

Middle Scioto River Biological and Water Quality Assessment:

Scioto River Mainstem: 5th Avenue to Circleville

Olentangy River Mainstem: Delaware-Franklin Co. Line to Mouth

Scioto_Olentangy Tributaries: Project Blueprint Watersheds

Continuing Scope of Work for 2022-23

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Middle Scioto River Biological and Water Quality Assessment Scope of Work for 2022-23

Introduction

In August 2019 the Midwest Biodiversity Institute (MBI) proposed to perform tasks in support of a biological and water quality assessment of the Middle Scioto River in Franklin and Pickaway Counties Ohio beginning in 2020 and as supported by the City of Columbus Division of Sewers and Drains (DOSD). A Scope of Work (SOW) based on meeting a schedule of tasks within a project period of May 2020 through 2021 was developed. In March 2020 MBI was requested to expand the original SOW to include river and stream reaches in the Project Blueprint watersheds along the Olentangy River in Clintonville and Beechwold and other tributaries within Columbus MS4 subwatersheds. A similar scope will be repeated in 2022-23 with modifications as described in this scope of work (SOW).

The 2022-23 SOW includes tasks and subtasks and adheres to the description of their general sequence within a project “year”. The cost estimates are included separately for the biological and habitat assessment (Appendix A) and for the chemical assessment (Appendix B), the latter of which includes the large river nutrient parameters consistent with the approach proposed by Ohio EPA and additional parameters commonly included in the assessment of municipal wastewater and urban stormwater impacts. New in 2022 is the continuous deployment of four (4) Datasondes between mid-May and mid-October and assessing the feasibility of installing permanent locations. MBI will also assume responsibility for the sestonic and benthic chlorophyll a lab analyses by contracting directly with two laboratories in 2022. The chemical, biological, and habitat data collection will be paired at each site within a summer-early fall seasonal index period of June 16-October 15, 2022 and in accordance with the development of a Level 3 Project Study Plan (PSP) the same as was done for the 2020 survey. The mobilization and planning tasks for each will also include seeking permission and securing permits for access to Columbus Recreation and Parks and Franklin County Metroparks properties and other public private properties as needed.

The full cycle of a “year” initiates with pre-survey planning in the Spring followed by field sampling within the summer-early fall index period (June 16-October 15). Data management and analysis and reporting consistent with the content of the 2020 report follows in the ensuing Fall, Winter, and Spring months with report writing in the Summer and Fall of 2023. The description of tasks and costs is done separately for the biological/habitat and chemical water quality phases of the overall assessment.

A. Biological and Habitat Assessment Project Scope of Work (SOW)

The sequence of biological, habitat, and water quality assessment tasks for a “year” includes the following (Figure 1):

MBI Middle Scioto River Bioassessment Tasks & Schedule 2022-23

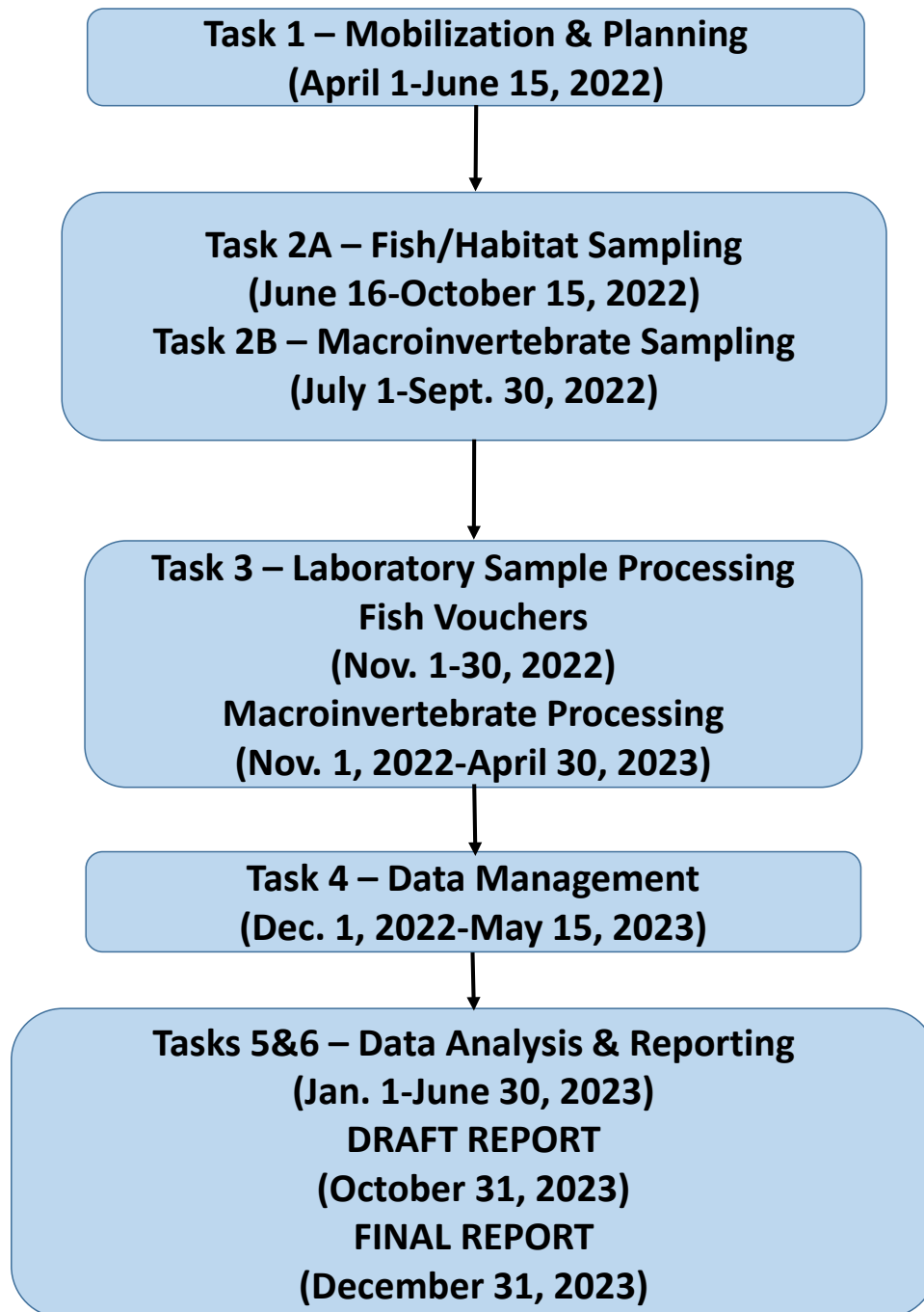


Figure 1. Flow chart of the schedule and sequence of tasks and subtasks for the Middle Scioto River biological and habitat assessment, 2022-23.

Task 1 – Bioassessment Mobilization & Planning

This task involves mobilizing and planning for the 2022 biological, habitat, and water quality assessment in accordance with a Level 3 Project Study Plan (PSP) that will be submitted for approval to Ohio EPA under the Ohio Credible Data Law and Regulations¹ following the format used by MBI in 2020 (MBI 2020). Task 1 includes the preparation and submittal of a Level 3 PSP to the Ohio Credible Data Program (OCDP) to cover the 2022 biological and habitat assessment and eventually the chemical assessment. Chemical data is accepted from laboratories that hold accreditation from the National Environmental Laboratory Accreditation Program (NELAP) which is an Ohio EPA requirement for achieving Level 3 status. The Columbus DOSD laboratory is currently pursuing NELAP accreditation and when received the PSP will be revised accordingly, submitted for approval, and past data submitted for retroactive approval by Ohio EPA. Mobilization tasks includes the purchasing and preparation of equipment, supplies, arranging laboratory support, sample delivery, and readying of personnel for sampling ahead of the summer-early fall index period, and demobilization once field sampling is completed.

Task 2 – Biological & Habitat Field Sampling

This task includes all of the activities focused on the field collection of samples within two subtasks – 2A Fish and Habitat, and 2B – Macroinvertebrates. The 2022 sampling will include the Scioto River mainstem between Columbus and Circleville, the Olentangy River mainstem downstream from Delaware Dam to the mouth, and selected major tributaries (Big Walnut, Alum Creek) for a total of approximately 60 sites. Mixing zone sites will be included for the Jackson Pike and Southerly 001 outfalls. Twelve (12) tributary sites within priority Project Blueprint watersheds (e.g., Adena Brook, Beechwold Run) and at other representative locations are included in the 2022-23 SOW. Each subtask is described as follows:

Task 2A – Fish/Habitat Sampling

This includes the sampling of the fish assemblage in accordance with Ohio EPA methods (Ohio EPA 2006, 2015) within a seasonal index period of June 16-October 15. Fish will be sampled two times at each of the mainstem river and major tributary sites by using boat or raft mounted electrofishing. Habitat will be assessed simultaneously using the Qualitative Habitat Evaluation Index (QHEI). Wadeable sampling gear will be used to sample the smaller and wadeable tributary streams once each within the seasonal index period.

Task 2C – Macroinvertebrate Sampling

Macroinvertebrate sampling will likewise be conducted under the specifications of the Ohio EPA (2015) within a seasonal index period of July 1-September 30 by deploying artificial substrate samplers for a six-week colonization period at the mainstem river and major tributary locations. A qualitative sample will be collected at the time of substrate retrieval and a site description will be recorded for each site. Qualitative only samples will be collected once each at the smaller wadeable tributary sites.

¹ Ohio Revised Code 6111.5 and Ohio Administrative Code 3745-4.

Task 3 – Biological Laboratory

This task includes all post-field laboratory tasks including the verification of fish identifications and the processing, sorting, and identification of macroinvertebrates in accordance with Ohio EPA (2015) methods. Raw macroinvertebrate samples will be reduced to subsamples and identified to the lowest taxonomic level that is practicable. Fish identification verifications will generally take place prior to November 30, 2022 and macroinvertebrate sample processing extends into the following year being completed by the end of April 2023.

Task 4 – Biological & Habitat Data Management

This is a post-field and post-laboratory task that includes the organization and logging of field and lab sheets, entering data, and proofing data entry. MBI will utilize its own version of the Ohio ECOS data management system to enter, store, and retrieve biological and habitat data. ECOS produces standardized reports and it can also be queried in support of specialized analyses of the data.

Tasks 5 & 6 – Biological & Habitat Data Analysis and Reporting

Tasks 5 and 6 include the production of a comprehensive report (Task 6) based on the data analyses (Task 5) and the conclusions reached as a result of those analyses. This includes the calculation of the Ohio fish Index of Biotic Integrity (IBI), Modified Index of Well-Being (MIwb), and macroinvertebrate Invertebrate Community Index (ICI) scores and metrics, the determination of aquatic life use attainment status, and the assignment of causes and sources to any documented biological impairments generally following Ohio EPA practices. Habitat, chemical water quality, and effluent loadings data will be integrated with the bioassessment results for the assessment of causes and sources. A nutrient effects assessment will be performed following the in-development version of the large river nutrient assessment by Ohio EPA. Other parameters will be evaluated by exceedances of the Ohio WQS, regional thresholds available in Ohio EPA (1999, 2020), and other suitable effect threshold compendia.

B. Chemical Water Quality Assessment Project Scope of Work (SOW)

The sequence of chemical water quality assessment tasks for a “year” includes the following (Figure 2):

Task 1 – Chemical Water Quality Mobilization & Planning

This task involves mobilizing and planning for the 2022 chemical and water quality assessment that will be coordinated with the biological and habitat assessment. The 2022 sampling will include the collection of grab water samples at each biological and habitat site in the Scioto River mainstem between Columbus and Circleville and the lower Olentangy River downstream from Delaware Dam. Grab samples will be collected six times during summer-fall “normal” flows and will include periods of maximum summer ambient temperatures and stable low flows

MBI Middle Scioto River Chemical Assessment Tasks & Schedule 2022-23

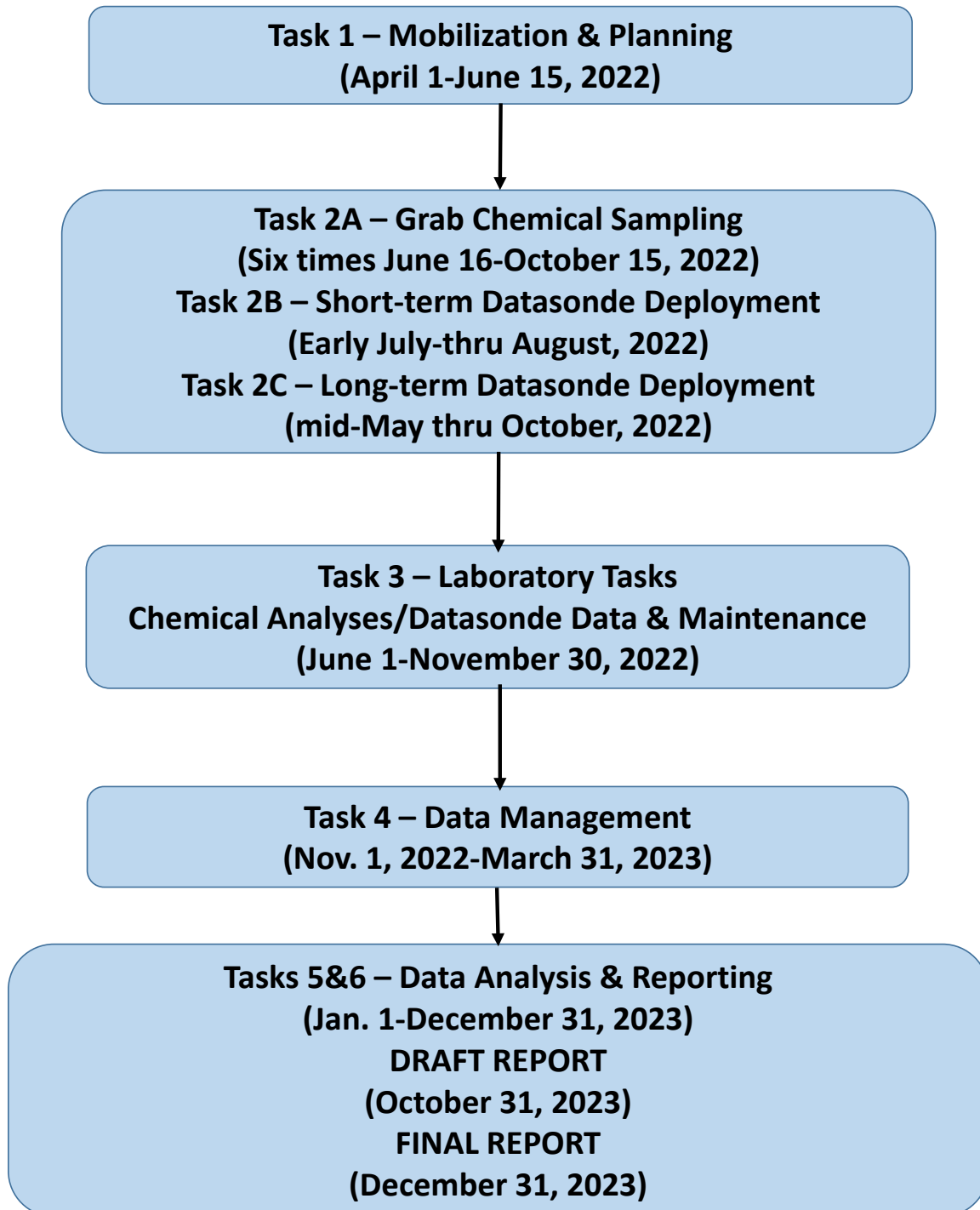


Figure 2. Flow chart of the schedule and sequence of tasks and subtasks for the Central Scioto River watersheds chemical water quality assessment, 2022-23.

to assess the effects of nutrient enrichment. Grab samples will be collected four times from each of the smaller, wadeable streams affiliated with Project Blueprint and the MS4 wet weather program. Sediment samples will be collected once at the mainstem river sites and selected tributary locations in mid to late October 2022 for chemical analysis of heavy metal and organic compounds.

A short-term deployment of Datasondes for the collection of continuous dissolved oxygen (D.O.), temperature, conductivity, and pH, at a minimum, will occur over 4-5 day periods under maximum summer ambient temperatures and stable low flows to assess the effects of the effects of nutrient enrichment in the Scioto and Olentangy River mainstems over a cumulative period of 4 weeks by deploying 10 Datasondes at a time. Longer term Datasonde deployments will be done at four selected locations in the Scioto and lower Olentangy Rivers continuously between mid-May and October 31, 2022. Planning will include the preparation of a Level 3 Project Study Plan (PSP), a sampling schedule, and a detailed allocation of laboratory parameters to be analyzed. Including the latter in the Level 3 PSP depends on the status of the Surveillance Lab obtaining NELAP certification. Mobilization also includes the preparation of equipment, supplies, and personnel for field sampling and for demobilization following the field season.

Task 2 – Water Quality Field Sampling

Grab water samples will be collected six times within a summer-early fall seasonal index period from each of the Scioto River mainstem and lower Olentangy River sites. Grab samples will be collected four times in the smaller streams that are tributary to the Olentangy and Scioto Rivers. This task includes all of the activities focused on the collection of chemical water quality samples and includes three subtasks – 2A Chemical Grab Sampling, 2B – Short-term Datasonde Deployment, and 2C - Long-term Datasonde Deployment. Each subtask is described as follows:

Task 2A – Chemical Grab Sampling

This includes the collection of grab water samples in accordance with Ohio EPA standard protocols (Ohio EPA 2019a,b) and within a seasonal index period of June 16-October 15. Each Scioto River and Olentangy River site will be sampled six times and samples will be preserved and maintained on ice for same day delivery to the DOSD Surveillance laboratory. Grab water samples will be collected four times at each of the smaller wadeable stream locations. Samples will be delivered to the lab and analyzed in accordance with specified holding times and a schedule of sample delivery in keeping with the sample load capacity of the lab. A list of core and supplemental chemical/physical analytes appears in Appendix C.

Task 2B – Short-term Datasonde Deployment

Datasonde units will be deployed at approximately 40 locations in the Central Scioto River mainstem for 4-5 day periods during maximum summer ambient temperatures and low river flows. Grab water sampling will be coordinated accordingly to include the ancillary parameters consistent with the proposed Ohio EPA large river nutrient assessment methodology to include

both benthic and sestonic chlorophyll a at Scioto and Olentangy River Datasonde locations. Benthic and sestonic chlorophyll a will be analyzed by two contract laboratories.

Task 2C – Long-term Datasonde Deployment

Datasondes will be deployed over a longer term period between May 15 and October 31 in order to better quantify the durations of periods of stress and recovery for D.O. and other parameters including pH, temperature, specific conductance, chlorophyll a, blue green algae, and phycocyanins. The latter will be measured by adding EXO Total Algae probes to the four EXO3 units owned by DOSD. At least three and possibly four locations will be selected to include upstream controls and reaches that showed wide diel D.O swings and high concentrations of chlorophyll a. This effort will also consider how to install semi-permanent housings for future and possibly longest term deployments. The long term data should also help to better frame the results from the short term deployments in terms of the implications of the Ohio EPA nutrient assessment methodology.

Task 3 – Chemical Water Quality Laboratory

This task includes preparing and maintaining water quality meters and the MBI and DOSD owned Datasondes to assure proper functioning and calibration. MBI will coordinate the laboratory and delivery services for the sestonic and benthic chlorophyll a analyses. This task also includes the timely delivery of the grab water samples to the Columbus DOSD Surveillance laboratory in accordance with a schedule and management of sample flow to the laboratory as determined in coordination with DOSD.

Task 4 – Chemical Water Quality Data Management

This is a post-field and post-laboratory task that includes the organization and logging of field and lab sheets, entering data, and proofing data entry. Chemical grab sample data will be provided by the DOSD Surveillance lab via a LIMS system output directly to MBI in spreadsheet format. MBI will manage the Datasonde results.

Tasks 5 and 6 – Chemical Water Quality Data Analysis and Reporting

These final tasks include reporting (Task 6) about the data analyses (Task 5) and the conclusions based on the analyses of that data. This will include the analysis of the grab chemical data for exceedances of water quality criteria, the thresholds from the Ohio EPA combined effects assessment of nutrients (Miltner 2018), and other biological effect thresholds (Ohio EPA 1999, 2020). The Datasonde results will likewise be examined for water quality criteria exceedances and will additionally provide the data needed to assess the likelihood and severity of nutrient enrichment related effects including the diel D.O. variation. The chemical water quality results and analyses will be merged with the biological, habitat, and effluent loadings data in an integrated assessment of causes and sources of impairments. The report will include sections for the three major aspects of the proposed study, the Scioto River mainstem, the Olentangy

River mainstem, and the Project Blueprint Tributaries. The following outline will be used for the report (in addition to a cover page, table of contents, acronyms, and definition of terms):

Executive Summary

A brief synopsis of the findings of the biological and water quality assessment including a quantitative description of impairments, major causes and sources of impairment, opportunities for restoration and protection, lessons learned, and recommendations for future monitoring.

Section 1 – Introduction

This will describe the purposes of the monitoring and the goals and objectives of DOSD for using monitoring data to support water quality decision-making.

Section 2 – Study Area Description

A detailed description of the study area including maps and lists of sites, major pollution sources, dams, and other features that relate to the biological and water quality assessment. Much of this will have already been accomplished by the Level 3 PSP.

Section 3 – Methods

A description and summary of all chemical, physical, and biological methods used to collect the data, data management, and data analysis including the delineation of impairments, a description of the process used to assign causes and sources, and an approach for conducting any use attainability analyses.

Section 4 – Results

A comprehensive reporting of chemical, physical, and biological quality using tables and graphs to report the results. This will include an assessment of major point source pollutant loadings, chemical water quality criteria exceedances, exceedances of biologically relevant thresholds, analysis of habitat attributes, and reporting fish IBI, macroinvertebrate ICI, their respective metrics, and an assessment of biological response signatures.

Section 5 – Synthesis of Results

This section will report the results of the data analyses and causal assessment conducted under task 5. This is where the conclusions about causes and sources are explained including any patterns observed in the study area such as the differences in results observed between point source influenced and nonpoint source influenced sites and reaches. It will also include a retrospective analysis of historical results for supporting a continuing trend assessment which for biological data generally extends back to the mid to late-1970s and the mid to early 1970s for chemical water quality data. Trends were extensively analyzed by the 2020 report so for much of the effort this will include adding the 2022 data to what is now a 50+ year long database.

The major project product consists of a draft report for DOSD review (October 31, 2023) and a final report (December 31, 2023).

C. References

- Midwest Biodiversity Institute (MBI). 2020. Biological and Habitat Assessment Project Study Plan for the Middle Scioto River Mainstem, Lower Olentangy Mainstem, and Olentangy River Tributaries 2020. Franklin and Pickaway Counties, Ohio. Level 3 Project Study Plan submitted to Ohio EPA. 12 pp. + appendices.
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- Ohio Environmental Protection Agency. 2019a. Surface Water Field Sampling Manual for water quality parameters and flows. Final Manual April 22, 2019. Version 7.0. Division of Surface Water, Columbus, Ohio. 40 pp.
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- Ohio Environmental Protection Agency (Ohio EPA). 2006. Methods for assessing habitat in flowing waters: using the qualitative habitat evaluation index (QHEI). Division of Surface Water, Ecological Assessment Section, Columbus, OH. 23 pp.
- Ohio EPA. 1999. Appendices to association between nutrients, habitat, and the aquatic biota in Ohio Rivers and streams. Ohio EPA Technical Bulletin MAS/1999-1-1. 169 pp.

Appendix A. Central Scioto River 2022-23 Bioassessment Cost Estimate

Task	Description	Quote
1 - Mobilization & Planning	<ul style="list-style-type: none">• Pre-field planning & permits• Mobilize crews• Level 3 PSP	\$13,091.40
2 – Field Sampling	<ul style="list-style-type: none">• Fish/habitat sampling• Macroinvertebrate sampling	\$79,056.34
3 – Biological Laboratory	<ul style="list-style-type: none">• Fish vouchers• Macroinvertebrate sample sorting• Macroinvertebrate identifications	\$40,403.55
4 – Data Management	<ul style="list-style-type: none">• Data entry, QA/QC• Data management & retrieval	\$10,497.96
5&6 – Data Analysis & Reporting	<ul style="list-style-type: none">• Analysis of biological and habitat data.• Integration of chemical & stressor data.• Draft & Final Reports	\$28,727.82
TOTAL		\$171,777.07

Appendix B. Central Scioto River 2022-23 Water Quality Assessment Cost Estimate

Task	Description	Quote
1 - Mobilization & Planning	<ul style="list-style-type: none"> • Pre-field planning & permits • Mobilize crews • Study plan² 	\$5,444.60
2 – Field Sampling	<ul style="list-style-type: none"> • Chemical grab sampling • Short-term Datasonde deployment • Benthic chlorophyll a collection • Semi-permanent Datasonde deployment 	\$51,379.72
3 – Chemical Laboratory	<ul style="list-style-type: none"> • Prepare, maintain, and calibrate meters and Datasonde units. • Chlorophyll a lab analysis 	\$17,925.60
4 – Data Management	<ul style="list-style-type: none"> • Data entry, QA/QC • Data management & retrieval 	\$12,957.12
5&6 – Data Analysis & Reporting	<ul style="list-style-type: none"> • Analysis of chemical grab and Datasonde data. • Draft & Final Reports 	\$16,673.58
TOTAL		\$104,380.62

² A Level 3 PSP for chemical data can be added when the Surveillance laboratory is NELAP certified.

Appendix C: Central Scioto River Chemical Parameters 2022

The following list of chemical/physical parameters are suggested for chemical water quality assessments of Ohio rivers and streams. The proposed Ohio large river nutrient related parameters are yellow highlighted. Supplemental parameters are brown highlighted and can be added consistent with overall project objectives.

Field (Fi):	Demand (De):	Nutrients (Nu):	Metals (Me)	Other Toxics (T)	Organics (O):	Sediment:
Conductivity	Alkalinity	Benthic Chl a	Ag	Cyanide	BNAs	BNAs
D.O.	BOD ₅	Chlorophyll a	Al	Phenols	Pesticides	Metals ¹
pH	Chloride	NH ₃ -N	As	O&G	VOCs	PAHs
Temp.	COD	NO ₂ -N	Be			PCB
	Conductivity	NO ₃ -N	Bo			Pesticides ²
	Fluoride	TKN	Ca			VOCs
	pH	Total P	Cd			
	SSC	D.O. (Sonde)	Co			
	Sulfate	Diss. P	Cr			
	TDS (TFR)	Diss. Reactive P	Cr ⁺⁶			
	TOC		Cu			
	TSS		Fe			
			K			
			Mg			
			Mn			
			Na			
			Ni			
			Pb			
			Se			
			Sr			
			Vd			
			Zn			
	- core chemical parameters.					
	- proposed Ohio EPA stream (SNAP) and large river nutrient parameters.					
	- supplemental; add as needed per study area setting and program goals & objectives.					
¹ - same list as water column metals.						
² - may include new generation compounds detected in USGS study (Van Metre 2014) as needed.						