



Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Lower Great Miami River, 2021



Ohio EPA Technical Report AMS/2021-LWGMR-1

Division of Surface Water

April 2021

TMDL DEVELOPMENT | ●○○○○○

Quality Assurance Project Plan (QAPP)
for the Biological and Water Quality Study of the Lower Great Miami
River, 2021

Butler and Hamilton Counties

Version 1.0

April 2021

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Section A

A1 – Title and Approval

Quality Assurance Project Plan for the Biological and Water Quality Study of the lower Great Miami River, 2021

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Click or tap here to enter text.

Date: _____

List of Acronyms - (Glossary of Terms can be found [here](#))

2C	Priority Pollutant Analyte List Form
ALU	Aquatic Life Use
BLM	Biotic Ligand Model
Ca	Calcium
Cl	Chlorine
CWA	Clean Water Act
DES	Division of Environmental Services
DQO	Data Quality Objective
DOC	Dissolved Organic Carbon
EA3	Ecological Assessment and Analysis Application
EPA	Environmental Protection Agency
FEG	Fish Evaluation Group
GFO	Groveport Field Office
GC/MS	Gas Chromatograph/ Mass Spectrometer
HUC	Hydrological Unit Code
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
ID	Identification
IR	Integrated Report
ITS	Information Technology Services
K	Potassium
Mg	Magnesium
Na	Sodium
MIwb	Modified Index of Well-being
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OAC	Ohio Administrative Code
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QHEI	Qualitative Habitat Evaluation Index
pH	Potential Hydrogen
RL	Reporting Limit
S-VOCs	Semi-volatile Organic Chemicals
SOP	Standard Operating Procedure
SO₄	Sulfate
SOCC	State of Ohio Computer Center
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSD	Technical Support Document

WAU	Watershed Assessment Unit
WQ	Water Quality
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant

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A3 – Distribution List

This QAPP will be distributed to the following division management and staff, saved on the DSW collaboration site and posted on the DSW Biological and Water Quality Monitoring and Assessment webpage.

Table 1 — Distribution List

Name/Title	Contact Email/Phone	
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Jared Burson, Environmental Specialist 2	jared.burson@epa.ohio.gov	(614) 721-8697
DSW Southwest District Office		
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Laura Marshall, Environmental Specialist 2	laura.marshall@epa.ohio.gov	(937) 285-6031
Michelle Waller, Environmental Specialist 2	michelle.waller@epa.ohio.gov	(937) 285-6028
Robert Ostendorf, Environmental Specialist 2	robert.ostendorf@epa.ohio.gov	(937) 285-6107
DES		
Jennifer Kraft, Environmental Manager	jennifer.kraft@epa.ohio.gov	(614) 644-3020
Steve Roberts, Environmental Supervisor	steven.roberts@epa.ohio.gov	(614) 644-4225
Kristin Sowards, Sample Receiving Coordinator	kristin.sowards@epa.ohio.gov	(614) 644-4243

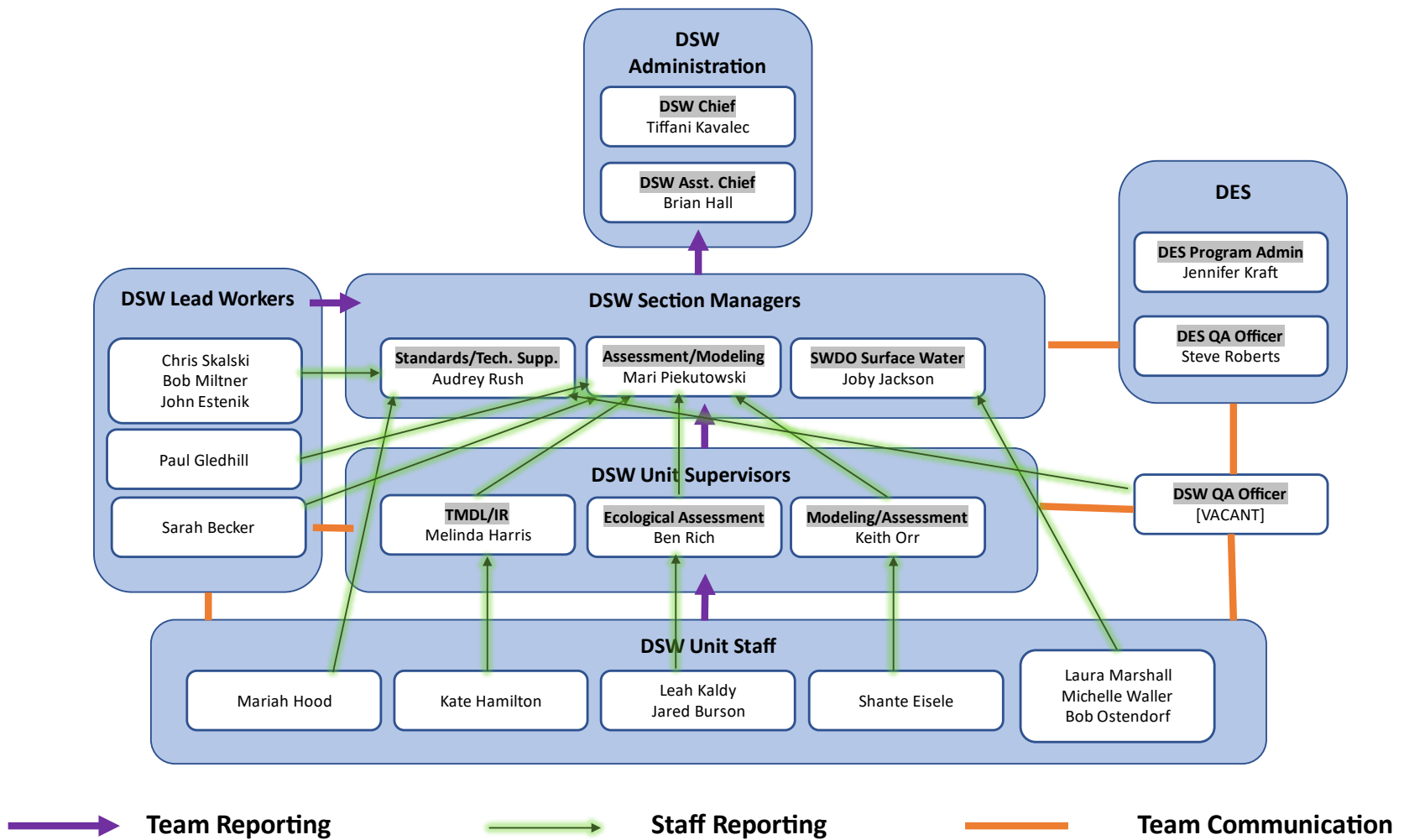
A4 – Project Organization and Communication

Table 2 — Roles and Responsibilities.

Individual(s) Assigned: Division of Surface Water	Responsible for:	Authorized to:
Tiffani Kavalec/Brian Hall DSW Chief/Assistant Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
Mari Piekutowski Assessment & Modeling Section Manager	Overall management of monitoring section.	Assign staff; approve plans; edit reports.
Melinda Harris TMDL and IR Unit Supervisor	Coordination of biennial Integrated Report update; TMDL program development.	Assign and support staff; edit reports.
Kate Hamilton TMDL and IR Unit Staff	Leading TMDL projects.	Write assigned TMDL sections.
Keith Orr Modeling & Assessment Unit Supervisor	Supporting modeling field crews with supplies, equipment and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Shante Eisele Modeling & Assessment Unit Staff	Dissolved oxygen surveys, stream flow measurements and chemistry sampling.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Audrey Rush Standards and Tech Support Section Manager	Quality management (QAPPs, SOPs); staff training; water quality standard rules.	Approve plans and edit reports.
Bob Miltner Standards and Tech Support Lead Worker	Water quality standard criteria development and rule updates.	Help plan study. Review project actions and documents in relation to listed responsibilities.
VACANT	DSWs quality management program.	Develop and implement field QA/QC guidelines. Track field QA/QC and staff training.
John Estenik	DSWs quality management program.	Quality Support
Chris Skalski Standards and Tech Support Lead Worker	Water quality standard criteria development and rule updates.	Help plan study. Make recommended beneficial use changes.
Mariah Hood Standards and Tech Support Staff	Representing agency in fish and wildlife consumption and contact advisory matters.	Help plan study. Make waterbody specific consumption and contact advisory recommendations.
Ben Rich Ecological Assessment Unit Supervisor	Supporting biological field crews with supplies, equipment and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Sarah Becker Ecological Assessment Unit Lead Worker	Assist with property access, track project progress, managing data and compiling information for Integrated Report.	Provide landowner information for access consent. Upload fish, bug and chemistry data into EA3. Review and comment on reports. Write assigned Integrated Report sections.
Paul Gledhill Modeling and Lake Erie Units Lead Worker	Modeling and assessment technical guidance and review.	Assist in project documents development and data collection.

Individual(s) Assigned:	Responsible for:	Authorized to:
Jared Burson Ecological Assessment Unit Fish Crew Leader	Fish population and stream habitat assessments.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Leah Kaldy Ecological Assessment Unit Bug Crew Leader	Macroinvertebrate population assessments.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Joby Jackson SWDO District Surface Water Section Manager	Implementing division goals at the district level. Supporting water quality field crews with supplies, equipment, and training.	Review documents and reports; suggest changes and edits; obtain approvals and signatures; develop budgets; conduct field audits
Robert Ostendorf SWDO District Permits & Enforcement	NPDES permit related issues.	Obtain wastewater and storm water permit information needed for planning and reporting.
Laura Marshall, Michelle Waller, SWDO District Water Quality Unit	Water and sediment data collection, validation, and management.	Help plan study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
Division of Environmental Services		
Jennifer Kraft Program Administrator	Overall administration of laboratory activities.	Help solve laboratory information management system problems. Develop analytical methods and SOPs.
Steve Roberts QA Officer	DES quality management program.	Oversee data completeness, validation, and delivery.
Kristin Sowards Sample Receiving Coord.	Intake of laboratory samples, coordination with field staff	Help solve daily sample scheduling and sample submission issues.

Figure 1 — Organization Chart. (editable version [HERE](#))



A5 – Problem Definition & Background

Ohio EPA began conducting a bioassessment census survey of Ohio's large river assessment units (LRAUs) in 2020 consisting of an intensive ambient assessment that will continue and be completed during the 2021 field sampling season. The data gathered from this Large Rivers survey during the 2020 field sampling season revealed impairment of the macroinvertebrate community in the lower Great Miami River beginning downstream of Middletown near Liberty-Fairfield Road at river mile 44. For this special study of the lower Great Miami River biological, macro-habitat and water quality data will be collected and evaluated to identify the causes and sources associated with the impairment revealed by the biological criteria. Data will also be collected at select sites along Dicks Creek, which converges with the lower Great Miami River at river mile 47.61, to identify any potential contributions to the impairment observed in the lower Great Miami mainstem. The most recent biological data collected by Ohio EPA along Dicks Creek is 23 years old, so its inclusion in this targeted survey will also serve to update historical sampling data.

Watershed Monitoring and Assessment History

As part of Ohio's statewide monitoring strategy, biological and water quality assessments will be done during the 2021 field season in the lower Great Miami River watershed. The focus of this study area encompasses portions of Butler and Hamilton counties and spans portions of the lower two Great Miami River LRAUs. It also includes the Dicks Creek 12-digit watershed assessment unit (WAU). The assessment units and their descriptions are listed in Table 3 and Figure 2 is a map of the watershed with station locations. Information collected as part of this survey will support the Data Quality Objectives listed in A7.

The entire lower Great Miami River watershed was last studied by OEPA in 2010. Of the 75 river miles assessed during this 2010 survey, 60.6 miles were fully attaining the designated Warmwater Habitat aquatic life use. Of the 14.4 miles in non-attainment, nutrient over-enrichment was the principal cause of impairment.

The Friends of the Great Miami (FOGM) are an active watershed group that concentrate their efforts in the Butler and Hamilton County portions of the lower Great Miami River watershed. The FOGM conduct education programs, recreational canoe floats and river clean-ups. They also have an ongoing citizen's water quality monitoring program that includes chemical analyses and macroinvertebrate testing. This group originated from Rivers Unlimited which also continues in cooperation with FOGM. More information about this group can be found at:

<http://www.riversunlimited.org/wqm/>

More information on previous studies done in the lower Great Miami River watershed can be found at Ohio EPAs TMDL page published at: <https://epa.ohio.gov/dsw/tmdl/index>

A6 – Project Description

The study area includes segments of the lower two Great Miami River large river assessment units beginning at river mile 55.14 (north of Middletown at State Route 4) downstream to river mile 15.49 (at Miamitown at Harrison Road). Additionally, Dicks Creek from river mile 5.45 (near Middletown at Cincinnati-Dayton Road) downstream to river mile 1.4 (at Middletown at Amanda

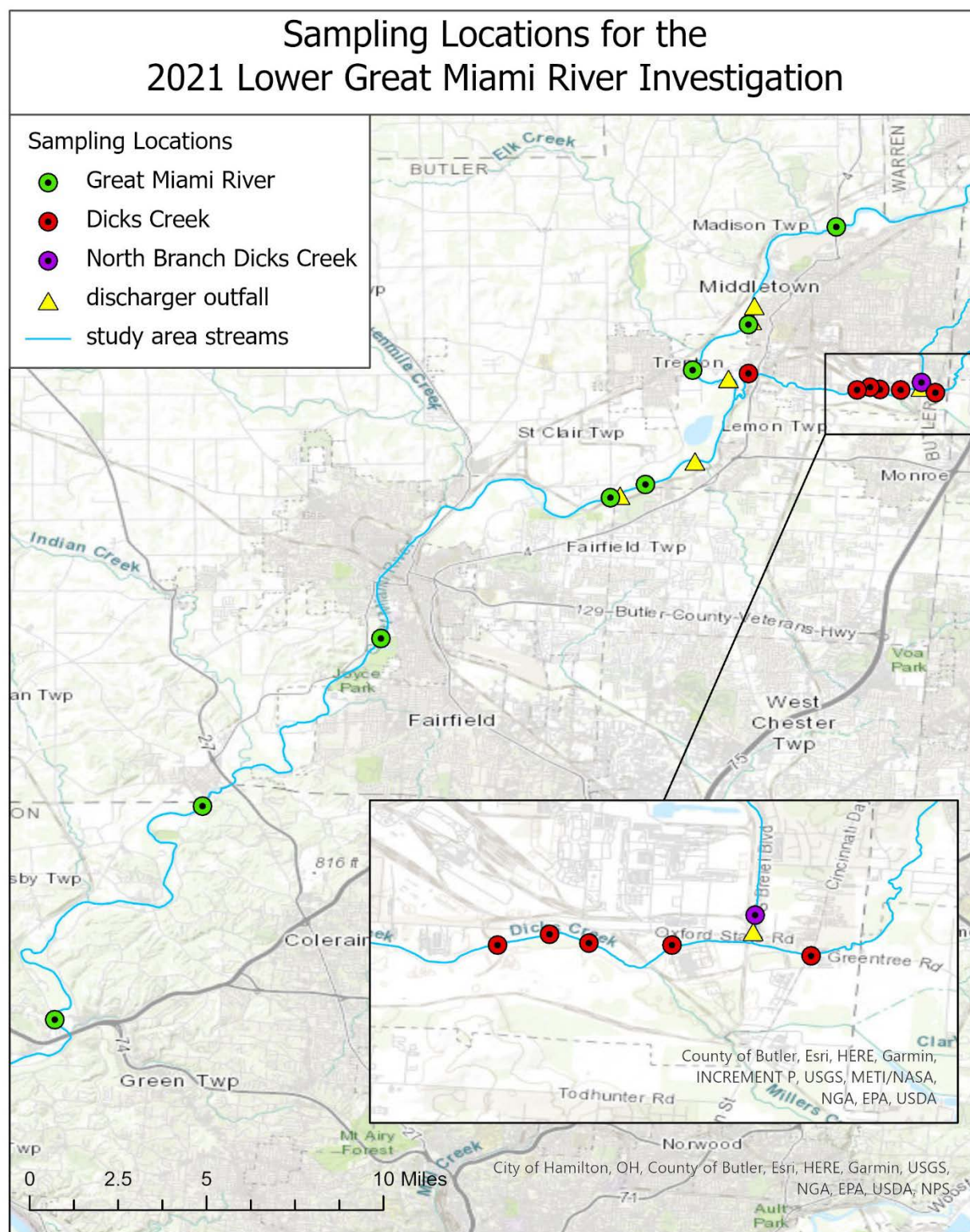
Road) and North Branch Dicks Creek at river miles 0.18 (0.1 miles upstream AK Steel Outfall 004) and 0.08 (at AK Steel Outfall 004) are included in this special study to acquire updated biological, macro-habitat and water quality data. Individual sites selected are listed in Appendix 2 and sample parameters are detailed in Appendix 4.

For DSW a routine field season can run from May 1st to October 31st. The index period for biological sampling and nutrient sampling is June 15th to October 15th.

Table 3 – List of Assessment Units in Study Area

Large River Assessment Units (LRAU)	
05080002 90 01	Great Miami River: Mad River to Fourmile Creek: RMs 81.48-38.38
05080002 90 02	Great Miami River: Fourmile Creek to mouth: RMs 38.38-0.00
HUC 12 Watershed Assessment Units (WAU)	
05080002 07 04	Dicks Creek

Figure 2- Sampling Locations Map



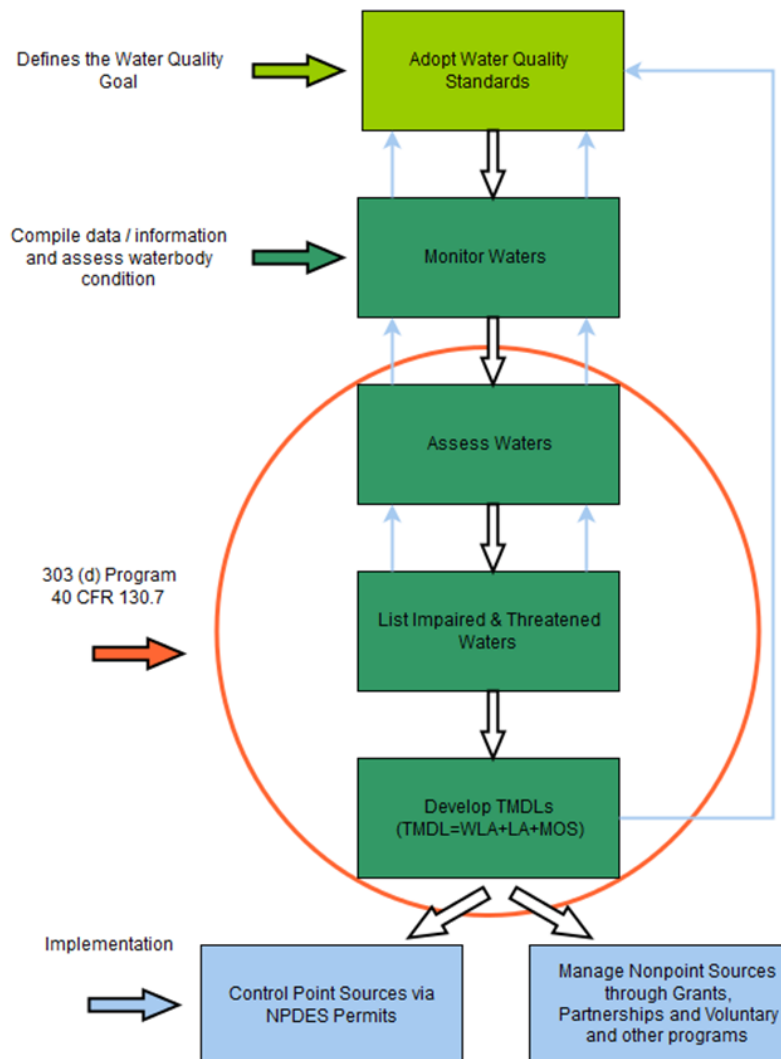
A7 – Data Quality Objectives

The data collected during this special study of the lower Great Miami River watershed fulfills multiple objectives:

- Assess and report on the status of Water Assessment Units (WAUs) as required by the Clean Water Act (CWA) 305(b) and 303(d)
- Assess the causes and sources of impairment that may be contributing to the non-attainment revealed by the biological criteria during the 2020 field sampling season of the Large Rivers survey.
- Support water quality standards development
- Provide data for the Ohio Fish Tissue Consumption Monitoring Program
- Support the National Permit Discharge Elimination System (NPDES) permitting
- Total Maximum Daily Load (TMDL) development and implementation

Figure 3- Water Quality-Based Approach of the Clean Water Act

Water Quality-Based Approach of the Clean Water Act



Source: <https://www.epa.gov/tmdl/overview-identifying-and-restoring-impaired-waters-under-section-303d-cwa>

Monitor and Assess Ohio's Waters

Under Section 305(b) of the Clean Water Act (CWA), Ohio EPA is required to assess and report on the quality of Ohio's waters. Ohio EPA determines attainment/non-attainment status of water quality standards in three main ways:

- Three aquatic community indexes serve as the principal arbiters of Aquatic Life Use (ALU) attainment or condition status of Ohio's lotic waters: Index of Biotic integrity (IBI), Modified Index of Well-being (MIwb) and the Invertebrate Community Index (ICI). Where quantitative macrobenthos data are unavailable, corresponding narrative equivalents derived from qualitative sampling are used in lieu of ICI scores (need a reference). Further explanations of Ohio EPA's biocriteria can be found in Ohio Administrative Code (OAC) Chapter 3745-1-07 and additionally at epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.
- *E. coli* is used as an indicator to determine attainment/non-attainment of recreational uses as codified in OAC 3745-1-07. Water quality must meet a 90-day geometric mean and a statistical threshold not to be exceeded more than 10 percent of the time. Each WAU will have at least 1 site sampled. Most effort will focus on streams with public access that are more highly used for recreation. Several sites on the Great Miami River have been identified as access points for the State and nationally designated Great Miami River Water Trail.
- Chemical concentrations in fish tissue are used to determine attainment/non-attainment of non-drinking water human health water quality standards and for the development of fish consumption advisories.

Under Section 303(d) of the CWA Ohio EPA is federally obligated to list impaired and threatened waters by determining attainment/non-attainment status of water quality standards. To support this objective, the following data are planned to be collected: fish and macroinvertebrate community assemblages, physical stream habitat evaluation (Qualitative Habitat Evaluation Index, or QHEI), organic and inorganic water column chemistry (parameters in Appendix 4), continuous sonde measurements, continuous temperature measurements, *E. coli* bacteria, and fish tissue chemical concentrations.

Assess Causes and Sources of Impairment

Chemical and physical monitoring is a direct measure of the CWA goal, and can be used to determine the factors that limit biologic attainment. Specific objectives for each planned measurement are included below:

- **Physical Habitat Assessments:** The Qualitative Habitat Evaluation Index (QHEI) (Rankin 1989, 1995, and Ohio EPA 2006) is a method that evaluates microhabitat necessary to support biological assemblages consistent with Ohio's tiered ALU designations. Channel morphology, lithography, gradient, and riparian conditions are fundamental components of riverine habitat, affecting the diversity, structure, organization, and viability of aquatic communities. Because the QHEI explicitly measures the presence, absence, or relative function of these key attributes, it serves as an important and cost-efficient monitoring tool

to describe and rank macrohabitat quality, evaluate habitat effects in surface water assessments, and aid in establishing ALU potential for underperforming waters.

- **Inorganic Surface Water Chemistry:** A standard suite of inorganic surface water chemical parameters will be collected at every site listed in Appendix 2. Impairment due to chemical contaminants in the water column can be assessed by comparing water column chemical concentrations to numeric criteria in Ohio EPA's rules: aquatic life (Table 35-1), wildlife (Table 35-12), recreation/aesthetics (Table 37-1), water supply (Table 33-1) and human health (Table 34-1).
- **Nutrient Enrichment:** The water quality parameter sondes will be deployed to capture a minimum of 48 continuous hours of diel dissolved oxygen flux, pH, temperature, and specific conductance measurements. Benthic and sestonic chlorophyll *a* samples are to be collected during every sonde deployment if site conditions are appropriate. Continuous measurements will be evaluated against water quality criteria and, along with chlorophyll *a* results, will be used to provide lines of evidence for causes of biological impairment such as nutrient or organic enrichment. Additionally, the continuous nature of sondes can provide evidence of episodic dischargers. For instance, if pollutants are only discharged a few hours overnight, the sondes could capture such an event that daytime grab sampling may miss.
- **Organic Surface Water Chemistry:** Water column samples will be analyzed for organic constituents (see Appendix 4 for parameters) at a subset of sites. Sites were selected based on local knowledge of dischargers or legacy issues. Semi-volatile organic carbons (s-VOCs) (USEPA Method 625) testing will generally be focused on industrial facilities, municipal areas with categorical users of these constituents, and/or historic reference locations. Once one SVOC pass is conducted district WQ staff may evaluate the data to determine whether more passes are necessary. This evaluation should be based on parameters with results above method detection. Herbicide (USEPA Methods 515.1 and 525.2) testing will be focused in agricultural areas and used as an indicator of potential overall agrichemical impact to biology. Organochlorine insecticides (USEPA Method 608/8081) mostly are compounds that are no longer used and are typically not water soluble. For that reason, these constituents will generally only be sampled if there is evidence of legacy pollution or knowledge of current site conditions warrant an investigation. Each site where pesticides will be collected will be sampled a minimum of two times. The objective of two passes is to screen whether select organic constituents are present in the water column; a statistic evaluation or geometric mean does not need to be calculated for each site. Samples for agricultural chemicals such as herbicides will be collected early in the sampling season to coincide with typical timing of applications.
- **Sediment:** Sediment sampling is an important component of a pollution monitoring program. The analytical results serve as valuable lines of evidence for identifying impacted areas, determining the magnitude and extent of contamination, and elucidating probable causes and sources of beneficial use impairment that may not be detected in water column sampling alone. Sediment contaminant data can be used to locate historical, intermittent, point and nonpoint contaminant sources, or contaminant concentrations of concern, which

include direct discharge, groundwater infiltration, soil erosion, aerial deposition, and sediment translocation and redeposition.

Support Water Quality Standards Development

- **Use Designations:** All data collected as part of this survey will form the basis of UAAs for unassessed waters, verify or reaffirm existing beneficial uses, or readjust the current aquatic life use designations as appropriate for updates to the WQS.
- **Antidegradation:** The collection of biological and habitat data will support updates to the State's list of special high-quality waters.

Provide data for the Ohio Fish Tissue Consumption Monitoring Program

Fish tissue samples will be collected from the Great Miami River at 1 location and from Dicks Creek at 3 locations as part of the Ohio Fish Tissue Consumption Monitoring Program. Sampling locations may vary based on the availability of sport fish collected at each location. Fillet samples of edible-size sport fish will be tested for organochlorinated pesticides, PCBs, mercury, lead, cadmium, arsenic, and selenium. Results will be used in the Ohio Sport Fish Consumption Advisory Program and used to determine attainment status of non-drinking water human health criteria in the Integrated Report.

Support NPDES Permitting

A list of NPDES permitted dischargers in the survey area is presented in Appendix 3. Survey data will be collected to provide the NPDES program with necessary biological and/or chemical sampling data. Stream water and effluent chemistry samples will be collected to specifically assess five wastewater treatment plant (WWTP) and facility discharges at Wausau Paper Towel and Tissue LLC, AK Steel Corporation, Middletown WWTP, Miller Coors USA LLC and LeSourdsville Regional WRF.

TMDL Implementation

The Total Maximum Daily Load (TMDL) program, established under Section 303(d) of the Clean Water Act, focuses on identifying and restoring polluted rivers, streams, lakes, and other surface water bodies. TMDLs are prepared for waters identified as impaired on the 303(d) list in the Integrated Report. 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. The objectives of the TMDL process are to estimate pollutant loads from the various sources within the basin, define or characterize allowable loads to support the various beneficial uses, and to allocate pollutant loads among different pollutant sources through appropriate controls (e.g., NPDES permitting, storm water management, 319 proposals, NPS controls or other abatement strategies). The components of the TMDL process supported by this survey are primarily the identification of impaired waters, verification (and re-designation if necessary) of beneficial use designations, gathering ambient information that will factor into the wasteload allocation, and ascribing causes and sources of use impairment. These data are necessary precursors to the development of effective control or abatement strategies.

A8 – Special Training/Certification

All staff who conduct surface water sampling, whether from streams or lakes, receive initial training by someone experienced in the proper techniques required, usually a supervisor or veteran employee. Mandatory refresher training is done on an annual basis for all Agency surface water samplers. Annual boating safety refresher training is required by internal safety policy SP 10-12. Employees who operate watercraft must also demonstrate proficiency in boat operation to their supervisor on an annual basis. Supervisors should also conduct an annual field audit to verify standard operating procedures are followed.

A9 – Documents and Records

Microsoft® SharePoint is used as a document library. Access is through Ohio EPA's Intranet collaboration site.

<https://epaportal.sp.ohio.gov/dsw/waterqual/SitePages/Home.aspx?RootFolder=%2Fdsw%2Fwaterqual%2FShared%20Documents%2FWater%20Quality%20Studies%2F2019%2FAuglaize%20River%20%28upper%29%2F1%20%2D%20Study%20Plan&FolderCTID=0x0120004B0C401D7828204DAEDD6A7ADA6DD1A4&View=%7bCBC22BD2-C45C-4217-A97E-2F1B5DFD3D34%7d>

Examples of documents posted to this location include;

Pre-sampling documents:

- Preliminary information sheets
- Property access forms
- Draft and final QAPP versions

Project documents:

- All data files
- Draft report sections
- Changes to sites, staff, parameters, etc. should be filed in the project folder by the study team leader
- Project photos will be moved to and stored in the Lynx Photo System. All files and original data sheets will be initially retained by Ohio EPA at the Groveport Field Office while the survey report is being finalized in accordance with established retention schedules.
- Long term survey information and data storage will take place at the State's Storage Facility in accordance with established retention schedules.

Changes in project leadership or major actions which might affect the DQOs require an updated QAPP and signoff sheet. The study team leader shall retain copies of all management reports, memoranda, and all correspondence between team members.

For analytical samples the original chain of custody form is delivered to DES along with the samples and retained by the Laboratory. A copy of the form may be kept in a binder by the sample collector as well. After water samples are analyzed and the results are approved by the DES QA Officer the data will be released to Sample Master® and subsequently uploaded to DSW's Ecological Assessment and Analysis Application (EA3). The sample collector reviews laboratory sheets for completeness and accuracy, validates field QC, adds comments and completes edits if necessary and approves the sheet. All data approved in EA3 is sent to U.S. EPA's Water Quality Exchange.

Datalogger temperature data files will be created for each stream location. The district study team will download the data files from the dataloggers and transmit them to the Modeling and Assessment Section staff for data reduction and analysis.

Original fish and QHEI data sheets will be retained at the Groveport Field Office. Data from the field sheet is manually entered into the EA3 database using the appropriate data entry screen. The sheets are double entered to minimize mistakes.

Section B – Data Generation and Acquisition

B1 – Sampling Process and Design

The site selection process for this special study of the lower Great Miami River watershed is designed to specifically target portions of the lower two Great Miami River LRAUs and includes the Dicks Creek 12-digit WAU with the intent of identifying the causes and sources of the aquatic life use impairment revealed during the 2020 field sampling season of the Large Rivers survey. The focus of this special study extends from the lower Great Miami River at river mile 55.14 downstream to river mile 15.49, with emphasis on bracketing known point sources. Sampling emphasis is also placed on the lower 5.5 river miles of Dicks Creek, both to identify any potential impacts that may be contributing to the lower Great Miami mainstem impairment and to update Ohio EPA sampling data that is over two decades old.

A summary of the planned sampling effort is shown in Appendix 1. A detailed list of sampling sites and the type of sampling at each is shown in Appendix 2. A list of facilities regulated by individual NPDES permit is shown in Appendix 3.

B2 – Sampling Methods

For further detail on the collection and reporting of water quality data, the 2019 version of the Surface Water Field Sampling Manual can be found at:

https://epa.ohio.gov/dsw/document_index/docindx

Stream Habitat Evaluation

Physical habitat is evaluated based on methods described in Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989, 1995, and Ohio EPA 2006). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Habitat attributes scored include the type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality and gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site.

Biological Community Assessment

Fish and macroinvertebrate sampling protocols are detailed in Ohio EPA Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 2015b). Published at:

https://www.epa.state.oh.us/Portals/35/documents/BioCrit15_Vol3.pdf

A combination of quantitative and qualitative methods will be employed to monitor benthic macroinvertebrate communities. Quantitative collections are made using modified Hester-Dendy multiple plate artificial substrate samplers, deployed at all biomonitoring sites draining more than 20 mi², or at reference sites regardless of size. Once deployed, artificial substrates are left to colonize, in-stream, for a six-week period. Qualitative sampling will be conducted at all biomonitoring stations. This sampling method consists of a basic inventory of macroinvertebrate taxa from natural substrates, noting dominant taxa among major habitat types.

Fish will be sampled at each sampling location using pulsed DC headwater, wading or boat electrofishing methods depending on watershed size at each sampling zone. Sites with drainage areas greater than 20 mi² or at reference site locations will be sampled twice during the sampling index period. The number of passes may be adjusted as necessary based on best professional judgment of the fish crew leader. Reasons for a single pass monitoring at sites otherwise identified as needing multiple passes may include extremely difficult and time-consuming access, work delays related to weather, or the emergence of alterations (natural or otherwise) at points of access or sampling reach, rendering replication of the initial effort hazardous or costly, or both. Fish are processed in the field, which includes identifying each specimen to species level, counting individuals at all sites, weighing individuals at wading and boat sites, and recording external abnormalities.

Surface Water

When feasible, surface water physical and chemical testing will be done to coincide with biological monitoring. Ideally these samples will be collected across a variety of flow conditions. A minimum of five sets of samples will be collected. If this is not feasible, sites where $n < 3$ will be noted in the report to question the validity of any arithmetic or geometric mean calculated.

Inorganic surface water chemical parameters will be collected at every site listed in Appendix 2. Physical water quality measurements will be taken with a multimeter probe each time a grab sample is collected. Analytical methods and laboratory reporting levels for chemical and physical parameters for different media samples collected within the study are listed in Appendix 4.

Surface water grab samples will be collected and preserved using appropriate methods as outlined in the Surface Water Field Sampling Manual for water column chemistry, bacteria, and flows. This document is hereafter referred to as the Surface Water Field Sampling Manual. Samples are delivered via overnight courier to Ohio EPA's Division of Environmental Services (DES) for analyses. Field measurements of dissolved oxygen, pH, temperature and conductivity will be made using YSI Professional Plus or ProDSS meters.

Laboratory reporting limits are adequate to evaluate most pollutants. Potential exceptions include nitrate-nitrite and ammonia. It is common for nitrogen to become depleted during the summer in aquatic environments. In instances where a value is needed to calculate a mean concentration and the result is below reporting limit (RL), the reported "value" will be used in the calculation.

Water Quality Sonde Deployments

Continuous multi-parameter measurement sondes will be deployed at all stream assessment sites; 17 locations. Sonde surveys should be done during stable, baseflow conditions. Ideally, each site

targeted will have 2 surveys done. Water quality sondes will be placed at select locations (indicated in Appendix 2) to evaluate diel measurements of dissolved oxygen, pH, temperature, and conductivity. The sonde deployment goal is to capture a minimum of 48 continuous hours. Sestonic and benthic chlorophyll-a samples are to be collected during each sonde deployment as site conditions allow. All sampling, analysis and procedures adhere to those specified in the Surface Water Field Sampling Manual – Appendix II for water quality parameters and flows. Section F of Appendix II outlines equipment preparation, deployment, equipment retrieval, data management, quality control testing, and maintenance.

Temperature

Continuous temperature measurements will be recorded at 14 locations using Onset HOBO Water Temperature Pro v2 Data Loggers. The sampling will be conducted in accordance with procedures outlined in the Surface Water Field Sampling Manual Section G, Standard Operating Procedure for Continuous Temperature Data Logger Deployments. The loggers are accurate to approximately 0.2°C with an expected drift of approximately 0.1°C per year. Accuracy of the logger will be tested against a calibrated thermometer prior to deployment, ensuring the readings are within the accuracy range provided by the manufacturer. A stream temperature datapoint will be collected every 30 minutes from July 1 through August 31 to determine the temperature regime for the streams during this time.

Chlorophyll

Benthic and sestonic chlorophyll *a* will be collected and preserved using appropriate methods, as outlined in Appendix II of the Surface Water Field Sampling Manual and delivered to Ohio EPA- DES for analyses.

Sediment

Fine-grained, multi-incremental sediment samples will be collected in the upper four inches of bottom material using either decontaminated stainless steel scoops or dredges. Potential sediment sampling parameters are listed in Table 4. Collected sediment will be placed into appropriate containers, placed on ice (to maintain 4°C) and shipped to Ohio EPA-DES for analysis. Sampling and decontamination protocols will follow those listed in Appendix III of the Surface Water Field Sampling Manual.

Fish Tissue

Tissue fillet samples will be collected from fish of edible size and species preferred for analysis may include spotted bass, largemouth bass, smallmouth bass, flathead catfish, walleye, saugeye, white bass, common carp, freshwater drum, buffalo and channel catfish. When possible, composite samples (by species) should include a minimum of three fish, yielding at least 150 grams of tissue. At each fish tissue sampling location, an attempt will be made to collect five fish species for analysis. Fish will be collected using standard electrofishing methods (Ohio EPA 2015b). Sampling locations are listed in Table 2 and the parameters to be analyzed are listed in Table 4. Fish used for tissue analysis will be filleted in the field using decontaminated stainless-steel fillet knives. Samples will be wrapped in aluminum foil, placed in a sealed plastic bag, along with necessary site documentation. Temporary storage in the field may take one of two forms. Samples may be stored on wet ice for a period not exceeding 48 hours. For longer periods of field storage, samples must be

placed on dry ice. Collection, decontamination, and field processing of tissue samples will follow protocols listed in the Ohio EPA Fish Tissue Collection Guidance Manual (Ohio EPA 2012). From the field, fish tissue samples will be stored and inventoried in chest freezers at the Ohio EPA Groveport Field Office prior to delivery to DES.

B3 – Sample Handling and Custody

Sample Master® software is used by DES to manage laboratory information. A guidance manual for use of the software is in Appendix IV of the Surface Water Field Manual (2019d). The sample collector logs into the system and places an order by selecting the appropriate project, stations to be sampled, and test group(s) to be analyzed. The program creates a chain of custody form and container labels for each site.

B4 – Analytical Methods

The analytical methods to be used in this study are provided in Appendix 4 along with the preservatives, holding times, and reporting limits. SOPs for the analytical methods are available upon request.

B5 – Quality Control

Stream Habitat Evaluation

To ensure technical proficiency and promote standardized observations between and among all Ohio EPA field staff tasked with macrohabitat assessment, participation in annual QHEI refresher training is required. The training pre-dates the onset of sampling activities by several weeks, is field-based, and typically organized and lead by a senior Fish Evaluation Group (FEG) biologist. Participants are asked to independently generate a QHEI from one or several target stream segments; this followed by a group discussion, on-site, where each component of each of the five metrics that comprise the QHEI are reviewed in detail. In this way, all investigators are obliged to revisit guidance material and reaffirm the various definitions, categories, and related classifications that underpin this key assessment tool. The annual refresher has proved an efficient method to discipline observations made by front-line field staff and as such has served as a practical check on investigator drift.

Water Quality Sonde Deployments

Sondes will be calibrated according to manufacturer specification prior to deployment. A calibration record is kept for all sondes at the Groveport Field Office (GFO). After each deployment, sondes undergo a precision quality control check, for more details see section F and Appendix II of the Surface Water Field Sampling Manual. All field quality control requirements and data validation methods are detailed in the Surface Water Field Sampling Manual.

Temperature Data

Battery-life and quality assurance of the loggers will be tested prior to deployment and upon retrieval. QA of the loggers will be tested by a method called herd calibration. This is done by placing groupings of the loggers into a homogenized water bath and recording the temperature every minute for approximately 15 – 20 minutes. The deviation of each individual logger should be

within 0.5°C from the group average. Loggers that fail the QA test during the pre-deployment test will not be deployed.

Upon receipt of temperature data, the data will go through an initial review process to flag/remove anomalous data. Anomalous data could be a result of a malfunction of the probe or an indication that the probe was not reading accurate information which could occur if the probe was not continuously submerged underwater, became buried under fine sediment, etc. Methods employed will take advantage of the ContDataQC R package developed by Tetra Tech, Inc

(<https://github.com/leppott/ContDataQC>). Data will be evaluated in a manner consistent with Ohio EPA's Standard Operating Procedure for the Analysis of Continuous Temperature Data for Determining Coldwater Habitats. See Appendix II, Section G of the Surface Water Field Manual for guidelines

Surface Water Chemistry

Ten percent of the total number of water samples will be submitted to the laboratory as field quality control samples. About five percent will be duplicates, including replicates if natural variability is a concern, and about five percent will be blanks, including field blanks and equipment blanks. Matrix spike duplicates will be collected for organic water samples at a minimum of five percent. Data will be validated based on the results of the field quality control samples as outlined in Appendix IV in the Surface Water Field Sampling Manual. The laboratory will validate data according to the requirements defined in the applicable analytical method (see Appendix 4). Field instruments will be calibrated according to manufacturer guidelines. Field instruments utilizing electrochemical sensors must be calibrated daily.

Chlorophyll

Ten percent of the total number of chlorophyll samples collected will be quality control samples. Approximately five percent will be equipment blanks and five percent will be duplicates. Equipment blanks for benthic and sestonic samples are collected following two separate procedures that are each outlined in Appendix II of the Surface Water Field Sampling Manual. Duplicates are collected as two aliquots pulled from the same sample, designed to measure the variability in sample processing (not sample collection). Chlorophyll data will be validated based on the results of the equipment blanks and duplicates as outlined in Appendix IV in the Surface Water Field Sampling Manual.

Sediment

Ten percent of the number of sediment samples should be collected as quality control samples, approximately 5 percent should be duplicates and five percent equipment blanks. Field duplicate samples are collected to determine laboratory analytical variability and/or field compositing techniques and of sediment heterogeneity within a single collected sample. Quality control sampling protocols will follow those listed in Appendix III of the Surface Water Field Sampling Manual. Sediment data will be validated based on the results of the equipment blanks and duplicates as procedures outlined in Appendix IV in the Surface Water Field Sampling Manual.

B6 – Instrument/Equipment Testing, Inspection and Maintenance

All instruments/equipment will be inspected prior to each use. All field meters are service annually by the manufacturer to verify that they are operating within specifications. Parts are repaired or replaced at this time if necessary.

B7 – Instrument Calibration and Frequency

The appropriate calibration procedure, as specified in the instrument's user manual, must be followed. All calibration solutions used will be checked for expiration dates before utilized. All equipment is assigned a logbook that will detail the equipment's calibration and maintenance history. For more details see Section D and Appendix II of the Surface Water Field Sampling Manual. Other equipment used will follow specifications provided in the biological and habitat methods cited.

B8 – Inspection/Acceptance of Supplies

Supplies and consumables will be inspected upon receipt by the field sampling teams. Nearly all supplies utilized for this project are maintained and used during Ohio EPA's normal business operations. The field team leaders will be responsible for ensuring that all sample containers and all needed supplies and consumables are available in advance of all field work. It will be their responsibility to maintain and replenish stock when needed. Consumable supplies include, but are not limited to: sample containers, acid preservatives, Lugol's iodine solution, ethyl alcohol, buffers, filters and miscellaneous supplies such as distilled water, disposable gloves, and towels. Field personnel will confirm that all reagents are within applicable shelf life.

B9 – Data Acquisition Requirements for Non-Direct Measurements

Data collected for this project and other data previously collected by Ohio EPA will be used to develop data summaries for each waterbody.

B10 – Data Management

The data management process is shared by the Division of Surface Water (DSW) and Division of Environmental Services (DES). DES uses Sample Master® software to manage laboratory information and DSW uses the Ecological Assessment and Analysis Application (EA3) to manage data. These programs are linked together to allow the transfer of information between the two systems. EA3 software is used to assign a permanent six-digit station ID number to each sampling location and to create a project name to associate locations so data can subsequently be exported and assessed in groups.

Field measurements are collected instantaneously using a multi-parameter meter and saved in an internal file storage system. These files are downloaded to the manufacturer's software, exported to Microsoft Excel® and then uploaded to Sample Master® so field data can be associated with chemistry data in the database.

Field and chemistry data tabulated in Sample Master® are eventually uploaded into EA3. Then, in EA3, the sample collector will review each data sheet for accuracy, validate field QC, add comments and complete edits, if necessary, before approving the sheet. This data is then available for use in IR

reports. All agency files are ultimately backed up and housed in the State of Ohio Computer Center (SOCC).

The project leader will maintain the project file in a dedicated folder on SharePoint. The goal or objective is to have a complete record of all decisions about modifications of data collection, validation, or interpretation between the QAPP signoff and project report completion. To achieve this, the project leader will need to be included on emails or otherwise receive summaries of all actions that meet the above description. Project photos should all be filed in the Lynx photo management system.

Section C – Assessment and Oversight of Data Collection

C1 – Assessment and Response Actions

Assessments

Periodic assessment of field sites, field equipment, and laboratory equipment is necessary to ensure that data obtained meets project needs. This is an ongoing process that continues every day during project implementation, as well as on larger scale assessments that take place less frequently (*e.g.*, annually). The assessments generally focus on readiness and consistency of implementation but also are looking for continual improvement opportunities.

Daily assessments (for each day of project activities, as applicable) include assessment of field equipment and supplies, laboratory equipment and supplies, completeness of the day's samples and associated field notes, future needs, etc.

Response Actions

Despite best preparations, assessments may find situations requiring corrective actions. Small day-to-day level assessment findings are often addressed by the individual doing the assessment in the field or in the laboratory and are common enough to the process to not necessitate a formal response.

- Laboratory personnel are aware that response may be necessary. Many of these will result in changes to the analytical reporting via data qualifiers and comments, for more information see Appendix IV of the field manual if:
- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or relative percent difference (RPD) between duplicates
- There are unusual changes in detection limits
- Deficiencies are detected by the laboratory and or project QA officers during any internal or external audits or from the results of performance evaluation samples
- Inquiries concerning data quality are received

Corrective action implementation will be determined by the likelihood that the situation may affect the quality of the data. Field corrective actions will be brought to the attention of the study team for consideration as to their impact on the data, their potential interest to other sampling teams/subcontractors, any future considerations for process improvement, and for their potential inclusion to the quarterly reports. Laboratory corrective actions will follow regular laboratory procedures and SOPs. Any laboratory corrective action with the potential to affect data quality will be conveyed to the study team leader by the laboratory.

The datalogger installations will be visited periodically over the summer to make sure the logger remains in place within the stream. The dataloggers will be checked as soon as possible after large storm events which may dislodge or bury a logger. It is critical to reset the logger as soon as possible to prevent the loss of no more than several days of the entire data record. Weather and stream conditions will also be monitored if streams are at risk of going dry. Loggers may need to be relocated to deeper pools in the same area.

Reporting and Resolution of Issues

Any audits or other assessments that reveal findings of practice or procedure that do not conform to the written QAPP will be corrected as soon as possible. The study team and QA coordinator will be notified regarding deviations.

Data Completeness

Success of the project will be judged by the resulting data fulfilling the needs outlined in the data objectives. Potential data gaps will be monitored as the project progresses and the project schedule will be revised to fill these gaps where they are determined to be significant or to potentially impact the fulfillment of project objectives.

Reports to Management

The project leader or district supervisor will receive regular updates from field staff throughout the sampling season and will report to division management during Senior Management Team meetings. Any problems that jeopardize completion of the project will lead to memorandum and consultation with program management and quality assurance staff.

The final TSD will report all study results and findings. Aquatic life use attainment will be determined by biological criteria. Causes and sources of aquatic life use impairment will be identified and supported by water chemistry, sediment chemistry, and stream habitat evaluations. Public water supply use will be determined on surface water chemistry and recreational use will be determined on bacteriological results.

Section D – Data Validation and Usability

D1 – Data Review, Validation and Verification Requirements

Data verification will be conducted by the study team with assistance from other DSW staff. This process will confirm that sample results received are congruent with samples submitted and parameters requested from the laboratory. The process will also result in summaries of any differences between initial sampling and methods planned in the QAPP and results reported and available. Differences may result from samples not being collected (due to weather, scheduling,

etc.), samples not being submitted (due to accidents like broken containers, or delays resulting in being past holding times, etc.), problems at the laboratory (methods changing, containers or equipment breaking), or other reasons. It is also possible that additional sampling would take place because of field observations/conditions. Documenting deviations from the QAPP is the responsibility of the project leader.

The DES laboratory does the initial validation on all data and may qualify data based on laboratory QA/QC alone or with feedback from the sampler (regarding specific sampling procedures, variable sampling matrix, conditions, blank contamination, duplicate agreement, matrix spike recovery, etc.). The data user can evaluate the data given their knowledge of sampling conditions, expected variability given location and matrix, data uses, etc.

All fish, macroinvertebrate, and habitat data are hand-entered into the EA3 database using a double data entry method. This helps to minimize data entry errors. Final approval of data involves a reconciliation between the paper forms and the electronic data which is completed by the data collector or a database administrator in the Ecological Assessment Unit.

Upon approval in EA3, field and laboratory data cannot be revised without intervention from database administrators in the Agency's Office of Information Technology Services (ITS).

D2 – Validation and Verification Methods

Biological and habitat field sampling results will be verified and validated based on field staff experience and qualifications and adherence to training and QA/QC procedures for current and new field staff available in Subsection 1, Part A (macroinvertebrates) and Subsection 2, Part A (Fish and Habitat) in Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities.

In addition to verifying data completeness, the study team will oversee data validation for the project that will include confirmation of sample holding times, proper preservatives, sample containers, analysis methods, QA/QC results (including assessment of results for blanks, spikes, and duplicates), etc. This will be an ongoing effort, concluding in a data validation summary to be included in the final report.

The study team will make final decisions regarding validity and usability and will evaluate the sample collection, analysis, and data reporting processes to determine if the data is of sufficient quality to meet the project objectives. Data validation involves all procedures used to accept or reject data after collection and prior to use. These include screening, editing, verifying, and reviewing. Data validation procedures ensure that objectives for data precision and bias will be met, that data will be generated in accordance with the QAPP and SOPs, and that data are traceable and defensible. The process is both qualitative and quantitative and is used to evaluate the project.

The laboratory QA staff will conduct a systematic review of the analytical data for compliance with

the established QC criteria using batch and sample QA/QC information including spike, duplicate, and blank results. All technical holding times will be reviewed, the laboratory analytical instrument performance will be evaluated, and results of initial and continuing calibration will be reviewed and evaluated.

Field QC sample results will be evaluated using recently clarified DSW procedures available in Section I of the Surface Water Field Sampling Manual. Much of this work is facilitated by a centralized automated QC data evaluation Excel file. Use of this file is explained in the document “QC Tracking and Data Qualification” available in SharePoint in DSW Quality Management/Documents/DSW Procedures.

For most DSW chemical water quality data, data validation is generally confined to evaluation of blank results, duplicate/replicate results, paired parameter results (defined below) and confirming that samples were properly preserved/prepared (including filtration, *etc.* - if indicated by the method). Standards for evaluation of analytical results of those QC sample types and general field samples are described in Appendix IV, Section A of the Surface Water Field Sampling Manual.

D3 – Reconciliation with Data Quality Objectives

Issues related to biological and habitat data uncertainty, including any patterns of analytical or field QC uncertainties, will be assessed by field staff and their management. For most situations, issues can be addressed with acknowledgement of factors captured in the sample metadata which can confirm, explain, and document the data quality concern. Significant, persistent, or unresolved issues will be brought to the attention of the project study team, division QC personnel, and Ecological Assessment Unit and/or DSW management for further evaluation. This combination of personnel will assess how to best label affected data for storage in the EA3 database and how to eliminate or limit any similar problems going forward. Consideration will also be given on how best to memorialize data limitations or anomalies as the data is transferred to other databases, including the WQ Portal, so that future users of the sampling data are aware of any data quality issues or limitations.

Appendix 1 – Summary of Sampling Effort*

Type of Sample	# of sites	# of passes	Total #
Biology			
Fish < 20 mi ² (1 pass)	2	1	2
Fish > 20 mi ² (2 pass)	12	2	24
Macroinvertebrate (Quantitative)	14	1	14
Macroinvertebrate (Qualitative)	14	1	14
Fish Tissue			
Fish Tissue	4	1	4
Water Quality			
Inorganic Samples	22	5	110
Nutrient (sonde deployment & Chlorophyll-a)	17	1-2	17-34
Semi-volatile Organic Samples (BNA)	3	2	6
PCBs	3	2	6
Temperature Dataloggers	14	1	14
Sediment Quality			
Metals	3	1	3
Pesticides/PCB's and Semi-volatile Organics	3	1	3

* numbers do not include the sampling at potential supplemental sampling locations. Including the supplemental sampling locations in the survey will be dependent on the availability of field staff resources

** If staffing resources allow, an additional chemistry pass will be conducted

Appendix 2 – Streams, Sampling Locations, and Sampling Types

Station	Site Name	River Mile	Area (mi ²)	HUC12	County	Lat.	Lon.	(key in footnote) Sampling
Great Miami River Mainstem (Mad River to Four Mile Creek) (14-001-000)								
H09W28	N. of Middleton @ St. Rt. 4	55.14 (55.1)	3117	050800020702	Butler	39.5399	-84.3841	MQ, T, F2, N, C
H09E10	Wausau (Essity) Paper	51.71	3137	050800020702	Butler	39.5081	-84.4176	C
H09W30	AK Steel 011	51.28	3137	050800020702	Butler	39.502	-84.41872	C
H09W78	Dst. AK Steel 011, between CSO's	51.24	3137	050800020702	Butler	39.5	-84.42	MQ, T, F2, N, C, FT
600330	Near Middleton @ St. Rt. 73	49.27 (49.35)	3189	050800020706	Butler	39.4814	-84.4428	MQ, T, F2, N, C
H09W33	Middletown WWTP	48.29	3191	050800020706	Butler	39.4783	-84.4282	C
H09W36	LeSourdsville WWTP	45.42	3271	050800020706	Butler	39.4446	-84.44188	C
201886	UPST Liberty-Fairfield Road	44.1	3278	050800020706	Butler	39.4347	-84.4621	MQ, T, F2, N, C
H09E11	Miller (Molson) Brewery	43.46	3278	050800020706	Butler	39.4306	-84.4725	C
610090	@ Liberty-Fairfield Rd.	43.23	3280	050800020706	Butler	39.4293	-84.4764	MQ, T, F2, N, C
Great Miami River Mainstem (Four Mile Creek to Ohio River) (14-001-000)								
H11W35	0.1 mi. upst. Hamilton WWTP	34.1	3636	050800020902	Butler	39.3718	-84.5702	MQ, T, F2, N, C
H11C01	dst. Fernald, 1 mi. dst Dry Run	24.55 (24.4)	3789	050800020904	Hamilton	39.3033	-84.6431	MQ, T, F2, N, C

Station	Site Name	River Mile	Area (mi ²)	HUC12	County	Lat.	Lon.	(key in footnote) Sampling
H11W20	At Miamitown at Harrison Road	15.49	3838	050800020906	Hamilton	39.2161	-84.7035	MQ, T, F2, N, C
Dicks Creek (14-018-000) (Confluence w/ GMR at RM 47.61)								
H09S20	Near Middletown @ Cincinnati-Dayton Road	5.45	9.8	050800020704	Butler	39.4722	-84.3436	MQ, T, F, N, C, O1, S
H09S19	At Middletown at road dst North Branch	4.7	17.9	050800020704	Butler	39.4733	-84.3578	MQ, T, F, N, C
H09P22	0.1 mi upst AK Steel 015, dst Shaker Creek	4.14	39	050800020704	Butler	39.4735	-84.366281	MQ, T, F2, N, C, FT
H09G02	dst. AK Steel 003, upst AK Steel 015	3.9	40	050800020704	Butler	39.4744	-84.3703	N, C
H09S18	dst. AK Steel 003 and 015	3.62	41	050800020704	Butler	39.4733	-84.3756	MQ, T, F2, N, C, O1, S, FT
H09G05	Dicks Creek at Middletown, upst Yankee Rd/dst landfill trib	2.6	44.5	050800020704	Butler	39.4738	-84.3943	MQ, T, F2, N, C, O1, S, FT
H09K22	Dicks Creek at Middletown @ Amanda Rd.	1.4	48	050800020704	Butler	39.4792	-84.4125	MQ, T, F2, C, N, FT
North Branch Dicks Creek (14-019-000) (Confluence w/ Dicks Creek at RM 5.11)								
H09P16	0.1 mi uspt AK Steel 004	0.18	7.6	050800020704	Butler	39.47636	-84.349311	N, C
H09E08	AK Steel 004	0.08	8	050800020704	Butler	39.4748	-84.34952	N, C

* -- Potential supplemental sampling locations. Sampling and the level of assessment at these stations is dependent on the availability of field staff resources

M – modified reference site. R – reference site. Red font indicates discharges

Code	Sample Type	Code	Sample Type
F	Fish – 1 Pass	O1	Organics -- SVOCs (semi-volatile organic compounds) and PCBs
F2	Fish – 2 Pass	O2	Organics -- herbicides and insecticides
FT	Fish Tissue	B	<i>E. coli</i> bacteria
MQ	Macroinvertebrate - Quantitative (HD)	S	Sediment
Mq	Macroinvertebrate – Qualitative	N	Nutrient site
C	Chemistry	T	Temperature datalogger

Appendix 3 – NPDES permitted facilities

Watershed LRAU / WAU	Ohio Permit Number	Facility Name	Design Flow ¹ (MGD)	Average Flow ² (MGD)	Type of Waste	Stream and River Mile at Discharge	County
05080002							
90 01	1PD00004*QD	Franklin Regional WWTP	4.5	3.481	Municipal	Great Miami River (RM 59.65)	Warren
90 01	1IA00119*HD	Wausau Paper Towel and Tissue, LLC	4.0	3.150	Industrial	Great Miami River (RM 53.0)	Butler
90 01	1ID00001*LD	AK Steel Corporation - Outfall 011	---	6.722	Industrial (see Table X) ³	Great Miami River (RM 51.28)	Butler
90 01	1PE00003*QD	Middletown WWTP	26	17.42	Municipal	Great Miami River (RM 48.29)	Butler
90 01	1IH00011*JD	Miller Coors USA LLC	2.82	1.498	Industrial (WWTP)	Great Miami River (RM 46.02)	Butler
90 01	1PK00011*ND	LeSourdsville Regional WRF	15.0	9.432	Municipal	Great Miami River (RM 45.65)	Butler
90 02	1IB00008*MD	Hamilton Municipal Power Plant	109.9	0.065	Industrial	Great Miami River (RM 37.12)	Butler
90 02	1PE00002*ND	Hamilton WRF	32.0	9.103	Municipal	Great Miami River (RM 34.0)	Butler
90 02	1PD00003*QD	Fairfield WWTP	10.0	5.226	Municipal	Great Miami River (RM 31.53)	Butler
90 02	1IO00004*JD	USDOE Fernald Preserve	8.2	6.742	Industrial (groundwater pump and treat)	Great Miami River (RM 24.75)	Hamilton
90 02	1PK00015*ED	Taylor Creek WWTP	5.5	2.948	Municipal	Great Miami River (RM 15.3)	Hamilton
07 04	1ID00001*LD	AK Steel Corporation - Outfall 002	---	0.911	Industrial (see Table X) ³	Dicks Creek (RM 2.92)	Butler
07 04	1ID00001*LD	AK Steel Corporation - Outfall 003	---	3.925	Industrial (see Table X) ³	Dicks Creek (RM 3.80)	Butler
07 04	1ID00001*LD	AK Steel Corporation - Outfall 015	---	1.086	Industrial (see Table X) ³	Dicks Creek (RM 4.04)	Butler
07 04	1ID00001*LD	AK Steel Corporation - Outfall 004	2.64	3.638	Industrial (see Table X) ³	N. Branch Dicks Cr. (RM 0.08)	Butler

¹ Design flows that are greater than 1.0 million gallons per day (MGD) classify a facility as a major discharger.

² Average flows are displayed for 2020 unless otherwise noted.

³ This facility is designed to treat storm water associated with an industrial activity and therefore does not have a design flow rate.

⁴ Controlled discharge

Refer to [Table X – Description of AK Steel - Middletown Works Outfalls and Treatment Systems](#)

Appendix 4 – List of Physical/Chemical Parameters and Reporting Limits

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
Oxygen Demand				
BOD, 5 day	SM 5210B	2 mg/L		
cBOD, 20 day	OEPA 310.2	2 mg/L		
COD	SM 5220D	20 mg/L		
Physical Properties				
Alkalinity	USEPA 310.1	5 mg/L		
Hardness	USEPA 200.7	10 mg/L		
Dissolved Oxygen (mg/l and % saturation)	Field Meter/Sonde	0 mg/L 0% sat		
pH	Field Meter/Sonde	0 s.u.		
pH		0 s.u.	0 s.u.	
Specific Conductance	SM 2510B	1 µS/cm		
Specific Conductance	Field Meter/Sonde	1 µS/cm		
Temperature	Field Meter/Sonde	0 °C		
Total Dissolved Solids	SM 2540C	10 mg/L		
Total Suspended Solids	SM 2540D	5 mg/L		
% Solids	SM 2540G		0%	
% Lipids	OEPA 581.5			0%
Nutrients				
Ammonia-N	USEPA 350.1	0.05 mg/L	7 mg/kg	
Nitrate-Nitrite	USEPA 350.1	0.5 mg/L		
Nitrite	USEPA 353.2	0.02 mg/L		
Total Kjeldahl Nitrogen	USEPA 351.2	0.2 mg/L		
Total Phosphorus	USEPA 365.4	0.01 mg/L	50 mg/kg	
Orthophosphate (as P)	USEPA 365.4	0.01 mg/L		
Total Organic Carbon	SM 5310B	2 mg/L	0.1%	
Dissolved Organic Carbon	SM 5310C	2 mg/L		
Anions				
Bromide	USEPA 300.1	0.02 mg/L		
Carbonate/Bicarbonate	SM 2320B	5 mg/L		
Chloride	USEPA 325.1	5 mg/L		
Fluoride	USEPA 300.1	0.02 mg/L		
Sulfate	USEPA 375.2	10 mg/L		
Cations				
Aluminum	USEPA 200.7	200 µg/L	200 µg/L	

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
Barium	USEPA 200.7	15 µg/L	15 µg/L	
Calcium	USEPA 200.7	2 mg/L	2 µg/L	
Iron	USEPA 200.7	50 µg/L	50 µg/L	
Magnesium	USEPA 200.7	1 mg/L	1 µg/L	
Manganese	USEPA 200.7	10 µg/L	10 µg/L	
Potassium	USEPA 200.7	2 mg/L	2 µg/L	
Sodium	USEPA 200.7	5 mg/L	5 µg/L	
Strontium	USEPA 200.7	30 µg/L	30 µg/L	
Metals				
Zinc	USEPA 200.7	10 µg/L	8 mg/kg	
Arsenic	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.05mg/kg
Beryllium	USEPA 200.8		20 µg/L	
Cadmium	USEPA 200.8/SM 3113B	0.2 µg/L	0.08 mg/kg	.004 mg/kg
Chromium	USEPA 200.8	2 µg/L	0.8 mg/kg	
Cobalt	USEPA 200.8		2 µg/L	
Copper	USEPA 200.8	2 µg/L	0.8 mg/kg	
Lead	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.04 mg/kg
Nickel	USEPA 200.8	2 µg/L	0.8 mg/kg	
Selenium	USEPA 200.8/SM 3113B	2 µg/L	0.8 mg/kg	0.05 mg/kg
Silver	USEPA 200.8		0.08 mg/kg	
Titanium	USEPA 200.7		50 µg/L	
Vanadium	USEPA 200.7		50 µg/L	
Mercury	USEPA 245.1/SM 3113B		0.02 mg/kg	0.02 mg/kg
Bacteria				
Escherichia coliform	USEPA 1603	2 CFU		
Algal Biomass				
Chlorophyll a	USEPA 445.0	2 µg/L		
Organic Compounds				
Chlorinated Herbicides	USEPA 515.1	40 µg/L		
Acid Herbicides	USEPA 525.2	200 µg/L		
Semi-volatile organics	USEPA 625	2-20 µg/L		
Semi-volatile organics	USEPA 8270C	2 – 10 mg/l	0.4-2 mg/kg	
Organochlorine Pesticides	USEPA 8082A/OEPA 590.1	1-10 µg/L	4 µg/kg	10 µg/kg
PCBs	USEPA 8082A/OEPA 590.1		20 µg/kg	50 µg/kg

Appendix 5 – Safety Contacts and Hospital Locations

Safety:	
County Wildlife Officers:	County Sheriff:
Butler County – (513) 403-6591 Hamilton County – (513) 446-7028 Montgomery County – (937) 545-6768 Warren County – (513) 520-9896	Butler County – (513) 785-1300 Hamilton County – (513) 946-6400 Montgomery County – (937) 225-4192 Warren County – (513) 695-1280
OEMA:	State Highway Patrol:
Butler County – (513) 785-5810 Hamilton County – (513) 263-8200 Montgomery County – (937) 224-8934 Warren County – (513) 695-1315	Butler County – (513) 863-4606 Hamilton County – (513) 777-6037 Montgomery County – (937) 832-4794 Warren County – (513) 932-4444
Hospitals:	
Butler County TriHealth Bethesda Butler Hospital 3125 Hamilton Mason Road, Hamilton, OH 45011 (513) 894-8888	Hamilton County TriHealth Bethesda North Hospital 10500 Montgomery Road, Cincinnati, OH 45242 (513) 865-1111
Montgomery County Miami Valley Hospital 1 Wyoming Street, Dayton, OH 45409 (937) 208-8000	Warren County TriHealth Bethesda Arrow Springs 100 Arrow Springs Blvd, Lebanon, OH 45036 (513) 282-7000

References

- DeShon, J.E. 1995. *Development and Application of the Invertebrate Community Index (ICI)*, Davis W.S. and T.P. Simon (Eds.), *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Press, Boca Raton, FL (1995), pp. 217-244.
- Hughes, R.M., D.P. Larsen, and J.M. Omernik. 1986. *Regional reference sites: a method for assessing stream pollution*. *Env. Mgmt.* 10(5): 629-635
- Karr, J.R. and D.R. Dudley. 1981. *Ecological perspective on water quality goals*. *Env. Mgmt.* 5(1): 55-68.
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 1987. *Biological Criteria for the Protection of Aquatic Life: Volume I: The Role of Biological Data in Water Quality Assessment*. Published at: <https://www.epa.state.oh.us/Portals/35/documents/Vol1.pdf>
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2006. *2006 Updates to Biological Criteria for the Protection of Aquatic Life: Volume II and Volume II Addendum: Users Manual for Biological Field Assessment of Ohio Surface Waters*. Published at: https://www.epa.state.oh.us/Portals/35/documents/BioCrit88_Vol2Updates2006.pdf
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2015. *Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities*. Published at: https://epa.ohio.gov/portals/35/documents/BioCrit15_Vol3.pdf
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2006. *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)*. Published at: <https://www.epa.state.oh.us/portals/35/documents/QHEIManualJune2006.pdf>
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2012. *Fish Tissue Collection Manual*. Published at: <https://www.epa.ohio.gov/portals/35/fishadvisory/FishCollectionGuidanceManual12.pdf>
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2019. *Surface Water Field Sampling Manual: for Water Quality Parameters and Flows*. Published at: https://epa.ohio.gov/Portals/35/bioassess/SW%20Sampling%20Manual_2019_Update_Main_web.pdf
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2019. *Surface Water Field Sampling Manual - Appendix II: for Water Quality Parameters and Flows*. Published at: https://epa.ohio.gov/Portals/35/bioassess/SW%20Sampling%20Manual_2019_Update_App%20II_web.pdf

Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2019. *Surface Water Field Sampling Manual - Appendix III: Sediment Sampling*. Published at:
<https://epa.ohio.gov/Portals/35/documents/SW-Sampling-Manual-2018-AppIII.pdf>

Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2018. *Surface Water Field Sampling Manual - Appendix IV: Data Management*. Published at:
<https://epa.ohio.gov/Portals/35/documents/SW-Sampling-Manual-2018-AppIV.pdf>

Omernik, J.M. 1987. Ecoregions of the conterminous United States. *Ann. Assoc. Amer. Geogr.* 77(1): 118-125.

Omernik, J.M. and A.L. Gallant, 1988. Ecoregions of the upper Midwest states. EPA/600/3-88/037. U. S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, Oregon. 56 pp.

Yoder, C.O. and E.T. Rankin, 1995. Biological Criteria Development and Implementation in Ohio, Davis W.S., T.P. Simon (Eds.), *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Press, Boca Raton, FL (1995), pp. 109-144

Rankin, E.T. 1989. *The qualitative habitat evaluation index (QHEI): rationale, methods, and application*. Division of Water Quality Planning and Assessment, Columbus, Ohio.

Rankin E.T., 1995. *Habitat indices in water resource quality assessments*, Davis W.S., T.P. Simon (Eds.), *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Press, Boca Raton, FL (1995), pp. 181-208.

Table X – Description of AK Steel - Middletown Works Outfalls and Treatment Systems

Outfall	Type of Waste	Treatment System	Discharge Point
011	Treated process water (in-plant stations 613 and 614), non-contact cooling water, storm water runoff, boiler water, zeolite rinse, Kinney Rinse	None at final outfall (see 001, 613 and 614)	Great Miami River
001	Calculated sum of stations 613 and 614	(See 613 and 614)	Outfall 011
613	Treated process water from blast furnace	Settling, activated sludge aeration, chemical precipitation, flocculation, settling, landfilling of sludge.	Outfall 011
614	Process water from cold temper mills, acid pickling, alkaline cleaning, fume scrubbers, hot coating lines, inorganic chemicals, oxygen and nitrogen production, non-contact cooling water from oxygen/nitrogen production.	<i>North Terminal WWTP:</i> Oil skimming, neutralization, chemical precipitation, chemical oxidation (aeration), flocculation, settling, vacuum filtration and landfilling of sludge.	Outfall 011
002	Non-contact cooling water from by-products area of coke plant, other non-contact cooling waters and storm water runoff	None	Dicks Creek
003	Treated process water from basic oxygen furnace clarification system (in-plant station 631), cooling tower blowdown, storm water runoff	None at final outfall (see outfall 631)	Dicks Creek
631	Treated process water from basic oxygen furnace (steelmaking)	Settling, flocculation, vacuum filtration and landfilling of sludge	Outfall 003
803	Storm water runoff from City of Middletown.	None	Outfall 003

Table X. Continued.

Outfall	Type of Waste	Treatment System	Discharge Point
004	Blowdown from South Terminal Treatment Plant (in-plant station 641), treated process water from station 642, non-contact cooling water from annealing, storm water runoff	None at final outfall (see 641/642)	North Branch Dicks Creek
641	Treated process water from cold temper mill, acid pickling, alkaline cleaning, fume scrubbers	<i>South Terminal WWTP:</i> Oil skimming, chemical precipitation, neutralization, chemical oxidation (aeration), flocculation, settling, vacuum filtration and landfilling of sludge.	Outfall 004
642	Treated process water from electrogalvanizing line	<i>#2 EGL WWTP:</i> Chemical precipitation, neutralization, chemical oxidation (aeration), flocculation, settling, rapid sand filtration, vacuum filtration and landfilling of sludge.	Outfall 004
015	Treated process water from hot strip mill, continuous caster and vacuum degassing (outfall 005) non-contact cooling water, storm runoff.	None at final outfall (see 005)	Dicks Creek
005	Treated process water from hot strip mill, continuous caster and vacuum degassing.	Settling, flocculation, settling, vacuum filtration and landfilling of sludge.	Outfall 015
008	Storm water runoff	None	Dicks Creek
009	Storm water runoff from AK landfill	Settling ponds	Dicks Creek
099	Calculated downstream Dicks Creek station used to determine compliance with water quality-based limit. (DRAFT PERMIT PROPOSES TO ELIMINATE THIS STATION.)		Does not physically exist.