AMBIENT SURFACE WATER QUALITY MONITORING NETWORK

Water Year 2020-2022
QUALITY ASSURANCE PROJECT PLAN

New Jersey Department of Environmental Protection; Bureau of Freshwater and Biological Monitoring and United States Geological Survey, New Jersey Water Science Center

Lamington River at Burnt Mills, Somerset County

New Jersey Department of Environmental Protection
Water Monitoring and Standards Element
Bureau of Freshwater and Biological Monitoring

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1.0 Project Name: Ambient Surface Water Quality Monitoring Network (ASWQMN)

2.0 Project Partners: New Jersey Department of Environmental Protection (NJDEP); Bureau of Freshwater and Biological Monitoring (BFBM), United States Geological Survey (USGS), New Jersey Water Science Center (NJWSC), Bureau of Environmental Analysis, Restoration and Standards (BEARS), Division of Water Quality (DWQ), Site Remediation Program (SRP), New Jersey Water Supply Authority (NJWSA).

3.0 Date of Project: Water Year 2020-2022 (October 2019- September 2022).

4.0 Project Fiscal Information: Corporate Business Tax, Federal 106 Grant, USGS Federal Match

5.0 Project Officers: Chris Kunz, NJDEP, Bureau of Freshwater and Biological Monitoring (**chris.kunz@dep.nj.gov**), Anna Boetsma, USGS, New Jersey Water Science Center (**aboetsma@usgs.gov**)

6.0 Special Training Needs/Certification

The Project Officers will be responsible for any necessary training. All staff participating in this project will be trained in the proper collection techniques as outlined in the United State Geological Survey's Techniques for Water Resources Investigations; http://pubs.er.usgs.gov/publication/twri09 and/or the "NJDEP Field Sampling Procedures Manual," August 2005, Section 6.8,2; the document available online at the NJDEP's webpage, http://www.state.nj.us/dep/srp/guidance/fspm/.

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 the following parameters during field work for this project: dissolved oxygen, temperature, pH, conductance, and turbidity.

7.0 Project Background

The federal Clean Water Act and the 106 Water Grant requirements mandate that states monitor the quality of their ambient waters. States' monitoring strategies are to cover all waters of the state (streams, rivers, lakes, reservoirs, estuaries, coastal waters, wetlands and ground water) for the various designated water uses The monitoring is necessary for the determination of water-quality status and trends in order to manage, protect, and restore water bodies, and to provide publicly accessible water-quality data on the condition of these resources. This network is designed to address many of these requirements. The network is a cooperative effort (design and sampling) between BFBM and USGS, which began in 1976. The network's design is subject to revision based on input from the members of the

Ambient Surface Water Quality Monitoring Network workgroup (members include staff from partner organizations and interested parties), with the last major revision of permanent site design occurring in 1997. The network's current design is outlined below.

8.0 Project Description

The network currently consists of approximately 123 sites (73 permanent and 50 probabilistic sites; see Attachment A). Permanent sites include background/reference sites, land use indicator sites and watershed integrator sites. Probabilistic sites are selected using a USEPA Generalized Random Tessellation Stratified (GRTS) survey design (http://acwi.gov/monitoring/conference/2006/2006_conference_materials_notes/WorkshopsandShortCourses/Spatial_Sampling_Workshops_Olsen/Surve_%20Design_Short_Courses/GRTS_Site_Selection.pdf). Probabilistic sites are re-selected every two years. All sites are monitored quarterly for two years (8 samples for conventional physical/chemical parameters; frequencies for other parameters detailed in Section 13.0).

9.0 Project Objectives

The objectives of the Ambient Surface Water Quality Monitoring Network are to:

(1) Assist in determining statewide water quality status for designated uses
(2) Evaluate water quality trends over time
(3) Evaluate effects of land use and management practice on water quality
(4) Determine background water quality
(5) Complement biological, atmospheric and groundwater networks
(6) Better define non-point source contributions
(7) Identify emerging and watershed specific issues, including Per- and Polyfluoroakyl Substances (PFAS)
(8) Enable statistical estimates of water quality for statewide assessment

10.0 Monitoring Network Design

The network consists of approximately 123 sites (73 permanent and 50 probabilistic sites; see Attachment A). Permanent sites include 7 background/reference sites, 43 land use indicator sites and 23 watershed integrator sites. The 73 fixed sites will allow for long-term trends assessments, evaluation of background water quality and evaluation of land-use impacts. 50 probabilistic sites were selected using a Generalized Random Tessellation Stratified (GRTS) survey design. This design provides information on all 5 DEP water regions and enables statistical estimates of condition (i.e. fully supporting, or good, fair, poor) for statewide assessment of 50 sites, every two years. After all panels are completed in 10 years (250 sites), comprehensive statewide estimates of water quality condition can be made for each DEP water region categories with good confidence (90-95%). All sites are

monitored quarterly for two years. Stations selected for this year are included in Attachment A.

Conventional, nutrients, and metals

Samples for conventional/nutrient parameters will be collected during each sampling event (8 samples). Metals monitoring (including low level mercury samples) will occur at 22 fixed sites due to budgetary constraints and approximately half of the background/reference sites twice per year at times (January – March and July – September) selected to produce both high flow and low flow data (see Attachment D for biennial schedule of sites to be monitored for metals and pesticides). Pesticide samples will be collected at background/reference sites and 22 fixed sites each year during spring sampling months (May-June). Trace metals and pesticide samples are collected at long-term fixed stations in order to compile trend information at those locations. Sediment samples will be collected at 20 probabilistic sites per year during summer sampling months (August-September) when water levels are low and sediment is more easily accessible. Sediment is collected at probabilistic sites to get a statewide snapshot of sediment quality and is limited to 20 sites per year due to budgetary constraints. Probabilistic sites (for sediment samples) may be substituted with fixed sites if sediment in some streams is not accessible or available.

Synoptic Survey for PFAS

Samples will be collected to develop a general understanding of the occurrence of per- and polyfluoroalkyl substances (PFAS) throughout the State. Data collected at each station will be used to evaluate water quality with regard to PFAS compounds. Samples will be analyzed for 28 PFAS compounds (Attachment B) in the water column using a lab-specific modified version of U.S. EPA Method 537 (SGS AXYS, Orlando (NJ laboratory certification number FL002) using method LCID537 AQ) using liquid chromatography and tandem mass spectrometry, with isotopic dilution.

Sample collection of PFAS will be conducted as a synoptic survey, separate from routine sampling. Samples will be collected at all network stations twice a year (February-March and August-September) for the first year. See Attachment E. for table of sampling schedule and associated parameters. Since PFAS compounds are prone to adhering to solids and surfaces, grab samples collected for PFAS analyses will be total, unfiltered. Field blanks will be collected and analyzed for all samples.

Guidelines for sample collection will be based on the Draft Interstate Technology Regulatory Council (ITRC) recommendations (Site Considerations, Sampling Precautions, and Laboratory Analytical Methods for PFAS found at https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_site_characterization_3_15_18.pdf. All water-quality data meeting USGS quality-assurance guidelines will be entered into the USGS National Water Information System (NWIS) database. This provisional data will be available to the general public from the NWISWeb site at http://waterdata.usgs.gov/nj/nwis/qw/. The provisional data will be quality-assured

and approved for publication annually to the USGS NWISWeb at http://waterdata.usgs.gov/nj/nwis/.

11.0 Sampling Procedures

11.1 General Procedures: Sampling frequencies for conventional parameters (nutrients, suspended solids, chloride, etc.) and field parameters will be quarterly (Jan. to March, Apr. to June, July to Sept. and Oct. to Dec.). Discharge (flow) measurements at each non-tidal station will be taken during each quarterly sampling event by USGS or BFBM staff utilizing similar procedures. A full explanation of BFBM's procedures for discharge measurement can be found in Attachment C. At tidally impacted sites, monitoring will be at low, slack tide. Metals monitoring (including low level mercury samples) will occur at 22 fixed sites and approximately half of the background/reference sites twice per year at times (January – March and July – September) selected to produce both high flow and low flow data. Pesticide samples will be collected at background/reference sites and 22 fixed sites each year. Sediment samples will be collected at 20 probabilistic sites per year. Samples for PFAS will be collected at all network stations twice a year (February-March and August-September) for the first year. Probabilistic sites (for sediment samples) may be substituted with fixed sites if sediment in some streams is not accessible or available. Sample bottles for analytical parameters will be provided by the contracted New Jersey (or nationally accredited) certified laboratory (New Jersey Department of Health; laboratory certification number 11036 or the USGS National Water Quality Laboratory (NWQL) which is certified through the National Environmental Laboratory Accreditation Program (NELAP) or SGS AXYS, Orlando (NJ laboratory certification number FL002)). Sample volume and container type will be as described in the respective laboratory's "Quality Manual" and/ or SOP, approved by the Office of Quality Assurance (OQA). This information is also included in Attachment B.

11.2 Cleaning Sample Equipment: Because the possibility of contamination of samples is great, all sampling devices used to collect water-quality samples for the parameters listed will be cleaned as thoroughly as possible between each sampling site. Detailed protocols for cleaning equipment can be found in USGS' Techniques for Water Resources Investigations; Book 9, Chapter A3 (http://pubs.usgs.gov/twri/). Procedures specific to PFAS can be found in the Draft Interstate Technology Regulatory Council (ITRC) recommendations

11.3 In-Stream Analytical Sampling Procedures and Parameters:

The collection of water quality samples will be accomplished using the Equal Width Increment (EWI) sampling method or multiple verticals, depending on stream velocity, and a churn splitter to obtain cross sectional composite samples. Samples will be collected as per USGS' Techniques for Water Resources Investigations, Book 9, Chapter A4 (http://pubs.er.usgs.gov/publication/twri09) and/or the "NJDEP Field Sampling Procedures Manual," August 2005, Section 6.8.2; the document available online at the NJDEP's webpage, http://www.state.nj.us/dep/srp/guidance/fspm/.

Field parameters (dissolved oxygen, pH, specific conductance, water temperature, air temperature, and turbidity) will be made at each site during each sampling event. The chemical and field parameters are listed Attachment B.

Instantaneous streamflow is derived directly from continuous-record discharge gaging stations when the sampling site is co-located at a gaging station. Streamflow is measured at the sites that are not located at continuous-record discharge gaging stations. Discharge measurements will be made at each station (where applicable) during each sampling event using USGS procedures found at http://pubs.er.usgs.gov/publication/twri09 and at http://training.usgs.gov/TEL/Nolan/SWProcedures/Index.html

Sample collection for Per- and Polyfluoroalkyl Substances (PFAS) will follow guidelines outlined in the *Draft* Interstate Technology Regulatory Council (ITRC) recommendations (Site Considerations, Sampling, Precautions, and Laboratory Analytical Methods for PFAS can be found at https://pfas-1.itrcweb.org/fact-sheets/. Additional guidelines and standard operating procedures specific to this study can be found in Attachment G. Since PFAS compounds are prone to adhering to solids and surfaces, grab samples collected for PFAS analyses will be total, unfiltered.

12.0 Data Quality/Quality Control Requirements

12.1 Sampling Locations: Sampling locations will be established using an approved global positioning system (GPS) device (Trimble Geo Explorer 3 or newer model). Subsequently all sampling locations will be verified by sampling staff during each sampling event using a GPS device to navigate to, and record, the point of the site. In addition, photos will be taken and site sketches will be made for each sampling location.

12.2 Field Measurements

All field sensors (thermistors, thermometers, dissolved oxygen sensors, specific conductance sensors, pH sensors, and turbidimeters shall be

operated and maintained according to the "Regulations Governing the Certification of Laboratories and Environmental Measurements", N.J.A.C. 7:18. BFBM is certified by the Office of Quality Assurance (certified lab ID # 11896) (USGS is certified through NELAP (National Environmental Laboratory Accreditation Program)) for all parameters listed below:

BFBM staff
Water temperature, pH, specific conductance, DO, and pH are measured using a Hach model # HQ40D. The Hach HQ40D is a multi-parameter water quality instrument that combines temperature, pH, conductance, and luminescent dissolved oxygen (LDO) probes into one meter.

USGS staff
Water temperature, specific conductance, DO, and pH are measured using a YSI EXO2 multiparameter instrument. USGS staff members follow manufacturer guidelines and procedures outlined in USGS Techniques for Water Resources Investigations, Book 9, Chapter A6 (http://pubs.er.usgs.gov/publication/twri09).

- *Barometric Pressure*
- *Air Temperature:* The probe is calibrated with a NIST certified thermometer on a quarterly basis. Records of the calibration shall be maintained by the BFBM.
- *Water Temperature:* **(BFBM Standardized Analytical Method for Temperature (11.1300), 2005**
  The probe is calibrated with a NIST certified thermometer on a quarterly basis. Records of the calibration shall be maintained by the BFBM.
- *pH:* **(BFBM Standardized Analytical Method for Determining pH by the Electrometric Method, 2008)**
  The probe is calibrated on a daily basis per the manufacturer recommendations. The pH meter is calibrated each day of use, including calibration with two standard pH buffers bracketing the value to be measured. After calibration, a standard buffer with pH within the calibration range shall be measured without any control adjustments to check the calibration. When the pH meter is in use for longer than a 3-hour period, the pH of the third buffer shall be checked once every three hours. If the pH differs by more than 0.2 pH units from the standard buffer value, the meter shall be recalibrated. Records of all calibrations and calibration checks shall be maintained in the field log. Duplicate samples will be analyzed daily or every 20 samples by each sampling staff member.
- *Specific Conductance:* **(BFBM Standardized Analytical Method for Specific Conductance (10.0870), 2006)**
  The probe is calibrated daily per the manufacturer recommendations. The probe is calibrated each day of use with a

certified standard which corresponds to the expected range of the values to be measured. Records of all calibrations and calibration checks shall be maintained in the field log. Duplicate samples will be analyzed daily or every 20 samples by each sampling staff member.

- *DO:* **(BFBM Standard Analytical Method for Dissolved Oxygen by the Luminescence Measurement of Dissolved Oxygen (LDO), 2013)**
  A Winkler check is performed on a weekly basis (not required for USGS staff) and the meter (Hach HQ40D) is barometrically compensated and checked at each sampling site. Records of all calibrations and calibration checks shall be maintained in the field log. Duplicate samples will be analyzed daily or every 20 samples by each sampling staff member.
- *Turbidity:* **(BFBM Standard Operating Procedure for Field Turbidity Measurement, 2000)**
  HACH Model 2100P (NJDEP) and Model 2100Q turbidimeters are calibrated once per sample quarter with formazin per manufacturer recommendations. The meter is then checked with certified StablCal standards for accuracy within the calibration range during each day of use, followed by a check in deionized water. Records of all calibrations and calibration checks shall be maintained in the field log.
- *Discharge*: Instantaneous streamflow is derived directly from continuous-record discharge gaging stations when the sampling site is co-located at a gaging station. Streamflow is measured at the sites that are not located at continuous-record discharge gaging stations.

Relevant Documents

- Bureau of Water Monitoring Certified SOP, for field measurements and calibrations.
- NJDEP Field Sampling Procedures Manual (2005). http://www.state.nj.us/dep/srp/guidance/fspm
- NJAC 7:18 - Regulations Governing the Certification of Laboratories and Environmental Measurements.

12.3 Additional Testing performed by NJ/National Certified Laboratories

Analytical samples will be delivered to a NJ certified laboratory (New Jersey Department of Health; laboratory certification number 11036 or the USGS National Water Quality Laboratory (NWQL) which is certified through the National Environmental Laboratory Accreditation Program (NELAP)); http://www.nelac-institute.org/newnelap.php . Samples for Per- and Polyfuoroalkyl Substances (PFAS) will be delivered to a USGS contracted laboratory which is also certified by New Jersey's Office of Quality Assurance (SGS AXYS, Orlando (NJ laboratory certification number FL002).

Samples sent to NJDOH will be analyzed using a method for which the laboratory has certification. Quality control procedures (including required calibrations and quality control procedures required by regulation or by the method) shall be defined in the laboratory's Quality Manual (QM) (Quality Manual; Environmental and Chemical Laboratory Services, February, 2019 or updated version thereof) or Standard Operating Procedures (SOPs) (Attachment E). The QM and SOPs must be approved by the OQA.

13.0 Sampling Schedule

Beginning in November 2019, sampling frequencies for conventional physical/chemical parameters (nutrients, suspended solids, chlorides, etc.) and field parameters will be quarterly (November-December, February-March, May-June and August-September). Discharge measurements will be taken at each station (where possible) during each quarterly sampling event by USGS or BFBM staff utilizing the same procedures. Metals monitoring (including low level mercury and low-level hexavalent chromium) will occur twice per year at 22 fixed sites and approximately half of the background/reference sites at times (February – March and August – September) assumed to produce both high-flow and low-flow data. Pesticide samples will be taken in the May-June sampling period at 22 fixed sites and approximately half of the background/reference sites. Sediment samples will be collected at 20 probabilistic sites per year, but may be substituted with fixed sites if probabilistic sites are not wadable or would not provide adequate sediment (i.e., rocky bottomed, fast-moving streams). Samples for Per- and Polyfluoroalkyl Substances (PFAS) will be collected at all stations twice a year; once in February-March and once in August-September as a sampling synoptic separate from routine sample collection.

14.0 Resource Allocation (NJDEP): In order to complete this project as described, at least four full-time and one hourly staff are required. This will allow for physical/ chemical sample collection, discharge measurements and data quality assurance and control.

15.0 Quality Assurance

15.1 Sampling Locations: All sampling locations will be established and verified during each sampling visit using global positioning system (GPS) device.

15.2 Laboratory Analysis: All physical/ chemical parameters will be analyzed by a qualified New Jersey certified laboratory (New Jersey Department of Health, laboratory certification number 11036, USGS National Water Quality Laboratory, USGS Mercury Research Laboratory, or an approved USGS contract laboratory. Any laboratory used for this project shall be certified by NJDEP's OQA or NELAP for the requested parameters. The reporting levels listed in Attachment B are **required** for this project.

15.3 **Sample Containers:** With the exception of low-level mercury samples, sample containers shall be dedicated, single-use. Sample containers shall be provided by the NJ certified laboratory (New Jersey Department of Health) and the USGS National Water Quality Laboratory. Sample bottles for low-level mercury are prepared and provided by the USGS Wisconsin Mercury Research Laboratory.

15.4 **Sample Retention:** All samples must be retained by the laboratory through the applicable holding times for each analyte requested, in case results show that a re-analysis is warranted.

15.5 **Chain of Custody:** Chain of custody forms are required for all samples forwarded to a NJ or nationally certified laboratory for testing. Information to be recorded includes all information required by N.J.A.C. 7:18-5.6(d) and 8.5(c).

15.6 **Quality-Control Samples (Blanks/Replicates):**

Two types of Quality-Control (QC) samples are routinely collected for this project: blanks and replicates. Blanks are used to estimate bias, and replicates are used to estimate variability. QC samples prepared in the field incorporate bias and variability associated with all aspects of sample collection, processing, shipping, storage, and laboratory analysis.

A blank is a sample that is prepared with water intended to be free of measurable concentrations of the analytes of interest. Blank samples are analyzed to estimate positive bias that could result from extraneous contamination of environmental samples. Types of blank samples are defined in part by the location where the blank sample is collected or in regard to the equipment that is used during sample collection. Field blanks are prepared in a manner that exposes the blank water to all of the potential sources of contamination that might affect environmental water samples during collection and processing. In addition, field blanks, like any other laboratory-analyzed sample, include potential contamination introduced during laboratory handling and analysis. Field blanks are used to evaluate the adequacy of field and laboratory protocols. Specifically, they can indicate whether: (1) equipment has been adequately cleaned to remove contamination introduced by samples obtained at previous sites, (2) sample collection and processing have not resulted in contamination, and (3) sample handling and transport have not introduced contamination.

Each staff member participating in this project will submit two annual field blank samples (one during each of the Feb-March and Aug-Sept sampling quarters) for metals parameters collected in a churn splitter. If a blank sample reveals any sampling deficiencies, an internal field audit will be performed on the relevant staff member(s) by the Project Officer or

Supervisor. In addition, the staff member(s) may be subject to an audit by USGS or NJDEP's Office of Quality Assurance.

In addition, each staff member participating in this project will submit one split-replicate sample. Replicates are two or more samples collected, prepared, and analyzed such that the samples are considered to be essentially identical in composition. Replicate environmental samples are used to estimate the variability (random measurement error) in analytical results. Replicates can be collected in several ways. Different types of replicates assess different sources of variability. Split replicates are made from a single sample that is collected and then subdivided into other samples. Split replicates include potential variability introduced by sample processing, shipment and laboratory analysis. Split replicates do not capture short-term environmental variability.

Replicates should be targeted at sites and times where concentrations of at least some target analytes are expected to exceed detection limits. If concentrations of most target analytes are expected to be less than detection, collection of replicates should be deferred until conditions are more favorable for detection.

Split replicates will be submitted to the analytical laboratories for all routine constituents with the exception of the supplemental parameters (water-column pesticides and trace elements and streambed-sediment analyses).

Field blanks will accompany each sample collected and analyzed for Per- and Polyfluoroalkyl Substances (PFAS).

15.7 National Field Quality Assurance

To document the quality of field measurements, all personnel responsible for sample collection and field analysis participate in the USGS National Field Quality Assurance (NFQA) Program. Personnel receiving an unsatisfactory rating will participate in the second round of the NFQA program. If sampling personnel receive a second unsatisfactory rating in one year, that person shall be required to undertake additional training in the proper techniques of field measurements.

15.8 Field Audits

All personnel involved in the collection of water quality data are required to be audited by the water quality specialist and/or the project officer(s) every two years. Any inconsistencies or concerns are discussed during the audit and recorded on the audit form, which is provided to the project officer(s) from the perspective sampling agency and archived locally. In

addition, all sampling staff will be subject to periodic audits by NJDEP or OQA.

QA data, including NFQA sample results and field blanks, are reviewed by the Project Officer, Supervisor and Water Quality Specialist.

16.0 Data Validation (Records Review and Quality Assurance)

Data validation is the process whereby water-quality and associated data are checked for completeness and accuracy. The Project Officer(s) are responsible for all initial data validation.

All field notes and field measurements are reviewed for completeness and accuracy as soon as possible after returning from the field trip by project personnel. All chemical analyses are reviewed for completeness, and questionable values are noted. Prompt review is necessary to allow analytical re-analysis to be performed before sample holding times have been exceeded for accuracy and precision. The Water Science Center review procedure requires that analysis results be reviewed early enough that the samples will not be destroyed at the laboratory prior to requests for reanalysis. For example, within 7 days of receipt of nutrient results and less than 21 days of sample collection, or when all analytical results have been returned but less than the 6-month holding time for major ions. General validation checks, as described in the U.S. Geological Survey Open File Report 02/383; 2003, entitled, *"Methods for Quality Assurance Review of Water Quality Data in New Jersey."* may include but are not limited to the following:

- Comparison of determined and calculated values for dissolved solids,
- Comparison of dissolved constituents and total constituents,
- Comparison of specific conductance with dissolved solids, cations, and anions
- Comparison of sum of cations with sum of anions (ion balance).

Field and laboratory analyses, such as pH, specific conductance, and alkalinity, are compared to confirm agreement of independent measurements. If data from more than one sample are available for a site, the analysis also is compared with previous analyses within a hydrologic context to identify obvious errors, such as decimal errors, and possible sample mix-ups or anomalies warranting analytical re-analysis. These reports and comparisons are reviewed and noted. If necessary, corrections or re-analysis may be requested by project personnel.

Requests to the NWQL for re-analysis are made by USGS employees through the NWQL in-house NWQL Sample Status Web page and in writing to other laboratories for verification of analytical results if reanalysis is not possible as stipulated in the laboratory contract, such as the New Jersey Department of Health and Senior Services Environmental and Chemical Laboratory Services. Special emphasis on transcription of data to assure that no transposition of figures occurred will be requested. The NJ certified laboratory will be asked to check on equipment

calibration. Re-analysis requests are logged and tracked by project personnel. Corrections to NWIS resulting from reruns by the NWQL must be made to the laboratory database as well as to NWIS database and are made in writing by project personnel.

If apparent anomalous data are suspected (e.g. dissolved values larger than total values; field blank values larger than ambient values), the USGS Project Officer and/or the Supervisor will review the sampling procedures with the field sampler to make sure the proper collection and preservation procedures were followed.

If no obvious problems are found after these reviews, the complete data set will be reported with the suspect data identified as such. The BFBM will then conduct its own review of the data, as it relates to the objectives(s) and data accuracy required in this project.

Project QC data, such as blanks and replicates, periodically are tabulated or graphed by project personnel to facilitate identification of inaccuracies or systematic bias that may not be discernible when reviewing an individual analysis. Questionable values or values in error are qualified in NWIS upon approval by the Project Officer, Supervisor, or Water Quality Specialist.

17.0 Data Management

Water-quality data are recorded electronically or on paper and include chemical, physical data, along with observations, and ancillary field information. Paper records are documented on standard USGS field forms and stored in site records folder. The field form templates are modified according to project objectives and NJWSC policy with input from all personnel associated with processing, checking, reviewing, and approving water-quality data. Electronic records include field notes and measurements and analytical results. Electronic field notes such as those produced from PCFF are printed in the field or the database is backed-up on independent media for subsequent printing. Data that are recorded on paper and electronically typically are entered either in the NWIS QWDATA database or in NWIS ADAPS database. The NWIS is the storage medium for all water-quality, streamflow, well, and water-use information collected by the USGS.

Attachment C contains the complete data storage and availability.

18.0 Performance System Audits

All NJ certified laboratories used are subject to audits and to the requirements of the OQA Laboratory Certification Program as well as internal performance evaluations. The OQA will be notified of field monitoring schedules for possible audits.

USGS Water Mission Area (WMA) policies state that all laboratories supplying WMA projects with inorganic analytical data are required to participate in the

USGS **Standard Reference Sample Project (SRS). SRS** is conducted semiannually on laboratory performance assessment for inorganic analytes. To comply with this policy, NJDOH participates in the SRS round-robin twice per year. Samples are prepared and supplied by USGS Water Mission Area and ordered by the water quality specialist for NJDOH Laboratory analysis of high-level and low-level nutrients in water.

19.0 Data Reporting and Publication

19.1 Preliminary Reporting of Data

Preliminary analytical data will be reported to BFBM, from the laboratory employed for this project, in either electronic format or by verbal communication to the Project Officer, within 21 calendar days from receipt of sample. Samples which yield results considered anomalous by the Project Officer(s) will be validated as specified in section 16.0, Data Validation, before the holding time of the retained sample has expired. If the results remain suspect after an internal review of the laboratory procedures, calculations, and/or on transcription of data has been conducted, then the sample shall be reanalyzed by the laboratory using the retained portion of the sample. This reanalysis shall be performed within the parameter holding time. (Reanalysis within holding time may or may not be possible in the case of analytes with holding times of 48 hours or less). If reanalysis does not change the suspect results, this data will not be reported.

19.2 Approval and Availability of Data

All field data and analytical data meeting USGS quality-assurance standards will thoroughly be checked and reviewed by project personnel, the Project Officer, and the Water Quality Specialist. Until all data have been reviewed, data will remain provisional and subject to change. Approved data, as well as provisional data, are available from the USGS NWISWeb interface at http://waterdata.usgs.gov/nj/nwis/.

20.0 Corrective Action

If for any reason, any aspect of this Quality Assurance Project Plan needs to be modified, all signatories will be supplied with a revised edition for review/approval and signature.

21.0 Assessment, Oversight, and Response

The Project Officers will be responsible for the oversight of all activities relating to this project. The Project Officers 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 objectives(s) and data accuracy required in this project, all original signees of the QAPP will be notified.

22.0 Safety

The safety of field personnel is a priority for the both USGS and the NJDEP.

NJDEP Staff

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.

USGS Staff

The USGS NJWSC communicates information and directives related to safety to all USGS personnel through in-house and out-of-office training, classes, memoranda, and webinars, to assure that personnel follow established safety procedures and policies. NJWSC personnel who have questions or concerns pertaining to safety, or who have suggestions for improving some aspect of safety, should direct those questions, concerns, and suggestions to the Associate Director of Data and/or the Center Safety Officer.

ATTACHMENT A: ASWQMN Station List (October, 2019 - September, 2022); revised 10/2020

Station ID	AMNET/Prob #	Station Name	Sampler	Gage Type/Flow	WMA	Station Type	Land Use	Latitude	Longitude
01367625	AN0297	Wallkill River at Sparta	USGS	STAFF	2	LUI	URBAN	41.04028	-74.62972
01367770	AN0302	Wallkill River near Sussex	USGS	STAFF	2	WI		41.19389	-74.57528
01367800	AN0304	Papakating Creek at Pellettown	USGS	DCP	2	LUI	AGRICULTURE	41.16261	-74.67530
01367815	UNEQUAL-0115	Papakating Creek near McCoys Corner NJ	KB	USGS	2	PB		41.17712	-74.64050
01367950	UNEQUAL-0404	Quarryville Brook near Sussex NJ	JK	USGS	2	PB		41.23443	-74.57242
01368000		Wallkill River near Unionville, NY	USGS	STAFF	2	WI		41.26009	-74.54849
01368012	UNEQUAL-0148	Wallkill River tributary 4 near Rockport NJ	KK	USGS	2	PB		41.29752	-74.58871
01368520		Double Kill at Wawayanda	USGS	STAFF	2	BKG		41.18694	-74.42000
01368823	UNEQUAL-0420	Lake Lookout Brook Trib near Kempe NJ	KA	NJDEP	2	PB		41.16181	-74.42264
01377000		Hackensack River at Rivervale	AD	DCP	5	LUI	URBAN	40.99917	-73.98917
01377850	UNEQUAL-0443	Pascack Brook at Brookside Ave at Rivervale NJ	JG	USGS	5	PB		40.99016	-74.01035
01378400	AN0068	Dwars Kill at Anderson Ave at Alpine	USGS	STAFF	5	BKG		40.97667	-73.98417
01378560	AN0211	Coles Brook at Hackensack	USGS	STAFF	5	LUI	URBAN	40.91111	-74.04028
01378671	UNEQUAL-0143	Passaic R abve Indian Grave Bk nr Bernardsville NJ	KM	NJDEP	6	PB		40.74153	-74.54903
01378780	AN0215	Primrose Brook at Morristown National Historic Park	USGS	STAFF	6	BKG		40.76500	-74.52972
01379200	AN0227	Dead River near Millington	USGS	STAFF	6	LUI	URBAN	40.64972	-74.52417
01379340	UNEQUAL-0120	Passaic R at Berkeley Heights NJ	CM	USGS	6	PB		40.68971	-74.44027
01380100		Beaver Brook at Rockaway	USGS	STAFF	6	LUI	UNDEVELOPED	40.90222	-74.50139
01380295	UNEQUAL-0431	Stony Brook trib near Lake Juliet NJ	CM	NJDEP	6	PB		40.95019	-74.41386
01381720	UNEQUAL-0507	West Brook near Whippany NJ	JG	USGS	6	PB		40.83287	-74.40744
01381800	AN0238	Whippany River near Pine Brook	JG	DCP	6	WI		40.84500	-74.34722
01382000		Passaic River at Two Bridges	USGS	RP	6	WI		40.89722	-74.29278
01382320	UNEQUAL-0127	Pequannock R below Clinton Bk nr Newfoundland NJ	KA	USGS	3	PB		41.04794	-74.44192
01382500	AN0264	Pequannock River at Macopin Intake Dam	CM	DCP	3	WI		41.01833	-74.40111
01387500	AN0266	Ramapo River near Mahwah	KM	DCP	3	LUI	MIXED	41.09806	-74.16278
01387630	UNEQUAL-0500	Macmillan Re out stream near Darlington NJ	AD	NJDEP	3	PB		41.07975	-74.19682
01387958	UNEQUAL-0516	Haycock Brook tributary near Pompton Lakes NJ	CM	NJDEP	3	PB		40.99009	-74.25647
01388500	AN0268	Pompton River at Pompton Plains	JK	DCP	3	WI		40.96972	-74.28194
01388675*	UNEQUAL-0132	East Ditch tributary near Pompton Plains NJ	KM	NJDEP	3	PB		40.97684	-74.31887
01388720	AN0269	Beaver Dam Brook at Ryerson Road, at Lincoln Park	USGS	STAFF	3	LUI	URBAN	40.92639	-74.29278
01389020	UNEQUAL-0452	Preakness Brook tributary near North Haledon NJ	KA	NJDEP	4	PB		40.96302	-74.21246
01389500	AN0274	Passaic River at Little Falls	JG	DCP	4	LUI	URBAN	40.88472	-74.22611
01389710	UNEQUAL-0111	Slippery Rock Bk at Barbour P at Woodland Park NJ	AD	USGS	4	PB		40.90181	-74.18385
01391500		Saddle River at Lodi	KB	DCP	4	WI		40.89028	-74.08056
01393350	UNEQUAL-0408	West Branch Elizabeth River near Union NJ	JK	NJDEP	7	PB		40.69301	-74.24964
01394500	AN0194	Rahway River near Springfield	KK	DCP	7	LUI	URBAN	40.68750	-74.31167
01395000		Rahway River at Rahway	JK	DCP	7	WI		40.61889	-74.28333
01396067	UNEQUAL-0503	SB Raritan River trib 9 near Budd Lake NJ	JK	NJDEP	8	PB		40.88192	-74.74493
01396660	AN0321	Mulhockaway Creek at Van Syckel	KK	DCP	8	LUI/WSA	UNDEVELOPED	40.64750	-74.96889
01397000	UNEQUAL-0138	SB Raritan at Stanton NJ	USGS	NJDEP	8	PB		40.57222	-74.86806
01397157	UNEQUAL-0522	Prescott Brook tributary 2 near Stanton NJ	KA	NJDEP	8	PB		40.58433	-74.84766

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01398000	AN0333	Neshanic River at Reaville	CM	DCP	8	LUI	AGRICULTURE	40.47333	-74.82778
01398100	UNEQUAL-0442	SB Raritan R near South Branch NJ	AD	USGS	8	PB		40.52607	-74.70562
01398102	AN0341/UNEQU	South Branch Raritan River at South Branch	USGS	STAFF	8	WI/WSA/PB		40.54694	-74.69639
01399568	UNEQUAL-0106	Rockaway Creek near Bissell NJ	JG	NJDEP	8	PB		40.67722	-74.79611
01399680	UNEQUAL-0474	SB Rockaway Creek at Nelson Rd near Whitehouse NJ	KM	NJDEP	8	PB		40.62042	-74.77262
01399780	AN0370	Lamington River at Burnt Mills	USGS	STAFF	8	WI		40.63472	-74.68667
01400000	AN0374	North Branch Raritan River near Raritan	KA	DCP	8	WI/WSA		40.57056	-74.67917
01400120	UNEQUAL-0506	Raritan R at Raritan NJ	JG	USGS	9	PB		40.56463	-74.63574
01400640	AN0382	Millstone River at Grovers Mill	USGS	STAFF	10	LUI	AGRICULTURE	40.31333	-74.58917
01400850		Stony Brook trib 3 at Rileyville	USGS	STAFF	10	FRG		40.44333	-74.73472
01400978	UNEQUAL-0515	Cleveland Brook near Rosedale NJ	KK	USGS	10	PB		40.35624	-74.72988
01401400	AN0396	Heathcote Brook at Kingston	USGS	STAFF	10	LUI	MIXED	40.36944	-74.61611
01402000	AN0410	Millstone River at Blackwells Mills	KM	DCP	10	WI		40.47500	-74.57583
01403385	AN0424	Bound Brook at Route 28, at Middlesex	USGS	STAFF	9	LUI	URBAN	40.58083	-74.49917
01403391	UNEQUAL-0488	Green Brook near Watchung NJ	KB	USGS	9	PB		40.66321	-74.42813
01405340	AN0439	Manalapan Brook at Federal Road, near Manalapan	USGS	STAFF	9	LUI	MIXED	40.29611	-74.39778
01407059	UNEQUAL-0496	Mahoras Brook trib at mouth near Holland NJ	KA	USGS	12	PB		40.38452	-74.14786
01407705	UNEQUAL-0448	Shark River 400 ft ds Remsen Mill Rd nr Glendola NJ	JK	USGS	12	PB		40.19791	-74.06926
01407713	UNEQUAL-0512	Jumping Bk tributary at Tinton Falls NJ	AD	NJDEP	12	PB		40.24335	-74.09168
01407760	AN0480	Jumping Brook near Neptune City	CM	DCP	12	LUI	URBAN	40.20833	-74.06583
01407874	UNEQUAL-0416	Manasquan Riv blw Banner Medow Brk at Wyckoff Mills NJ	KB	USGS	12	PB		40.20490	-74.25431
01408000	AN0493	Manasquan River at Squankum	KB	DCP	12	WI		40.16139	-74.19472
01408009	AN0495	Metedeconk Brook near Earle	USGS	STAFF	12	LUI	UNDEVELOPED	40.21250	-74.16833
01408100	AN0502	North Branch Metedeconk River at Lakewood	USGS	STAFF	12	LUI	URBAN	40.10902	-74.21917
01408505		Toms River at park footbridge, near Toms River	KK	DCP	13	WI		39.97639	-74.21833
01408830	AN0546	Cedar Creek at Cedar Crest	USGS	STAFF	13	LUI	UNDEVELOPED	39.89722	-74.31639
01409387	AN0563	Mullica River at Outlet of Atsion Lake, at Atsion	USGS	STAFF	14	LUI	UNDEVELOPED	39.74028	-74.72667
01409396*	UNEQUAL-0130	Mullica River Trib near Indian Mills NJ	AD	NJDEP	14	PB		39.76228	-74.71963
01409416	AN0577A	Hammonton Creek at Wescoatville	USGS	STAFF	14	LUI	MIXED	39.63389	-74.71778
01409470	AN0586	Batsto River at Quaker Bridge	USGS	STAFF	14	WI		39.70944	-74.66639
01409815	AN0602	West Branch Wading River at Maxwell	USGS	STAFF	14	LUI	UNDEVELOPED	39.67500	-74.54083
01409968**	UNEQUAL-0529	Breeches Branch Tributary	AD	NJDEP	14	PB		39.75137	-74.48679
01410150	AN0612	East Branch Bass River near New Gretna	JK	DCP	14	LUI	UNDEVELOPED	39.62306	-74.44139
01411035	AN0627	Hospitality Branch at Blue Bell Road, near Cecil	USGS	STAFF	15	LUI	MIXED	39.64444	-74.98583
01411110	AN0635	Great Egg Harbor River at Weymouth	USGS	STAFF	15	WI		39.51389	-74.77972
01411196	AN0640	Babcock Creek near Mays Landing	USGS	STAFF	15	LUI	UNDEVELOPED	39.46889	-74.69250
01411207	UNEQUAL-0150	Gravelly Run Trib near Gravelly Run NJ	CM	USGS	15	PB		39.42545	-74.66430
01411291**	UNEQUAL-0534	Sharps Branch	KM	NJDEP	15	PB		39.36833	-74.86466
01411400	AN0771	Fishing Creek at Rio Grande	USGS	STAFF	16	LUI	UNDEVELOPED	39.02750	-74.89639
01411444	AN0765	West Creek at Leesburg	USGS	STAFF	16	LUI	UNDEVELOPED	39.28000	-74.91139
01411456	UNEQUAL-0141	Little Ease Run near Clayton NJ	KK	NJDEP	17	PB		39.66377	-75.06776
01411466	AN0724	Indian Branch near Malaga	USGS	STAFF	17	LUI	UNDEVELOPED	39.59083	-75.05972
01411493	UNEQUAL-0482	Long Branch near Newfield NJ	CM	NJDEP	17	PB		39.52905	-74.99288
01411500	AN0740	Maurice River at Norma	KB	DCP	17	WI		39.49556	-75.07694

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01411355		Gravelly Run at Laurel Lake	USGS	STAFF	17	BKG		39.33727	-75.05083
01412000	UNEQUAL-0454	Menantico Creek near Millville NJ	KM	USGS	17	PB		39.41920	-74.96575
01412800	AN0712	Cohansey River at Seeley	KA	DCP	17	LUI	AGRICULTURE	39.47250	-75.25556
01413049	UNEQUAL-0429	Stow C trib at Jericho NJ	KB	USGS	17	PB		39.47364	-75.34950
01439805	UNEQUAL-0483	Big Flat Brook trib 2 at Tuttles Corner NJ	JK	NJDEP	1	PB		41.18651	-74.79476
01440000	AN0008	Flat Brook near Flatbrookville	KA	DCP	1	LUI	UNDEVELOPED	41.10611	-74.95250
01442760	AN0012	Dunnfield Creek at Dunnfield	USGS	STAFF	1	BKG		40.97083	-75.12667
01443276	UNEQUAL-0459	East Branch Paulins Kill near Sussex Mills NJ	KB	USGS	1	PB		41.06649	-74.68332
01443500	AN0025	Paulins Kill at Blairstown	AD	DCP	1	LUI	UNDEVELOPED	40.98083	-74.95333
01445160	AN0040A	Bear Brook at Dark Moon Road, near Johnsonburg	USGS	STAFF	1	LUI	AGRICULTURE	40.97500	-74.84889
01446400	AN0048	Pequest River at Belvidere	USGS	STAFF	1	WI		40.82917	-75.07361
01455780	UNEQUAL-0523	Lubbers Run at Lockwood NJ	AD	USGS	1	PB		40.92774	-74.71549
01457400	AN0074	Musconetcong River at Riegelsville	USGS	STAFF	1	WI		40.59250	-75.18611
01458080	UNEQUAL-0110	Milford Creek near Spring Mills NJ	KM	USGS	11	PB		40.58925	-75.11461
01458550	UNEQUAL-0458	Nishisakawick Ck trib ds CR519 nr Everittstown NJ	KK	USGS	11	PB		40.55507	-75.01776
01458570	AN0081	Nishisakawick Creek near Frenchtown	USGS	STAFF	11	LUI	AGRICULTURE	40.54417	-75.04639
01460870	UNEQUAL-0414	Lockatong Creek at Kingwood NJ	KB	USGS	11	PB		40.47017	-75.02182
01462033	UNEQUAL-0403	Delaware River trib 4 near Lambertville NJ	KA	USGS	11	PB		40.35673	-74.93847
01463850	AN0115	Miry Run at Route 535, at Mercerville	USGS	STAFF	11	LUI	URBAN	40.24694	-74.68667
01464020	AN0118	Assunpink Creek at Peace Street, at Trenton	USGS	STAFF	11	WI		40.21722	-74.76861
01464424	UNEQUAL-0405	Deep Run trib near Jacobstown NJ	KK	USGS	20	PB		40.08838	-74.55839
01464504	AN0126	Crosswicks Creek at Groveville Road, at Groveville	USGS	STAFF	20	WI		40.16722	-74.67750
01464515	AN0129	Doctors Creek at Allentown	USGS	STAFF	20	LUI	AGRICULTURE	40.17694	-74.59889
01464527	AN0132	Blacks Creek at Chesterfield	USGS	STAFF	20	LUI	AGRICULTURE	40.10944	-74.64167
01465850	UNEQUAL-0441	South Branch Rancocas Creek at Vincentown NJ	CM	USGS	19	PB		39.94304	-74.75584
01465895	AN0156	Little Creek at Chairville	USGS	STAFF	19	LUI	UNDEVELOPED	39.89806	-74.76833
01465928	UNEQUAL-0409	Masons Crk us of Springville Rd nr Springville NJ	JG	USGS	19	PB		39.92942	-74.86258
01466500	AN0146	McDonalds Branch in Bymie State Forest	KM	DCP	19	BKG		39.88500	-74.50528
01466900	AN0148	Greenwood Branch at New Lisbon	AD	DCP	19	LUI	UNDEVELOPED	39.95611	-74.62778
01467005	AN0151	North Branch Rancocas Creek at Iron Works Park, at Mt Holly	USGS	STAFF	19	WI		39.99806	-74.78139
01467150	AN0191	Cooper River at Haddonfield	KK	DCP	18	LUI	URBAN	39.90306	-75.02139
01467359		NB Big Timber Creek at Glendora	USGS	STAFF	18	LUI	URBAN	39.83444	-75.06694
01477120	AN0683	Raccoon Creek near Swedesboro NJ	JK	DCP	18	WI		39.74056	-75.25917
01482500	AN0691	Salem River at Woodstown	JG	DCP	17	LUI	AGRICULTURE	39.64389	-75.33028
0138013550	UNEQUAL-0495	Rockaway River trib 3 near Rockaway Valley NJ	KK	NJDEP	6	PB		40.92093	-74.46005
0140540950	AN0570	Blue Anchor Brook at Elm	USGS	STAFF	14	LUI	MIXED	39.66806	-74.99472
0141145250	UNEQUAL-0397	Reed Branch near Franklinville NJ	JG	USGS	17	PB		39.62039	-75.10445
0144347170	UNEQUAL-0455	Trout Brook tributary near Five Points NJ	KM	USGS	1	PB		41.08635	-74.86122
0146450240	UNEQUAL-0126	Crosswicks Creek tributary 4 near Chesterfield NJ	JK	NJDEP	20	PB		40.13603	-74.61822

shaded stations require supplemental parameters (pesticides and metals) this sampling period

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* Samped from 11/2019 to 9/2020 but discontinued to intermittent and/or non-flowing conditions

** Replacement sites from 11/2020 to 9/2022

ATTACHMENT B: PARAMETER LIST

CONSTITUENT OR COMPOUND NAME	PARAMETER CODE	LABORATORY METHOD	CAS NUMBER	REPORTING LEVEL	UNITS	REPORTING LEVEL TYPE
WATER COLUMN METAL PARAMETERS						
FIELD-DETERMINED PARAMETERS						
Discharge, instantaneous	00061					
Specific Conductance	00095			1.0	us/cm	
pH, field	00400			0.1	SU	
Temperature, Water	00010			0.1	C	
Temperature, Air	00020			0.1	C	
Gage Height	00065			0.01	ft	
Barometric Pressure	00025			1.0	mm Hg	
Oxygen, Dissolved	00300			0.1	mg/L	
Oxygen, Dissolved, in percent of saturation	00301			1.0	% sat	
Turbidity	63676			0.1	NTRU	
SCHEDULE 1923, COMMON IONS						
Acid Neutralizing Capacity (ANC), laboratory	90410	TT040	471-34-1	4.0	mg/L	ltmdl
Calcium	00915	PLA11	7440-70-2	0.022	mg/L	DLDQC
Chloride	00940	IC022	16887-00-6	0.02	mg/L	DLDQC
Fluoride	00950	IC003	16984-48-8	0.01	mg/L	DLDQC
Inductively coupled plasma (ICP) setup	N/A	N/A	-	N/A	unsp	lrl
Magnesium	00925	PLA11	7439-95-4	0.011	mg/L	DLDQC
pH, laboratory	00403	EL006	-	0.1	pH	mrl
Potassium	00935	PLO03	7440-09-7	0.03	mg/L	DLDQC
Residue, 180 degrees Celsius (TDS)	70300	ROE10	-	20	mg/L	mrl
Silica	00955	CL151	7631-86-9	0.06	mg/L	DLDQC
Sodium	00930	PLA11	7440-23-5	0.06	mg/L	DLDQC
Specific conductance, laboratory	90095	WHT03	-	5	uS/cm	mrl
Sulfate	00945	IC022	14808-79-8	0.02	mg/L	DLDQC
NJDOH NUTRIENTS & RESIDUE						
Nitrogen, ammonia, dissolved	00608	SM4500NH3H		0.01	mg/L	
Residue, Total suspended	00530	SM2540F		0.1	mg/L	
Hexavalent Chromium	01032	218.6		0.1	ug/L	
Total Organic Carbon (TOC)		SM5310C11		1.00	mg/L	
SCHEDULE 1286, NUTRIENTS						
Nitrogen, ammonia + organic nitrogen	00623	KJ003	17778-88-0	0.07	mg/L	DLDQC
Phosphorus	00665	CL021	7723-14-0	0.004	mg/L	DLDQC
Phosphorus	00666	CL019	7723-14-0	0.004	mg/L	DLDQC
SCHEDULE 1287, CARBONS AND UV'S						
Inorganic carbon	00688	00127	-	0.03	mg/L	ltmdl
Organic carbon	00681	OX008	-	0.23	mg/L	DLDQC
Organic carbon	00689	CAL06	-	0.05	mg/L	mrl
Total Particulate Carbon (TPC)	00694	COMB6	-	0.05	mg/L	ltmdl
Total Particulate Nitrogen (TPN)	49570	COMB7	17778-88-0	0.030	mg/L	ltmdl
Ultraviolet absorbing organic constituents - 254 nm	50624	UV005	-	0.005	u/cm	LTMDL
Ultraviolet absorbing organic constituents - 280nm	61726	UV007	-	0.005	u/cm	LTMDL
WATER COLUMN METAL PARAMETERS						
SCHEDULE 1279, WATER COLUMN TRACE ELEMENT, TOTAL RECOVERABLE (COLLECTED AT 7 BACKGROUND AND 22 FIXED SITES IN FEB/MAR and AUG/SEPT)						
Arsenic, total recoverable	01002	PLM11	7440-38-2	0.2	ug/L	DLDQC
Barium	01007	PLA15	7440-39-3	0.3	ug/L	DLDQC
Beryllium	01012	PLM47	7440-41-7	0.02	ug/L	DLDQC
Boron	01022	PLM47	7440-42-8	5	ug/L	DLDQC
Cadmium	01027	PLM47	7440-43-9	0.03	ug/L	DLDQC
Chromium	01034	PLM11	7440-47-3	0.4	ug/L	DLDQC
Copper	01042	PLM11	7440-50-8	0.8	ug/L	DLDQC
Digestion for trace metals	99870	00144	-	N/A	no.	mrl
ICP Mass Spectrometry (ICPMS) setup	N/A	N/A	-	N/A	unsp	mrl
Inductively coupled plasma (ICP) setup	N/A	N/A	-	N/A	unsp	lrl
Iron	01045	PLA15	7439-89-6	4.6	ug/L	DLDQC
Lead	01051	PLM48	7439-92-1	0.04	ug/L	DLDQC
Manganese	01055	PLA15	7439-96-5	0.2	ug/L	DLDQC
Nickel	01067	PLM11	7440-02-0	0.2	ug/L	DLDQC
pH, laboratory	00403	EL006	-	0.1	pH	mrl
Selenium	01147	PLM11	7782-49-2	0.1	ug/L	DLDQC
Silver	01077	PLM48	7440-22-4	0.03	ug/L	DLDQC

ATTACHMENT B: PARAMETER LIST

specific conductance, laboratory	90095	WHT03	-	5	uS/cm	mrl
Zinc	01092	PLM11	7440-66-6	2	ug/L	DLDQC
LAB CODE 3122, WATER COLUMN TRACE ELEMENT, DISSOLVED						
(COLLECTED AT 7 BACKGROUND AND 22 FIXED SITES IN FEB/MAR and AUG/SEPT)						
Arsenic, dissolved	01000	PLM10	7440-38-2	0.1	ug/L	DLDQC
USGS WISCONSIN MERCURY LAB						
(COLLECTED AT 7 BACKGROUND AND 22 FIXED SITES IN FEB/MAR and AUG/SEPT)						
Mercury, low-level	71900	1631E		0.17	ng/L	
STREAMBED SEDIMENT PARAMETERS						
ADD-ON CARBON AND PHOSPHORUS, STREAMBED SEDIMENT						
(COLLECTED AT 20 PROBABILISTIC SITES IN AUG/SEPT)						
pH, streambed sediment	70310	Field Meas.		0.1	SU	
Carbon, inorganic, streambed sediment	00686	Add-on LC 0133		0.2	g/kg	
Carbon, total, streambed sediment	00693	Add-on LC 2321		0.1	g/kg	
Phosphorus, total, streambed sediment	00668	RTI Lab (contract)		40	mg/kg	
SCHEDULE 1719, TRACE ELEMENTS in STREAMBED SEDIMENT						
(COLLECTED AT 20 PROBABILISTIC SITES IN AUG/SEPT)						
Arsenic	64847	PLM13	7440-38-2	0.1	mg/kg	mrl
Cadmium	01028	PLM46	7440-43-9	0.1	mg/kg	mrl
Chromium	01029	PLA14	7440-47-3	0.6	mg/kg	mrl
Cobalt	01038	PLM13	7440-48-4	0.1	mg/kg	mrl
Copper	01043	PLA14	7440-50-8	1.4	mg/kg	mrl
Digestion, Acid, Bed Sediment, Microwave Assisted	N/A		-	N/A	no.	
ICP Mass Spectrometry (ICPMS) setup	N/A	N/A	-	N/A	unsp	mrl
Inductively coupled plasma (ICP) setup	N/A	N/A	-	N/A	unsp	lrl
Iron	01170	PLA14	7439-89-6	4.6	mg/kg	mrl
Lead	01052	PLM46	7439-92-1	0.1	mg/kg	mrl
Manganese	01053	PLA14	7439-96-5	0.2	mg/kg	mrl
Mercury	71921	00026	7439-97-6	0.005	mg/kg	mrl
moisture content, fraction of dry weight	00495	GRV28	-	0.10	pct	mrl
Nickel	01068	PLM13	7440-02-0	0.1	mg/kg	mrl
Sediment preparation, trace elements	N/A	N/A	-	N/A	unsp	mrl
Selenium	64848	PLM13	7782-49-2	0.1	mg/kg	mrl
Zinc	01093	PLA14	7440-66-6	2.0	mg/kg	mrl
SCHEDULE 2504, PAHs & PCB PARAMETERS in STREAMBED SEDIMENT						
(COLLECTED AT 20 PROBABILISTIC SITES IN AUG/SEPT)						
1,2-Dimethylnaphthalene	49403	GCM71	573-98-8	50	ug/kg	lrl
1,6-Dimethylnaphthalene	49404	GCM71	575-43-9	50	ug/kg	lrl
1-Methyl-9H-fluorene	49398	GCM71	1730-37-6	50	ug/kg	lrl
1-Methylphenanthrene	49410	GCM71	832-69-9	50	ug/kg	lrl
1-Methylpyrene	49388	GCM71	2381-21-7	50	ug/kg	lrl
2,3,6-Trimethylnaphthalene	49405	GCM71	829-26-5	50	ug/kg	lrl
2,6-Dimethylnaphthalene	49406	GCM71	581-42-0	50	ug/kg	lrl
2-Ethylnaphthalene	49948	GCM71	939-27-5	50	ug/kg	lrl
2-Fluorobiphenyl (surrogate)	49279	GCM71	321-60-8	N/A	pct	
2-Methylanthracene	49435	GCM71	613-12-7	50	ug/kg	lrl
4H-Cyclopenta[def]phenanthrene	49411	GCM71	203-64-5	50	ug/kg	lrl
Acenaphthene	49429	GCM71	83-32-9	50	ug/kg	lrl
Acenaphthylene	49428	GCM71	208-96-8	50	ug/kg	lrl
Anthracene	49434	GCM71	120-12-7	50	ug/kg	lrl
Benz[a]anthracene	49436	GCM71	56-55-3	50	ug/kg	lrl
Benzo[a]pyrene	49389	GCM71	50-32-8	50	ug/kg	lrl
Benzo[b]fluoranthene	49458	GCM71	205-99-2	50	ug/kg	lrl
Benzo[ghi]perylene	49408	GCM71	191-24-2	50	ug/kg	lrl
Benzo[k]fluoranthene	49397	GCM71	207-08-9	50	ug/kg	lrl
Chrysene	49460	GCM71	218-01-9	50	ug/kg	lrl
Dibenz[a,h]anthracene	49461	GCM71	53-70-3	50	ug/kg	lrl
Fluoranthene	49466	GCM71	206-44-0	50	ug/kg	lrl
Fluorene	49399	GCM71	86-73-7	50	ug/kg	lrl
Indeno[1,2,3-cd]pyrene	49390	GCM71	193-39-5	50	ug/kg	lrl
Isophorone	49400	GCM71	78-59-1	50	ug/kg	lrl
Naphthalene	49402	GCM71	91-20-3	50	ug/kg	lrl
Nitrobenzene-d5 (surrogate)	49280	GCM71	4165-60-0	N/A	pct	
p-Cresol	49451	GCM71	106-44-5	50	ug/kg	lrl
Phenanthrene	49409	GCM71	85-01-8	50	ug/kg	lrl

ATTACHMENT B: PARAMETER LIST

Phenanthridine	49393	GCM71	229-87-8	50	ug/kg	lrl
Polychlorinated biphenyls, total	39519	00069	1336-36-3	5	ug/kg	mrl
Pyrene	49387	GCM71	129-00-0	50	ug/kg	lrl
sample weight, schedule 2502	99854	00019	-	N/A	g	
set number, schedule 2502	99825	00019	-	N/A	no.	
Terphenyl-d14 (surrogate)	49278	GCM71	1718-51-0	N/A	pct	
total Nonachlorobiphenyl (surrogate)	90758	00069	53742-07-7	N/A	pct	
WATER COLUMN PESTICIDE PARAMETERS						
SCHEDULE 2033, PESTICIDES, FILTERED						
(COLLECTED AT 3 BACKGROUND AND 22 FIXED SITES and 3 BACKGROUND SITES IN MAY/JUNE)						
1-Naphthol	49295	GCM39	90-15-3	0.050	ug/L	lrl
2,6-Diethylaniline	82660	GCM35	579-66-8	0.0060	ug/L	lrl
2-Chloro-2,6-diethylacetanilide	61618	GCM39	6967-29-9	0.010	ug/L	lrl
2-Chloro-4-isopropylamino-6-amino-s-triazine (CIAT)	04040	GCM35	6190-65-4	0.010	ug/L	lrl
2-Ethyl-6-methylaniline	61620	GCM39	24549-06-2	0.010	ug/L	lrl
3,4-Dichloroaniline	61625	GCM39	95-76-1	0.006	ug/L	lrl
3,5-Dichloroaniline	61627	GCM39	626-43-7	0.006	ug/L	lrl
4-Chloro-2-methylphenol	61633	GCM39	1570-64-5	0.008	ug/L	lrl
Acetochlor	49260	GCM33	34256-82-1	0.010	ug/L	lrl
Alachlor	46342	GCM35	15972-60-8	0.008	ug/L	lrl
alpha-Endosulfan	34362	GCM39	959-98-8	0.006	ug/L	lrl
alpha-HCH-d6 (surrogate)	99995	GCM32	86194-41-4	N/A	pct	
Atrazine	39632	GCM35	1912-24-9	0.008	ug/L	lrl
Azinphos-methyl	82686	GCM35	86-50-0	0.12	ug/L	lrl
Azinphos-methyl oxon	61635	GCM39	961-22-8	0.042	ug/L	lrl
Benfluralin	82673	GCM35	1861-40-1	0.014	ug/L	lrl
Carbaryl	82680	GCM35	63-25-2	0.06	ug/L	lrl
Carbofuran	82674	GCM35	1563-66-2	0.060	ug/L	lrl
Chlorpyrifos	38933	GCM35	2921-88-2	0.010	ug/L	lrl
Chlorpyrifos, oxygen analog	61636	GCM39	5598-15-2	0.08	ug/L	lrl
cis-Permethrin	82687	GCM35	61949-76-6	0.010	ug/L	lrl
cis-Propiconazole	79846	GCM40	60207-90-1	0.008	ug/L	lrl
Cyanazine	04041	GCM35	21725-46-2	0.022	ug/L	lrl
Cyfluthrin	61585	GCM39	68359-37-5	0.016	ug/L	lrl
Cypermethrin	61586	GCM39	52315-07-8	0.020	ug/L	lrl
Dacthal	82682	GCM35	1861-32-1	0.0076	ug/L	lrl
Desulfinylfipronil	62170	GCM29	-	0.012	ug/L	lrl
Desulfinylfipronil amide	62169	GCM29	-	0.029	ug/L	lrl
Diazinon	39572	GCM35	333-41-5	0.0060	ug/L	lrl
Diazinon, oxygen analog	61638	GCM14	962-58-3	0.012	ug/L	lrl
Diazinon-d10 (surrogate)	99994	GCM32	100155-47-3	N/A	pct	
Dichlorvos	38775	GCM39	62-73-7	0.04	ug/L	lrl
Dicrotophos	38454	GCM39	141-66-2	0.08	ug/L	lrl
Dieldrin	39381	GCM35	60-57-1	0.008	ug/L	lrl
Dimethoate	82662	GCM40	60-51-5	0.010	ug/L	lrl
Disulfoton	82677	GCM35	298-04-4	0.040	ug/L	lrl
Disulfoton sulfone	61640	GCM39	2497-06-5	0.010	ug/L	lrl
Endosulfan sulfate	61590	GCM39	1031-07-8	0.016	ug/L	lrl
EPTC	82668	GCM35	759-94-4	0.0056	ug/L	lrl
Ethion	82346	GCM40	563-12-2	0.0046	ug/L	lrl
Ethion monoxon	61644	GCM39	17356-42-2	0.021	ug/L	lrl
Ethoprophos	82672	GCM35	13194-48-4	0.016	ug/L	lrl
Fenamiphos	61591	GCM39	22224-92-6	0.030	ug/L	lrl
Fenamiphos sulfone	61645	GCM39	31972-44-8	0.054	ug/L	lrl
Fenamiphos sulfoxide	61646	GCM39	31972-43-7	0.08	ug/L	lrl
Fipronil	62166	GCM29	120068-37-3	0.018	ug/L	lrl
Fipronil sulfide	62167	GCM29	120067-83-6	0.016	ug/L	lrl
Fipronil sulfone	62168	GCM29	120068-36-2	0.024	ug/L	lrl
Fonofos	04095	GCM35	944-22-9	0.0048	ug/L	lrl
Hexazinone	04025	GCM39	51235-04-2	0.012	ug/L	lrl
Iprodione	61593	GCM39	36734-19-7	0.014	ug/L	lrl
Isofenphos	61594	GCM39	25311-71-1	0.014	ug/L	lrl
lambda-Cyhalothrin	61595	GCM39	91465-08-6	0.014	ug/L	lrl
Malaoxon	61652	GCM39	1634-78-2	0.022	ug/L	lrl
Malathion	39532	GCM35	121-75-5	0.016	ug/L	lrl
Metalaxyl	61596	GCM39	57837-19-1	0.014	ug/L	lrl

ATTACHMENT B: PARAMETER LIST

Methidathion	61598	GCM39	950-37-8	0.012	ug/L	lrl
Methyl parathion	82667	GCM35	298-00-0	0.008	ug/L	lrl
Metolachlor	39415	GCM35	51218-45-2	0.012	ug/L	lrl
Metribuzin	82630	GCM35	21087-64-9	0.012	ug/L	lrl
Molinate	82671	GCM35	2212-67-1	0.008	ug/L	lrl
Myclobutanil	61599	GCM39	88671-89-0	0.010	ug/L	lrl
Oxyfluorfen	61600	GCM39	42874-03-3	0.010	ug/L	lrl
Paraoxon-methyl	61664	GCM39	950-35-6	0.014	ug/L	lrl
Pendimethalin	82683	GCM35	40487-42-1	0.012	ug/L	lrl
Phorate	82664	GCM35	298-02-2	0.020	ug/L	lrl
Phorate oxon	61666	GCM39	2600-69-3	0.027	ug/L	lrl
Phosmet	61601	GCM39	732-11-6	0.14	ug/L	lrl
Phosmet oxon	61668	GCM39	3735-33-9	0.051	ug/L	lrl
Prometon	04037	GCM35	1610-18-0	0.012	ug/L	lrl
Prometryn	04036	GCM39	7287-19-6	0.010	ug/L	lrl
Propanil	82679	GCM35	709-98-8	0.010	ug/L	lrl
Propargite	82685	GCM35	2312-35-8	0.020	ug/L	lrl
Propyzamide	82676	GCM35	23950-58-5	0.008	ug/L	lrl
Sample volume	99972	GCM32	-	N/A	mL	
Set number	N/A	N/A	-	N/A	no.	
Simazine	04035	GCM35	122-34-9	0.006	ug/L	lrl
Tebuconazole	62852	GCM14	107534-96-3	0.020	ug/L	lrl
Tebuthiuron	82670	GCM35	34014-18-1	0.028	ug/L	lrl
Tefluthrin	61606	GCM39	79538-32-2	0.014	ug/L	lrl
Terbufos	82675	GCM35	13071-79-9	0.018	ug/L	lrl
Terbufos oxygen analog sulfone	61674	GCM39	56070-15-6	0.045	ug/L	lrl
Terbuthylazine	04022	GCM39	5915-41-3	0.008	ug/L	lrl
Thiobencarb	82681	GCM35	28249-77-6	0.016	ug/L	lrl
trans-Propiconazole	79847	GCM40	60207-90-1	0.018	ug/L	lrl
Tribufos	61610	GCM39	78-48-8	0.018	ug/L	lrl
Trifluralin	82661	GCM35	1582-09-8	0.018	ug/L	lrl
QUALITY ASSURANCE / QUALITY CONTROL						
FIELD BLANKS for TRACE ELEMENTS						
1 per sampler during Feb-March and Aug-Sept						
Arsenic	01000	PLM10	7440-38-2	0.1	ug/L	DLDQC
Copper	01040	PLM10	7440-50-8	0.8	ug/L	DLDQC
Lead	01049	PLM43	7439-92-1	0.04	ug/L	DLDQC
Nickel	01065	PLM10	7440-02-0	0.2	ug/L	DLDQC
Zinc	01090	PLM10	7440-66-6	2	ug/L	DLDQC
Mercury, low-level	71900	1631E		0.17	ng/L	
ADD-ONS SPECIFICALLY FOR NJWSA						
(not included in cooperative Ambient Surface Water Quality Monitoring Network)						
DISSOLVED BORON (LC2110) AND ORTHO-PHOSPHORUS (LC3118)						
Boron, dissolved	1020	PLA13	7440-42-8	2.0	ug/L	DLDQC
Phosphorus, phosphate, ortho	671	PHM01	14265-44-2	0.004	mg/L	DLDQC
PER- and POLYFLUOROALKYL SUBSTANCES						
SGS AXYS ANALYTICAL SERVICES, LTD.						
Collected at all sites twice per year (February-March and August-September)						
Perfluorobutanoic acid		LCID537 AQ	375-22-4	0.0080	ug/L	
Perfluoropentanoic acid		LCID537 AQ	2706-90-3	0.0040	ug/L	
Perfluorohexanoic acid		LCID537 AQ	307-24-4	0.0040	ug/L	
Perfluoroheptanoic acid		LCID537 AQ	375-85-9	0.0040	ug/L	
Perfluorooctanoic acid		LCID537 AQ	335-67-1	0.0040	ug/L	
Perfluorononanoic acid		LCID537 AQ	375-95-1	0.0040	ug/L	
Perfluorodecanoic acid		LCID537 AQ	335-76-2	0.0040	ug/L	
Perfluoroundecanoic acid		LCID537 AQ	2058-94-8	0.0040	ug/L	
Perfluorododecanoic acid		LCID537 AQ	307-55-1	0.0040	ug/L	
Perfluorotridecanoic acid		LCID537 AQ	72629-94-8	0.0040	ug/L	
Perfluorotetradecanoic acid		LCID537 AQ	376-06-7	0.0040	ug/L	
Perfluorobutanesulfonic acid		LCID537 AQ	375-73-5	0.0040	ug/L	
Perfluoropentanesulfonic acid		LCID537 AQ	2706-91-4	0.0040	ug/L	
Perfluorohexanesulfonic acid		LCID537 AQ	355-46-4	0.0040	ug/L	
Perfluoroheptanesulfonic acid		LCID537 AQ	375-92-8	0.0040	ug/L	
Perfluorooctanesulfonic acid		LCID537 AQ	1763-23-1	0.0040	ug/L	
Perfluorononanesulfonic acid		LCID537 AQ	68259-12-1	0.0040	ug/L	
Perfluorodecanesulfonic acid		LCID537 AQ	335-77-3	0.0040	ug/L	

ATTACHMENT B: PARAMETER LIST

Perfluorooctane sulfonamide (PFOSA)		LCID537 AQ	754-91-6	0.0040	ug/L	
MeFOSAA		LCID537 AQ	2355-31-9	0.020	ug/L	
EtFOSAA		LCID537 AQ	2991-50-6	0.020	ug/L	
4:2 Fluorotelomer sulfonate		LCID537 AQ	757124-72-4	0.0080	ug/L	
6:2 Fluorotelomer sulfonate		LCID537 AQ	27619-97-2	0.0080	ug/L	
8:2 Fluorotelomer sulfonate		LCID537 AQ	39108-34-4	0.0080	ug/L	
HFPO-DA (GenX)		LCID537 AQ	13252-13-6	0.020	ug/L	
ADONA		LCID537 AQ	919005-14-4	0.0080	ug/L	
9Cl-PF3ONS (F-53B Major)		LCID537 AQ	756426-58-1	0.0080	ug/L	
11Cl-PF3OUdS (F-53B Minor)		LCID537 AQ	763051-92-9	0.0080	ug/L	

All constituents with remarks "from NJDOH" are analyzed at the NJDOH lab. Starting in FY2007, NJDEP contracts directly with NJDOH for this work. The cost for the analyses are no longer included in the NJDEP/USGS joint funding agreement.

Revised 06-23-99: all schedules updated from SPN files.

Revised 12-02-99: all schedules updated by SPIN files, new schedules notes,

Revised 09-05-03: S1286, S1287, S1307, S2001, L9502, & NJDOH BTM MAT updated.

Headings, field parms, and S1923 rearranged. mjd.

Revised 10-02-03: Removed S1286; added S3262 (Ocala); S1279 to 2x's/yr, S1282 renamed to S1719. mjd Revised 07-01-04: LC9502 renamed to S2504. mjd.

Revised 09-16-04 Removed Ocala S3262 , replaced with S1286. rgr Revised 02-01-05: Added dissolved arsenic (L3122) rgr

Revised 09-01-06: Replaced pesticide schedule 2060 with 2033 rgr

Revised 09-2007: Removed BOD, ecoli, enterococci, fecal coliform, nitrite (00613) rgr Revised 09-20-08: removed boron LC2110 rgr

Revised 07-31-09:Removed TKN in bottom sediments, P in bottom sediments analyzed at NWQL, removed VOC schedule 2021 rgr

Revised 06-14-10: Removed ortho phosphate (00671) rgr

Revised 7-29-2015: Removed analysis of total mercury from NWQL S1279 (LC2707). Added lower-level analysis of total mercury at USGS-WI Mercury Lab. hlh/hah

ATTACHMENT C
DATA REPORTING AND STORAGE

Public Web Site	Data Source(s)	Web Address
1. National Water Monitoring Council Water Quality Portal	• USGS NWIS database	http://www.waterqualitydata.us/
2. USGS National Water Information System (NWIS)	• USGS NWIS database	http://waterdata.usgs.gov/nwis

ATTACHMENT D: ASWQMN Metals and Pesticide Stations (2019-2021)

Station ID	AMNET #	Station Name	Sampler	Gage Type	WMA	Station Type	Land Use	Flow Needed
01377000		Hackensack River at Rivervale	NJDEP	DCP	5	LUI	URBAN	YES
01382000		Passaic River at Two Bridges	USGS	RP	6	WI		YES
01391500		Saddle River at Lodi	NJDEP	DCP	4	WI		YES
01394500	AN0194	Rahway River near Springfield	NJDEP	DCP	7	LUI	URBAN	YES
01407760	AN0480	Jumping Brook near Neptune City	NJDEP	DCP	12	LUI	URBAN	YES
01408000	AN0493	Manasquan River at Squankum	NJDEP	DCP	12	WI		YES
01408009	AN0494	Mingamahone Brook near Earle	USGS	STAFF	12	LUI	UNDEVELOPED	YES
01408100	AN0502	North Branch Metedeconk River at Lakewood	USGS	STAFF	13	LUI	URBAN	YES
01411400	AN0771	Fishing Creek at Rio Grande	USGS	STAFF	16	LUI	UNDEVELOPED	YES
01411444	AN0765	West Creek nr Leesburg	USGS	STAFF	16	LUI	UNDEVELOPED	YES
01412800	AN0712	Cohansey River at Seeley	NJDEP	DCP	17	LUI	AGRICULTURE	YES
01446400	AN0048	Pequest River at Belvidere	USGS	STAFF	1	WI		YES
01458570	AN0081	Nishisakawick Creek near Frenchtown	USGS	STAFF	11	LUI	AGRICULTURE	YES

ATTACHMENT D: ASWQMN Metals and Pesticide Stations (2019-2021)

01463850	AN0115	Miry Run at Route 533, at Mercerville	USGS	STAFF	11	LUI	URBAN	YES
01464504	AN0126	Crosswicks Creek at Groveville Road, at Groveville	USGS	STAFF	20	WI		YES
01464515	AN0129	Doctors Creek at Allentown	USGS	STAFF	20	LUI	AGRICULTURE	YES
01464527	AN0132	Blacks Creek at Chesterfield	USGS	STAFF	20	LUI	AGRICULTURE	YES
01465893	AN0158	Little Creek at Chairville	USGS	STAFF	19	LUI	UNDEVELOPED	YES
01467005	AN0151	North Branch Rancocas Creek at Iron Works Park, at Mt Holly	USGS	STAFF	19	WI		YES
01467359		NB Big Timber Creek at Glendora	USGS	STAFF	18	LUI	URBAN	YES
01477120	AN0683	Raccoon Creek near Swedesboro NJ	NJDEP	DCP	18	WI		YES
0140940950	AN0570	Blue Anchor Brook at Elm	USGS	STAFF	14	LUI	MIXED	YES

Table 3. SAMPLING SCHEDULE FOR THE AMBIENT SURFACE-WATER-QUALITY MONITORING NETWORK IN FY 2020 73 Fixed and 50 PB sites; Metals (LLHg-auto) at 22 fixed and 7 BKG (2x/yr); Pest at 22 fixed sites/yr; Bottoms at 20 PB sites/yr; PFAS at all network sites (2x/yr)

STATION TYPE	NUMBER OF SITES [1]	FLOW	1st Quarter November 1 to December 31 *Includes Hydrologic Conditions Report	2nd Quarter February 1 to March 30	3rd Quarter May 1 to June 30	4th Quarter August 1 to September 30
Background (BKG)	7 1 DEP 6 USGS	YES [2]	ROUTINES	ROUTINES WC METALS PFAS	ROUTINES WC PESTICIDES (1/2 of sites)	ROUTINES WC METALS PFAS
Watershed Integrator (WI)	23 11 DEP 12 USGS	YES [2]	ROUTINES	ROUTINES WC METALS (1/3 of sites) PFAS	ROUTINES WC PESTICIDES (1/3 of sites)	ROUTINES WC METALS (1/3 of sites) PFAS
Land Use Indicator (LUI)	43 14 DEP 29 USGS	YES [2]	ROUTINES	ROUTINES WC METALS (1/3 of sites) PFAS	ROUTINES WC PESTICIDES (1/3 of sites)	ROUTINES WC METALS (1/3 of sites) PFAS
Probabilistic Sites	50 48 NJDEP 2 USGS	YES [2]	ROUTINES	ROUTINES PFAS	ROUTINES	ROUTINES BOTTOM SED[3] (20 of 50) PFAS
Quality Assurance	17 7 DEP 10 USGS	n/a	ROUTINE REPLICATE	DISS. TRACE ELEMENT BLANK PFAS[4]		DISS. TRACE ELEMENT BLANK PFAS[4]

1 = Actual number may vary from year to year at the discretion of the network design committee.

2 = All 73 network sites and 50 probabilistic (1 col-located with a network site) sites have flows associated with each sample collected. Continuous-record discharge gages are located at 27 network sites; therefore discharge measurements are made at 46 network and 50 probabilistic sites each quarter (totaling 384 Qms)
3 = Bottom sediments at 20 of the 50 probabilistic sites.
4 = Field blanks collected at all sites for PFAS (74 DEP, 47 USGS)

ROUTINES = field parameters, nutrients, common ions, suspended sediment, and organic carbons at all 122 sites in the network
BOTTOM SEDIMENTS (SED) = pH, nutrients, carbon, metals, PAH & PCB compounds, and particle size at 20 PB sites
WATER COLUMN (WC) METALS = Water-column, 15 whole-water-recoverable metals at 22 Fixed (WI & LUI) and 7 BKG sites
WATER COLUMN (WC) PESTICIDES = 85 compounds from schedule 2033, analyzed at 22 Fixed (WI & LUI) & 3-4 BKG sites
PFAS = collected at all network sites

There are 122 sites in the network this year.

ATTACHMENT F.

New Jersey Chemical/AMNET Probabilistic Survey Design

Contact:
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Description of Sample Design

Target Population: All freshwater, non-tidal rivers and streams (above the head of tide). The entire length of the mainstem of the Delaware River has been excluded from the data frame.

Sample Frame: Leigh Lager, NJ DEP, will provide the GIS coverage for the sample frame.

Survey Design: A Generalized Random Tessellation Stratified (GRTS) survey design for a linear stream resource was used. The GRTS design includes reverse hierarchical ordering of the selected sites.

Weighting: unequal weighting, this procedure is used in the site selection process to guarantee inclusion of all stream orders

Stratification: None

Multi-Density Categories: 5 DEP regions (Atlantic Coast, Lower Delaware, Northeast, Northwest, Raritan)

Panels: Five total panels. Each panel (50 streams/rivers statewide) will be sampled for water chemistry quarterly for 2 years.

Panel	Water Year	# Sites	# Chemical Sampling events	# AMNET Sampling events
One	2016-2017	50	400	50
Two	2018-2019	50	400	50
Three	2020-2021	50	400	50
Four	2022-2023	50	400	50
Five	2024-2025	50	400	50
	Totals	**250**	**2000**	**250**

Sample Size: 250 streams/rivers will be sampled in 5 years using a total of 2000 site visits for chemical sampling and 250 site visits for AMNET sampling.

Target Criteria:

1. No canals (except for the Delaware and Raritan Canal which traverses a large portion of the State, is a receiving waterbody for several large streams and generally behaves like a flowing river/stream), ditches, pipelines, bogs, wetlands (unless in a flowing state and where surrounding topography may prohibit the existence of a true channel), intermittent streams, and lakes or impoundments
2. At least 1 square mile of drainage area to ensure adequate flow year-round. This is based on available GIS hydrology layers/coverages. Due to limitations and errors in the layers, sites may be acceptable if recon and/or previous knowledge confirms the existence of an adequately flowing stream.
3. At least 100 feet upstream of the inlets to impoundments (ponds, lakes, reservoirs); move further if obvious that stream is affected by impoundment (we'll evaluate on a case by case basis during recon)
4. At least 500 feet downstream of outlets from impoundments

Oversample: 400% = 1000 oversample sites

Summary: This design option would provide information on all 5 DEP water regions. This design would enable for statistical estimates of condition (i.e. fully supporting, or good, fair, poor) for statewide assessment of 50 sites, every two years. After all panels are completed in 10 years, comprehensive statewide estimates of water quality condition can be made for each DEP water region categories with good confidence (90-95%). Due to the target population being used for both chemical/physical and macroinvertebrate sample collection, the evaluation criteria and evaluation process may be slightly different (e.g. macroinvertebrate sample collection requires a wadable condition), and therefore most locations will overlap, but there will be differences in the sites that are ultimately chosen for each purpose.

Table 1. Summary of selected probabilistic sites by water region and panel structure

Region	OverSample	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Sum
Atlantic Coast	231	12	12	12	10	8	285
Lower Delaware	197	10	9	12	10	12	250
Northeast	150	6	7	8	8	8	187
Northwest	192	10	9	9	8	12	240
Raritan	230	12	13	9	14	10	288
Sum	1000	50	50	50	50	50	1250

Table 2. Summary of selected probabilistic sites by water region and Strahler stream order

	Strahler Order							
Region	1	2	3	4	5	6	7	Sum
Atlantic Coast	136	59	39	35	15	1	0	285
Lower Delaware	114	61	46	18	7	4	0	250
Northeast	62	55	27	22	9	7	5	187
Northwest	111	51	31	16	23	8	0	240
Raritan	126	78	32	32	14	5	1	288
Sum	549	304	175	123	68	25	6	1250

Evaluation Process

The survey design weights that are given in the design file assume that the survey design is implemented as designed. Typically, users prefer to replace sites that cannot be sampled with other sites to achieve the sample size planned. The site replacement process is described above. When sites are replaced, the survey design weights are no longer correct and must be adjusted. The weight adjustment requires knowing what happened to each site in the base design and the over sample sites. EvalStatus is initially set to "NotEval" to indicate that the site has yet to be evaluated for sampling. When a site is evaluated for sampling, then the EvalStatus for the site must be changed. Recommended codes are:

Category	Target Status	Description	Evaluation Code
Dry Channel	Non-Target	Channel present, but no flowing water	DRY
Non-Riverine Habitat	Non-Target	Wetland, pond, or standing water present, no definable channel	NRH
Mapping Error	Non-Target	Error in GIS mapping, point not on stream, no stream present, incorrect application of criteria	ME
Tidal	Non-Target	Below true head of tide	TD
Non-Wadable	Non-Target*	Not able to be waded to sample	NW
Canal or Ditch	Non-Target	Not a flowing stream, but a drainage catchment or conduit	CD
Drainage Area	Non-Target	Drainage area <1 square mile and not likely to be flowing year round	DA
Denied Access	Target	Private landowner denied permission to access and sample stream	LD
Inaccessible	Target	Sampling location was not assessable and often in a remote location with no roads within 1/2 mile of point on stream	IA
Physical Barrier	Target	Sampling location was inaccessible due to some site-specific condition such as a cliff or impassible vegetation or wetlands	PB
Not Needed	Target	Location evaluated but not needed to fulfill the quota for the current panel	NN
Target-Sampled	Target	Stream was determined to be a target and samples were collected	TS

* AMNET specific, Chemistry can sample if feasible at non wadable sites

Re-positioning Locations:

During reconnaissance of site locations, it may become necessary to re-position locations due to the original location being inaccessible (i.e. landowner denial, physical barrier, etc...) or if the original location does not meet the target criteria (i.e. drainage area, proximity to impoundments, etc..). In each case where a location is re-positioned, it will only be re-located if there are no significant land-use changes between the two sites and/or there are no known or significant tributaries between the two locations. New locations will also avoid incorporating any additional road crossing where possible. In general, re-positioning of locations will not exceed 0.5 miles, but some locations may present unique circumstances which would allow for that distance to be greater (i.e. sites in protected and undeveloped areas where access is limited). Staff will use GIS and best professional judgement to assess any re-positioning of sites. If a site cannot be re-positioned without changes in land-use or incorporating additional tributaries, then the original site will not be sampled and will be classified appropriately.

Statistical Analysis

Any statistical analysis of data must incorporate information about the monitoring survey design. In particular, when estimates of characteristics for the entire target population are computed, the statistical analysis must account for any stratification or unequal probability selection in the design. Procedures for doing this are available from the Aquatic Resource Monitoring web page given in the bibliography. A statistical analysis library of functions is available from the web page to do common population estimates in the statistical software environment R.

ATTACHMENT G

February 3, 2020

QUALITY ASSURANCE PLAN & SURFACE WATER SAMPLING GUIDANCE

USGS NJWSC PFAS Assessment as part of Ambient Surface Water Quality Monitoring Network

Project Account number GC20LJ00003LB00

Start: Feb 2020
End: Sept 2020

Problem Definition/Background:

PFAS are man-made chemicals used to make everyday household and industrial products. They are used in a very wide-range of products including stain, grease, and water resistance, and some firefighting materials. PFAS are also used in industrial processes such as aerospace, automotive, building and construction, and electronics. PFAS are persistent in the environment; they take a long time to breakdown.

The concern for PFAS are the widespread exposure to humans, the persistence in the environment, observed toxicity in animal models, and insufficient information to properly assess human health risk across the entire structural class.

This project will document the presence and quantify the concentration of PFAS in surface water at each station in the long-term, cooperative NJ Ambient Surface Water Monitoring Network. This is the first state-wide dataset for PFAS contamination in NJ surface waters.

Project/Task Description:

Surface water samples will be collected twice during Water Year 2020, once during Feb-March and once during Aug-Sept, at all 122 stations that are included in the cooperative NJ Ambient Surface Water Monitoring Network.

Samples will be collected as a PFAS Synoptic, to be performed separate from routine sampling due to restrictions and with intent to involve a small group of samplers (efficient communication etc). Samples should be collected as a team of 2 samplers to effectively employ low-level (clean hands/dirty hands) sampling protocols.

The goal is to perform PFAS Synoptics during low flows. In general, allow a minimum of 3 days in northern NJ to allow higher flows to fall, but in southern NJ, allow a minimum of 5 days. This guidance is loose, based on the type of precipitation, location, and nature of the event.

Data will be publicly available through NWISWeb. No official report or presentation summarizing the data is planned at this time (Jan 2018), however it is a possibility for future collaboration.

Fieldwork to start collecting PFAS environmental samples and PFAS field blanks is scheduled to begin in February 2020.

Participation in PFAS method development at NWQL, James Gray

Leave this blank for potential further collaboration. To be completed prior to sample collection.

SGS North America Lab (Orlando, FL) method for PFAS (certified by State of NJ for PFAS analysis)

EPA method 537 Modified LC/MS/MS with isotopic dilution.

Data Availability

USGS NWQL and RTI (contract) will sub-contract with SGS North America Lab (Orlando, FL). These parties are responsible for electronic data delivery (NWQL LIMS and QWDX), and the data will ultimately be available in NWISWeb.

Planned measures for minimizing influence from sampling equipment:

Due to the lack of standardized collection techniques and methods at the time of the proposal and sample collection, this project will follow guidelines and recommendations by Interstate Technology and Regulatory Council (ITRC) as outlined in the Joint Funding Agreement and Project Workplan. Because PFAS compounds are known to adhere to certain materials, a grab sample, which consists of 2 sample bottles, will be collected at center of flow at each site to be analyzed for a list of 28 PFAS compounds (Table) by SGS North America Lab (contract with NWQL, subcontract with RTI Lab).

A field blank, which consists of 2 sample bottles clearly denoted as the field blank, will be performed at each sampling site.

QA/QC samples to be collected:

1) **1 Field Blank (each consisting of 2 sample bottles) per site**

Additional preparations and information:

Consultation with internal USGS WMA PFAS workgroup and internal PFAS T&M workgroup, including Andrea T (formerly Andrea Weber, Harvard University).

Trizma or Tris, which is used to dechlorinate regulatory/drinking-water samples, is not needed for this project (non-drinking water). The agent helps to stabilize the pH of the sample and some labs will reject any samples that were not field preserved, but this is not a concern for this non-drinking-water project. (Trizma used to remove chlorine: Shoemaker and others, 2009. Development of a U.S. EPA Drinking Water Method for the Analysis of Selected Perfluoroalkyl Acids by Solid-Phase Extraction and LC-MS-MS, Journal of Chromatographic Science, v47, pgs3-11.)

SURFACE WATER SAMPLING GUIDANCE

Sample preparation/collection instructions:

- Use HDPE sample bottles provided by SGS North America Lab for environmental samples and field blanks.
- Do NOT filter samples.
- Do NOT preserve samples with acid/buffer. (Trizma not necessary for this project. See explanation above.)
- CHILL ON ICE
- Amount needed: 250mL

When sampling more than 1 station per day, begin by sampling the cleaner (agricultural, parkland, low density residential) site, and end the day by sampling the more contaminated (urban, dense residential, commercial/industrial) sites.

Follow the steps below to collect samples using low-level sampling techniques.

1. Wash hands. Walk to bank with PFAS sampling kit (blank bottles, blank water, sample bottles) and freshly washed hands (Note: dilute liquinox is acceptable).
2. Change gloves to elbow length, part number Q530FLD from 1-Stop shopping.
3. Collect field blank sample set (2 field blank bottles per site) at streamside by using ultra low-level sampling techniques.
    a. One at a time - pour contents of 2 bottles of blank water, provided by SGS North America Lab, to 2 clean sample bottles. Fill to neck. Headspace is okay.

4. Rebag field blanks, denote as field blanks, place labels directly on sample bottle, and discard gloves. Both blank sample bottles receive same time. Time of blank sample is ONE MINUTE prior to time of environmental sample.
5. At center of flow, change gloves.
6. To collect the sample:
    a. By wading to CENTER OF FLOW-- Lower the inverted, CAPPED sample bottle through air-water interface to approximately **0.5 ft below water surface**, remove cap, fill to neck, and replace cap beneath water surface. The bottles need to be filled to the neck. Headspace is okay. Rebag sample bottle. Change gloves.
    b. By using a pole/swing sampler – Attach the sample bottle to the pole sampler. Change gloves. Remove cap. Extend pole sampler to center of flow. Lower sample bottle **0.5 feet below water surface** to get sample. Return cap. Change gloves before collecting 2nd sample bottle (using the pole sampler).
7. Repeat step 6 to a collect the 2nd sample bottle. Label both sample bottles. Place bottle label directly on sample bottle. Put in ziplock bag, and store on ice.
8. Collect TOC (lab-approved sample bottle), Turbidity sample, and Quiescent pH bottle at center of flow.
9. Measure field parameters (including pH) at 5-10 points along the cross section. Record medians.
10. Record SVAP.
11. Label TOC (waterproof 3M label may have PFAS, do this step after PFAS samples are contained and put away). Preserve with H2SO4 to a pH less than 2. Chill on ice.
12. Measure turbidity values 3 times (swirl and pour) and record the median value.
13. Measure quiescent pH from collection bottle. Enter quiescent pH on field form/PCFF for database entry.
14. Measure air temperature.
15. Samples need to be stored on ice. Secure them away from potential contamination at subsequent sites.
16. Complete field form, ASR for SGS (PFAS blanks & PFAS enviro sample), ASR for NJDOH (TOC).

Sample Notes:

Hold time for TOC is 28 days. Analysis may be performed by NJDOH. Collect TOC sample and hold in sample refrigerator.

Instantaneous discharge is NOT part of this study due to lack of funding.

RTI/SGS Lab information:

The USGS has a contract through RTI labs to run PFAS sample analysis. RTI has subcontracted the PFAS analysis to SGS North America Lab.

RTI Contact: David Howell (dhowell@rtilab.com), Director of Federal Programs

734-422-8000 ext. 302
540-422-1532 cell

Use RTI ASR with Chain of Custody. CIN 50392 (28 PFAS compounds)

USGS will return 4 sample bottles (2 Field Blanks, 2 Environmental) to SGS North America Lab.

Shipping to SGS North America Lab:

SGS North America, 4405 Vineland Rd, Suite C-15, Orlando, FL 32811, 407-425-6700
Email FedEx tracking info to andrea.colby@sgs.com

Remember there will be two sample containers per sample ID plus 2 more for that same sample ID for Field Blanks.

Samples are to be shipped overnight on ICE at least every 2 days. SGS is staffed to receive samples Monday through Saturday, but to avoid the loss of data, standard USGS practice is to limit shipping to Monday through Thursday in case of FedEx oversight. Sample hold time is 28 days, based on EPA Method 537.1Mod.

Data Delivery and Availability

Results turnaround time from SGS Axys Lab is approximately 21 days from receipt of sample(s). The EDDs/reports are forwarded to Gary Cottrell, Denise Wilkins, and Donna Damrau at NWQL. NWQL performs a QA review and upload the data to NWIS.

RESOURCES

Due to the ubiquitous nature of PFAS, sampling crews must review all materials used to avoid contamination. Collection of quality assurance and quality control (QA/QC) samples is a useful tool to assess field contamination. Sometimes it is impossible to eliminate materials that affect PFAS results in samples. For example, these materials might be needed at sites where hazards warrant the use of specific personal protective equipment (PPE), where PFAS are the secondary or co-contaminant and the primary contaminant requires specific materials for proper sampling, or *where the opportunity to collect a sample occurs before a proper sampling program is developed.* When PFAS-containing equipment and supplies cannot be eliminated, increasing the equipment rinse blank samples will more thoroughly document the PFAS concentrations. In these situations, a thorough QA/QC program becomes even more important. Not all PFAS are hydrophilic, and some are volatile. As a result, these chemicals may sorb to sampling equipment and supplies or be lost from samples during sample collection. Preliminary data suggest that sorption may occur quickly. Additionally, volatile losses have not yet been characterized. Until they are better quantified, sampling efforts should consider whether these losses would affect project objectives and adjust accordingly.

1. USEPA Technical Brief: Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Methods and guidance for sampling and analyzing water and other environmental media

https://www.epa.gov/sites/production/files/2020-01/documents/pfas_methods-sampling_tech_brief_7jan2020-update.pdf

"Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. For example, polytetrafluoroethylene products (tubing, sample containers, and sampling tools) are often used in sampling; however, since these products can contain PFAS, they cannot be used in sampling for PFAS. In addition, many consumer goods brought to a sampling site may contain PFAS that can contaminate samples. Field sampling and laboratory hygiene protocols are critical to ensuring that testing results reflect actual PFAS levels in the analyzed media. The Interstate Technology and Regulatory Council has summarized site characterization, sampling precautions, and analytical method issues and options through their fact sheet series." **(see resource link below)**

2. ITRC Guidance Site Characterization Considerations, Sampling Precautions, and Laboratory Analytical Methods for Per- and Polyfluoroalkyl Substances (PFAS) – March 2018

https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_site_characterization_3_15_18.pdf

3. NEWMOA presentation for guidance on sampling gear, material, personal gear – Aug 2016

http://www.newmoa.org/events/docs/228/PFAS_Sampling_Chiang_Aug2016.pdf

4. USDOD Bottle Selection and other Sampling Considerations When Sampling for Perand Poly-Fluoroalkyl Substances (PFAS) – as recommended in ITRC Guidance - July 2017

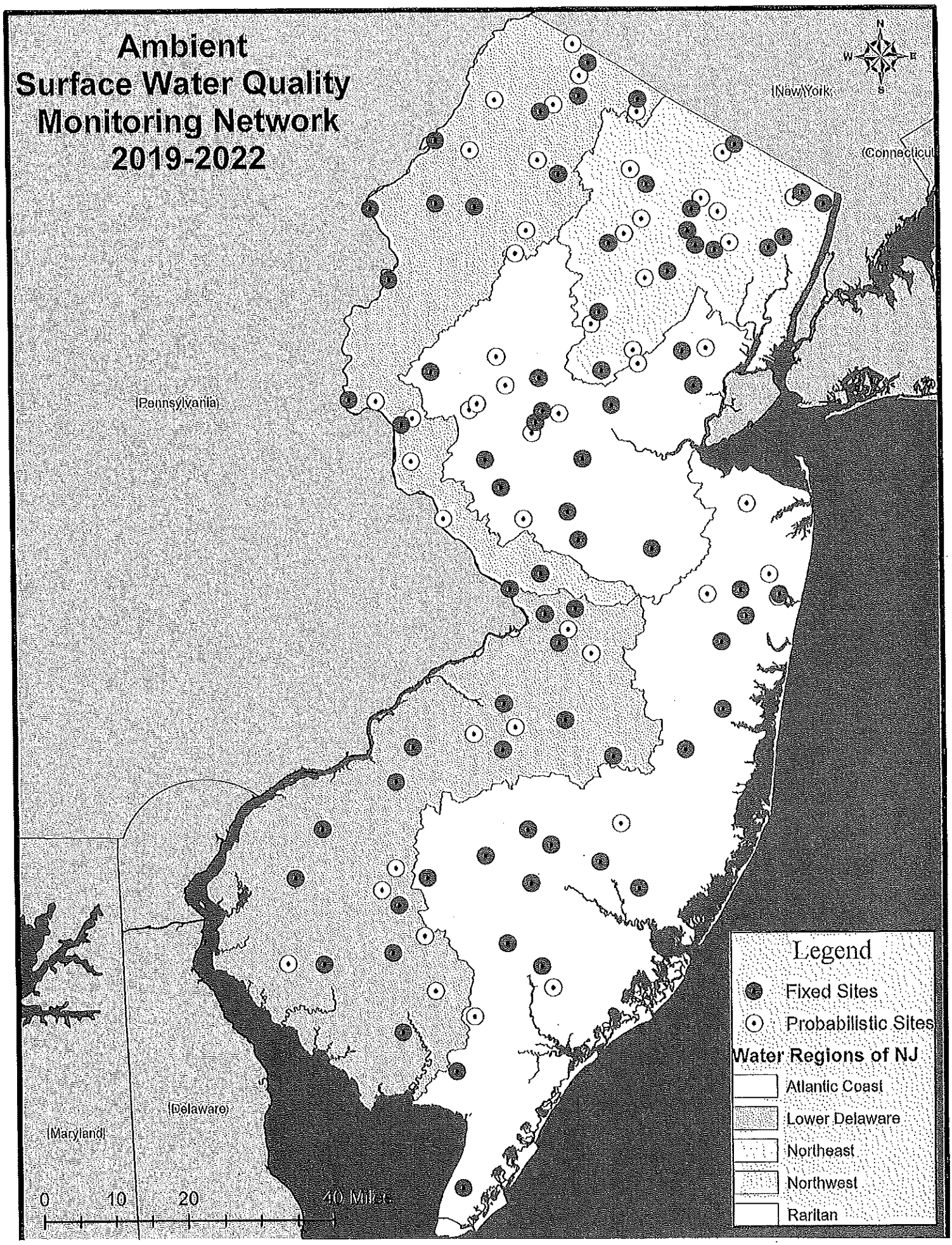
ATTACHMENT G

https://www.denix.osd.mil/edqw/home/what-s-new/unassigned/edqw-pfas-sampling-factsheet-rev-1-2-july-2017/

Many materials used in the course of environmental investigation can potentially contain PFAS. There is limited published research or guidance on how certain materials used by field staff affect sample results. Therefore, a **conservative approach** is recommended to exclude materials known to contain PFAS. Many precautions for sampling procedures, however, don't have scientific data to prove the concerns, so we are trying to find the *balance* between being **cautious versus over-reacting** (NEWMOA, 2016).

In summary of guidance documents noted above:

- Materials to AVOID include:
  - Teflon, polytetrafluoroethylene (PTFE) • waterproof coatings containing PFAS • food containers • anything with fluoro in the name • fluorinated ethylene propylene (FEP) • ethylene tetrafluoroethylene (ETFE) • low density polyethylene (LDPE), polyvinylidene fluoride (PVDF).
  - Many waterproof coatings contain PFAS, such as Gore-tex treated PPE or most waterproof papers, but some products are waterproofed with acceptable materials such as polyurethane, rubber, or PVC.
  - Water resistant, waterproof, stain-treated clothing or shoes including Gore-Tex™ and Tyvek® (coated) materials
  - Materials incidentally transported to sites may contain PFAS. For example, fast food wrappers, to-go containers, and microwave popcorn bags may contain PFAS.
  - Paper products such as waterproof field books, plastic clipboards, binders, spiral hard cover notebooks, sticky notes or glue materials, markers
  - Chemical (blue) ice packs
  - There is some documentation that indicates that some personal care products, as well as food and drinks, may introduce additional ways your sample may get contaminated. Therefore, these additional precautions should be taken: • Field personnel should not use cosmetics, moisturizers, hand cream, or other related products. • Many manufactured sunblock and insect repellents contain PFAS.
- ACCEPTABLE sunscreens and insect repellents (NEWMOA, 2016):
  - • Sunscreens - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, and baby sunscreens that are "free" or "natural"
  - • Insect Repellents - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics • Sunscreen and insect repellant - Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion
- When in doubt, change gloves.
- Document measures taken and potential for error/contamination. **ALWAYS TAKE COPIOUS NOTES!** Record gage height upon arrival and after sample collection to determine hydrologic condition. Note whether precipitation took place prior to sampling. If so, what kind of precip? Prior to or during sample collection? If prior, by how much—5 days, 3 days, 2 days, 1 day prior? Heavy/moderate/light? Include potential for if unknown or if environmental indicators are unknown.


Ambient
Surface Water Quality
Monitoring Network
2019-2022
N
W
E
S
New York
Connecticut
Pennsylvania
Delaware
Maryland
0
10
20
40 Miles
Legend
Fixed Sites
Probabilistic Sites
Water Regions of NJ
Atlantic Coast
Lower Delaware
Northeast
Northwest
Raritan