Ohio Environmental Protection Agency

Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Rush Run-Olentangy River WAU 2018 Franklin and Delaware Counties

Division of Surface Water
August 10, 2018

Quality Assurance Project Plan (QAPP) for the Biological and Water Quality Study of the Rush Run-Olentangy River WAU, 2018

Franklin and Delaware Counties

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Prepared by
State of Ohio Environmental Protection Agency

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SECTION A – PROJECT MANAGEMENT

A1 – Quality Assurance Project Plan for the Biological and Water Quality Study of the Rush Run-Olentangy River WAU

_____ Date: _____
Chief or Assistant Chief

_____ Date: _____
Marianne Mansfield, EAU Manager

Jeffrey W. Reynolds _____ Date: 8/10/18
Jeff Reynolds, Ohio EPA Quality Assurance Coordinator

JBohne _____ Date: 8/10/2018
Jeff Bohne, EAU Supervisor

_____ Date: 8/10/2018
Michael Gallaway, District Manager

Jeff Lewis _____ Date: 8-13-18
Jeff Lewis, District Water Quality Supervisor

_____ Date: _____
Eric Saas, District Field Staff

_____ Date: 08/10/2018
Chloe Welch, District Field Staff

This document, Quality Assurance Project Plan (QAPP), contains elements of the overall project management, data generation and acquisition, information management, assessment and oversight, and data validation and usability for the Ohio EPA Division of Surface Water Program. The complete QAPP includes this document as well as other references. Together, these items comprise the integrated set of QAPP documents. All project members should follow these guidelines. Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use.

A2 – Table of Contents

A3 – Distribution List and Contacts

This QAPP, which includes the associated manuals and guidelines, will be distributed to the following internal staff and Management:

A3.1 – Table 1. Ohio EPA Central Office Staff

Name/Title	Contact E-mail	Phone
Marianne Mansfield, EAU Manager	Marianne.piekutowski@epa.ohio.gov	614-836-8780
Jeff Bohne, EAU Supervisor	Jeff.Bohne@epa.ohio.gov	614-836-8798
Jordan Jenkins, Fish Biologist	jordan.jenkins@epa.ohio.gov	614-836-8786
Chuck McKnight, Macroinvertebrate Biologist	Chuck.mcknight@epa.ohio.gov	614-836-8784
Jennifer Kraft, DES Environmental Manager	Jennifer.kraft@epa.ohio.gov	614-644-4270
Steve Roberts, DES QA Supervisor	Steven.roberts@epa.ohio.gov	614-644-4225
Audrey Rush, STS Manager	Audrey.Rush@epa.ohio.gov	614-644-2035
Jeff Reynolds, Quality Assurance Officer	Jeffrey.reynolds@epa.ohio.gov	614-705-1011

A3.2 – Table 2. Ohio EPA Central District Office Staff

Name/Title	Contact E-mail	Phone
Michael Gallaway, District Manager	Michael.Gallaway@epa.ohio.gov	614-728-3843
Jeffrey Lewis, District Water Quality Supervisor	Jeffrey.Lewis@epa.ohio.gov	614-466-2657
Chloe Welch, District Field Staff	Chloe.Welch@epa.ohio.gov	614-728-3852
Eric Saas, District Field Staff	Eric.Saas@epa.ohio.gov	614-728-3855

A3.3 – Table 3. Other Interested Parties

Organization (contact name)	Contact E-mail	Phone
Friends of the Lower Olentangy Watershed (Laura Fay)	lfay9785@columbus.rr.com	614-580-2656

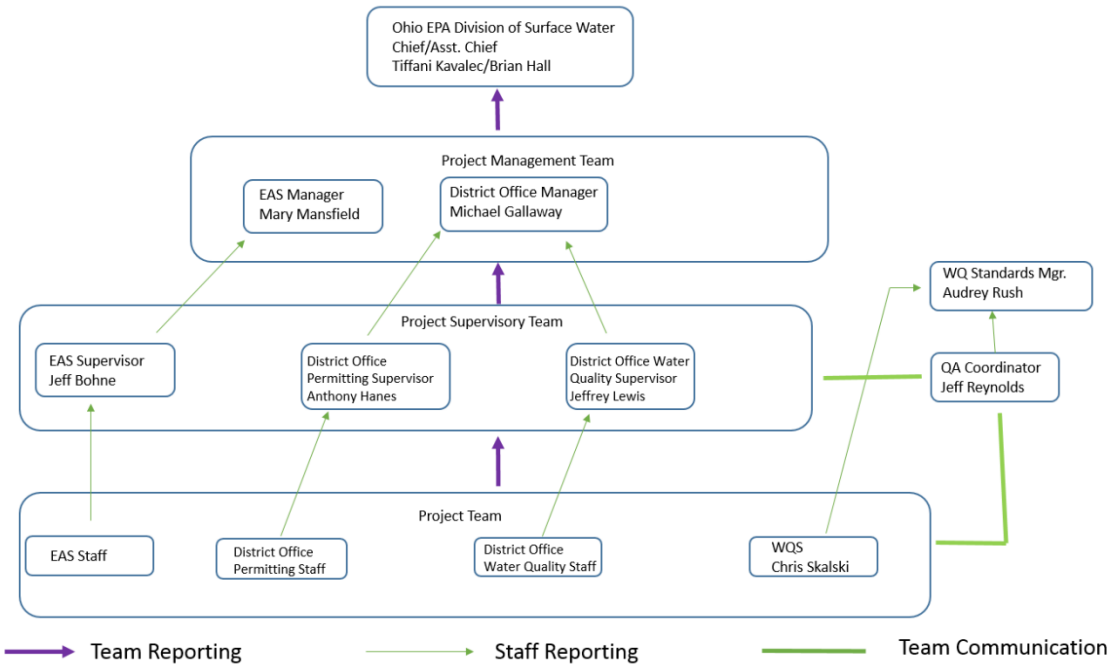
A4 – Project/Task Organization and Communication

A4.1 – Table 4. Roles & Responsibilities

Individual(s) Assigned:	Responsible for:	Authorized to:
Marianne Mansfield, EAU Manager **Jeff Bohne**, EAU Supervisor	Staff assignment, signatures, payments, and reporting.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
Audrey Rush, WQS Manager **Jeff Reynolds,** Quality Assurance Officer	QA/QC input to document development. Prepare documents and reports.	Review documents and reports. Review documents and reports; suggest changes and edits.
Michael Gallaway, DSW District Manager **Jeff Lewis**, District Water Quality Supervisor	Staff assignment, signatures, payments, and reporting.	Review documents and reports; suggest changes and edits; obtain approvals and signatures.
STUDY TEAM		
Jordan Jenkins, Fish Biologist **Chuck McKnight**, Macroinvertebrate Biologist	Scheduling and coordination of field activities. Complete field activities and quality control; field sampling and analysis, data collection, review, analysis, verification, database population and transmission. Assist with project planning.	Prepare documents and reports. Arrange for external training. Schedule field activities.
Eric Saas, District Water Quality **Chloe Welch***, District Water Quality	Complete field activities and quality control; field sampling and analysis, data collection, review, analysis, verification, database population and transmission. Assist with project planning.	Prepare documents and reports. Arrange for external training. Schedule field activities.

*Study Team Leader

A4.2 – Figure 1: Organizational and Communication Chart



A5 – Problem Definition/Background

Much of the monitoring data for tributaries in the Rush Run watershed was last collected in 1999. The Friends of the Lower Olentangy Watershed (FLOW) contacted Ohio EPA in the spring of 2018 to discuss the possibility of collecting updated watershed information on Rush Run. Updated monitoring information would help assess current beneficial use conditions. FLOW is interested in using the information to update their 9-element watershed plan and identify potential restoration activities for the watershed.

In support of this effort, a basic ambient assessment will be conducted during the 2018 field sampling season within the Rush Run-Olentangy River Watershed Assessment Unit (WAU) (HUC12 050600011102).

A5.1 – Beneficial Use Designations

Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the goals specified by each use designation. The beneficial use designations evaluated as part of this survey are Aquatic Life, Recreation, Agricultural Water Supply, and Industrial Water Supply. Beneficial use designations have been verified for all 4 of the waterbodies or waterbody segments that will be assessed within this study area. Beneficial use designations pertinent for waterbodies in the study area are detailed in OAC 3745-1-26.

A6 – Project/Task Description

The purpose of this study is to evaluate fish and macroinvertebrate communities, stream habitat and water chemistry conditions at four (4) sites in the Rush Run WAU, which is a subwatershed of the larger Olentangy River watershed. Results from this study will be used to update aquatic life use and recreation use attainment status for the watershed assessment unit. Data from the study will be used to report on Clean Water Act Section 305(b) trends in the 2020 Ohio EPA Integrated Report.

The Rush Run-Olentangy River WAU is located in central Ohio in Franklin County and drains 30.65 square miles of the Eastern Corn Belt Plains (ECBP) Ecoregion. It is one of three WAUs that make up the Lower Olentangy Watershed. It is predominantly made up of developed land (75.5%), with other land uses throughout, such as forest (16.9%), grass/pasture (5.9%) and row crops (1.3%). Municipalities in the Rush Run WAU include the cities of Powell and Worthington, the Village of Riverlea and Sharon Township. Antrim Lake is located in the WAU. The last comprehensive survey of the Rush Run WAU was conducted in 1999 and the leading causes of partial and non-attainment for tributaries studied were excessive nutrients and toxicity associated with urban runoff and CSO/SSO discharges, altered flow regimes, and bacteria.

Potential site locations were chosen based on previously sampled locations, historically known problem stream reaches, pour points, and largest drainage area. Potential locations are depicted in map(s) and tables included in the Appendix.

The timing of the chemical sampling may be limited by flow as low stable flows and storm runoff flows are required, however biological and QHEI data can be collected throughout the season unless flows are very high. Results from this study will provide data used to report on Clean Water Act Section 305(b) trends in the 2020 Ohio EPA Integrated Report.

A6.1 – Project Objectives

The study area is composed of one HUC 12 watershed assessment unit. A total of 4 sampling stations are allocated to this effort and will provide for the assessment of 4 streams (Table 1). Ambient biology, macrohabitat quality, water column chemistry, and bacteriological data will be collected concurrently from most of these sites. Sediment chemistry (metals, organics, and particle size) will be evaluated at all sampling locations to potentially supplement information about any possible causes of impairment. See Appendix – Table 5 for specific details on stream sampling locations and sampling types.

The general objectives of the study are to:

> Collect water quality information (physical, chemical and biological) from selected streams to assess current aquatic life and recreational uses for the Rush Run WAU,
>
> Document any changes in the aquatic life use and recreation use conditions of the study sites compared to historic data and expand Ohio EPA database for reporting on statewide trends (e.g. 305[b]).

A6.2 – Beneficial Use Designations

The beneficial use designations evaluated as part of this survey are the Aquatic Life, Recreation, Agricultural Water Supply, and Industrial Water Supply uses. Attainment of the aquatic life beneficial use is determined using results from biological sampling as described on page 8-7 in Ohio EPA (1987). Attainment of non-aquatic life uses, such as recreational use, are determined by screening water column chemistry data for bacteriological data for recreational use against relevant standards criteria.

A7 – Quality Objectives and Criteria

A7.1 – QC Performance criteria for water chemistry

Blanks and duplicate QC samples will be collected at rates consistent with the Surface Water Field Sampling Manual for water quality parameters and flows, 2018, herein referred to as Field Manual. Target rates are 5% for the sum of field and equipment blanks and 5% for the sum of duplicates and replicates. The results of these will be evaluated using techniques and thresholds also described in section A of Appendix IV to the Field Manual (2018). That Section describes assessment methodology and acceptable thresholds for blanks, duplicates, and paired parameter agreement. The project coordinators will plan sampling to ensure collection of an appropriate number of QC samples. The division will also do an annual review of QC sampling rates, rates of blank detects, and duplicate sample qualification by parameter.

A7.2 – *QC Performance criteria for biological and habitat data*

Gather ambient environmental information (biological and physical habitat) from selected streams to assess aquatic life use attainment and to recommend an appropriate ALU (using procedures described in the Biocriteria for Aquatic Life User's Manual and OAC 3745-1-07).

A8 – Special Training/Certification

DSW has developed an Access database called "TrainTrack" to document initial trainings and refreshers. All staff involved in collecting any type of environmental sample must complete training associated with that sampling method. The first line supervisors shall ensure staff have the necessary safety and skill set training (initial and refresher training) prior to sampling. Annual chemical sampling refresher training covers a rotating sequence of difference methods, instruments, and other issues pertinent to field sampling. Biological trainings and Quality Assurance refresher activities are described in the Biological Criteria Manual Volume 3 Ohio EPA 2015b. Initial training and refresher trainings are conducted annually for Ohio EPA staff (both full time and intermittent) who will be collecting biological data and/or habitat sampling.

A9 – Documents and Records

The final Quality Assurance Project Plan (QAPP) will be provided to the appropriate project personnel by email as detailed in the distribution list. As the plan is updated, each person on the distribution list will be sent an email with the most current document. The most current date of revision will be included in the document name and in the header of the document.

The QHEI habitat forms, chain of custody forms, sample submission forms, and field logs will be maintained in their original form and information from those forms will be included in Agency databases. The databases are backed up on secure servers.

Field measurements taken with a YSI® EXO1 sonde will be recorded electronically and uploaded at the end of the day. In the event that a YSI® EXO1 sonde meter is used that does not have datalogging capabilities, a field sheet will be completed and the data will be input manually into the database for storage and dissemination.

The results from samples sent to the Ohio EPA Division of Environmental Services for analysis will follow the protocol typical to Ohio EPA standard practice. The data will be placed directly into Agency databases that have secure backup and ease of retrieval.

The format for all data recording will be consistent with the requirements and procedures used for data validation and assessment described in this QAPP. Files generated according to applicable and attached standard operating procedures (such as raw data, results of QC checks, problems encountered, etc.) will be documented and reported to the study team.

All communications regarding study plan changes or refinements, such as changes to sites, staff, parameters, etc. will be filed in the Sharepoint project file by the project leader. Other major actions which might affect the DQOs, project leader changes, etc. will require an updated QAPP with a new signoff sheet.

A9.1 – Document/record control

The recording media for the project will be a combination of paper and electronic means to document site conditions. Data gathered using paper will be recorded using indelible ink, and changes to such data records will be made by drawing a single line through the error with an initial by the responsible person. Similar methods will be used for electronic data recording.

The Study Team Leader shall retain the most recent version of the QAPP and be responsible for distribution of the current version of the QAPP to the project team. Agency management and the QAC will approve updates to the QAPP, as needed. The Study Leader shall retain copies of all management reports, memoranda, and all correspondence between team members identified in Section A. Retention of records should emphasize any deviations from the signed QAPP including the rationale for those changes.

A9.2 – Document storage

The Study Team Leader will maintain a central project file, which will act as a repository for all data collected or generated as part of this project. The project file will include both hardcopy and electronic data and will be stored at the Ohio EPA office. Project photos will be moved to and stored in the Lynx Photo System.

All files will be retained by Ohio EPA indefinitely (for a minimum of 10 years).

SECTION B – DATA GENERATION AND ACQUISITION

B1 – Sampling Process Design

Biological, chemical, and physical stream data will be collected during the 2018 field sampling season within the Rush Run-Olentangy River WAU. Results from this study will be used to update aquatic life use attainment status for the watershed assessment unit. Data from the study will be used to report on Clean Water Act Section 305(b) trends in the 2020 Ohio EPA Integrated Report.

Biological data collected will characterize any potential aquatic life use impairment. Habitat and water chemistry provide additional information which further inform the biological findings, adding to the weight of evidence approach to help diagnose the cause of any aquatic life or other beneficial use impairments.

B1.1 – Types and numbers of samples required

Samples will be collected to assess nutrient, metal, and bacteria concentrations. The DES templates for stream and sediment samples and their associated parameters can be found in the Appendix – Table 7. For number of sites see Table 1.

B1.2 – Design of the sampling

The sampling is designed to span the entire Rush Run WAU and encompass previously sampled sites and tributaries with the largest drainage area. Site locations will be determined based on spatial representativeness, historically sampled sites for trend assessment, and other special interest areas. Site location descriptions can be found in the Appendix – Figure 2 and Table 6.

B1.3 – Sampling locations and frequencies

Chemical water quality and bacteriological samples will be collected during 5 separate sampling runs at all sites. Sediment chemistry sampling sites will be sampled one time during this survey at all sites. Blanks will be collected at a rate of 5% of the total and duplicate/replicate samples will be collected at a rate of 5% of the total as indicated in the DSW Field Sampling Manual.

B1.4 – Sample matrices

Water chemistry samples will be collected at all sites from the water column. Surface sediment samples will be collected at all sites from the top two to four centimeters of sediment.

B2 – Sampling Methods

All biological, chemical, data processing, and data analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2018), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 2015b), 2015 Updates to the Biological Criteria for the Protection of Aquatic Life, Volume II (Ohio EPA 2015a), and The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989b, 2006) for habitat assessment.

B2.1 – Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b, 2006). The QHEI is a rapid, visual assessment of instream physical habitat quality and is designed to provide a measure of habitat features that generally correspond to those physical factors that affect fish communities, and which are generally important to other aquatic life. Evaluations of type and quality of substrate, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site.

B2.2 – Biological Community Assessment

Macroinvertebrates will be collected from artificial substrates and from the natural habitats. Qualitative sampling will be conducted in all four streams since their drainage areas are all less than 20 mi^2. This sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, and margin). Fish will be sampled at each sampling location with pulsed DC current. Only one fish pass is necessary to characterize fish assemblages, since the drainage area of all four streams is less than 20 mi^2. Detailed biological sampling protocols are documented in the Ohio EPA manual Biological Criteria for the Protection of Aquatic Life, Volume III (OEPA 2015b).

B2.3 – Sediment

Fine grained multi-incremental sediment samples will be collected in the upper 4 inches of bottom material using either decontaminated stainless-steel scoops or Ekman dredges. Collected sediment will be placed into appropriate containers, placed on ice (to maintain 4°C) and shipped to the Ohio EPA lab. Sampling and decontamination protocols will follow those listed in the Ohio EPA Sediment Sampling Guide and Methodologies, found in Appendix III of the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2018).

B2.4 – Surface Water

Surface water grab samples will be collected from the upper 12 inches of river water into appropriate containers. Collected water will be preserved using appropriate methods, as outlined in Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2018), and shipped overnight via courier to the Ohio EPA lab for analysis. Field measurements of dissolved oxygen, pH, temperature, and conductivity will be made using a YSI® EXO1 sonde along with all grab samples for surface water chemistry.

B2.5 – Bacteria

Samples are to be collected directly into a sterilized glass or polypropylene (or other autoclavable plastic) bottle. All sampling will adhere to methods outlined in Surface Water Field Sampling Manual for Water Quality Parameters and Flow (Ohio EPA, 2018). Bacteria sampling requires that 5 runs must occur in a 90-day period between May 1st to Oct. 31st.

B3 – Sample Handling and Custody

DSW will use Sample Master® to enter information for sample labels and parameters needed for analysis. This system directly connects to the DES Laboratory Information Management System (LIMS) so that the same number can now be used to track a sample from creation of sample runs and labels through DES electronic delivery of data. Sample submission forms are no longer necessary with this new system. Sample labels are transferred via photocopier to label stock that is adhered to sampling containers.

Written SOPs for Sample Master® are available in the Field Manual Appendix IV, Section D, Sample Master® Instruction Manual. This document describes run creation, addition of samples and parameters, labels and chains of custody, QC samples, field data entry/approval, and final approval of sampling results.

B4 – Analytical Methods

The analytical methods to be used in this study are provided in the Appendices - Table 3 along with the containers, preservatives, holding times, and reporting limits. SOPs for the analytical methods are available on the DES intranet site.

B5 – Quality Control

Five percent of the water samples will be submitted to the lab as field duplicates. Field blanks will occur at a minimum of 5 percent of the water samples. Field instruments will be calibrated daily, using manufacturer guidelines and requirements noted in the Field Sampling Manual for Water Column Chemistry, Bacteria and Flows (Ohio EPA 2018).

B6 – Instrument/Equipment Testing and Calibration, Inspection, and Maintenance

The team leaders have operated and maintained most of the equipment to be used during this project for a number of years. The team leaders will inspect the equipment prior to and during the sampling. The

team leaders will ensure that all equipment remains in functional working condition.

The YSI® EXO1 sondes will be calibrated in accordance with standard protocol prior to each day that the equipment is to be used. A standard provided by DES will be used to calibrate conductivity and pH. The oxygen sensor will be calibrated in ambient air. A log book is maintained for each sonde. This log book contains the date of each calibration and standardized pertinent information proving that the device is within specifications. If any of the sonde parameters do not conform to the specifications provided in the standard protocol, the sonde will be repaired or another unit will be used until the sonde is repaired or replaced. The calibration readings as well as the all repairs are entered into the log book.

Other equipment used will follow specifications provided in the biological and habitat methods cited.

B7 – Inspection/Acceptance of Supplies and Consumables

Supplies and consumables will be inspected upon receipt by the field sampling teams. Nearly all of the supplies utilized for this project are maintained and used during the normal business operations of the Ohio EPA. The field team leaders will be responsible to ensure 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. Consumable supplies include sample containers, preservatives, filters and miscellaneous supplies such as distilled water, disposable gloves, and towels. Field personnel will confirm that all reagents are within applicable shelf life.

B8 – Data Management

B8.1 – Chemistry Samples

The data management process is shared by the Division of Surface Water (DSW) and Division of Environmental Services (DES). DSW uses a specially designed program called Ecological Assessment and Analysis Application (EA3) and DES uses an off the shelf Lab Information Management System (LIMS) called Sample Master® for this purpose. These programs are linked together to allow the transfer of information back and forth 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. See Field Manual, Appendix IV, Section B.

Sample Master® is used to schedule and administer the samples that are submitted to DES for analysis. 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.

Field measurements are collected instantaneously using a YSI® EXO1 sonde following the methods described in the Field Manual. The multi-parameter units have an internal file storage system that allows for data to be saved in the field by selecting the correct station from a site list created within the instrument's menu system. Alternatively, parameters can be recorded manually on a paper form. Electronic files are downloaded to an Ohio EPA PC using software supplied by the manufacturer. These files can then be exported to Microsoft Excel and saved on a local or shared network. All agency files are ultimately backed up and housed in the State of Ohio Computer Center (SOCC).

Data files saved in Excel need to be transferred to a table in Sample Master® by the sample collector or delegated data manager. Field data recorded in paper form can also be manually entered into this table. Once entered, the sample collector or data manager validates and approves the results in Sample

Master®. Field and lab chemistry data from a site are paired together based on the lab ID number assigned during the sample order process. Field and lab chemistry data are reviewed and approved by DES before being released and uploaded into EA3. Then, in EA3, the sample collector reviews each data sheet for accuracy, validates field QC and adds comments, qualifiers and edits, if necessary, before approving the sheet. This data is then available for use WQ reports such as the Technical Support Documents.

B8.2 – Biological and Habitat Data Sheets

The original fish, macroinvertebrates and QHEI data sheets are filed at the Groveport Field Office. Data from the field sheets are manually entered into EA3 using the appropriate data entry screen then validated and approved. The sheets are double-entered to eliminate mistakes.

B8.3 – Data management Summary

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

SECTION C: ASSESSMENT AND OVERSIGHT

C1 – During Sampling Assessments/Analysis and Response Actions

C1.1 – Assessments

Periodic assessment of field sites, field equipment, and laboratory equipment is necessary to ensure that sampling goes smoothly and data obtained meets project needs. This is an ongoing process that continues every day on which the project is implemented as well as larger scale assessments that take place less frequently (*e.g.*, annually). The assessments generally will 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) will include assessment of field equipment and supplies, laboratory equipment and supplies, completeness of the day's samples and associated field notes, future needs, etc.

Annual assessments will include reviews of data validation and verification, sample completeness and QA/QC review results, quality system targets and processes, status of project resources. These assessments will be completed by the PI and reported to the Project Manager.

C1.2 – Response Actions

Despite best preparations, assessments may find situations requiring corrective actions (CAs). Small day-to-day level assessment findings are often addressed by the individual doing the assessment in the field or in the lab and are common enough to the process, so as 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) if:

- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or RPD between duplicates

- There are unusual changes in detection limits
- Deficiencies are detected by the laboratory and or project QA officers during any internal or external audits or from the results of performance evaluation samples
- Inquiries concerning data quality are received

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

Lab corrective actions will follow regular laboratory procedures and SOPs. Any lab corrective action with the potential to affect data quality will be conveyed to the PI by the laboratory. The PI will evaluate if data requires any additional qualifiers and/or if it is usable for its originally intended purpose.

Field corrective actions may include troubleshooting malfunctioning meters, replacing dead batteries, other equipment issues, or issues with site access. The need for correcting any of these issues will be minimized to the best of the field staff's ability with ample planning and preparation. However, if equipment fails and is unable to be repaired in the field, sampling will be postponed until the equipment can either be fixed or swapped out with functioning equipment. The Rush Run WAU is a very short distance from the Central District field office, so any potential trip back should not significantly affect the overall length of a field day. Site access issues will be dealt with if they come up. Sites may be relocated if access issues are unable to be resolved.

District staff are also responsible for evaluating field blanks and duplicates in a timely manner and making any corrections or adjustments accordingly to prevent future contamination of samples.

C1.3 – Reporting and Resolution of Issues

Any audits or other assessments that reveal findings of practice or procedure that do not conform to the written QAPP will be corrected as soon as possible. The Study Team and QA Officer will be notified regarding deviations. Management will be contacted as necessary.

C1.4 – Data Completeness

Overall success of the project will require the majority of described sampling resulting in successful useable sample results. 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 – Reports to Management

Biweekly or monthly oral progress reports are to be provided to management on the survey/study and what steps are being taken to resolve any issues or problems. This may include access problems early on that lead to changes of sites and weather or resource problems during sampling. After the samples have been evaluated, the team leader and project biologists will have a meeting to evaluate the use recommendations. An update to the 305(b) statistics will be generated from this meeting, which will be included in the 303(d) assessment as part of the 2020 Ohio Integrated Water Quality Monitoring and Assessment Report.

The 305(b) statistics update included in the 2020 Integrated Report will contain a discussion of the following:

C2.1 – Use Attainment

Attainment/non-attainment of aquatic life uses will be determined by using biological criteria codified in Ohio Administrative Code (OAC) 3745-1-07, Table 7-17. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the basic aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH] were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL if all three indices (or those available) meet the applicable criteria, PARTIAL if at least one of the indices did not attain and performance did not fall below the fair category, and NON if all indices either fail to attain or any index indicates poor or very poor performance.

C2.2 – Stream Habitat Evaluation

Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas. Habitat scores are not used alone for the determination of attainment, rather as support to the biological scores which determine impairment.

C2.3 – Recreational Use Attainment (Bacteria)

Recreational use attainment will be determined using *E. coli* bacteria. *E. coli* is now the primary indicator organism for the potential presence of pathogens in surface water resulting from the presence of untreated human or animal wastes and is the basis for recreational use water quality criteria in Rule 3745-1-37 of the Ohio Administrative Code (OAC). *E. coli* results are compared against the applicable *E. coli* criteria in Table 37-2 to determine recreational use attainment status.

C2.4 – Surface Water Quality

Surface water quality (chemistry) data will be reviewed for any exceedances of the water quality criteria and possible causes of impairment.

C2.5 – Sediment Evaluation

Sediment data will primarily be used as a resource to help determine causes and sources of aquatic life impairment. More detailed follow up studies may be recommended in some instances. To determine the

potential for sediment contaminants to exert adverse effects the data will first be compared to Ohio sediment reference values and consensus-based sediment quality guidelines. This constitutes a Tier I assessment as described in *Guidance on Evaluating Sediment Contaminant Results* (Ohio EPA, 2010). No further assessment is needed if the sediment passes the screening. If not, it is considered above levels of concern and further evaluation is needed using the Tier II process. This process estimates bioavailability using total organic carbon to normalize pollutant concentrations.

SECTION D: DATA VALIDATION AND USABILITY

D1 – Data Review, Verification, and Validation

Data verification will be conducted by the Study Team with assistance from other DSW staff. This process will confirm that sample results received match up with samples submitted and parameters requested from the lab. The process will also result in summaries of any differences between initial sampling and methods planned in the QAPP and final 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 lab (methods changing, containers or equipment breaking), or other reasons. It is also possible that additional sampling would take place as a result of field observations/conditions. Any deviations from the QAPP will be documented by the study leader.

The Division of Environmental Services (DES) laboratory does the initial data review on all data. The Division of Environmental Services laboratory may qualify data based on laboratory QA/QC alone or with feedback from the sampler (regarding specific sampling procedures, variable sampling matrix, conditions, blank contamination, duplicate agreement, matrix spike recovery, etc.). DES points out potential QA/QC issues but leaves much of the final data qualification to the sampler/data user (supposing that data may be useable for some purposes and not for others). The data user can evaluate the data given their knowledge of sampling conditions, expected variability given location and matrix, data uses, etc.

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

D2 – Verification and Validation Methods

Biological and habitat field sampling results will be verified and validated based on field staff experience and qualifications, and adherence to training and QA/QC procedures for current and new field staff available in Subsection 1, Part A (macroinvertebrates) and Subsection 2, Part A (Fish and Habitat) in Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (June 2015, available at: http://epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.aspx).

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

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 (2018, available at: http://epa.ohio.gov/dsw/document_index/docindx.aspx). The information below was adapted from that document. 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.

D2.1 - Data Validation Guidelines for QC and Field Samples

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 of the Field Manual, Data Management. Data Qualifiers are also explained in the manual.

D3 – Reconciliation with User Requirements

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 EAU 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. Data qualifiers applied to sample results by DES at the lab and by samplers in the EA3 system will remain with the analytical results both in EA3 and in STORET/Water Quality Portal when the data is transferred to US EPA. This will reflect limitations of analytical results for current and future users of sampling data. Consideration will also be given on how best to memorialize data limitations or anomalies as the data is transferred to other databases, including the WQ Portal, so that future users of the sampling data are aware of any data quality issues or limitations.

APPENDIX

Figure 2. Rush Run Sampling Location Site Map.

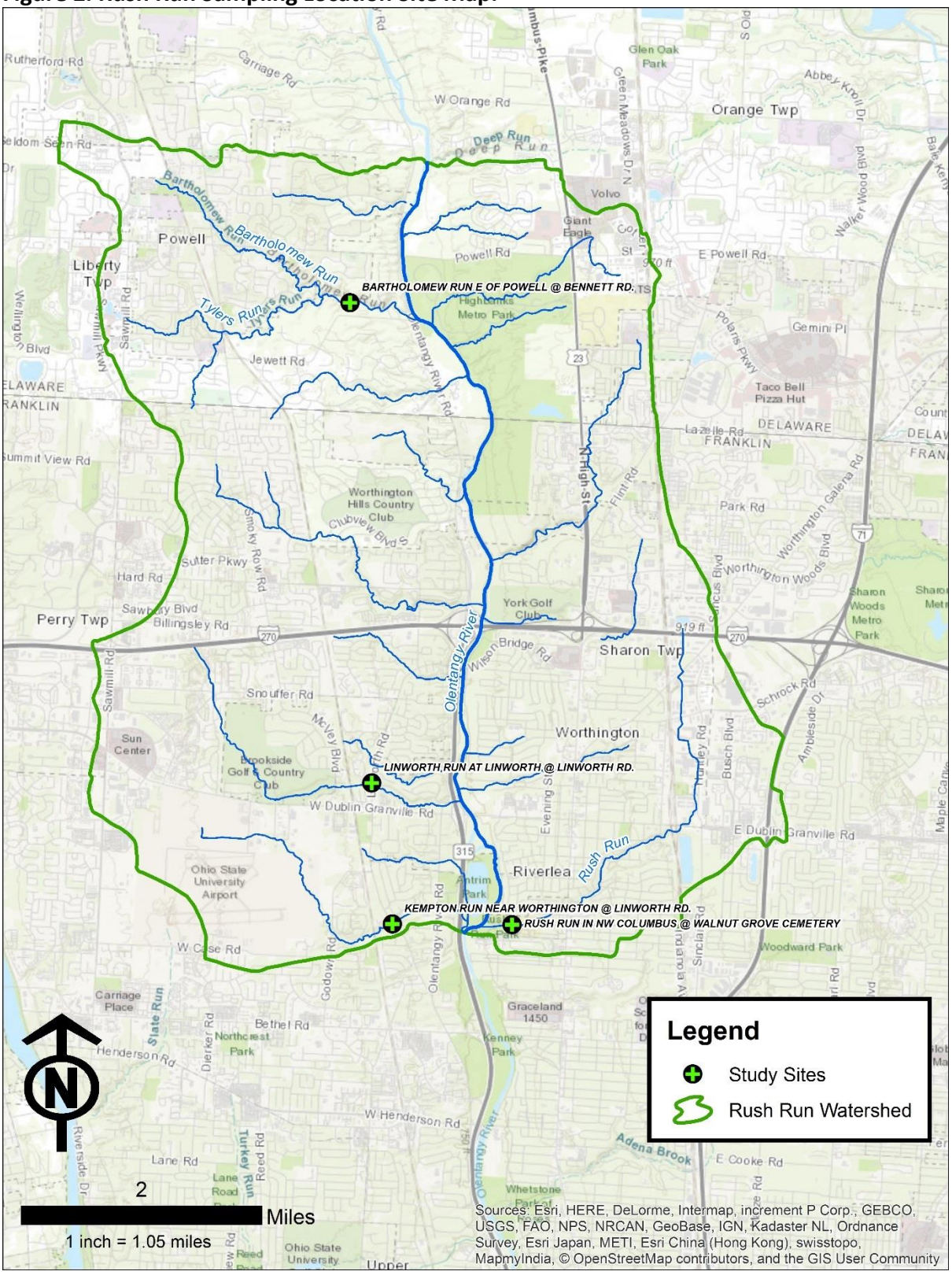


Table 5. Summary of Sampling Effort.

Type of sample	# Sites	# Passes	Total #
	Biological Communities		
Fish (Headwater)	4	1	4
Macroinvertebrate (Qualitative)	4	1	4
	Water Chemistry		
Conventional (Inorganic Samples)	4	5	20
	Sediment		
Metals (Selected)	4	1	4
PCB's and Semivolatiles (BNA)	4	1	4
	Bacteria		
E. coli cultures	4	5	20

Table 6. Streams, Sampling Locations, and Sampling Types.

Station ID	Site Name (as in EA3)	RM	DA	Sampling Type	Lat	Long	County
V04Q17	Kempton Run near Worthington at Linworth Road	0.83	1.50	C, B, Sd, Mq, F	40.076157	-83.046225	Franklin
V04Q18	Linworth Run at Linworth at Linworth Road	0.90	2.70	C, B, Sd, Mq, F	40.093163	-83.049608	Franklin
V04P15	Rush Run in NW Columbus at Walnut Grove Cemetery	0.28	1.80	C, B, Sd, Mq, F	40.076164	-83.027407	Franklin
201450	Bartholomew Run E of Powell at Bennett Road	0.70	3.60	C, B, Sd, Mq, F	40.151163	-83.053508	Delaware

B-bacteria sampling *F-single pass fish sampling* *N-nutrient sampling*
C-chemistry sampling *F2-two pass fish sampling* *Sd-sediment sampling*
FT-fish tissue sampling *Sn-sentinel site*
MQ-macroinvertebrate quantitative *Mq-marcoinvertbrate qualitative sampling*

Table 7. List of chemical/physical water quality parameters to be analyzed/measured in surface water and sediment from the Rush Run-Olentangy River WAU, 2018.

Parameters	Test Method	Holding Time	Water (RL)	Sediment (RL)
Alkalinity	USEPA 310.1	14 days	X (5 mg/l)	
Solids, Dissolved (TDS)	SM 2540C	7 days	X (10 mg/l)	
Solids, Suspended (TSS)	SM 2540D	7 days	X (5 mg/l)	
Ammonia-N	USEPA 350.1	28 days	X (0.05 mg/l)	X
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	28 days	X (0.2 mg/l)	
Nitrate-Nitrite	USEPA 350.1	28 days	X (0.5 mg/l)	
Nitrite	USEPA 353.2	48 hours	X (0.02 mg/l)	
Chloride	USEPA 325.1	28 days	X (5 mg/l)	
Chemical Oxygen Demand (COD)	USEPA 410.4	28 days	X (20 mg/l)	
Sulfate	USEPA 375.2	28 days	X (10 mg/l)	
Total Phosphorus	USEPA 365.4	28 days	X (0.01 mg/l)	X (50 mg/kg)
Orthophosphate (as P)	USEPA 365.1	28 hours	X (0.01 mg/)	
ICP 1 (Al, Ba, Ca, Fe, Mg, Mn, Na, K, Sr, Zn, Hardness)	USEPA 200.7	6 months	X	
ICPMS 1 (As, Cd, Cr, Cu, Ni, Pb, Se)	USEPA 200.8	6 months	X	
pH	OEPA 120.2/Field Meter	n/a	X	X
Conductivity	SM 2510B/Field Meter	n/a	X	
Dissolved Oxygen (mg/l and % saturation)	Field Meter	n/a	X	
Temperature	Field Meter	n/a	X	
E. coli	USEPA 1603	8 hours	X	
ICP 3 (Al, Ba, Ca, Fe, Mg, Mn, Na, K, S, Zn)	USEPA 200.7	6 months		X
ICPMS 5 (As, Be, Cd, Co, Cr, Cu, Ni, Pb, Se)	USEPA 6020A	6 months		X
Sr, Ti, Vn	USEPA 200.7	6 months		X
Percent Solids	SM 2540G	7 days		X
Total Organic Carbon	OEPA 335.4	28 days		X (0.1%)
Mercury	USEPA 7471A	1 year		X
PCBs	OEPA 590.1	14 days (sed)		X
Pesticides	OEPA 590.1	14 days (sed)		X
BNA Organics (SVOCs)	USEPA 8270	14 days (sed)		X

Table 8. Safety Contacts and Hospital Locations.

Safety:	
ODNR Wildlife Officers:	**County Sheriff Offices:**
Franklin County – Brad Kiger (614) 902-4212 Delaware County – Maurice Irish (614) 902-4221	Franklin County – (614) 525-3360 Delaware County – (740) 833-2810
Hospitals:	
Franklin County:	**Delaware County:**
OhioHealth Riverside Methodist Hospital 3535 Olentangy River Road Columbus, OH 43214 (614) 566-5000	Westerville Medical Campus 300 Polaris Parkway Westerville, OH 43082 (614) 533-3000

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Ohio Watershed Data website: **http://www.watersheddata.com/Default.aspx**

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