

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATER MONITORING AND STANDARDS
BUREAU OF FRESHWATER AND BIOLOGICAL MONITORING
P.O. Box 420; TRENTON, NEW JERSEY 08625
QUALITY ASSURANCE PROJECT PLAN

National Water Quality Initiative (NWQI), Upper Salem River Watershed Monitoring,
Year 7, 2021

Project Officer:	<i>Ismail Sukkar</i>	7/1/21
		Date
	Ismail Sukkar, Environmental Specialist 1 NJDEP Bureau of Freshwater and Biological Monitoring (BFBM)	
Project Supervisor:	<i>Dean Bryson</i>	7/6/21
		Date
	Dean Bryson, Environmental Specialist 4 NJDEP Bureau of Freshwater and Biological Monitoring (BFBM)	
Project Data Manager:	<i>Leigh Lager</i>	7/14/21
		Date
	Leigh Lager, GIS Specialist 1 NJDEP Bureau of Freshwater and Biological Monitoring (BFBM)	
Approved by:	<i>Melissa D.M. Hornsby</i>	9/22/21
		Date
	Melissa Hornsby, Administrative Analyst 3 NJDEP Bureau of Quality Assurance and Environmental Monitoring	
Approved by:	<i>Victor Poretti</i>	7/8/21
		Date
	Victor Poretti, Bureau Chief NJDEP Bureau of Freshwater and Biological Monitoring (BFBM)	
Reviewed by:	<i>Frank Klapinski</i>	8/25/21
		Date
	Frank Klapinski, Environmental Scientist 3 NJDEP Bureau of Environmental Assessment, Restoration, and Standards (BEARS)	

Table of Contents

1.0	Project Name
2.0	Requesting Agencies
3.0	Date of Project
4.0	Project Fiscal Information
5.0	Project Oversight
6.0	Special Training Needs/Certification
7.0	Project Description/Objective
8.0	Data Usage
9.0	Monitoring Design/Site Selection
10.0	Parameters and Sampling Procedures
11.0	Data Quality/Quality Control Requirements
12.0	Macroinvertebrate Identification
13.0	Resource Needs
14.0	Sampling Frequency and Schedule
15.0	Quality Assurance
16.0	Data Analysis
17.0	Data Validation
18.0	Performance System Audits
19.0	Data Storage and Distribution
20.0	Data Reporting
21.0	Corrective Action
22.0	References

Attachments:

Appendix A Data Management Tables

Table 1	Site Locations
Table 2	Sample Types
Table 3	Partners
Table 4	Field Parameters
Table 5	Chemical Parameters
Table 6	Laboratory Worksheet
Table 7	Habitat Assessment Parameters
Table 8	Habitat Assessment Metrics
Table 9	Individual Index Metrics
Table 10	Overall Index Metrics
Table 11	Data Inventory Supplement
Table 12	Data Management Supplement

Appendix B Map of Sites

Appendix C NJDOH Laboratory Submittal/Chain-of-Custody Forms

1.0 Project Name: National Water Quality Initiative (NWQI), Upper Salem River Watershed Monitoring, Year 7, 2021

2.0 Requesting Agencies: The United States Environmental Protection Agency (USEPA) and The United States Department of Agriculture's (USDA) National Resources Conservation Service (NRCS)

3.0 Date of Project: August-November 2021

4.0 Project Fiscal Information: 35950000

5.0 Project Oversight:

Project Officer: Ismail Sukkar, NJDEP-BFBM, Ismail.Sukkar@dep.nj.gov

Project Supervisor: Dean Bryson, NJDEP-BFBM, Dean.Bryson@dep.nj.gov

Project Data Manager: Leigh Lager, NJDEP-BFBM, Leigh.Lager@dep.nj.gov

Quality Assurance Officer: Melissa Hornsby, NJDEP-OQA, Melissa.Hornsby@dep.nj.gov

6.0 Special Training Needs/Certification

All personnel assisting with field sampling and/or laboratory processing of samples for this project will be trained on all applicable methods and techniques, including sample collection, handling, and documentation. Sample collection and handling will conform to the "NJDEP Field Sampling Procedures Manual" (2005) and the requirements of the respective analytical method. For physical/ chemical analysis, the training will entail calibration of meters, deployment techniques, and data retrieval from the equipment. For benthic macroinvertebrate sampling, training includes proper method for benthic macroinvertebrate sample collection, preservation, and performing habitat assessment and field observations. Training in the laboratory for analysis of benthic macroinvertebrates will include sample processing and sorting. Only designated, experienced, full-time staff will perform taxonomic identifications. The Project Officer or designee will be responsible for any necessary training.

Safety training and safety requirements will comply with Bureau of Freshwater and Biological Monitoring Field Work Health and Safety Plan (HASP) Version #2 August 2019.

BFBM is certified by the NJDEP-Office of Quality Assurance (certified lab ID # 11896) for all physical/chemical parameters to be measured.

7.0 Project Description/Objective

The National Water Quality Initiative (NWQI) is a joint project of the USEPA and the USDA. The USDA's National Resources Conservation Service (NRCS) is providing financial assistance to farmers and ranchers throughout the Nation to implement conservation practices aimed at reducing nutrients, sediment, and pathogens in rivers and streams from agricultural lands. Initially, three watersheds (HUC12s) were selected in New Jersey to receive this funding. With USEPA guidance, one of these watersheds, the Upper

Salem River, was selected to receive focused monitoring, conducted by NJDEP-BFBM, to assess the effectiveness of these conservation practices in the watershed. The lag time between implementation of these practices and detecting measurable change in nutrients, pathogen, and/or sediment parameters is expected to be 5-7 years. The monitoring design will be re-assessed, and a new QAPP prepared each year, to ensure the effectiveness of conservation practices is being measured adequately. This QAPP is for Year 7 of the monitoring, which began in 2015.

8.0 Data Usage

Water quality and biological data obtained will be used by NJDEP and NRCS to assess whether water quality and/or biological condition related to nutrients, sediment, or pathogens has changed in the watershed, and if the change can be associated with implemented agricultural conservation practices (Best Management Practices, BMPs). Parameters selected were based on technical guidance received from Tetra Tech, Inc., contracted by USEPA for this project, via the Technical Memorandum in 2014: “Monitoring Design and Application of the CPMI, Upper Salem River, NJ.”

9.0 Monitoring Design/Site Selection

NRCS provided NJDEP the type and acreage of conservation practices funded in watershed in 2013 and 2014, in the Upper Salem River waters, by nearest stream reach. Data collected by the Rutgers Cooperative Extension (RCE) as part of a watershed restoration and protection plan in the Upper Salem River watershed was utilized as pre-BMP implementation data (RCE, 2012). Sites were selected in subwatersheds where RCE data or historic data indicated elevated nutrients, bacteria, TSS, and/or biological impairment, and where the type of conservation practice being implemented, such as cover crops, was known to have a positive effect on water quality, in particular sediment and nutrient concentrations. Monitoring sites were placed at locations upstream and downstream of conservation practices, at both a watershed scale and sub-watershed scale, to bracket areas with BMPs, and therefore, improve the ability to detect changes in pollutant levels.

After 2019, NJDEP and NRCS met to review and discuss data collected to date. Based on these discussions, and evaluation of monitoring sites with respect to current and planned conservation practices in the watershed by NRCS, these sites were determined to be adequately situated to assess critical source areas. Also, an additional site, BA70, to better assess the NWQI watershed at the HUC12 scale, was added in 2020.

01482455, Salem River @ Pole Tavern Rd. (Rt. 77), Upper Pittsgrove Twp.
AN0690, Salem River @ Rt. 581 (Commissioner’s Road), Upper Pittsgrove Twp.
BA74, UNT to Salem River @ Rt. 615, Pilesgrove Twp.
BFBM000239, UNT to Salem River @ Rt. 40, Pilesgrove Twp.
BFBM000240, UNT to Salem River @ Rt. 581, Upper Pittsgrove Twp.
BA73, UNT to Salem River @ Renter Road, Pilesgrove Twp.
AN0691, Salem River @ Mill St. (outlet of Memorial Lake), Woodstown Borough
AN0692, Nichomus Run @ Rt. 45, Pilesgrove Twp.
AN0693, Salem River @ Kings Highway, Pilesgrove Twp.

BA70, Salem River @ Courses Landing, Mannington Twp.

All positions were logged into the Geographic Information System (GIS). A hand-held GPS unit will be used to confirm correct locations at the time of sampling.

10.0 Parameters and Sampling Procedures

Physical/Chemical Parameters

All parameters will be collected and/or measured as per requirements and procedures outlined in N.J.A.C. 7:18 (as amended 2017) and NJDEP Field Sampling Procedures Manual (NJDEP, 2005). For water column samples, a single grab sample will be collected at all locations where the stream width is six feet or less. At sampling locations with a width greater than six feet, water column samples will be collected using the Equal Width Increment (EWI) sampling method to obtain cross-sectional composite samples. A minimum of 4 subsurface grab samples of equal volume (i.e., quarter points) equaling 500ml will be collected at equidistant points across the stream. Horizontal intervals will be at least one foot wide. These grab samples will be composited in a 2-liter container; from which the 500ml will be transferred as the sample bottles (See section 14). A dedicated large volume container will be assigned to each sample location.

Nutrient samples (Total Phosphorus, Total Kjeldahl Nitrogen (TKN), and Nitrite-Nitrate) will be preserved in the field with sulfuric acid to pH <2, and then stored cold (<4°C) until delivery to the analytical laboratory. Nitrite-only and Total Suspended Solids (TSS) samples are required to be stored cold (<4°C), with no additional preservative.

Bacteriological samples (*E. coli*) will be collected as center-of-flow grab samples, into a single-use bacteriology bottle, as outlined in the Field Sampling Procedures Manual (NJDEP, 2005), stored on ice (<10°C).

Field readings for analyze-immediately parameters (dissolved oxygen, pH, specific conductivity, water temperature, and turbidity) will be made at each site during each sampling event. BFBM (#11896) is certified by NJDEP's OQA to perform these analyze-immediately parameters. All analyze-immediately measurements will be made concurrent with all water column or benthic macroinvertebrate sample collections.

All sampling devices used to collect water quality samples for the parameters listed will be cleaned as thoroughly as possible between each use using a 1% solution of lab detergent (Liquinox) and deionized water. Once thoroughly cleans, each container shall be rinsed with deionized water three times to ensure no residual soap or other contaminants remain in the container. All equipment cleaning will be performed at BFBM's preparation laboratory.

Macroinvertebrate Sampling

Benthic macroinvertebrates will be sampled once for this project by BFBM at all sites during the Fall season, except BA70 which is not wadeable. Streams of the Coastal Plain

of New Jersey typically lack riffle/run habitat. Therefore, sampling will focus on the most productive habitats present in these low gradient streams- submerged vegetated banks, macrophytes (rooted aquatic plants), and submerged snags (logs and branches) (Standard Operating Procedure, NJDEP, 2007). A 800x900µm mesh D-frame net will be used to collect samples, using the “jab and sweep” method (Maxted *et al.*, 2000). Approximately one liter of sample will be collected into a re-usable one-liter wide-mouth plastic container (thoroughly rinsed three times between uses to remove contaminants) and preserved on site using a 5-10% formalin solution. The net will be rinsed after sampling in the stream, and examined adhering organisms. Specimens fixed with formalin will remain preserved indefinitely.

For Quality Control, a duplicate macroinvertebrate sample will be taken at an adjacent reach at approximately 10% of the samples. The results from the primary sample will be reported and the duplicate result will only be used to provide precision estimates of the individual metrics and overall index scores and ratings (Stribling *et al.*, 2008b).

Habitat Assessment

A visual-based habitat assessment will be performed at each site concurrent with the collection of the benthic macroinvertebrate sample, using the format given in USEPA’s Rapid Bioassessment Protocols for Use in Streams and Rivers, second edition (USEPA,1999) for low gradient streams. This method, which assesses 10 different in-stream and riparian zone parameters, is tabulated for each site. Based on the score, the habitat is rated as optimal, suboptimal, marginal, or poor. The stream reach sampled plus the immediate upstream area which can be adequately observed, will be assessed using the respective protocol. The habitat assessment scores and rating will be presented along with the index score and rating. These habitat scores and ratings do not factor into the calculation of the index scores, but are collected as additional information in the assessment of sampling results, along with photographs and observations.

Field Precautions for Aquatic Invasives

To prevent the potential spread of nuisance or invasive aquatic organisms such as *Didymosphenia* sp. from stream to stream, all nets, waders, etc. will be decontaminated in the field between sites by spraying with a commercial disinfectant cleaner and rinsing with tap water. The Bureau has discontinued use of felt bottom waders.

11.0 Data Quality/Quality Control Requirements

Water temperature, pH, specific conductivity, and dissolved oxygen (DO) will be measured using a Hydrolab MS5, or equivalent water quality meter(s). The Hydrolab MS5 is a multi-parameter water quality meter that combines temperature, pH, specific conductivity and DO probes into one device that is submersible to the desired depth. All equipment will be calibrated, maintained, and used following manufacturer's instructions and in accordance with the specifications given in N.J.A.C. 7:18-3 and 7:18-8 (NJDEP, as amended September, 2018).

Conductivity: This probe is calibrated each day of use with a certified standard whose concentration is in the expected sample range. If calibrations are not in valid range a substitute meter would be used that passed the calibration. Calibration records are maintained, signed and dated by the sampler in the BFBM field logbook.

Dissolved Oxygen: A Winkler check is performed on a weekly basis and the meter is barometrically calibrated once on day of use. Calibration records are maintained, signed and dated by the sampler in the BFBM field logbook.

pH: The probe is calibrated each day of use with two certified buffers that bracket the expected range of the value being measured. A third certified pH buffer, within the bracket, is then used to check the calibration. After three hours of continuous use, the pH of the third certified buffer will be checked. Calibration records are maintained, signed and dated by the sampler in the BFBM field logbook.

Temperature: The probe is calibrated with a NIST-certified thermometer on a quarterly basis. Records of the calibration shall be maintained by the BFBM.

Turbidity: HACH Model 2100P turbidimeter is calibrated quarterly per manufacturer recommendations. The meter is then checked with certified standards for accuracy within the calibration range during each day of use. Records of all calibrations and calibration checks shall be maintained in the BFBM field logbook.

Barometer: Thommen TX Mechanical Barometer or equivalent instrument.

Chain of Custody

Chain of custody procedures will be followed for all samples submitted to an analytical laboratory. No chain of custody will be used for the benthic macroinvertebrate samples, and data for this project will not be used for regulatory purposes.

12.0 Macroinvertebrate Identification

Macroinvertebrate Identification

Macroinvertebrate samples will be processed and identified in the BFBM Biomonitoring Laboratory. A 100-organism subsample will be randomly sorted from each sample, as described in USEPA (1999); all individuals will be identified to the lowest possible taxonomic level (usually genus or species). Only designated, experienced, full-time staff will perform taxonomic identifications. A thorough program for taxonomic quality control, as given in the Biomonitoring laboratory Standard Operating Procedures (SOP) is practiced (NJDEP, 2007). A comprehensive collection of over 50 major references (including books and monographs), by recognized experts in invertebrate taxonomy, is maintained in the laboratory; new references are added when appropriate to keep abreast of taxonomic advances.

For verification, 10% of the samples are sent to an outside qualified consultant for parallel identifications. Results of the parallel identifications will be analyzed by calculating the Percent Taxonomic Disagreements (%PTD), using procedure defined by Stribling *et al.*, 2008a. The goal is less the 15% disagreements.

Equipment for Macroinvertebrate Identification

Macroinvertebrates will be identified using a stereomicroscope capable of up to 40x magnification. The Biomonitoring laboratory uses Leica Model MZ6 stereomicroscopes, each with fiber optic illumination. A compound microscope with 100x, 200x, 400x, and 1000x magnification will be used for very detailed identifying features. The biomonitoring laboratory currently uses Leica models DMLS (with phase contrast) and DME.

13.0 Resource Needs

BFBM will utilize two full-time and two hourly personnel for collection of the water column samples and field measurements. One full-time and one hourly personnel will be utilized in collection and analysis of the benthic macroinvertebrate samples.

14.0 Sampling Frequency and Schedule

The target frequency of physical/chemical monitoring will be 6 times between August and October 2021, with 2 weeks between sampling events. Sampling at BA70 will be twice over the sampling season- once at beginning and one at end. Sampling will take place at ambient flow conditions (non-flooding). All sites (except BA70) will be sampled once for benthic macroinvertebrates during the Fall season.

15.0 Quality Assurance

Laboratory Analysis

The New Jersey Department of Health (NJDOH) Public Health and Environmental Laboratories (#11036), West Trenton, NJ, will be utilized for the analysis of all water column samples. The NJDOH laboratory is certified by NJDEP-OQA for the requested parameters and methods.

Parameter	Laboratory	Method	Reporting Level (mg/L)	Holding Time	Preservative
Nitrite + Nitrate	NJDOH	SM 4500-NO3-F	0.012	28 days	pH<2, Ice to 4°C
TKN	NJDOH	EPA 351.2	0.100		
Nitrite	NJDOH	SM 4500-NO3-F	0.012	48 hours	Ice to 4°C
Total Phosphorus	NJDOH	SM 4500-P B5-11+ E11	0.010	28 days	pH<2, Ice to 4°C
TSS	NJDOH	SM 2540-D	1.0	7 days	Ice to <6°C
<i>E. coli</i>	NJDOH	SM 9223-B	1 MPN/100 ml	8 hours	Ice to <10°C

Sample Containers

Sample containers shall be dedicated single-use, of suitable volume, provided by NJDOH.

Chain of Custody

Chain of Custody (COC) forms are required for all samples submitted to the New Jersey Department of Health (NJDOH) laboratory.

16.0 Data Analysis

Macroinvertebrates

Macroinvertebrate samples will be sorted and identified by BFBM staff. The Coastal Plain Macroinvertebrate Index (Maxted et al., 2000), re-scaled to a 100-point scale (CPMI 100), will be used to assess the benthic macroinvertebrate community. Based on the index score, a rating is assigned, Excellent, Good, Fair, and Poor. Detailed methods for analysis are outlined in the biomonitoring laboratory Standard Operating Procedures (SOP).

<u>Assessment Rating</u>	<u>CPMI 100 Score</u>
Excellent	≥ 75
Good	41-<75
Fair	21-<41
Poor	<21

Physical/ Chemical and Bacteriological

All chemical and bacteriological samples will be analyzed by New Jersey Department of Health (NJDOH) laboratory for the requested parameters. The reporting levels listed in Section 15.0 are required for this project.

17.0 Data Validation

The Project Officer is responsible for data validation. If apparent anomalous data is suspected, the Project Officer will review the sampling procedures with the field sampler to make sure the proper collection and preservation procedures were followed. If the data is still suspect, an internal review of the laboratory procedures and/or calculations used in the analysis of the suspect sample, with special emphasis on transcription of data to assure that no transposition of figures occurred will be conducted. If no problems are found in the laboratory procedures, the data may then be compared to any historical data that might have been collected at the same site prior to the most recent sampling event to see if similar anomalies might have been found previously. The suspect data may also be compared to literature values or standard analytical treatises to verify whether the results are within the limits of accuracy of the test method.

If no obvious problems are found after these reviews, the complete data set will be reported with the suspect data identified as it relates to the objective(s) and data accuracy required in this project.

18.0 Performance System Audits

BFBM is subject to audits and guidelines of the NJDEP-OQA's Laboratory Certification Program as well as internal performance evaluations.

19.0 Data Storage and Distribution

All field measurements will be recorded in a field logbook and transferred into a Microsoft Access database, along with site location, date, time, and sampler's name. All habitat assessment data, and site observations collected will be recorded on the BFBM's Biological Field Observations and Data Sheet, and transferred into a Microsoft Access database. All macroinvertebrate identifications and counts will be recorded on the BFBM's Macroinvertebrate Laboratory Data Sheet. Macroinvertebrate taxonomic data and counts, along with metric and index scores and ratings will be stored in a Microsoft database.

Following validation by the project officer, all data and results will be uploaded into USEPA's Water Quality Exchange (WQX) by June of the year following validation.

All field measurements, analytical results, habitat assessment parameters, and taxonomic identifications/counts will be available for download from the Water Quality Portal (waterqualitydata.us).

All raw data records shall be maintained for a period of no less than five years.

20.0 Data Reporting

As requested, updates will be provided to NRCS and USEPA's National Nonpoint Source Program.

21.0 Corrective Action

The Project Officer will be responsible for the oversight of all activities related to this project. The Project Officer will assess field collection functions and make corrections when necessary to maintain the data accuracy as defined in this plan. If any changes or modifications are made to this plan regarding data collection, as it relates to the objective(s) and data accuracy required in this project, all original signees of the QAPP will be notified.

22.0 References

Maxted, J.R., M.T. Barbour, J. Gerritsen, V. Poretti, N. Primrose, A. Silvia, D. Penrose, and R. Renfrow, 2000. Assessment framework for mid-Atlantic coastal streams using benthic macroinvertebrates. Journal of North American Benthological Society, 19(1):128-144.

NJDEP, 2005. Field sampling procedures manual. NJDEP, Trenton, NJ. 360pp.

NJDEP, amended 2015. Regulations governing the certification of laboratories and environmental measurements. N.J.A.C. 7:18. NJDEP. Trenton, NJ.

NJDEP, 2007. Standard operating procedures (SOP) for the ambient biological monitoring using benthic macroinvertebrates. Doc.#BMNJ2, NJDEP, BFBM. Trenton, NJ. www.state.nj.us/dep/wms/bfbm/download/AMNET_SOP.pdf

RCE, 2012. Upper Salem River watershed restoration and protection plan. Rutgers Cooperative Extension, 103 p.

Stribling, J.B., K.L. Pavlik, S.M. Holdsworth, E.W. Leppo, 2008a. Data quality, performance, and uncertainty in taxonomic identification for biological assessments. J. N. Am. Benth. Soc. 27(4):906-919.

Stribling, J.B., B.K. Jessup, and D.L. Feldman, 2008b. Precision of benthic macroinvertebrate indicators of stream condition in Montana. J.N. Am. Benthol. Soc. 27(1):58-67.

USEPA, 1999. Rapid bioassessment protocols for use in streams and rivers: periphyton, benthic macroinvertebrates, and fish. Second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency. Washington, D.C. Ch. 1-11 and appendices.

Tetra Tech, 2014. Monitoring Design and Application of the CPMI, Upper Salem River, NJ in a Technical Memorandum from Tetra Tech, dated 6/18/2014.

Appendix A Data Management Tables

For Data Management purposes, Water Chemistry is defined as parameters analyzed by a laboratory; Field measurements are defined as analyze-immediately parameters.

Table 1 Site Locations

Station ID(WQDE compliant and referenced)	Waterbody/Location	Latitude-dd	Longitude-dd	County	Site exists in WQDE already?	Location Type
01482455	Salem River @ Pole Tavern Rd. (Rt. 77)	39.60261294	-75.2376872	Salem	YES	River/stream
AN0690	Salem River @ Rt. 581 (Commissioner's Road)	39.62158086	-75.2682052	Salem	YES	River/stream
BA74	UNT to Salem River @ 615	39.62670062	-75.2913017	Salem	YES	River/stream
BFBM000239	UNT to Salem River @ Rt. 40	39.63885035	-75.2762913	Salem	YES	River/stream
BFBM000240	UNT to Salem River @ Rt. 581	39.64426795	-75.2518797	Salem	YES	River/stream
BA70	Salem River @ Courses Landing	39.66100	-75.40940	Salem	YES	River/Stream
BA73	UNT to Salem River @ Renter Rd.	39.63439956	-75.2822994	Salem	YES	River/stream
AN0691	Salem River @ Mill St (outlet of Memorial Lake)	39.64360289	-75.3303988	Salem	YES	River/stream
AN0692	Nichomus Run @ Rt. 45	39.63952437	-75.349233	Salem	YES	River/stream
AN0693	Salem River @ Kings Highway	39.65275957	-75.3680551	Salem	YES	River/stream

Table 2 Sample Types

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection	Habitat	Metrics	Indices
01482455	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
AN0690	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
BA74	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
BFBM000239	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
BFBM000240	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
BA70	YES	NO	YES	NO	NO	NO	YES	NO	NO	NO
BA73	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
AN0691	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES

AN0692	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES
AN0693	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES

Table 3 Partners

STATION ID	Field Msr/Obs	Flow	Water Chemistry	Continuous Monitoring	Biological Sampling	Sediment Collection	Bacteria Collection
01482455	DEP	NO	DEP	NO	DEP	NO	DEP
AN0690	DEP	NO	DEP	NO	DEP	NO	DEP
BA74	DEP	NO	DEP	NO	DEP	NO	DEP
BFBM000239	DEP	NO	DEP	NO	DEP	NO	DEP
BFBM000240	DEP	NO	DEP	NO	DEP	NO	DEP
BA70	DEP	NO	DEP	NO	NO	NO	DEP
BA73	DEP	NO	DEP	NO	DEP	NO	DEP
AN0691	DEP	NO	DEP	NO	DEP	NO	DEP
AN0692	DEP	NO	DEP	NO	DEP	NO	DEP
AN0693	DEP	NO	DEP	NO	DEP	NO	DEP

Table 4 Field Parameters

Field Name	WQDE Name	Media	Units
DO	Dissolved oxygen (DO)	Water	mg/l
Water Temp	Temperature, Water	Water	° C
Spec Cond	Specific conductance	Water	µS/cm
pH	pH	Water	None
Turbidity	Turbidity	Water	NTU

Table 5 Chemical Parameters (Analyzed by the NJDOH)

Analysis (lab name)	EPA Characteristic Name	Method Speciation Name	Result Sample Fraction	Result Measure Unit	Result Value Type	Sample Collection Type	Sample Collection Equipment
Nitrite + Nitrate as N	Inorganic nitrogen (nitrate and nitrite)	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
Nitrite as N	Nitrite	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
Nitrogen, Nitrate by Calculation	Nitrate	as N	Total	mg/l	Calculated	Grab	Water Sampler (Other)
Total Kjeldahl Nitrogen	Kjeldahl nitrogen	as N	Total	mg/l	Actual	Grab	Water Sampler (Other)
E. Coli	Escherichia coli			#/100ml	Actual	Grab	Water Sampler (Other)
TSS	Total suspended solids		Total	mg/l	Actual	Grab	Water Sampler (Other)

Table 6 Laboratory Worksheet

Parameter	Laboratory	Lab Number	Method	Method ID Context	Lower Reporting Limit	units	Method Detection Limit	units	Upper Reporting Limit	units	Holding Time	Preservative
Nitrite + Nitrate	NJDOH	11036	4500-NO3(F)	SM	0.012	mg/l	0.00487	mg/l			28 days	pH<2, Ice to 4°C
Nitrite	NJDOH	11036	4500-NO3(F)	SM	0.012	mg/l	0.00487	mg/l			48 hours	Ice to 4°C
TKN	NJDOH	11036	351.2	USEPA	0.1	mg/l	0.046	mg/l			28 days	pH<2, Ice to 4°C
Total Phosphorus	NJDOH	11036	365.1	USEPA	0.01	mg/l	0.00553	mg/l			28 days	pH<2, Ice to 4°C
TSS	NJDOH	11036	2540-D	SM	1.0	mg/l	1.0	mg/l			7 days	Ice to <6 °C
E. coli	NJDOH	11036	Colilert-04	SM	1 MPN/100ml				241,960	MPN/100ml	8 hours	Ice to <10 °C

Table 7 Habitat Assessment Parameters

Code	Name	Description
HAB_0221	RBP2, Low G, Bank Stability, Left Bank	RBP2, Low G, Bank Stability, Left Bank (choice list)
HAB_0222	RBP2, Low G, Bank Stability, Right Bank	RBP2, Low G, Bank Stability, Right Bank (choice list)
HAB_0223	RBP2, Low G, Channel Alteration	RBP2, Low G, Channel Alteration (choice list)
HAB_0224	RBP2, Low G, Channel Flow Status	RBP2, Low G, Channel Flow Status (choice list)
HAB_0225	RBP2, Low G, Channel Sinuosity	RBP2, Low G, Channel Sinuosity (choice list)
HAB_0226	RBP2, Low G, Epifaunal Substrate/Available Cover	RBP2, Low G, Epifaunal Substrate/Available Cover (choice list)
HAB_0228	RBP2, Low G, Pool Substrate Characterization	RBP2, Low G, Pool Substrate Characterization (choice list)
HAB_0229	RBP2, Low G, Pool Variability	RBP2, Low G, Pool Variability (choice list)
HAB_0230	RBP2, Low G, Riparian Vegetative Zone Width, Left Bank	RBP2, Low G, Riparian Vegetative Zone Width, Left Bank (choice list)
HAB_0231	RBP2, Low G, Riparian Vegetative Zone Width, Right Bank	RBP2, Low G, Riparian Vegetative Zone Width, Right Bank (choice list)
HAB_0232	RBP2, Low G, Sediment Deposition	RBP2, Low G, Sediment Deposition (choice list)
HAB_0233	RBP2, Low G, Vegetative Protection, Left Bank	RBP2, Low G, Vegetative Protection, Left Bank (choice list)
HAB_0234	RBP2, Low G, Vegetative Protection, Right Bank	RBP2, Low G, Vegetative Protection, Right Bank (choice list)

Table 8 Habitat Assessment Metrics

Code	Name	Description
HAB_0227	RBP2, Low G, habitat assessment total score	RBP2, Low G, habitat assessment total score
HAB_0241	RBP2, Low G, habitat assessment total rating	RBP2, Low G, habitat assessment total rating

Table 9 Individual Index Metrics

Code	Name	Description
CPMI_001	Total number of taxa	Total number of taxa
CPMI_002	Ephemeroptera taxa	Ephemeroptera taxa
CPMI_003	Percent Ephemeroptera taxa	Percent Ephemeroptera taxa
CPMI_004	Percent Clingers	Percent Clingers
CPHGMIG_001	Hilsenhoff Biotic Index	Hilsenhoff Biotic Index

Table 10 Overall Index Metrics

Code	Name	Description
COASTAL	Coastal Plain Macroinvertebrate Index	Coastal Plain Macroinvertebrate Index
CPMIR	CPMI Rating	CPMI Rating

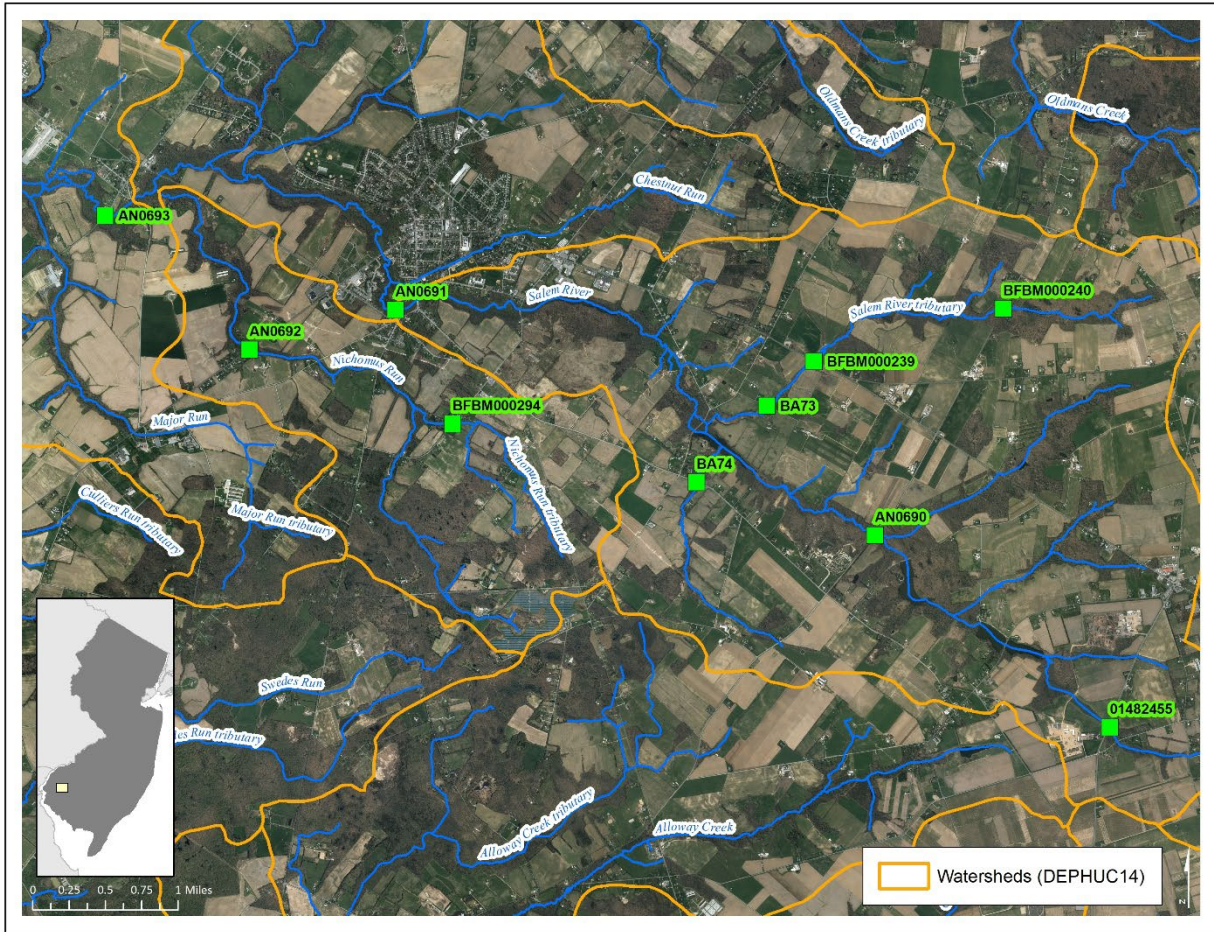
Table 11 Data Inventory Supplement

Geographic Regions	Maurice, Salem and Cohansey
Counties	Salem
Dates	August 1-November 30, 2021
Status	In progress-discrete
Sample Frequency	Periodic
Seasons Sampled	Summer; Fall;
Waterbody Type	River/Stream
Salinity Category	Fresh
Tidal Influence	Non-Tidal
Project Description	The United States Department of Agriculture's (USDA) National Resources Conservation Service (NRCS) is providing financial assistance to farmers and ranchers throughout the Nation to implement conservation practices aimed at reducing nutrients, sediment, and pathogens in rivers and streams from agricultural lands. Three watersheds (HUC12s) were selected in New Jersey to receive this funding. With USEPA guidance and support one of these watersheds, Upper Salem River, was selected to receive focused monitoring, conducted by NJDEP-BFBM, to assess the effectiveness of these conservation practices in the watershed.
Parameters analyzed type	Habitat; Microbiological/pathogenic; Biological- Benthic macroinvertebrates; Chemical- Conventional, Nutrients

Table 12 Data Management Supplement

QAPP network path file location?	V:\LUM\BFBM\Bfbm\Quality Assurance Plans\Calendar Year 2021 QAPPS\2021 NWQI-QAPP
Where will data be recorded in field (media)	Paper
If on tablets or phones, will download at office occur or will you connect wirelessly?	N/A
If on tablets or phones, who will do the download?	N/A
If data collected electronically, where will it be stored?	N/A
Format to be received from Lab	Data Feed
Method of receipt from lab/s	Electronic
Personnel receiving outside lab data	BFBM Leigh Lager
Is data expected to go to WQDE/STORET?	Yes
Data manager - (Bureau and Name)	BFBM- Leigh Lager

Appendix B Map of Sites



Appendix C Sample NJDOH COCs

Field ID Number

New Jersey Department of Health
Environmental and Chemical Laboratory Services
PO Box 361, Trenton, NJ 08625-0361
Phone: 609-530-2820
ORGANIC AND INORGANIC CHEMISTRY SAMPLE SUBMITTAL
(See Instructions)

Lab Sample Number
(For Lab Use Only)

AGENCY INFORMATION			
Submitting Agency NJDEP-BFBM	Send Results To NJDEP	Agency No. 207	Project Name NWQI-Salem
Street Address 35 Arctic Parkway	Final Report Option <input type="checkbox"/> Tier 1 <input type="checkbox"/> Tier 2	Would you like copies of the internal chain of custody forms sent with your report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Project Code NWQI21
	Electronic Report Option <input type="checkbox"/> EDD <input type="checkbox"/> E-2		Memo Number
City, State, Zip Code Trenton, NJ 08625	Phone 609-292-0427	Fax 609-633-1095	Email ismail.sukkar@dep.nj.gov

SAMPLE INFORMATION			
Sample Point/Station ID Number/Water Facility ID AN0693	Collection Date (YY/MM/DD)	Sample Type	
Sampling Site/Facility/Supply Location/Sampling Point ID Kings Highway	Coll. Time (24h) Start	Coll. Time (24h) End	<input checked="" type="checkbox"/> Stream/Surface <input type="checkbox"/> Ground Water <input type="checkbox"/> Private Well <input type="checkbox"/> Septic <input type="checkbox"/> Ocean/Saline <input type="checkbox"/> Sediment <input type="checkbox"/> Tissue <input type="checkbox"/> Sewage: <input type="checkbox"/> Raw <input type="checkbox"/> Effluent <input type="checkbox"/> Industrial: <input type="checkbox"/> Raw <input type="checkbox"/> Effluent
Waterbody Name Salem River	Sample Retention Retain? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Duration _____		<input type="checkbox"/> Groundwater Rule <input type="checkbox"/> Source <input type="checkbox"/> Confirmation <input type="checkbox"/> Raw <input type="checkbox"/> Finished <input type="checkbox"/> Private Well <input type="checkbox"/> At Source <input type="checkbox"/> Flushed <input type="checkbox"/> 1st Draw <input type="checkbox"/> Lead Source Line <input type="checkbox"/> Surface H ₂ O Intake <input type="checkbox"/> Distribution System
Municipality/County Salem	Type of Sampling Event <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Compliance <input type="checkbox"/> Repeat <input type="checkbox"/> Non-Regulatory <input type="checkbox"/> Other		<input type="checkbox"/> Dissolved <input type="checkbox"/> Other: <input type="checkbox"/> Priority: <input checked="" type="checkbox"/> Routine <input type="checkbox"/> Priority <input type="checkbox"/> Emergency
Sampling Point Street Address	If Repeat or GWR, List Original Lab Sample No.		
PWSID	Sample Collector	Trip #	

FIELD INFORMATION		
Air Temp °C	Water Temp °C	Stream Flow-CFS
Weather Conditions	Sample pH (Field)	Gage Height-Ft.
Preserved in: <input checked="" type="checkbox"/> Field <input type="checkbox"/> Lab Date: ___/___/___ Time: _____	DO (mg/l)	Spec. Cond. (µS/CM)
Chlorine Residual	DO% Sat	Salinity (ppm)
Comments/Field Checks	Sample Depth Ft.	Tide Stage
	Barometric Pressure (mmHg)	Turbidity (NTU)

ANALYSIS REQUESTS		
Metals <input type="checkbox"/> Ag Silver <input type="checkbox"/> Al Aluminum <input type="checkbox"/> As Arsenic <input type="checkbox"/> B Boron <input type="checkbox"/> Ba Barium <input type="checkbox"/> Be Beryllium <input type="checkbox"/> Ca Calcium <input type="checkbox"/> Cd Cadmium <input type="checkbox"/> Co Cobalt <input type="checkbox"/> CR-T Chromium <input type="checkbox"/> Cu Copper <input type="checkbox"/> Fe Iron <input type="checkbox"/> K Potassium <input type="checkbox"/> Mg Magnesium <input type="checkbox"/> Mn Manganese <input type="checkbox"/> Mo Molybdenum <input type="checkbox"/> Na Sodium <input type="checkbox"/> Ni Nickel <input type="checkbox"/> Pb Lead <input type="checkbox"/> Sb Antimony <input type="checkbox"/> Se Selenium <input type="checkbox"/> Si Silica <input type="checkbox"/> TI Thallium <input type="checkbox"/> U Uranium <input type="checkbox"/> V Vanadium <input type="checkbox"/> Zn Zinc Preferred Methodology <input type="checkbox"/> EPA 200.7 / 200.9 <input type="checkbox"/> EPA 200.8	General <input type="checkbox"/> Alkalinity <input type="checkbox"/> Bromide by IC <input type="checkbox"/> Chloride <input type="checkbox"/> Chloride by IC <input type="checkbox"/> Chromium, Hexavalent <input type="checkbox"/> Chromium, Hexavalent by IC <input type="checkbox"/> Color <input type="checkbox"/> Conductance <input type="checkbox"/> Cyanide <input type="checkbox"/> Dissolved Oxygen <input type="checkbox"/> Fluoride by IC <input type="checkbox"/> Hardness <input type="checkbox"/> MBAS <input type="checkbox"/> Odor <input type="checkbox"/> pH <input type="checkbox"/> Phenols (PW) <input type="checkbox"/> Phenols (NPW) <input type="checkbox"/> Sulfate by IC <input type="checkbox"/> Sulfate Lachat <input type="checkbox"/> Turbidity Mercury <input type="checkbox"/> Mercury by EPA 245.1 <input type="checkbox"/> Low Level Mercury EPA 1631E Nutrients <input type="checkbox"/> Nitrite <input checked="" type="checkbox"/> Total Phosphorus <input type="checkbox"/> Ammonia <input checked="" type="checkbox"/> Nitrate (Calculated) <input type="checkbox"/> Nitrogen, Total (Calculated) <input checked="" type="checkbox"/> Nitrite + Nitrate <input type="checkbox"/> Ortho Phosphorus <input checked="" type="checkbox"/> Total Kjeldahl Nitrogen (TKN)	Organics (Drinking Water) <input type="checkbox"/> EPA 504.1 - EDB, DBCP, 1,2,3-TCDF <input type="checkbox"/> EPA 505 - Chlordane <input type="checkbox"/> EPA 505 - Toxaphene <input type="checkbox"/> EPA 507 - N and P containing Pesticides <input type="checkbox"/> EPA 515.3 - Chlorinated Acid Herbicides <input type="checkbox"/> EPA 524.2 - Purgeables <input type="checkbox"/> EPA 525.2 - Liquid-Solid Extractables <input type="checkbox"/> EPA 531.1 - N-Methylcarbamoyloximes and N-Methylcarbamates Organics (Non-Potable Water) <input type="checkbox"/> EPA 624 - Purgeables <input type="checkbox"/> EPA 625 - Base/Neutral and Acid Extractables Demands <input type="checkbox"/> Total Organic Carbon (TOC) <input type="checkbox"/> Dissolved Organic Carbon (DOC) <input type="checkbox"/> Chemical Oxygen Demand (COD) Suggested Dilutions <input type="checkbox"/> BOD5 <input type="checkbox"/> BOD20 _____ <input type="checkbox"/> CBOD5 <input type="checkbox"/> CBOD20 _____
Residues <input checked="" type="checkbox"/> Total Suspended Solids (TSS) <input type="checkbox"/> Total Solids (TS) <input type="checkbox"/> Total Dissolved Solids (TDS) <input type="checkbox"/> Settleable Solids (SS) <input type="checkbox"/> Total Volatile Solids (TVS)		
Other <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____		

Relinquished By:	Affiliation:	Received By:	Affiliation:
Name (Print):	NJDEP-BFBM	Name (Print):	
Signature:		Signature:	
Name (Print):		Name (Print):	
Signature:		Signature:	

Field ID Number

New Jersey Department of Health
Sanitary Bacteriology Laboratory
PO Box 361, Trenton, NJ 08625-0361
Phone: 609-530-8395
BACTERIOLOGICAL SAMPLE SUBMITTAL

Lab Sample Number
(For Lab Use Only)

AGENCY INFORMATION
Submitting Agency: NJDEP
Send Results To: NJDEP
Agency No.: 207
Project Name: NWQI-Salem
Street Address: 35 Arctic Parkway
Final Report Option: Tier 1, Tier 2
Electronic Report Option: EDD, E-2
Would you like copies of the internal chain of custody forms sent with your report? Yes, No
City, State, Zip Code: Trenton, NJ 08625
Phone: 1-609-292-0427
Fax: 1-609-633-1095
Email: ismail.sukkar@dep.nj.gov

SAMPLE INFORMATION
Facility ID/Sample Point/Station ID Number: AN0690
Collection Date (YY/MM/DD): 21 / /
Sampling Point ID/Sampling Site/Facility/Supply/Location: Rt. 581 (Commissioner's Road)
Waterbody Name: Salem River
Municipality/County: Salem
Type of Sampling Event: Regular, Compliance, Repeat, Non-Regulatory, Other
Sample Retention: Retain? No, Yes
Sample Collector:
PWSID:
Trip #:
Sample Type: Non-Potable (Stream/Surface, Ground Water, Private Well, Septic, Ocean/Saline, Sediment), Potable (Groundwater Rule, Source, Confirmation, Raw, Finished, Private Well), Tissue, Sewage (Raw, Effluent), Industrial (Raw, Effluent), Distribution System, Fraction (Total, Dissolved), Other, Priority (Routine, Priority, Emergency)

FIELD INFORMATION
Air Temp °C, Water Temp °C, Stream Flow-CFS, Weather Conditions, Sample pH (Field), Gage Height-Ft., Preserved in: Field, Lab, Date: 21 / /, Time: , DO (mg/l), Spec. Cond. (µS/CM), DO% Sat, Salinity (ppm), Rain Events, Sample Depth Ft., Tide Stage, Barometric Pressure (mmHg), Turbidity (NTU), Comments, Chlorine Residual

ANALYSIS REQUESTS
Suggested Dilutions: 10, 1, .1, .2, .3, .4, .5, .6
Fecal Coliform/100 ml, Fecal Coliform by A1, Fecal Streptococci/100 ml, Enterococci / 100 ml, Total Coliform / 100 ml, Enterococci / 100 mL, Total Coliform E.Coli/ 100 mL, Enumeration (Coli-ert) (Non-Drinking Water) SM9223B, SPC/HPC/ml

Relinquished By: Affiliation: Received By: Affiliation: Date/Time Reason for Custody Change
Name (Print): Signature: Affiliation: NJDEP-BFBM Signature:
Name (Print): Signature:
Name (Print): Signature: