



# Environmental Protection Agency

## Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of Captina Creek, McMahon Creek, and select Ohio River tributaries - 2025



Ohio EPA Technical Report AMS/2025-CAPMC-1  
Division of Surface Water  
May 2025

# Group A: Project Management and Information/Data Quality Objectives

## A1. Title Page

### Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of Captina Creek, McMahon Creek, and select Ohio River tributaries - 2025

Belmont and Monroe Counties

April 2025

Version 1.0 - Effective 2025

**Prepared by:**

Ohio Environmental Protection Agency  
Division of Surface Water  
Lazarus Government Center  
50 W. Town Street, Suite 700  
Columbus, Ohio 43215

Ohio Environmental Protection Agency  
Ecological Assessment Section  
4675 Homer Ohio Lane  
Groveport, Ohio 43125

Ohio Environmental Protection Agency  
Southeast District Office  
2195 E. Front Street  
Logan, Ohio 43138

**Mail to:**

P.O. Box 1049  
Columbus, Ohio 43216-1049

**R. Mike DeWine**

Governor, State of Ohio

**John Logue**

Director, Ohio Environmental Protection Agency

## A2. Approval Page

Quality Assurance Project Plan for the Biological and Water Quality Study of Captina Creek, McMahan Creek, and select Ohio River tributaries 2025

_____	Date: _____
Erin Sherer, Division Assistant Chief	
_____	Date: _____
Katherine Harris, DSW Quality Assurance Coordinator	
_____	Date: _____
Andrew Phillips, Ecological Assessment/Study Coordinator	

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

<b>2C</b>	Priority Pollutant Analyte List Form
<b>ALU</b>	Aquatic Life Use
<b>AMD</b>	Acid Mine Drainage
<b>AMDAT</b>	Acid/Alkaline Mine Drainage Abatement and Treatment Plan
<b>BNA</b>	Basic, acidic, and neutral
<b>BOD</b>	Biochemical Oxygen Demand
<b>COD</b>	Chemical Oxygen Demand
<b>CWA</b>	Clean Water Act
<b>DDAGW</b>	Division of Drinking and Ground Waters
<b>DC</b>	Direct Current
<b>DES</b>	Division of Environmental Services
<b>DNR</b>	Department of Natural Resources
<b>DSW</b>	Division of Surface Water
<b>DQO</b>	Data Quality Objective
<b>EA3</b>	Ecological Assessment and Analysis Application
<b>EPA</b>	Environmental Protection Agency
<b>EWH</b>	Exceptional Warmwater Habitat
<b>FEG</b>	Fish Evaluation Group
<b>GFO</b>	Groveport Field Office
<b>GC/MS</b>	Gas Chromatograph/ Mass Spectrometer
<b>HD</b>	Hester Dendy
<b>HUC</b>	Hydrologic Unit Code
<b>IBI</b>	Index of Biotic Integrity
<b>ICI</b>	Invertebrate Community Index
<b>ID</b>	Identification
<b>IR</b>	Integrated Report
<b>ITS</b>	Information Technology Services
<b>MIwb</b>	Modified Index of well-being
<b>MRM</b>	Mineral Resources Management
<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>NPS</b>	Nonpoint Source
<b>OAC</b>	Ohio Administrative Code
<b>OSW</b>	Outstanding State Water
<b>QAM</b>	Quality Assurance Manager
<b>QAPP</b>	Quality Assurance Project Plan
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>QHEI</b>	Qualitative Habitat Evaluation Index
<b>PCB</b>	Polychlorinated Biphenyl
<b>pH</b>	Potential Hydrogen
<b>PWS</b>	Public Water Supply
<b>RL</b>	Reporting Limit
<b>RM</b>	River Mile
<b>RPD</b>	Relative Percent Difference
<b>S-VOCs</b>	Semi-volatile Organic Chemicals

<b>SEDO</b>	Southeast District Office
<b>SOP</b>	Standard Operating Procedure
<b>SOCC</b>	State of Ohio Computer Center
<b>SQL</b>	Structured Query Language
<b>SWCD</b>	Soil and Water Conservation District
<b>TDS</b>	Total Dissolved Solids
<b>TMDL</b>	Total Maximum Daily Load
<b>TSD</b>	Technical Support Document
<b>UAA</b>	Use Attainability Analysis
<b>USEPA</b>	United States Environmental Protection Agency
<b>USGS</b>	United States Geologic Survey
<b>WAP</b>	Western Alleghany Plateau
<b>WAU</b>	Watershed Assessment Unit
<b>WQ</b>	Water Quality
<b>WQP</b>	Water Quality Portal
<b>WQX</b>	Water Quality Exchange
<b>WQS</b>	Water Quality Standards
<b>WWH</b>	Warmwater Habitat
<b>WWTP</b>	Wastewater Treatment Plant

### **A3. Table of Contents, Document Format, and Document Control**

Group A: Project Management and Information/Data Quality Objectives ..... 1

    A1. Title Page ..... 1

    A2. Approval Page ..... 2

        List of Acronyms - (Glossary of Terms can be found here) ..... 3

    A3. Table of Contents, Document Format, and Document Control ..... 4

        List of Appendices ..... 7

        List of Figures ..... 7

        List of Tables..... 7

        Document Format ..... 7

    A4. Project Purpose, Problem Definition, and Background ..... 8

        Watershed Monitoring and Assessment History ..... 8

    A5. Project Task Description ..... 9

    A6. Information/Data Quality Objectives and Performance/Acceptance Criteria..... 13

        Monitor and Assess Ohio’s Waters..... 14

        Assess Causes and Sources of Impairment ..... 15

Provide Data for the Ohio Fish Tissue Consumption Monitoring Program.....	16
Support NPDES Permitting.....	17
TMDL Implementation .....	17
A7. Distribution List.....	18
A8. Project Organization .....	19
A9. Project Quality Assurance Manager Independence.....	21
A10. Project Organization Chart and Communication .....	22
A11. Personnel Training/Certification.....	23
A12. Documents and Records.....	23
Group B: Implementing Environmental Information Operations .....	24
B1. Identification of Project Environmental Information Operations .....	24
B2. Methods for Environmental Information Acquisition.....	25
Stream Habitat Evaluation .....	25
Biological Community Assessment .....	25
Surface Water .....	26
Water Quality Sonde Deployments .....	26
Bacteria.....	27
Temperature.....	27
Chlorophyll.....	27
Sediment .....	27
Fish Tissue .....	27
B3. Integrity of Environmental Information.....	28
B4. Quality Control.....	28
Stream Habitat Evaluation .....	28
Water Quality Sonde Deployments .....	29
Temperature Data.....	29
Surface Water Chemistry .....	29
Chlorophyll.....	29

---

Sediment .....	30
B5. Instruments/Equipment Calibration, Testing, Inspection, and Maintenance.....	30
B6. Inspection/Acceptance of Supplies and Services.....	30
B7. Environmental Information Management .....	30
Group C: Assessment, Response Actions and Oversight.....	31
C1. Assessment and Response Actions .....	31
Assessments .....	31
Response Actions .....	31
Reporting and Resolution of Issues .....	32
Data Completeness .....	32
C2. Oversight and Reports to Management .....	32
Group D: Environmental Information Review and Usability Determination .....	33
D1. Environmental Information Review .....	33
D2. Useability Determination .....	33
Appendix 1. Summary of Sampling Effort .....	35
Appendix 2. Streams, Sampling Locations, and Sampling Types .....	36
Appendix 3. NPDES Permitted Facilities.....	42
Appendix 4. NPDES Permitted Coal Facilities .....	43
Appendix 5. List of Physical/Chemical Parameters and Reporting Limits .....	44
Appendix 6. Safety Contacts and Hospital Locations .....	46
Appendix 7. Chemistry Sample Type/Parameter Crosswalk .....	47
References .....	49
Other Resources .....	49

## List of Appendices

---

***Appendix 1 - Summary of Sampling Effort***

***Appendix 2 – Streams, Sampling Locations, and Sampling Types.***

***Appendix 3 – NPDES Permitted Facilities***

***Appendix 4 – NPDES Coal Facilities***

***Appendix 5 – List of Physical/Chemical Parameters and Reporting Limits***

***Appendix 6 – Safety Contacts and Hospital Locations***

***Appendix 7 – Chemistry Sample Type/Parameter Crosswalk***

## List of Figures

---

Figure 1 - Sampling Locations Map.

Figure 2 - Water Quality-Based Approach of the Clean Water Act.

Figure 3 - Organization Chart.

## List of Tables

---

Table 1 – List of Watershed Assessment Units (WAU) in Study Area.

Table 2 – Distribution List

Table 3 – Roles and Responsibilities.

## Document Format

---

This Quality Assurance Project Plan follows the Quality Assurance Project Plan Standard, Directive Number **CIO 2105-S-02.0**, effective July 18, 2023.

## **A4. Project Purpose, Problem Definition, and Background**

### **Watershed Monitoring and Assessment History**

As part of Ohio's statewide monitoring strategy, biological and water quality assessments will be done during the 2025 field season in Captina Creek, McMahon Creek, and select direct Ohio River tributaries. The study area is in Belmont and a small portion of Monroe counties and spans two 8-digit hydrologic unit codes, or HUCs (05030106 and 05030201), and it is composed of fourteen 12-digit watershed assessment units (WAUs). The HUCs and their descriptions are listed in Table 1. Figure 1 is a map of the watershed displaying sampling locations that correspond to the sites listed in Appendix 2. Information collected as part of this survey will support the Data Quality Objectives listed in A7. Sampling in 2025 will focus biological and chemical monitoring throughout the watershed to describe condition status, identify areas of impairment to aquatic life, and to verify beneficial use designations. Biological and bacteriological sampling was conducted in 2024 at select locations to evaluate the beneficial use designations in small streams and to assess attainment of the recreational use criteria.

This effort includes Captina Creek, McMahon Creek, and several smaller tributaries which were last evaluated using the integrated assessment approach in 2009. The biological communities in the Captina Creek watershed were meeting at 94% of the sites surveyed (Ohio EPA, 2010). Most locations within the Captina Creek watershed had exceptional biological communities and streams were generally high quality. Captina Creek and several tributaries are designated as exceptional warmwater habitat (EWH), while most other streams retain the warmwater habitat (WWH) designation. Captina Creek is an Outstanding State Water (OSW) antidegradation classification based on the presence of a state endangered species (Eastern Hellbender), declining fish species and high mean Index of Biotic Integrity (IBI) and Invertebrate Community Index (ICI) scores. State endangered Eastern Hellbender salamanders have been found throughout the Captina Creek watershed.

The McMahon Creek watershed was fully meeting at 90% of the sites with exceptional communities found in the mainstem upstream from Little McMahon Creek. Little McMahon Creek was the only location in the watershed that was not meeting the goals of the Clean Water Act (CWA) due to significant iron discharges from the Buckeye Reclamation Landfill which also impacted the biological community in McMahon Creek mainstem, decreasing the biological scores from exceptional to good (Ohio EPA, 2010).

Six other direct Ohio River Tributaries are also included in this effort. Several of these were impacted by acid mine drainage and were not meeting the goals of the CWA when last evaluated. Two streams (Little Captina Creek and Stillhouse Run) have not been formerly evaluated.

Two of the largest coal mines owned by Murray Energy (Ohio Valley Coal Company and American Energy Corporation) formerly operated in the Captina Creek watershed during the previous 2009 survey but have since closed. Both mines and a slurry impoundment are currently being reclaimed. Captina Creek has a watershed coordinator through the Belmont County Soil Water Conservation District (SWCD) office and a land conservancy group that is working to protect the unique habitat and biological integrity of the watershed.

The predominant impacts found in the watershed during the 2009 survey were from abandoned surface and abandoned underground mines. Since the previous surveys, hydraulic fracturing for oil and gas began to occur throughout the watershed. Hydraulic fracturing requires large quantities of fresh water, along with sand and chemical lubricants when fracking a well. The water used in the fracturing process usually comes from a stream, river, reservoir or lake near the drill site, or in some cases, from a local municipal water plant. Each well drilled uses a significant amount of fresh water per well which can have a significant impact on smaller streams from groundwater withdrawals. Intentional and accidental spills of brine wastewater have also been reported in all the counties. In some cases, well pad explosions have occurred that have caused spills into nearby waterways and the evacuation of nearby residents. In addition to the water withdrawal, pipeline construction also ramped up in all the watersheds since the previous survey causing slips, sedimentation, stream fills, and spills. Follow up monitoring will be conducted in streams that have experienced impacts from spills and pipeline construction.

More information on previous studies done in the central Ohio River tributary watersheds can be found at the [Ohio EPA TMDL](#) webpage.

## **A5. Project Task Description**

During the 2025 summer sampling period, the biological, physical, and chemical integrity of the Captina Creek and McMahon watersheds and select direct Ohio River tributaries will be sampled at 85 locations.

The Captina Creek watershed is in the Western Allegheny Plateau (WAP) ecoregion in Monroe and Belmont Counties. The Captina Creek mainstem forms at RM 25.43 from the confluence of North Fork and South Fork flowing southeast and east, respectively, originating near Barnesville and upstream from Somerton. Captina Creek flows slightly southeast through Alledonia, Armstrong Mills, and Steinerville to Powhatan Point and its confluence with the Ohio River. It has a drainage area of approximately 180 square miles. Bethesda is a larger town in the northern portion of Captina Creek in upper Bend Fork sub watershed. Due to the superior physical habitat and chemical water quality and despite mining inputs and spills, the fish and macroinvertebrate community quality met EWH performance criteria at all Captina Creek mainstem sites in the 2008-2009 survey. Many historical sampling sites from the previous survey will be reevaluated to assess watershed trends and to assess the appropriateness of beneficial use designations.

The McMahon Creek watershed is in Belmont County with the mainstem flowing roughly east to west from near Morristown and near Belmont to Bellaire and the Ohio River. It drains approximately 91 square miles. This watershed is also within the WAP ecoregion. Towns along the mainstem included Lamira, Warnock, Glencoe, Stewartville, Neffs, and McClainville. The southern portions of St. Clairsville drain to part of the Little McMahon Creek subbasin. The primary water quality impairments in the McMahon Creek watershed were in Little McMahon Creek and were related to acid mine drainage (AMD) and landfill leachate from Buckeye Reclamation landfill, which is located on previously mined land. More extensive sampling will occur in this area. Biological community quality in McMahon Creek downstream from Little McMahon Creek only attained the WWH goals during the last survey, while higher community quality consistent with EWH streams was documented upstream

from Little McMahon Creek. Any other historical impacts stemming from acid mine drainage from tributary streams will be reevaluated.

Sampling will be focused largely on biological monitoring to determine attainment of the aquatic life beneficial use (ALU). Water chemistry and habitat quality sampling will also be conducted at sampling locations to determine whether water quality parameters collected exceeded their respective criteria (if applicable) and to help generate weight-of-evidence relationships between the biological communities, water chemistry, and instream physical habitat. Water quality sondes and chlorophyll- $\alpha$  sampling will be co-located in areas to describe streams along a eutrophication gradient or where nutrient over-enrichment may be. Continuous sonde deployment will also be attempted during wet-weather events to describe the potential impacts on stream chemistry from wet-weather runoff events from areas formerly mined.

Several public water supply intakes exist on run-of-the-river impoundments through the study area, including Slope Creek, several unnamed tributaries to North Fork Captina, and Little McMahon Creek. No public water supply (PWS) sampling will occur in streams as part of this assessment, but PWS sampling will be conducted at some inland reservoirs through the watershed; these efforts will be summarized under a separate **Inland Lakes** sampling quality assurance program plan. Bacteriological monitoring (*Escherichia coli* [*E. coli*]) was conducted in various streams in 2024 determine achievement of the Recreation Use criteria. Sport fish will be collected at select locations and their tissues processed for bioaccumulated contaminants pursuant to the Human Health beneficial use in the Ohio Fish Tissue Consumption Monitoring Program.

Following the survey, the results will be synthesized into a Technical Support Document (TSD). While the TSD is the primary support document for the TMDL program, the TSD also supports numerous additional Ohio EPA programs and regulatory actions including but not limited to Director's Orders, National Pollutant Discharge Elimination System (NPDES), Water Quality Standards, Public Water Supply, Ohio Nonpoint Source Assessment, and the biennial Integrated Water Quality Monitoring and Assessment Report (The 305 [b] and 303[d] report).

Depending on the sampling type, field season will run primarily from May 1 to October 31. The index period for fish and nutrient sampling is during the summer low flow period of June 15 – October 15. The macroinvertebrate sampling index period is slightly shorter, from June 15 – September 30. Bacteria sampling to evaluate recreation use will be conducted within a 90-day period during the recreation season, May 1 to October 31.

**Table 1 – List of Watershed Assessment Units (WAU) in Study Area.**

HUC8	HUC10	HUC12	HUC12 Name
05030106	<b>McMahon Creek</b>		
	<b>05030106 07</b>		
		05030106 07 01	Williams Creek
		05030106 07 02	Upper McMahon Creek
		05030106 07 03	Little McMahon Creek
		05030106 07 04	Lower McMahon Creek
05030106	<b>Wegee Creek</b>		
	<b>05030106 12</b>		
		05030106 12 06	Wegee Creek - Ohio River
		05030106 12 07	Pipe Creek - Ohio River
		05030106 12 08	Big Run - Ohio River
05030201	<b>Opossum Creek</b>		
	<b>05030201 10</b>		
		05030201 10 01	Stillhouse Run – Ohio River
05030106	<b>Captina Creek</b>		
	<b>05030106 09</b>		
		05030106 09 01	North Fork Captina Creek
		05030106 09 02	South Fork Captina Creek
		05030106 09 03	Bend Fork
		05030106 09 04	Piney Creek - Captina Creek
		05030106 09 05	Pea Vine Creek - Captina Creek
		05030106 09 06	Cat Run – Captain Creek

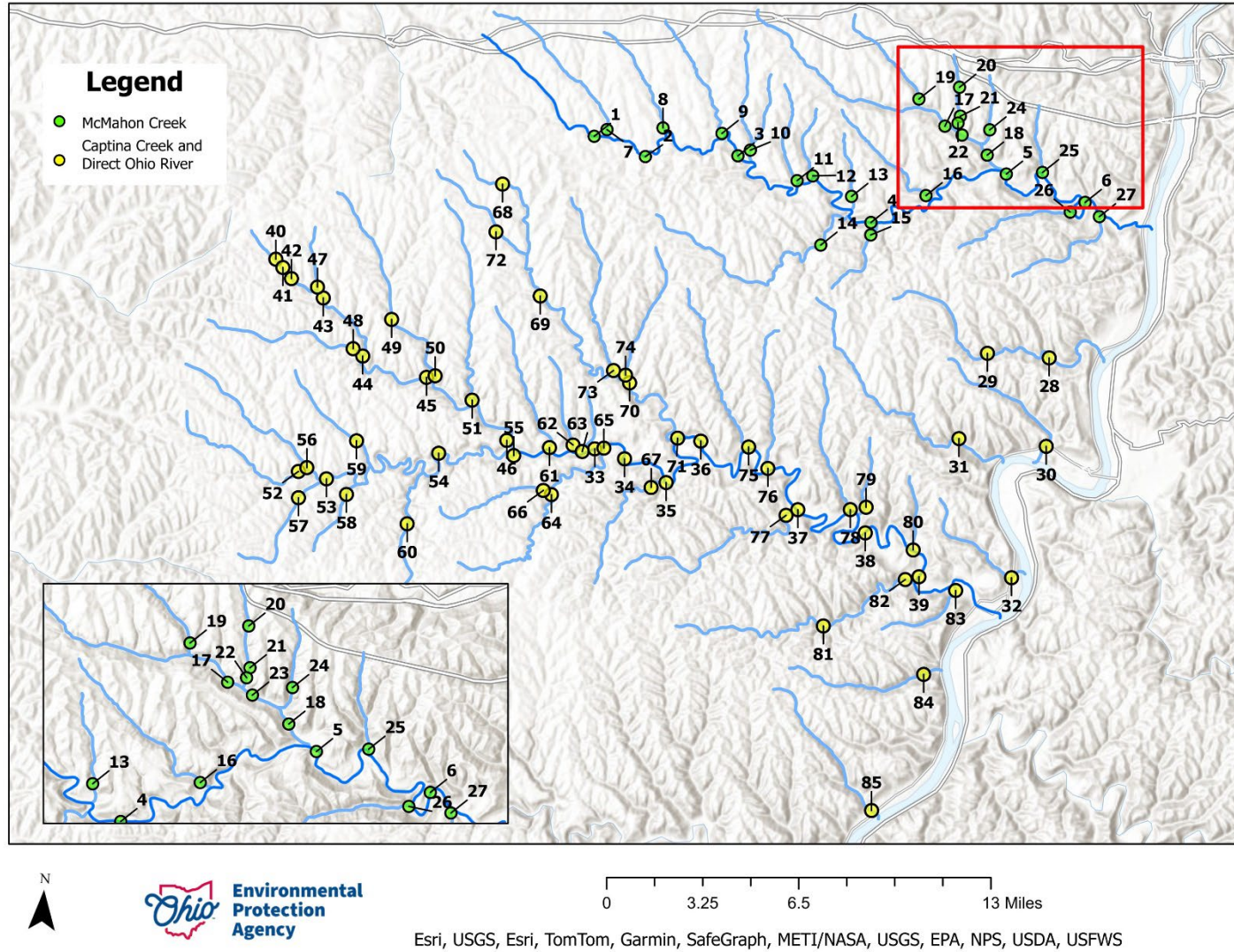


Figure 1 - Sampling Locations Map.

## **A6. Information/Data Quality Objectives and Performance/Acceptance Criteria**

The data collected during this watershed survey 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 causes and sources of impairment
- 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
- Determine and evaluate water quality trends at watershed, stream, and site level scales

### Water Quality-Based Approach of the Clean Water Act

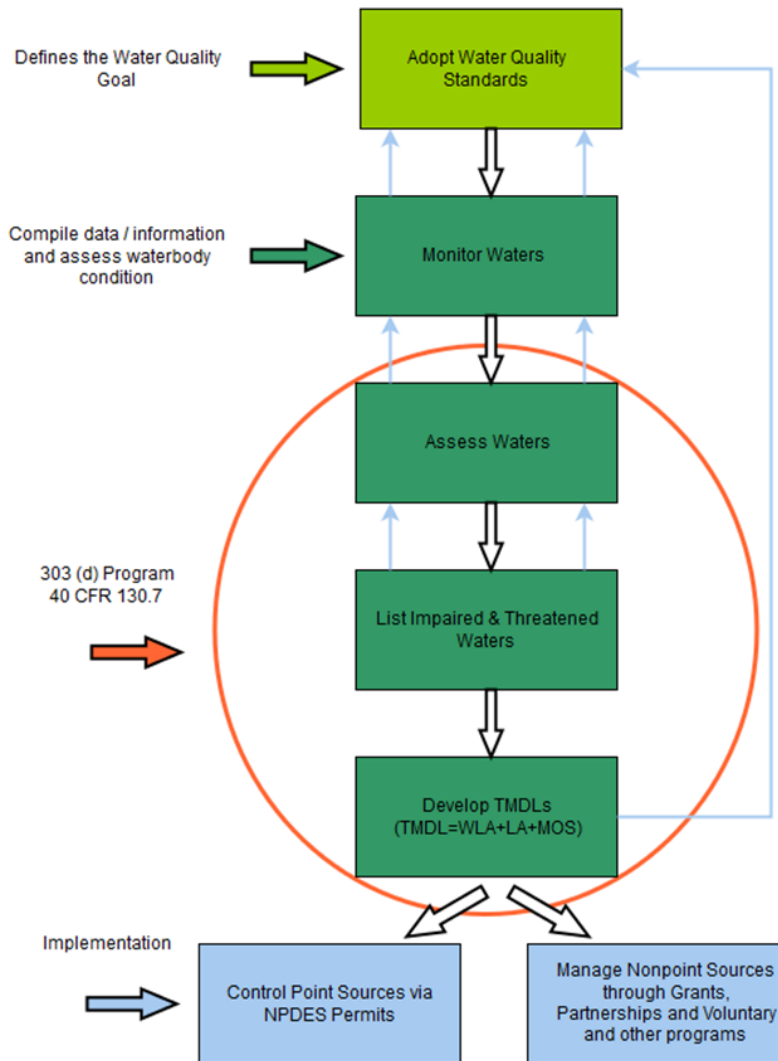


Figure 2 - Water Quality-Based Approach of the Clean Water Act. *Source.*

### 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 indices 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 (Ohio EPA 2015). Further explanations of Ohio

EPA's biocriteria can be found in Ohio Administrative Code (OAC) Chapter 3745-1-07 and on the [website](#).

- *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% of the time. Each WAU will have at least one site sampled. Most effort will focus on streams with public access that are more highly used for recreation.
- 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 is 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 5), 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, underlying geology, 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 about 48 continuous hours of hourly diel dissolved oxygen flux, pH, temperature, and specific conductance measurements. Benthic and/or sestonic chlorophyll- $\alpha$  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- $\alpha$  results, will be used to provide lines of evidence for causes of biological impairment such as nutrient or organic enrichment.

- **Organic Surface Water Chemistry:** Water column samples will be analyzed for organic constituents (see Appendix 5 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 water quality (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 on 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 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 the 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. Sediment sampling will occur in 2025 at sites with historical documented impairment due to contaminated sediments. Otherwise, sediment sampling will be conducted on a follow-up basis if sediment contamination is suspected to contribute to biological impairment.
- **Use Designations:** All data collected as part of this survey will form the basis of use attainability analysis (UAAs) for unassessed waters, verify or reaffirm existing beneficial uses, or readjust the current ALU designations as appropriate for updates to the standards.
- **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

Attempts at fish tissue sample collection will be made at eight locations in Captina Creek as part of the Ohio Fish Tissue Consumption Monitoring Program (Appendix 2). Final collections and sampling

locations may vary based on the availability of sport fish collected at each location. Final sampling locations will be noted in the addendum to this quality assurance plan. Fillet samples of regulation-size sport fish will be tested for organochlorinated pesticides, polychlorinated biphenyls (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, where appropriate, effluent chemistry samples will be collected to specifically assess wastewater treatment plant (WWTP) discharges in the study area at Barnesville. NPDES coal facilities found in Appendix 4 may also be evaluated during the survey as well.

### 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.

## A7. Distribution List

This quality assurance project plan (QAPP) will be distributed to the following division management and staff, saved on the Division of Surface Water (DSW) collaboration site and posted on the DSW Biological and Water Quality Monitoring and Assessment webpage.

**Table 2 – Distribution List**

<b>Name/Title</b>	<b>Contact Email/Phone</b>	
<b>DSW Central Office Administration</b>		
Mark Johnson, Environmental Administrator	<a href="mailto:mark.johnson@epa.ohio.gov">mark.johnson@epa.ohio.gov</a>	(614) 644-2274
Erin Sherer, Asst. Environmental Administrator	<a href="mailto:erin.sherer@epa.ohio.gov">erin.sherer@epa.ohio.gov</a>	(614) 644-2018
Ashley Ward, Asst. Environmental Administrator	<a href="mailto:ashley.ward@epa.ohio.gov">ashley.ward@epa.ohio.gov</a>	(614) 644-4852
Joby Jackson, Asst. Environmental Administrator	<a href="mailto:joby.jackson@epa.ohio.gov">joby.jackson@epa.ohio.gov</a>	(937) 285-6029
<b>Standards and Technical Support</b>		
Melinda Harris, Environmental Manager	<a href="mailto:melinda.harris@epa.ohio.gov">melinda.harris@epa.ohio.gov</a>	(614) 728-1357
Mariah Hood, Environmental Specialist 3	<a href="mailto:mariah.hood@epa.ohio.gov">mariah.hood@epa.ohio.gov</a>	(614) 644-2865
Richard Budnik, Environmental Specialist 3	<a href="mailto:richard.budnik@epa.ohio.gov">richard.budnik@epa.ohio.gov</a>	(614) 644-2002
Katherine Harris (QA/QC Officer)	<a href="mailto:katherine.harris@epa.ohio.gov">katherine.harris@epa.ohio.gov</a>	(614) 644-2014
Kelsey Heyob, Environmental Specialist 2	<a href="mailto:kelsey.heyob@epa.ohio.gov">kelsey.heyob@epa.ohio.gov</a>	(614) 705-1011
Bridget McGovern, Environmental Specialist 2	<a href="mailto:bridget.mcgovern@epa.ohio.gov">bridget.mcgovern@epa.ohio.gov</a>	(614) 448-1410
<b>NPDES/Permitting</b>		
Walter Ariss, Environmental Manager	<a href="mailto:walter.arriss@epa.ohio.gov">walter.arriss@epa.ohio.gov</a>	(614) 644-3075
<b>Assessment, Modeling, and TMDL Section</b>		
Mari Piekutowski, Environmental Manager	<a href="mailto:marianne.mansfield@epa.ohio.gov">marianne.mansfield@epa.ohio.gov</a>	(614) 644-2876
Josh Griffin, Environmental Manager	<a href="mailto:joshua.griffin@epa.ohio.gov">joshua.griffin@epa.ohio.gov</a>	(614) 644-2874
Ben Rich, Environmental Supervisor	<a href="mailto:benjamin.rich@epa.ohio.gov">benjamin.rich@epa.ohio.gov</a>	(614) 836-8772
James Kiourtsis, Environmental Supervisor	<a href="mailto:james.kiourtsis@epa.ohio.gov">james.kiourtsis@epa.ohio.gov</a>	(614) 644-2148
Paul Gledhill, Environmental Specialist 3	<a href="mailto:paul.gledhill@epa.ohio.gov">paul.gledhill@epa.ohio.gov</a>	(614) 644-2881
Ruth Briland, Environmental Specialist 3	<a href="mailto:ruth.briland@epa.ohio.gov">ruth.briland@epa.ohio.gov</a>	(614) 644-2046
Andrew Phillips, Environmental Specialist 2	<a href="mailto:andrew.phillips@epa.ohio.gov">andrew.phillips@epa.ohio.gov</a>	(614) 836-8773
Ed Moore, Jr., Environmental Specialist 2	<a href="mailto:edward.moore@epa.ohio.gov">edward.moore@epa.ohio.gov</a>	(614) 836-8785
Brittany Schuch, Environmental Specialist 2	<a href="mailto:brittany.schuch@epa.ohio.gov">brittany.schuch@epa.ohio.gov</a>	(614) 644-3468
Ashton Spencer, Environmental Specialist 2	<a href="mailto:Ashton.Spencer@epa.ohio.gov">Ashton.Spencer@epa.ohio.gov</a>	(614) 644-2885
<b>Water Quality</b>		
Chloe Welch, Environmental Manager	<a href="mailto:chloe.welch@epa.ohio.gov">chloe.welch@epa.ohio.gov</a>	(614) 728-3852
Kelly Capuzzi, Environmental Supervisor	<a href="mailto:kelly.capuzzi@epa.ohio.gov">kelly.capuzzi@epa.ohio.gov</a>	(740) 603-5627
Randy Spencer, Environmental Specialist 2	<a href="mailto:randy.spencer@epa.ohio.gov">randy.spencer@epa.ohio.gov</a>	(740) 380-5240
Emily Keil-Loudner, Environmental Specialist 2	<a href="mailto:emily.keil-loudner@epa.ohio.gov">emily.keil-loudner@epa.ohio.gov</a>	(614) 728-2384
<b>DSW Southeast District Office</b>		
Aaron Pennington, Environmental Specialist 3	<a href="mailto:aaron.pennington@epa.ohio.gov">aaron.pennington@epa.ohio.gov</a>	(740) 380-5272
<b>Division of Environmental Services</b>		
Jennifer Kraft, Environmental Manager	<a href="mailto:jennifer.kraft@epa.ohio.gov">jennifer.kraft@epa.ohio.gov</a>	(614) 644-3020
Steve Roberts, Environmental Supervisor	<a href="mailto:steven.roberts@epa.ohio.gov">steven.roberts@epa.ohio.gov</a>	(614) 644-4225

Kristin Sowards, Sample Receiving Coordinator	<a href="mailto:kristin.sowards@epa.ohio.gov">kristin.sowards@epa.ohio.gov</a>	(614) 644-4243
<b>DDAGW Central Office</b>		
Allison Reed, Environmental Manager	<a href="mailto:allison.reed@epa.ohio.gov">allison.reed@epa.ohio.gov</a>	(937) 285-6447
Callie Nauman, Environmental Specialist 3	<a href="mailto:callie.nauman@epa.ohio.gov">callie.nauman@epa.ohio.gov</a>	(614) 644-2752

## A8. Project Organization

**Table 3 – Roles and Responsibilities.**

<b>Individual(s) Assigned:</b>	<b>Responsible for:</b>	<b>Authorized to:</b>
<b>DSW Central Office Administration</b>		
Mark Johnson DSW Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
Erin Sherer Assistant Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
Ashley Ward Assistant Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
Joby Jackson Assistant Chief	Overall administration of division.	Confirm project existence; approve staff and capital resources; approve plans; edit reports.
<b>Standards and Technical Support</b>		
Melinda Harris Standards and Tech Support Section Manager	Quality management (QAPPs, SOPs); staff training; water quality standard rules.	Approve plans and edit reports.
Mariah Hood Standards and Tech Support Lead Worker	Water quality standard criteria development and rule updates.	Help plan study. Make recommended beneficial use changes.
Richard Budnik Standards and Tech Support Lead Worker	Represent agency in fish and wildlife consumption and contact advisory matters.	Help plan study. Make waterbody specific consumption and contact advisory recommendations.
Bridget McGovern Standards and Tech Support Staff	Represent agency in fish and wildlife consumption and contact advisory matters.	Help plan study. Make waterbody specific consumption and contact advisory recommendations.
Katherine Harris Standards and Tech Support Staff	DSWs quality management program.	Develop and implement field quality assurance and quality control guidelines. Track field and staff training.
<b>NPDES/Permitting</b>		
Walter Ariss Municipal NPDES Section Manager	NPDES permitting guidance and rule development.	Ensure NPDES staff involvement in planning, provide technical guidance and communication assistance to project team, and coordinate with NPDES staff to review and edit reports.
<b>Assessment, Modeling, and TMDL</b>		
Mari Piekutowski Assessment & Modeling Section Manager	Overall management of monitoring section.	Assign staff; approve plans; edit reports.

<b>Individual(s) Assigned:</b>	<b>Responsible for:</b>	<b>Authorized to:</b>
Josh Griffin TMDL and IR Unit Manager	Coordination of biennial Integrated Report update; TMDL program development.	Assign and support staff; edit reports.
Ruth Briland 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 Assessment Unit Lead Worker	Modeling and assessment technical guidance and review. 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.
James Kiourtsis Modeling & Assessment Unit Supervisor	Supporting modeling field crews with supplies, equipment, and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Ashton Spencer 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.
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.
Andrew Phillips Study Coordinator/Ecological Assessment Unit Fish Crew Leader	Fish community assessments. Study plan and final report coordination.	Plan and coordinate study. Schedule and complete assigned field activities. Tabulate data and write discussion for technical report.
<b>Water Quality</b>		
Chloe Welch Water Quality Section Manager	Overall management of water quality section.	Assign staff; approve plans; edit reports.
Kelly Capuzzi, Water Quality Section Supervisor	Support water quality field crews with supplies, equipment, and training.	Obtain approvals and signatures; develop budgets; conduct field audits; edit reports.
Emily Keil-Loudner Water Quality Staff, Southeast District Office (SEDO)	Fish population and stream habitat assessments, 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.
Randy Spencer, Water Quality Staff, SEDO	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.

<b>Individual(s) Assigned:</b>	<b>Responsible for:</b>	<b>Authorized to:</b>
<b>Permitting - Southeast District Office</b>		
Aaron Pennington, Permitting Lead Worker, SEDO	Technical lead for NPDES permitting in SEDO	Provide technical information to study team and coordinate with NPDES permitting staff. Review and suggest changes to reports.
<b>Division of Environmental Services</b>		
Jennifer Kraft Program Administrator	Overall administration of laboratory activities.	Help solve laboratory information management system problems. Develop analytical methods and SOPs.
Steve Roberts Quality Assurance Officer	Department of Environmental Services 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.
<b>Division of Drinking and Ground Waters</b>		
Allison Reed Central Office Emerging Contaminants	Harmful Algal Bloom program implementation	Coordinate with DSW on drinking water intake and inland lake monitoring.
Callie Nauman Central Office Emerging Contaminants	Harmful Algal Bloom program implementation	Coordinate with DSW on drinking water intake and inland lake monitoring.

### **A9. Project Quality Assurance Manager Independence**

The Project Quality Assurance Manager (QAM) shall be independent of environmental information operations. The project QAM’s independence is ensured through separation of sections and reporting chains within Ohio EPA’s Division of Surface Water. The Project QAM has oversight authority and responsibilities for planning, documenting, coordinating, and assessing effectiveness of the QAPP. The QAM has authority to access and discuss quality-related issues with senior management outside of the direct supervisory chain as necessary.

### A10. Project Organization Chart and Communication

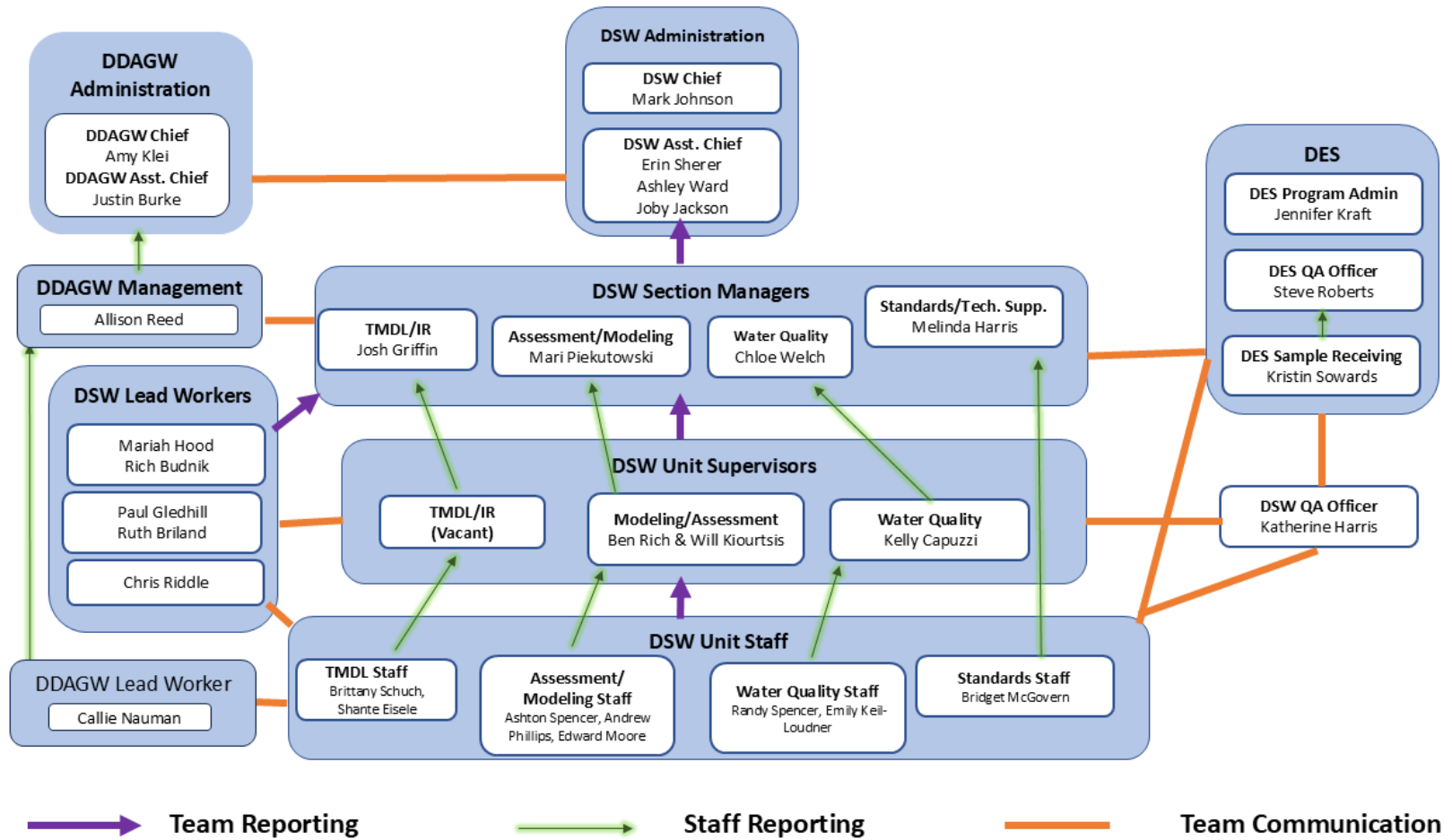


Figure 3 - Organization Chart.

## **A11. Personnel 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.

## **A12. Documents and Records**

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

Examples of documents posted to this location include:

Pre-sampling documents:

- Preliminary information sheets
- Property access forms
- Draft and final Quality Assurance Project Plan (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
- 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 the Division of Environmental Services (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 Quality Assurance (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 quality control, 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.

Data files for temperature probes will be created for each stream location where such probes are deployed. The Assessment and Modeling Section staff will implement data reduction, analysis, and storage on network drives.

Original fish and QHEI data sheets will be retained at the Groveport Field Office. Data from the field sheet is either manually entered into an Oracle application and then uploaded to the EA3 database or is entered directly into the EA3 database. Each collector then checks each sheet in EA3 with the field sheet for errors before final approval of the data.

## Group B: Implementing Environmental Information Operations

### **B1. Identification of Project Environmental Information Operations**

The site selection process for aquatic life beneficial uses is designed to systematically sample principal streams in the targeted study area with enough locations to ensure alignment with the Data Quality Objectives (DQOs) listed in Section A7. Principal streams are roughly defined as those that drain a surface area greater than 8 mi<sup>2</sup>, though smaller drainages may be sampled as deemed necessary. Each watershed assessment unit, or HUC-12, is independently evaluated to determine its existing, relevant characteristics that contribute to the fulfillment of study objectives. These characteristics include, but are not limited to historical biological impairment, active watershed Total Maximum Daily Load (TMDL) plans, known and suspected point and nonpoint discharges, land use changes (e.g., agriculture to urban, forest to agriculture, etc.), historical reference sites, unlisted/undesignated streams in the standards, known restoration activities, and other miscellaneous local impacts that may contribute to beneficial use impairment.

For HUC-12 units with more monotonous features (consistent land use, few/no known water quality issues, lack of development, etc.), one sampling location will be placed at or near the HUC-12 outlet, preferably where biological sampling has been historically conducted. Larger, longer streams that flow across multiple WAUs are additionally evaluated holistically to ensure adequate longitudinal sampling coverage. Available United States Geologic Survey (USGS) gage sites may be selected to obtain accurate stream flow data for load calculation purposes. The site selection process for Recreation beneficial use is designed to obtain a representative picture of conditions in an assessment unit as well as to evaluate areas of significant stream recreation. A minimum of one site per WAU is desired, though more sites may be included as Recreation uses deem necessary.

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 an individual NPDES permit is shown in Appendix 3 and NPDES coal permits are in Appendix 4.

## B2. Methods for Environmental Information Acquisition

### 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 evaluated based on their overall importance to the establishment of viable, diverse aquatic faunas. The habitat features 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 the local gradient. These various metrics can be used to evaluate the characteristics of both larger overall stream segments, and the characteristics of a singular 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*).

A combination of quantitative and qualitative methods will be employed to monitor benthic macroinvertebrate communities. Quantitative collections are made using modified Hester-Dendy (HD) multiple plate artificial substrate samplers, deployed at most all biomonitoring sites draining more than 20 mi<sup>2</sup>, or at reference sites regardless of size. Once deployed, artificial substrates are left instream for a six-week colonization period. Qualitative sampling will be conducted at all biomonitoring stations, which typically coincides with the collection of the HD if quantitative samples are also collected. This sampling method consists of a basic inventory of macroinvertebrate taxa from natural substrates with a standard dip net, noting dominant taxa among major habitat types.

Fish will be sampled at each designated location using pulsed direct current (DC) headwater, wading, backpack, or boat electrofishing methods depending on stream size at each sampling zone. Sites may be sampled once, twice, or more through the summer sampling season. Reasons why sites may be sampled multiple times during the sampling index period could include: sites downstream from permitted dischargers, reference site locations, sites that did not meet goals during the first sampling pass, or areas that are prone to greater fluctuations or system instability. Typically, at least four weeks should elapse between sampling at a particular site. The number of passes may be adjusted as necessary based on the best professional judgment of the Ohio EPA field staff. Reasons for a single pass monitoring at sites may include extremely difficult or time-consuming access, work delays related to weather, or the emergence of alterations (natural or otherwise) at points of access or through the sampling reach, rendering replication of the initial effort hazardous or costly. At least 10% of fish sampling locations will receive a second electrofishing sampling event. 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. Some specimens are preserved for further identification in the laboratory (if necessary) or to document new or noteworthy species records.

## 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 5. The 2025 version of the *Surface Water Field Sampling Manual* can be found on the Ohio EPA [website](#).

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 analysis. 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

---

A subset of the survey's stream assessment sites is designated as continuous monitoring sites. Continuous multi-parameter measurement sondes will be deployed during stable baseflow conditions as part of this watershed assessment. Additional sampling at a subset of these sonde sites will also occur during high streamflow events to evaluate for any wet weather impacts from former mines or other areas of interest. Ideally, at least two sonde deployments, both baseflow and wet-weather conditions, will be carried out at each designated assessment site.

Water quality sondes will be placed at select locations indicated as a sonde site on Appendix 2 to evaluate diel measurements of dissolved oxygen, pH, temperature, and conductivity. The goal for each sonde deployment is to capture about 48 continuous hours of hourly measurements. For the baseflow sampling, sestonic and benthic chlorophyll- $\alpha$  samples will be collected coinciding with each sonde deployment, as site conditions allow. All sampling, analysis and procedures adhere to those specified in the *Surface Water Field Sampling Manual*. Section G of this report outlines equipment preparation, deployment, equipment retrieval, data management, quality control testing, and maintenance.

---

## Bacteria

---

Attainment/non-attainment of recreational uses will be determined using *E. coli* criteria codified in Ohio Administrative Code (OAC) 3745-1-37, Table 37-2. Each assessment unit will have at least one sample site. Water quality must meet a 90-day geometric mean and a statistical threshold that must not be exceeded more than 10% of the time. Bacteria sampling to evaluate recreation use will be done within a 90-day period that falls from May 1 to October 31. Each site will have at least five sets of *E. coli* samples tested. Water samples will be collected into appropriate containers, cooled to 4°C, and transported to a contract laboratory and/or Ohio EPA's DES within six hours of sample collection. All samples will be analyzed for *E. coli* bacteria using U.S. EPA-approved methods.

---

## Temperature

---

Continuous temperature measurements using Onset HOB0 Water Temperature Pro v2 and/or TidbiT MX data loggers will be deployed at smaller streams across the study area. This effort will help describe the thermal regime of the different headwater streams in the study. The sampling will be conducted in accordance with procedures outlined in the *Surface Water Field Sampling Manual*. 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 analysis.

---

## Sediment

---

Sediment sampling will be conducted at six locations due to historical contamination that contributed to previous biological impairment. For the remaining sites, sediment sampling may be conducted in Year 2 if evaluation of biological, chemical and/or physical data indicate the need for sediment investigation as a potential cause of impairment. 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 Appendix Table 5. Collected sediment will be placed into appropriate containers, placed on ice (to maintain <6°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 regulation size that are typically consumed by anglers. Species preferred for analysis can include various black bass, sunfish, or catfish species that may be present. Other fish species like Common Carp (*Cyprinus carpio*), buffalo-fish, and Freshwater

Drum (*Aplodinotus grunniens*) not commonly consumed but that are long-lived and provide a good indication of fish tissue contamination at lower trophic levels are also targeted. 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 Appendix Table 2 and the parameters to be analyzed are listed in Appendix Table 5. Fish used for tissue analysis will be filleted either on-site or at the Ohio EPA Groveport Field Office 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 2021). 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. Integrity of Environmental Information**

Sample Master® software is used by the Division of Environmental Services (DES) to manage laboratory information. A guidance manual for the 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.

The analytical methods to be used in this study are provided in Appendix 5 along with the preservatives, holding times, and reporting limits. Standard operating procedures (SOPs) for the analytical methods are available upon request.

### **B4. 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 Qualitative Habitat Evaluation Index (QHEI) score 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 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. Quality assurance (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. 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 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 VI 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-*a* samples collected will be quality control samples. Approximately five percent will be 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 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 the *Surface Water Field Sampling Manual*.

## Sediment

---

Ten percent of the number of sediment samples should be collected as quality control samples, approximately five 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*.

### **B5. Instruments/Equipment Calibration, Testing, Inspection, and Maintenance**

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

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.

### **B6. Inspection/Acceptance of Supplies and Services**

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.

### **B7. Environmental Information Management**

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

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 quality control (QC), add comments and complete edits, if necessary, before approving the sheet. This data is then available for use in IR reports. Once data sheets are approved in EA3, they are batch queried and imported into WQX (Water Quality Exchange) by the Ecological Assessment Unit Lead Worker. Imported data is exported to the Water Quality Portal (WQP) by WQX and made available to the public. All agency files are ultimately backed up and housed in the State of Ohio Computer Center (SOCC).

Water quality sonde data are stored on an Ohio EPA-maintained, dedicated structured query language (SQL) database. Level logger, streamflow, and TidbiT water detection data will be maintained on network drives accessible to all DSW staff.

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 quality assurance project plan (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.

## Group C: Assessment, Response Actions and Oversight

### 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:

- Quality control (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 Quality Assurance (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 standard operating procedures (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 quality assurance project plan (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.

## C2. Oversight and Reports to Management

The project leader or Water Quality Section Supervisor/Manager 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 the completion of the project will lead to memorandum and consultation with program management and quality assurance staff.

The TSD will report all study results and findings. ALU attainment will be determined by biological criteria. Causes and sources of ALU 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.

## Group D: Environmental Information Review and Usability Determination

### D1. Environmental Information Review

Data verification will be conducted by the study team with assistance from other Division of Surface Water (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 quality assurance project plan (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 could 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 quality assurance and quality control (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 macroinvertebrate 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 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. Useability Determination

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 standard operating procedures (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*.

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 Water Quality 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	Total #
<b>Biology*</b>	
Fish	80
Macroinvertebrate (Quantitative)	12
Macroinvertebrate (Qualitative)	68
<b>Fish Tissue</b>	
Fish Tissue	9
<b>Water Quality</b>	
Inorganic Samples	85
Sonde deployment & Chlorophyll <i>a</i>	44
Wet-weather sonde deployment	10
Semi-volatile Organic Samples (BNA)	11
Temperature Probe	39
<b>Sediment Quality</b>	
Metals	20
Pesticides/PCB's and Semi-volatile Organics	20
<b>Bacteria**</b>	
<i>E. coli</i> Cultures	80
<p>*Biological sampling data from 21 locations in smaller headwaters streams throughout the study area were collected during the summer of 2024.</p> <p>**Bacteria sampling data from 16 sampling locations with 5 passes each were collected during the summer of 2024.</p>	

## Appendix 2. Streams, Sampling Locations, and Sampling Types

Site Number	Station	River Code	Site Name	River Mile	Area (mi <sup>2</sup> )	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
1	300643	06-500-000	MCPMAHON CREEK UPST. BARKCAMP CREEK, ADJ ST. RT. 149	24.10	6.9	050301060702	Belmont	40.027997	-81.009608	F, QL, C, T, N, WW	Spatial, Historical
2	C02W25	06-500-000	MCPMAHON CREEK AT LAMIRA @ CO. RD. 78	22.58	15.7	050301060702	Belmont	40.021497	-80.989543	F, QL, C, N, WW	Spatial, Historical
3	203439	06-500-000	MCPMAHON CREEK NW OF WARNOCK, DST. LANE OFF ST. RT. 149	18.60	26.0	050301060702	Belmont	40.024200	-80.944400	F, QT, C, N	Spatial, Historical
4	203438	06-500-000	MCPMAHON CREEK E. OF GLENCOE @ ST. RT. 149, DST. WILLIAMS CK.	12.10	51.0	050301060704	Belmont	40.002800	-80.877200	F, QT, C, N, S, B, FT	Spatial, Historical
5	C02S12	06-500-000	MCPMAHON CREEK AT NEFFS, DST. LITTLE MCPMAHON CREEK	7.00	78.5	050301060704	Belmont	40.024400	-80.812800	F, QT, C, N, S, FT	Spatial, Historical
6	C02K28	06-500-000	MCPMAHON CREEK @ 2ND RR BRIDGE UPST. TWP. RD. 476	2.30	85.8	050301060704	Belmont	40.015899	-80.773385	F, QT, C, N, FT	Reference, Historical
7	C02W23	06-518-000	BARKCAMP CREEK @ MOUTH E OF BELMONT AT LOOMIS	0.01	4.9	050301060702	Belmont	40.028100	-81.008600	F, QL, C, T	Beneficial Use
8	304548	06-517-000	ROBERTS RUN NEAR MOUTH DST. CO. RD. 149 (BELMONT-WARNOCK RD)	0.20	2.7	050301060702	Belmont	40.032649	-80.981905	C & T Only, 2024 Bio	Beneficial Use
9	C02S28	06-516-000	BRUSH RUN NW OF WARNOCK @ TWP. RD. 276	0.10	3.9	050301060702	Belmont	40.032150	-80.952943	F, QL, C, T	Beneficial Use
10	304549	06-509-000	NEFFS RUN UPST. WARNOCK, ADJ. TWP. RD. 56	0.30	3.1	050301060702	Belmont	40.026662	-80.938520	C & T Only, 2024 Bio	Beneficial Use
11	304552	06-507-000	PORTERFIELD RUN AT MOUTH OFF WARNOCK GLENCOE RD.	0.10	1.5	050301060702	Belmont	40.016475	-80.914677	C & T Only, 2024 Bio	Beneficial Use
12	304553	06-519-000	COALY HOLLOW RUN AT MOUTH OFF HURLEY RD.	0.05	1.4	050301060702	Belmont	40.018661	-80.907178	C & T Only, 2024 Bio	Beneficial Use
13	304551	06-506-000	WELSH RUN ADJ. GLENCOE RD.	0.60	0.9	050301060702	Belmont	40.012036	-80.887553	C & T Only, 2024 Bio	Beneficial Use
14	C02K30	06-504-000	WILLIAMS CREEK S OF GLENCOE, ADJ. JACOBSBURG-GLENCO RD.	1.40	11.4	050301060701	Belmont	39.993060	-80.900933	F, QL, C, N, S, B	Spatial, Reference, Historical
15	New	06-500-006	CUMBERLAND RUN NEAR MOUTH @ CUMBERLAND RUN RD.	0.10	2.5	050301060704	Belmont	40.001646	-80.874855	F, QL, C, T	Beneficial Use

Site Number	Station	River Code	Site Name	River Mile	Area (mi2)	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
16	New	06-500-005	BULL RUN E. OF GLENCOE @ GORDON ST. HWY. 149	0.20	3.1	050301060704	Belmont	40.014289	-80.851273	F, QL, C, T	Beneficial Use
17	304584	06-510-000	L. MCMAHON CREEK ADJ. WILLOW GROVE RD UST KINGS RUN	1.85	11.2	050301060703	Belmont	40.040286	-80.842274	C, N, WW, S, 2024 Bio	Pollution Monitoring
18	C02S18	06-510-000	L. MCMAHON CREEK NEAR NEFFS ADJ. WILLOW GROVE RD.	0.40	14.2	050301060703	Belmont	40.034555	-80.825443	C, N, WW, S, B, 2024 Bio	Spatial, Impaired, Historical
19	New	06-513-000	AULTS RUN SW OF ST. CLAIREVILLE ADJ. TWP. RD. 314	0.05	3.2	050301060703	Belmont	40.047835	-80.858142	F, QL, C	Beneficial Use
20	301077	06-512-000	KINGS RUN UPST. BUCKEYE RECLAMATION LANDFILL	1.20	0.6	050301060703	Belmont	40.055566	-80.838590	C, N, WW, 2024 Bio	Pollution Monitoring, Beneficial Use
21	301151	06-512-000	KINGS RUN ADJ BUCKEY RECLAMATION LANDFILL	0.25	1.1	050301060703	Belmont	40.042236	-80.837579	C Only, 2024 Bio	Pollution Monitoring, Beneficial Use
22	301078	06-512-000	BUCKEYE RECLAMATION LANDFILL 001 (KINGS RUN @ RM 0.18)	0.18	-	050301060703	Belmont	40.04160	-80.83830	C Only	Pollution Monitoring
23	C02S24	06-512-000	KINGS RUN NW OF NEFFS @ MOUTH	0.04	1.0	050301060703	Belmont	40.039700	-80.839200	C, N, WW, S, 2024 Bio	Pollution Monitoring, Beneficial Use
24	New	06-511-000	STILLHOUSE RUN NEAR MOUTH @ WILLOW GROVE RD.	0.02	0.9	050301060703	Belmont	40.034913	-80.825119	F, QL, C, T, N	Pollution Monitoring, Beneficial Use
25	New	06-500-004	MOSS RUN NEAR MOUTH	0.05	1.7	050301060704	Belmont	40.025953	-80.795202	F, QL, C, T	Beneficial Use
26	C02S17	06-502-000	TROUGH RUN W OF BELLAIRE AT MOUTH @ TWP. RD. 304	0.02	2.4	050301060704	Belmont	40.011900	-80.780300	F, QL, C, T	Beneficial Use
27	New	06-501-000	BROOKS RUN NEAR MOUTH @ FULTON HILL RD. (TWP. RD. 42)	0.05	3.0	050301060704	Belmont	40.010964	-80.765934	F, QL, C, T	Beneficial Use
28	C02L05	06-049-000	WEGEE CREEK SW OF SHADYSIDE, DST. STONE COAL RUN	2.21	9.3	050301061206	Belmont	39.956900	-80.785600	F, QL, C, B, O1	Spatial, Historical
29	304547	06-049-001	TRIB. TO WEGEE CK. (4.20) NEAR MOUTH @ CO. RD. 48	0.05	1.0	050301061206	Belmont	39.957006	-80.815907	F, C, T, 2024 QL	Beneficial Use Designation
30	C02S64	06-048-000	BIG RUN AT DILLES BOTTOM @ ST. RT. 7	0.32	4.1	050301061207	Belmont	39.923779	-80.784048	F, QL, C	Pollution monitoring, Historical, Impaired
31	203417	06-047-000	PIPE CREEK NEAR VADIS, ADJ. PIPE CREEK RD.	1.20	11.2	050301061207	Belmont	39.924400	-80.826900	F, QL, C, N, B, O1	Impaired, Spatial, Historical

Site Number	Station	River Code	Site Name	River Mile	Area (mi <sup>2</sup> )	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
32	C02S61	06-046-000	L. CAPTINA CREEK N OF POWHATAN @ ST. RT. 7	0.27	2.7	050301061207	Belmont	39.873760	-80.796486	F, QL, C	Beneficial Use Designation
33	C02S37	06-100-000	CAPTINA CREEK DST. CASEY RUN @ ST. RT. 148	23.12	75.4	050301060904	Belmont	39.911039	-81.004294	F, QT, C, N, S, B, FT	Historical
34	C02K05	06-100-000	CAPTINA CREEK UPST. ALLEDONIA, DST PERKINS RUN @ ST. RT. 148	22.10	87.0	050301060904	Belmont	39.908100	-80.989400	F, QT, C, N, S, WW, FT	Pollution Monitoring, Historical
35	C02S36	06-100-000	CAPTINA CREEK AT ALLEDONIA @ CO. RD. 86	20.54	96.0	050301060904	Belmont	39.900300	-80.968300	F, QT, C, N, S, WW, FT	Spatial, Historical, Reference
36	C02S80	06-100-000	CAPTINA CREEK 0.4 MI. DST. BEND FORK @ END OF ROAD	17.60	125.0	050301060905	Belmont	39.916700	-80.952800	F, QT, C, N, S, B, WW, FT	Spatial, Historical, Reference
37	C02S34	06-100-000	CAPTINA CREEK UPST. CRAVAT COAL CO.	11.70	141.0	050301060905	Belmont	39.893600	-80.903100	F, QT, C, N, S, O1, FT	Spatial, Historical
38	C02S32	06-100-000	CAPTINA CREEK AT CAPTINA @ ST. RT. 148	6.71	157.0	050301060905	Belmont	39.886700	-80.869400	F, QT, C, N, S, FT	Spatial, Historical, Reference
39	C02S31	06-100-001	CAPTINA CREEK UPST. STEINERSVILLE @ ST. RT. 148	3.33	163.0	050301060905	Belmont	39.871700	-80.841700	F, QT, C, N, B, O1, FT	Pollution Monitoring, Historical
40	C02W01	06-123-000	N. FK. CAPTINA CREEK JUST UPST. BARNESVILLE WWTP	10.52	1.0	050301060901	Belmont	39.971600	-81.163500	C, N	Pollution Monitoring
41	C02W02	06-123-000	BARNESVILLE WWTP 001 OUTFALL TO N. FK. CAPTINA CREEK	10.45	1.0	050301060901	Belmont	39.971500	-81.163300	C	Pollution Monitoring
42	C02S82	06-123-000	N. FK. CAPTINA CREEK DST. BARNESVILLE WWTP	10.12	1.6	050301060901	Belmont	39.966700	-81.158100	C, N	Pollution Monitoring
43	C02S57	06-123-000	N. FK. CAPTINA CREEK DST. BARNESVILLE WWTP @ TWP. RD. 180	9.02	4.0	050301060901	Belmont	39.960300	-81.141900	C, N	Pollution Monitoring
44	C02W05	06-123-000	N. FK. CAPTINA CREEK SE OF BARNESVILLE @ ST. RT. 148	6.65	7.0	050301060901	Belmont	39.939200	-81.120600	F, QL, C, S, N	Spatial, Pollution Monitoring, Historical
45	C02S68	06-123-000	N. FK. CAPTINA CREEK DST. LONG RUN @ CO. RD. 26	3.94	24.3	050301060901	Belmont	39.932200	-81.086700	F, QL, C, N	Pollution Monitoring, Historical
46	C02S54	06-123-000	N. FK. CAPTINA CREEK NEAR MOUTH @ CO. RD. 92	0.43	32.6	050301060901	Belmont	39.911900	-81.047500	F, QT, C, N, B, S, O1	Reference, Spatial, Historical
47	C02W04	06-123-001	TRIB. TO N. FK. CAPTINA CK. (9.27) SE OF BARNESVILLE @ MOUTH	0.01	1.1	050301060901	Belmont	39.964200	-81.145100	C Only, 2024 Bio	Beneficial Use Designation

Site Number	Station	River Code	Site Name	River Mile	Area (mi2)	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
48	304617	06-123-007	CHESTNUT CREEK ADJ. ST. RT. 148 NEAR MOUTH	0.10	4.3	050301060901	Belmont	39.941004	-81.123170	F, QL, C, T	Beneficial Use Designation
49	300594	06-125-000	LONG RUN @ TWP. RD. 92	2.24	7.7	050301060901	Belmont	39.954070	-81.107820	F, QL, C, T, N	Pollution Monitoring, Beneficial Use Designation
50	C02S59	06-125-000	LONG RUN SE OF BARNESVILLE @ ST. RT. 148	0.04	10.6	050301060901	Belmont	39.932800	-81.086400	F, QL, C, N	Spatial, Historical
51	C02S58	06-124-000	JAKES RUN S OF HUNTER @ MOUTH	0.01	5.1	050301060901	Belmont	39.926020	-81.065790	F, QL, C, T, N	Pollution Monitoring, Historical
52	304543	06-117-000	S. FK. CAPTINA CREEK, UPST. BARNESVILLE RESERVOIR 3	10.50	6.0	050301060902	Belmont	39.894831	-81.148144	F, QL, C, N	Pollution Monitoring, Spatial
53	C02S70	06-117-000	S. FK. CAPTINA CREEK S OF SOMERTON @ TWP. RD. 35	9.48	16.4	050301060902	Belmont	39.892800	-81.134200	F, QL, C, N	Spatial, Historical
54	C02S69	06-117-000	S. FK. CAPTINA CREEK N OF NEW CASTLE @ ST. RT. 26	2.97	33.7	050301060902	Belmont	39.905300	-81.080300	F, QL, C, N, O1	Impaired, Historical
55	C02S60	06-117-000	S. FK. CAPTINA CREEK AT MOUTH @ CO. RD. 92	0.10	36.1	050301060902	Belmont	39.906400	-81.043600	F, QT, C, N, S, B, O1	Reference, Spatial, Historical
56	304618	06-117-002	SLOPE RUN @ JOHNSON-RIDGE RD.	0.10	7.1	050301060902	Belmont	39.896472	-81.144143	F, QL, C, T	Beneficial Use Designation
57	C02S74	06-121-000	MILLERS RUN S OF SOMERTON @ ST. RT. 800	0.81	2.3	050301060902	Belmont	39.885000	-81.147200	F, QL, C, T	Beneficial Use Designation
58	C02S73	06-120-000	CRANENEST CREEK SE OF SOMERTON @ TWP. RD. 35	0.35	3.5	050301060902	Belmont	39.887500	-81.123900	F, QL, C, T	Beneficial Use Designation
59	C02S72	06-119-000	FLAG RUN E OF SOMERTON @ CO. RD. 102	0.78	2.9	050301060902	Belmont	39.907800	-81.120800	F, QL, C, T	Beneficial Use Designation
60	C02S71	06-118-000	BRUSHY CREEK SW OF NEW CASTLE @ TWP. RD. 64	1.63	3.0	050301060902	Belmont	39.878100	-81.093300	F, QL, C, T	Beneficial Use Designation
61	C02S53	06-116-000	MIKES RUN AT MOUTH @ ST. RT. 148	0.03	3.3	050301060904	Belmont	39.910319	-81.026407	C & T Only, 2024 Bio	Beneficial Use Designation
62	C02S52	16-114-111	BERRYS RUN AT MOUTH @ ST. RT. 148	0.15	1.4	050301060904	Belmont	39.911900	-81.015000	C & T Only, 2024 Bio	Beneficial Use Designation
63	C02K12	06-113-000	CASEY RUN AT MOUTH @ ST. RT. 148	0.10	0.6	050301060904	Belmont	39.909700	-81.010300	C & T Only, 2024 Bio	Beneficial Use Designation
64	300779	06-111-000	PINEY CREEK UPST. LONG RUN @ TWP. RD. 87	3.00	6.2	050301060904	Belmont	39.892793	-81.023869	F, QL, C, T, N	Beneficial Use Designation
65	C02S51	06-111-000	PINEY CREEK NW OF ALLEDONIA @ ST. RT. 148	0.02	9.9	050301060904	Belmont	39.911539	-80.999854	F, QL, C, T, N, O1, WW	Spatial, Historical, Beneficial Use Designation

Site Number	Station	River Code	Site Name	River Mile	Area (mi2)	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
66	300780	06-112-000	LONG RUN (TRIB. TO PINEY CREEK) @ TWP. RD. 87	0.20	2.4	050301060904	Belmont	39.894133	-81.027968	C & T Only, 2024 Bio	Beneficial Use Designation
67	C02S49	06-110-000	CRABAPPLE CREEK W OF ALLEDONIA @ TWP. RD. 103	0.46	8.2	050301060905	Belmont	39.898066	-80.975462	F, QL, C, N	Spatial, Historical
68	C02W15	06-106-000	BEND FORK JUST UPST. BETHESDA WWTP	12.21	1.0	050301060903	Belmont	40.007500	-81.058300	F, QL, C, N, S	Reference, Historical
69	C02S44	06-106-000	BEND FORK SE OF BETHESDA @ TWP. RD. 192	8.35	9.0	050301060903	Belmont	39.966700	-81.036100	F, QL, C, N, S	Spatial, Pollution Monitoring, Historical
70	C02S43	06-106-000	BEND FORK @ TWP. RD. 101	3.59	19.6	050301060903	Belmont	39.938457	-80.990683	F, QL, C	Pollution Monitoring, Historical
71	C02S81	06-106-000	BEND FORK N OF ALLEDONIA, NEAR MOUTH @ FIRST FORD	0.26	27.0	050301060903	Belmont	39.917200	-80.964200	F, QT, C, N, S, B	Reference, Pollution Monitoring, Spatial, Historical
72	304554	06-109-000	PACKSADDLE RUN AT CR 86 HUNTER BELMONT RD.	1.10	1.8	050301060903	Belmont	39.989495	-81.059880	C & T Only, 2024 Bio	Beneficial Use Designation
73	C02S47	06-108-000	JOY FORK AT MOUTH @ TWP. RD. 194	0.01	6.0	050301060903	Belmont	39.940800	-80.997800	F, QL, C, T, N	Spatial, Historical
74	C02S46	06-107-000	MILLERS RUN AT MOUTH @ TWP. RD. 101	0.01	2.6	050301060903	Belmont	39.938600	-80.991100	C & T Only, 2024 Bio	Beneficial Use Designation
75	C02S42	06-105-000	ANDERSON RUN N OF ARMSTRONGS MILLS @ TWP. RD. 118	0.10	5.8	050301060905	Belmont	39.915734	-80.929261	F, QL, C, T, O1	Beneficial Use Designation
76	C02S41	06-104-000	ROCKY FORK E OF ARMSTRONGS MILLS @ ST. RT. 148	0.09	4.4	050301060905	Belmont	39.908244	-80.919143	C & T Only, 2024 Bio	Beneficial Use Designation
77	C02S40	06-103-000	PEA VINE CREEK SE OF ARMSTRONGS MILLS @ CO. RD. 5	0.20	9.9	050301060905	Belmont	39.892800	-80.903600	F, QL, C, N	Spatial, Historical
78	C02S39	06-102-000	MOORE RUN NW OF CAPTINA @ ST. RT. 148	0.03	4.0	050301060905	Belmont	39.895000	-80.877500	C & T Only, 2024 Bio	Beneficial Use Designation
79	301380	06-100-004	TRIB. TO CAPTINA CREEK (8.70) NEAR MOUTH, UPST. ST. RT. 148	0.30	1.1	050301060905	Belmont	39.896300	-80.869870	F, QL, C, T	Beneficial Use Designation
80	304619	06-100-005	TRIB. TO CAPTINA CK. (4.16) NEAR MOUTH ADJ. TOWN HILL RD.	0.05	1.3	050301060905	Belmont	39.881573	-80.845456	F, QL, C, T	Beneficial Use Designation
81	C02K06	06-101-000	CAT RUN UPST. PIPELINE @ CO. RD. 56 (CAT RUN RD.)	3.30	8.2	050301060906	Monroe	39.850800	-80.886700	F, QL, C, N, S, O1	Reference, Impaired, Historical

Site Number	Station	River Code	Site Name	River Mile	Area (mi2)	HUC12	County	Lat.	Lon.	(refer to key in footnote) Sampling	Site Purpose
82	C02S38	06-101-000	CAT RUN NEAR MOUTH @ CO. RD. 56 (CAT RUN RD.)	0.30	12.8	050301060906	Belmont	39.870300	-80.848300	F, QL, C, N, S, B, O1	Spatial, Pollution Monitoring, Historical
83	304620	06-100-006	PORTERS RUN @ E. CAPTINA HWY.	0.20	1.4	050301060906	Belmont	39.867525	-80.823323	F, QL, C, T	Beneficial Use Designation
84	203416	06-045-000	BIG RUN SW OF POWHATAN POINT @ ST. RT. 7	0.10	4.3	050301061208	Monroe	39.835300	-80.836100	F, QL, C, N, B	Spatial, Beneficial Use Designation
85	304621	06-043-000	STILLHOUSE RUN N. OF CLARINGTON @ MARKET ST.	0.10	3.8	050302011001	Monroe	39.782989	-80.856873	F, QL, C, T	Spatial, Beneficial Use Designation

**M** – modified reference site. **R** – reference site.

Code	Sample Type	Code	Sample Type
F	Fish – 1 Pass	O1	Organics -- SVOCs (semi-volatile organic compounds)
FT	Fish Tissue	O2	Organics -- herbicides and insecticides
QT	Macroinvertebrate - Quantitative (HD)	B	<i>E. coli</i> bacteria
QL	Macroinvertebrate – Qualitative	S	Sediment
N	Sonde and chlorophyll site	PWS	Public Water Supply
C	Chemistry	T	Temperature Probe
WW	Wet weather		

### Appendix 3. NPDES Permitted Facilities

Nested HUC 12 Sub- watershed	Ohio Permit Number	Facility Name	Design Flow (MGD)	Average Flow (MGD)	Type of Waste	Stream and River Mile at Discharge	County
<b>05030106</b>							
09-01	OPC00001*KD	Barnesville WWTP	1.3	0.56	Public	North Fork Captina Creek at RM 10.5	Belmont
09-03	0PB00001*ID	Bethesda WWTP	0.31	0.161	Public	Bend Fok at RM 12.2	Belmont
09-04	0IL00091*HD	Belmont Co. Res., Inc -Century Mine	0.032	0.15	Industrial	UNT Bend Fork (9.5) at RM 0.5	Belmont
09-06	0IL00043*FD	Bellaire Corp Powhatan No. 5 Mine Town Run	0.02	---	Industrial	Captina Creek (Warren Run 0.6) at RM 0.05	Belmont
09-06	OPT00062*CD	Powhatan K-8 School	0.005	0.0089	Public	UNT Captina Creek (1.7) at 0.1	Belmont
<b>05030201</b>							
10-01	OPA00037*HD	Clarington WWTP	0.55	0.029	Public	Stillhouse Run at RM 0.3	Monroe

#### Appendix 4. NPDES Permitted Coal Facilities

Pond Description	Outfall	Stream	RM	Latitude	Longitude
<b>Belmont Co. Coal Res., Inc. - Century Mine - 050301060904</b>					
Pond 2 mine - dewatering pond	002	Long Run	0.02	39.8931	-81.0278
Pond 8C - SW from coal refuse and stockpiles	008	Tributary to Piney Creek (2.9)	0.05	39.8931	-81.0200
Pond 11 - mine rewatering pond	011	Piney Creek	2.70	39.8963	-81.0217
Pond 13 - SW coal refuse	013	Piney Creek	2.75	39.8975	-81.0242
Pond 14 - SW coal refuse	014	Tributary to Piney Creek (2.7)	0.30	39.8989	-81.0294
Pond 15 - SW coal refuse	015	Tributary to Captina Creek (24.94)	0.60	39.9036	-81.0317
Century Mine Sanitary WWTP	017	Piney Creek	2.67	39.8959	-81.0225
Pond 18 - SW coal refuse	018	Piney Creek	2.20	39.9022	-81.0214
Century Mine WWTP 2	117	Tributary to Bend Fork (7.8)	1.40	39.9803	-81.0233
Bethesda Portal WWTP	217	Tributary to Bend Fork (9.48)	1.40	39.9803	-81.0561
<b>Ohio Valley Coal Resources, Inc. Powhatan Mine No. 6 - 0500301060704</b>					
Prep Plant process water and SW	001	Perkins Run	0.30	39.9164	-80.9922
Treatment Pond #8	007	Captina Creek	21.10	39.9069	-80.9903
Pond #7 rail road loading area SW	011	Captina Creek	21.10	39.9069	-80.9922
Refuse disposal area and slurry impoundment dam	013	Perkins Run	0.25	39.9136	-80.9906
<b>Bellaire Corporation Powhatan Mine No. 5 - Town Run Refuse Area - 050301060906</b>					
Coal treatment pond	010	Captina Creek	4.00	39.8803	-80.8417
<b>Bellaire Corp. Powhatan Mine #1 - 050301060906</b>					
Coal treatment pond	002	Captina Creek (Warren Run)	1.29	39.8700	-80.8147

## Appendix 5. List of Physical/Chemical Parameters and Reporting Limits

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
<b>Oxygen Demand</b>				
BOD, 5-day	SM 5210B	2 mg/L		
cBOD, 20-day	OEPA 310.2	2 mg/L		
COD	SM 5220D	20 mg/L		
<b>Physical Properties</b>				
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)	Field Meter/Sonde	0 s.u.		
pH (Lab)		0 s.u.	0 s.u.	
Specific Conductance (Lab)	SM 2510B	1 µmhos/cm		
Specific Conductance (Field)	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%
<b>Nutrients</b>				
Ammonia-N	USEPA 350.1	0.05 mg/L	7 mg/kg	
Nitrate-Nitrite	USEPA 350.1	0.1 mg/L		
Nitrite	USEPA 353.2	0.02 mg/L		
Total Kjeldahl Nitrogen	USEPA 351.2	0.3 mg/L		
Total Phosphorus	USEPA 365.4	0.02 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		
<b>Anions</b>				
Carbonate/Bicarbonate	SM 2320B			
Chloride	USEPA 325.1	5 mg/L		
Sulfate	USEPA 375.2	10 mg/L		
<b>Cations</b>				
Aluminum	USEPA 200.7	200 µg/L	200 µg/L	
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	

Parameter	Method	Water (RL)	Sediment (RL)	Fish Tissue
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	
<b>Metals</b>				
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	
Chromium, hexavalent	USEPA 7196A	0.02 mg/L	0.02 mg/kg	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
<b>Bacteria</b>				
Escherichia coliform	USEPA 1603	2 CFU		
<b>Algal Biomass</b>				
Chlorophyll- $\alpha$	USEPA 445.0	1 µg/L		
Anatoxin	OEPA 706.0	0.4 µg/L		
Cylindrospermopsin	OEPA 703.0	0.05 µg/L		
Microcystin	OEPA 701.0	0.24 µg/L		
Saxitoxin	OEPA 702.0	0.022 µg/L		
<b>Organic Compounds</b>				
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 6. Safety Contacts and Hospital Locations

<b>Safety:</b>	
<b>County Wildlife Officers:</b>	<b>County Sheriff:</b>
Jefferson: Craig Porter (330) 245-3050 Belmont: Logan Ambrister (614) 563-1680 Harrison: Nick Turner (330) 245-3049 Monroe: Vacant (614) 563-5033 Washington: Scot Gardner (740) 412-9184	Jefferson: Fred Abdalla (740)283-8600 Belmont: David Lucas (740)695-3784 Harrison: Ronald Myers (740)942-2197 Monroe: Charles Black, Jr. (740) 472-1612 Washington: Larry Mincks, Sr. (740) 373-6623
<b>OEMA:</b>	<b>State Highway Patrol:</b>
Jefferson: (740)264-4646 Belmont (740)695-5984 Harrison: (740)942-3922 Monroe (740)472-2144 Washington (740)373-6623	Jefferson & Harrison: (740)264-1641 Belmont: (740)695-0915 Washington and Monroe: (740)374-6616
<b>Hospitals:</b>	
Jefferson: Trinity Medical Center East 380 Summit Ave. Steubenville, OH (740)283-7000	Belmont: East Ohio Regional Hospital 90 N. 4 <sup>th</sup> Street Martins Ferry, OH (740)633-1100
Monroe: Monroe Family Health Center 37984 Old Airport Rd Woodsfield, OH (740)472-0757	Washington: Marietta Memorial Hospital 401 Matthew St. Marietta, OH (740)374-1400

## Appendix 7. Chemistry Sample Type/Parameter Crosswalk

Parameter	Chemistry	Nutrient Site	Streams - 01	Streams - 02
<i>SampleMaster Test Group</i>	<i>TG Acid Mine Drainage</i>	<i>TG Stream Survey Nutrient</i>	<i>sVOCs</i>	<i>Herbicides Pesticides</i>
Acidity	X	X		
Alkalinity	X	X		
Aluminum	X	X		
Ammonia	X	X		
Anatoxin-a				
Arsenic	X	X		
Atrazine (ELISA)				
Barium	X	X		
BOD-5				
Bromide				
Cadmium	X	X		
Calcium	X	X		
Chloride	X	X		
Chlorophyll $\alpha$				
Chromium	X	X		
COD	X	X		
Conductivity (Lab)	X	X		
Copper	X	X		
Corrected Conductance	X	X		
Cylindrospermopsin				
Dissolved Oxygen	X	X		
DOC				
Hardness, Total	X	X		
Herbicides (multiple analytes)				X
Insecticides (see Pesticides)				
Iron	X	X		
Lead	X	X		
Magnesium	X	X		
Manganese	X	X		
Microcystins				
Nickel	X	X		
Nitrate + nitrite	X	X		
Nitrite	X	X		
Orthophosphate, dissolved		X		

Parameter	Chemistry	Nutrient Site	Streams - O1	Streams - O2
Pesticides (multiple analytes)				X
pH	X	X		
Potassium	X	X		
Saturation	X	X		
Saxitoxin				
Selenium	X	X		
Sodium	X	X		
Strontium	X	X		
Sulfate	X	X		
sVOCs - Organics (81 analytes)			X	
Temperature	X	X		
TKN	X	X		
TOC	X	X		
Total Dissolved Solids	X	X		
Total Phosphorous	X	X		
Total Suspended Solids	X	X		
Turbidity				
Uncorrected Conductance	X	X		
Zinc	X	X		

## References

- 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. [Link](#)
- 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). [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2021. Fish Tissue Collection Manual. [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2019. Surface Water Field Sampling Manual - Appendix I: Inland Lakes Sampling Procedure Manual. [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2023. Surface Water Field Sampling Manual: for Water Quality Parameters and Flows. [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2023. Surface Water Field Sampling Manual - Appendix II: for Water Quality Parameters and Flows. [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2023. Surface Water Field Sampling Manual - Appendix III: Sediment Sampling. [Link](#)
- Ohio EPA (Ohio Environmental Protection Agency – Division of Surface Water). 2023. Surface Water Field Sampling Manual - Appendix IV: Data Management. [Link](#)
- Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Division of Water Quality Planning and Assessment, Columbus, Ohio. [Link](#)
- 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.

## Other Resources

- 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. [Link](#)
- 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. [Link](#)
- 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