021
Harmonic Mean Flow	cfs	annual	391	USGS gage #03094000,1969-2021
Mixing Assumption	%	average	100	Stream-to-discharge ratio
	%	max	100	Stream-to-discharge ratio
Mahoning River Discharger Flows				
Thomas Steel Strip - 001	cfs (MGD)	avg.	0.648 (0.42)	NPDES permit application
Cleveland Cliffs Warren - 014	cfs (MGD)	avg.	5.69 (3.68)	NPDES permit application
Cleveland Cliffs Warren - 213	cfs (MGD)	avg.	15.78 (10.2)	NPDES permit application
Warren WWTP	cfs (MGD)	design	24.8 (16.0)	NPDES permit application
RMI Niles - 001	cfs (MGD)	avg.	0.774 (0.5)	NPDES permit application
Niles WWTP	cfs (MGD)	design	9.59 (6.2)	NPDES permit application
McDonald Steel - 001	cfs (MGD)	avg.	4.87 (3.2)	NPDES permit application
Youngstown WWTP	cfs (MGD)	design	54.2 (35.0)	NPDES permit application
Campbell WWTP	cfs (MGD)	design	2.94 (1.9)	NPDES permit application
Struthers WWTP	cfs (MGD)	design	9.28 (6.0)	NPDES permit application
Lowellville WWTP	cfs (MGD)	design	0.792(0.512)	NPDES permit application
Significant Dischargers to Tributaries within the Interactive Segment				
Trumbull Co. Mosquito Creek WWTP (to Mosquito Creek)				
	cfs (MGD)	design	8.12 (5.25)	NPDES permit application
Meander Creek WWTP (to Meander Creek)				
	cfs (MGD)	design	12.38 (8.0)	NPDES permit application
Girard WWTP (to Little Squaw Creek)				
	cfs (MGD)	design	7.74 (5.0)	NPDES permit application
Boardman WWTP (to Mill Creek)				
	cfs (MGD)	design	7.74 (5.0)	NPDES permit application
Background Water Quality for the Mahoning River				
Ammonia	mg/l	summer	0.08	Warren 801; 21 values, 0<MDL, 2017-22
Ammonia	mg/l	winter	0.15	Warren 801; 17 values, 0<MDL, 2017-22
Arsenic	µg/l	annual	2.3	EA3; 59 values, 17 <MDL, 2010-19

Parameter	Units	Season	Value	Basis
Barium	µg/l	annual	34.4	EA3; 59 values, 0 <MDL, 2010-19
Bis(2-ethylhexyl) phthalate	µg/l	annual	0	EA3; 3 values, 3 <MDL, 2013
Boron	µg/l	annual	0	No representative data available.
Cadmium	µg/l	annual	0	EA3; 59 values; 59 <MDL, 2010-19
Chlorine, Total Residual	mg/l	annual	0	No representative data available.
Chloroform	µg/L	annual	0	EA3; 2 values, 2 <MDL, 2013
Chromium	µg/l	annual	0.94	EA3; 59 values; 52 <MDL, 2010-19
Chromium, Dissolved Hexavalent	µg/l	annual	0	No representative data available.
Cobalt	µg/l	annual	0	No representative data available.
Copper	µg/l	annual	1.79	EA3; 59 values; 35 <MDL, 2010-19
Cyanide, free	µg/l	annual	0	No representative data available.
Dibromochloromethane	µg/L	annual	0	No representative data available.
Bromodichloromethane	µg/L	annual	0	EA3; 2 values, 2 <MDL, 2013
Fluoride	mg/l	annual	0	No representative data available.
Iron	µg/l	annual	900	EA3; 58 values, 0 <MDL, 2010-19
Lead	µg/l	annual	1.01	EA3; 59 values; 54 <MDL, 2010-19
Molybdenum	µg/l	annual	0	No representative data available.
Naphthalene	µg/l	annual	0	EA3; 5 values, 5 <MDL, 2013
Nickel	µg/l	annual	3.29	EA3; 58 values; 0 <MDL, 2010-19
Nitrate + Nitrite	mg/l	annual	0.72	EA3; 60 values, 0 <MDL, 2010-19
Peracetic Acid	µg/l	annual	0	No representative data available.
Selenium	µg/l	annual	0	EA3; 59 values; 59 <MDL, 2010-19
Silver	µg/l	annual	0	No representative data available.
Total Filterable Residue	mg/l	annual	250	EA3; 60 values; 0 <MDL, 2010-19
Zinc	µg/l	annual	4.46	EA3; 59 values; 53 <MDL, 2010-19

NPDES = National Pollutant Discharge Elimination System
USGS = United States Geological Survey
cfs = cubic feet per second
MGD = Million Gallons per Day
WWTP = wastewater treatment plant

Table 13. Water Quality Criteria in the Study Area for Monte Carlo Model

Parameter	Units	Outside Mixing Zone Criteria				Inside Mixing Zone Maximum [B]
		Average			Maximum	
		Human Health[A]	Agri-culture [A]	Aquatic Life [B]	Aquatic Life [B]	
Cadmium	µg/l	--	50	0.36 [D]	7.1	14
Chromium	µg/l	--	100	120	2500	5000
Copper	µg/l	1300 [D]	500	13	20	41
Lead	µg/l	--	100	5.3 [D]	200	410
Nickel	µg/l	610 [D]	200	73	660	1300
Selenium	µg/l	4200	50	5	62	120
Total Filterable Residue	mg/l	--	--	500 [D]	--	--
Zinc	µg/l	26000	25000	170	170	340

[A] Long-term average instream concentrations generated by the Monte Carlo model met both the Agricultural Water Supply and Human Health criteria.
[B] Based on river hardness of 149 mg/L.
[D] Pennsylvania WQC at the state line.

Table 14. Coefficients Associated with Stream Conditions for Monte Carlo Model

Parameter	Mean	Coefficient of Variation		Source
		Acute	Chronic	
Mahoning River at Leavittsburg				
Flow (MGD)[A]	--	--	--	USGS
Cadmium (µg/L)	0	0	0	EA3
Chromium, total (µg/L)	0.94	2.677	1.012	EA3
Copper (µg/L)	1.785	0.446	0.169	EA3
Lead (µg/L)	1.007	0.682	0.258	EA3
Nickel (µg/L)	3.291	0.379	0.143	EA3
Selenium (µg/L)	0	0	0	EA3
Total Filterable Residue (mg/L)	250.2	---	0.062	EA3
Zinc (µg/L)	4.463	1.021	0.386	EA3
(USGS station 03094000 and EA3 stations 602280, N03S64 and 200419)				
Mosquito Creek at mouth				
Flow (MGD)	85.37	1.362	0.515	USGS/SWIMS
Cadmium (µg/L)	0	0	0	EA3
Chromium, total (µg/L)	0	0	0	EA3
Copper (µg/L)	1.955	0.853	0.322	EA3
Lead (µg/L)	1.888	2.261	0.855	EA3
Nickel (µg/L)	1.082	1.018	0.385	EA3
Selenium (µg/L)	0	0	0	EA3
Total Filterable Residue (mg/L)	256.6	0.332	0.125	EA3
Zinc (µg/L)	9.19	1.306	0.494	EA3

Parameter	Mean	Coefficient of Variation		Source
		Acute	Chronic	
(USGS station 03095500, Mosquito Ck WWTP flow and EA3 stations 602370, N03S21 and N03S48)				
Meander Creek at mouth				
Flow (MGD)	3.866	0.323	0.122	SWIMS
Cadmium (µg/L)	0	0	0	EA3
Chromium, total (µg/L)	0.848	2.113	0.799	EA3
Copper (µg/L)	6.997	0.855	0.323	EA3
Lead (µg/L)	1.903	3.842	1.452	EA3
Nickel (µg/L)	6.876	0.538	0.203	EA3
Selenium (µg/L)	0	0	0	EA3
Total Filterable Residue (mg/L)	509.7	0.258	0.098	EA3
Zinc (µg/L)	27.3	0.695	0.263	EA3
(Meander Ck WWTP flow and EA3 stations 602380, N03P05 and N03S68)				
Little Squaw Creek at mouth				
Flow (MGD)	2.869	0.508	0.192	SWIMS
Cadmium (µg/L)	0	0	0	SWIMS
Chromium, total (µg/L)	0	0	0	SWIMS
Copper (µg/L)	9.533	0.503	0.19	SWIMS
Lead (µg/L)	0	0	0	SWIMS
Nickel (µg/L)	3.539	0.652	0.246	SWIMS
Selenium (µg/L)	1.689	1.307	0.494	SWIMS
Total Filterable Residue (mg/L)	603.3	0.136	0.0514	SWIMS
Zinc (µg/L)	45.62	0.396	0.15	SWIMS
(Girard WWTP flow and concentrations)				

Table 15. Summary of Effluent Limits to Maintain Applicable Water Quality Criteria

Parameter	Units	Outside Mixing Zone Criteria				Inside Mixing Zone Maximum [B]
		Average			Maximum	
		Human Health [A]	Agri-culture [A]	Aquatic Life [B]	Aquatic Life [B]	
Ammonia (Summer)	mg/L	--	--	6.23	--	--
Ammonia (Winter)	mg/L	--	--	16.5	--	--
Arsenic [B]	µg/L	39 [F]	460	368	816 [A]	680
Barium [B]	µg/L	11121 [A F]	--	2353	9945 [A]	7800
Bis(2-ethylhexyl) phthalate [B]	µg/L	1.4 [F]	--	23	2924 [A]	2100
Cadmium [B]	µg/L	--	--	2.54 [F]	24.68 [A]	14
Chlorine, Total Residual [B]	mg/L	--	--	0.031	0.052 [A]	0.038
Chloroform	µg/L	37 [F]	--	479	4327 [A]	2600
Chromium [B]	µg/L	--	--	490	5673 [A]	5000
Chromium, Dissolved Hexavalent	µg/L	--	--	29	40 [A]	31
Copper	µg/L	--	--	55.17 [A]	62.13 [A]	41
Free Cyanide	µg/L	14 [F]	--	9.9 [F]	41 [F]	92
Dibromochloromethane	µg/L	19 [F]	--	--	--	--
Bromodichloromethane	µg/L	16 [F]	--	--	--	--
Iron	µg/L	--	39213	4945 [F]	--	--
Lead [B]	µg/L	--	--	32.39 [F]	702 [A]	410
Mercury [C]	ng/L	12	10000 [A]	910	1700	--
Molybdenum [B]	µg/L	--	--	59918	554172 [A]	370000
Nickel	µg/L	--	--	359	2643 [A]	1300
Selenium	µg/L	--	--	23.71	248 [A]	120
Silver [B]	µg/L	--	--	3	8.1 [A]	6.4
Total Filterable Residue	mg/L	--	--	1725 [F]	--	--
Zinc	µg/L	--	--	822 [A]	627 [A]	340

[A] Allocation must not exceed the Inside Mixing Zone Maximum

[B] Parameter would not require a WLA based on reasonable potential procedures, but allocation requested by Permits Group.

[C] Bioaccumulative Chemical of Concern (BCC); no mixing zone allowed after 11/15/2010, WQS must be met at end-of-pipe, unless requirements for an exception are met as listed in OAC 3745-2-05(A)(2)(e)(ii)

[F] WLA based on Pennsylvania criteria.

Table 16. Parameter Assessment

Group 1: Due to a lack of numeric criteria, the following parameters were not evaluated at this time.

Chloride	Sulfate	

Group 2: PEQ < 25 percent of WQS or all data below minimum detection limit. WLA not required. No limit recommended; monitoring optional.

Arsenic	Barium	Bromodichloromethane
Cadmium	Chlorine, Total Residual	Chromium
Dibromochloromethane	Lead	Molybdenum
Nitrate + Nitrite	Silver	Strontium

Group 3: PEQ_{max} < 50 percent of maximum PEL and PEQ_{avg} < 50 percent of average PEL. No limit recommended; monitoring optional.

Ammonia (Summer)	Ammonia (Winter)	Chloroform
Chromium, Dissolved Hexavalent	Iron	Nickel
Selenium	Total Filterable Residue	Zinc

Group 4: $PEQ_{max} \geq 50$ percent, but < 100 percent of the maximum PEL or $PEQ_{avg} \geq 50$ percent, but < 100 percent of the average PEL. Monitoring is appropriate.

Copper	Cyanide, free [A]

Group 5: Maximum PEQ ≥ 100 percent of the maximum PEL or average PEQ ≥ 100 percent of the average PEL, or either the average or maximum PEQ is between 75 and 100 percent of the PEL and certain conditions that increase the risk to the environment are present. Limit recommended.

Limits to Protect Numeric Water Quality Criteria

			Recommended Effluent Limits	
Parameter	**Units**	**Period**	**Average**	**Maximum**
Mercury - TR (BCC)	ng/l	Annual	12	1700

[A] = requires a permit tracking requirement in accordance with OAC 3745-33-07(A)(2) since the PEQ is > or = 75 percent of the PEL.
PEL = preliminary effluent limit
PEQ = projected effluent quality
WLA = wasteload allocation
WQS = water quality standard

Table 17. Final Effluent Limits for Outfall 001

Parameter	Units	Concentration		Loading (kg/day)[a]		Basis[b]
		Daily Maximum	30 Day Average	Daily Maximum	30 Day Average	
Water Temperature	°C	- - - - - - - - - - Monitor - - - - - - - - - -				M[c]
Dissolved Oxygen	mg/L	5.0[m]	--	--	--	WQS
Total Suspended Solids	mg/L	30[d]	20	1817[d]	1211	PD
Oil & Grease	mg/L	10	--	--	--	WQS
Ammonia (summer)	mg/L	4.5 [d]	3.0	273 [d]	182	PD
Ammonia (winter)	mg/L	22 [d]	15	1332 [d]	909	PD
Total Kjeldahl Nitrogen	mg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Nitrate plus Nitrite	mg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Phosphorus	mg/L	- - - - - - - - - - Monitor - - - - - - - - - -				PMR
Orthophosphate	mg/L	- - - - - - - - - - Monitor - - - - - - - - - -				PMR
Nickel	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Zinc	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Cadmium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Lead	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Chromium	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Copper	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				RP
Chromium, Dissolved Hexavalent	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
E. coli	#/100 mL	284 [d]	126	--	--	WQS
Chloroform	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
Flow Rate	MGD	- - - - - - - - - - Monitor - - - - - - - - - -				M[c]
Chlorine	mg/L	0.024	--	--	--	WLA/ABS
Mercury	ng/L	1700	12	0.1	0.00073	WLA
Free Cyanide	µg/L	- - - - - - - - - - Monitor - - - - - - - - - -				RP
Acute Toxicity, *Ceriodaphnia dubia*	TUa	- - - - - - - - - - Monitor - - - - - - - - - -				WET
Chronic Toxicity, *Ceriodaphnia dubia*	TUc	- - - - - - - - - - Monitor - - - - - - - - - -				WET
Acute Toxicity, *Pimephales promelas*	TUa	- - - - - - - - - - Monitor - - - - - - - - - -				WET
Chronic Toxicity, *Pimephales promelas*	TUc	- - - - - - - - - - Monitor - - - - - - - - - -				WET
Total Filterable Residue	mg/L	- - - - - - - - - - Monitor - - - - - - - - - -				M
pH, maximum	SU	9.0	--	--	--	WQS
pH, minimum	SU	6.5[m]	--	--	--	WQS
Carbonaceous Biochemical Oxygen Demand - 5 Day	mg/L	18[d]	12	1090[d]	727	PD

[a] Effluent loadings based on average design discharge flow of 16.0 MGD.

[b] Definitions: ABS = Antibacksliding Rule (OAC 3745-33-05(F) and 40 CFR Part 122.44(l))
M = Division of Surface Water NPDES Permit Guidance 1: Monitoring frequency requirements for Sanitary Discharges
PD = Plant Design (OAC 3745-33-05(E))
PMR = Phosphorus monitoring requirements (ORC 6111.03)
TMDL = Total Maximum Daily Load
WET = Minimum testing requirements for whole effluent toxicity [OAC 3745-33-07(B)(11)]

WLA = Wasteload Allocation procedures (OAC 3745-2)
WQS = Ohio Water Quality Standards (OAC 3745-1)

[c] Monitoring of flow and other indicator parameters is specified to assist in the evaluation of effluent quality and treatment plant performance.
[d] 7 day average limit.
[m] minimum limit

Attachment 1.Whole Effluent Toxicity Reasonable Potential Analysis

Whole effluent toxicity testing produced only non-detection results for chronic toxicity in *Ceriodaphnia dubia* and for acute toxicity in *Pimephales promelas*, which therefore fall under Hazard Category 4. Reasonable potential analyses were only performed for *C. dubia* chronic (TUc Cd) and acute *P. promelas* toxicity (TUa Pp).

Hazard Category Summary

	Ceriodaphnia dubia		***Pimephales promelas***	
	Acute	**Chronic**	**Acute**	**Chronic**
Effluent Toxicity (Table A)	4	4	4	4
Near-Field Impact (Table B)	4		4	
Far-field Impact (Table C)		4		3
	4		4	

Hazard Categories: 1: Toxicity adequately documented 3: Toxicity possible
2: Toxicity strongly suspected 4: No toxicity

Table A. Effluent Toxicity

	Ceriodaphnia dubia		***Pimephales promelas***	
	Acute	**Chronic**	**Acute**	**Chronic**
WLA	1.0	7.39	1.0	7.39
# of tests	5	5	5	5
Maximum value	0.4	AA	AA	1.2
Percent of tests >WLA	0	--	--	0
Geometric mean	0.22	--	--	1.03
Average Exceedance (Geomean * Percent of tests >WLA)	0	--	--	0
Average Exceedance / WLA	0	--	--	0

Attribute Evaluated	**Hazard Category 1**	**Hazard Category 2**	**Hazard Category 3**	**Hazard Category 4**
Degree of Toxicity	Adequately Documented	Strongly Suspected	Possible	None
(1) Minimum number of tests	3 TUa Pp TUc Cd	1	0 or 1	0 or 1
(2) Percent of tests >WLA	>30	20 to 30	10 to 20	10 TUa Pp TUc Cd
(3) Average Exceedance/WLA[1] (Tables B and C data available)				
(a) Acute[2]	> 0.5	≥ 0.3	≥ 0.3	< 0.3 TUa Pp
(b) Chronic	>0.67	≥ 0.5	≥ 0.5	< 0.5 TUc Cd
(4) Maximum TU value (Tables 3B and 3C data available)	> WLA	≥ WLA	≥ 0.5xWLA	< 0.5xWLA TUa Pp TUc Cd

Table B. Near-Field Toxicity

Attribute Evaluated	Hazard Category 1	Hazard Category 2	Hazard Category 3	Hazard Category 4
Degree of Toxicity	Adequately Documented	Strongly Suspected	Possible	None
(1) Mortality within mixing zone[3]	≥ 20%	≤ 20%	≤ 20%	< 20%
(2) Stream community impact				
(a) implied chemically[4, 6]	≥3xIMZM or >LC50	≥1.5xIMZM or >LC50	≥0.75xIMZM or >0.75xLC50	≤0.5xIMZM or ≤0.75xLC50 TUa Pp
(b) implied toxicologically[4]	≥1.0 TUa	≥1.0 TUa	≥1.0 TUa	<1.0 TUa TUa Pp
(c) implied biologically	Toxic	Fair/poor community	Slight impact	None

Table C. Far-Field Toxicity

Attribute Evaluated	Hazard Category 1	Hazard Category 2	Hazard Category 3	Hazard Category 4
Degree of Toxicity	Adequately Documented	Strongly Suspected	Possible	None
(1) Aquatic life use impairment (Ohio EPA biological criteria)	Yes[5]	Yes or partial[5]	Partial TUc Cd	None
(2) Stream community impact implied toxicologically[3]	Significant effect	Significant effect	Unknown or slight effect	None
(3) Other indicators	Stress indicated	Stress indicated	Stress indicated	No stress

[1] Compare (per cent exceedances x geometric mean TU) to table factor.
[2] Use 0.3 x WLA for situations where AIM exists.
[3] Results of ambient toxicity test are not binding or required for classification as to category but, if available, will be interpreted under the weight of evidence principle giving due consideration as to sampling location and conditions.
[4] Based on effluent data. May not be appropriate for situations where AIM exists.
[5] Lack of attainment due to toxic, complex or unidentifiable type of impact.
[6] The LC50-based criteria are used only for pollutant parameters that do not have numeric criteria.

Attachment 2. Acronyms

ABS	Anti-backsliding
BPJ	Best professional judgment
CFR	Code of Federal Regulations
CMOM	Capacity Management, Operation, and Maintenance
CONSWLA	Conservative substance wasteload allocation
CSO	Combined sewer overflow
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DMT	Dissolved metal translator
IMZM	Inside mixing zone maximum
LTCP	Long-term Control Plan
MDL	Analytical method detection limit
MGD	Million gallons per day
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
ORSANCO	Ohio River Valley Water Sanitation Commission
PEL	Preliminary effluent limit
PEQ	Projected effluent quality
PMP	Pollution Minimization Program
PPE	Plant performance evaluation
SSO	Sanitary sewer overflow
TMDL	Total Daily Maximum Load
TRE	Toxicity reduction evaluation
TU	Toxicity unit
U.S. EPA	United States Environmental Protection Agency
WET	Whole effluent toxicity
WLA	Wasteload allocation
WPCF	Water Pollution Control Facility
WQBEL	Water-quality-based effluent limit
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant