**[Insert Project Name, NFWF ID No., Grant Type. Complete Information in Document Header] Example: “Shell Recycling Planning to Restore Long Island Sound Oyster Reefs and Shorelines (CT)”, NFWF Project No. 73270, Project Type: Planning/Design.**

 **QUALITY ASSURANCE PROJECT PLAN**

To be inserted by NFWF Project Funded under EPA LI-00A00XXXX, FC.RXXX

COMPLETED PLAN PREPARED BY:

**[Insert name here]**

**[Date]**

Refer correspondence to:

**[Name, organization, address, telephone, and email]**

*(Note to All Grantees: Instructions in this QAPP Template are given in bold, highlighted type. Make sure to complete or revise all sections and remove any underlining. Also, ERASE the instructions, including this one, as you complete the QAPP for your specific project. Make sure to define acronyms/abbreviations when they initially appear in the text (i.e., mg/L, NTU, etc.). Make changes in other places as necessary.* *If a section is not applicable to your project, delete the template text, replace with “N/A”, and include an explanation regarding why the section is not applicable. Template instructions should be addressed in narrative form, not Q&A)*

Please read the entirety of this document. Do not fill in information without reading the whole document. It is necessary to fully understand the contents of this Quality Assurance Project Plan (QAPP) in order to complete the required components successfully. Every QAPP will be unique and responsive to the proposal approved by NFWF. Please note that the QAPP is to be a stand-alone document.

qapp Approvals PAGE

Approval Signatures (required prior to project start):

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**[Insert Name]**

Project Lead, **[Insert Organization]**

**[Insert Title]**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**[Insert Name]**

**[Insert Role and Organization. Delete if not applicable. Copy and add additional signatories as appropriate. Delete extra spacing so that they fit on this single page. This expedites the signatory process]**

**[Insert Title]**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lynn Dwyer

Program Director, Northeast Coastal
National Fish & Wildlife Foundation

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Elizabeth Wright

U.S. Environmental Protection Agency

Project Officer, National Fish and Wildlife Foundation, Long Island Sound Futures Fund **(WHEN DOCUMENT IS COMPLETE \_ RIGHT CLICK ON Table of Contents and ‘UPDATE FIELD” then “UPDATE ENTIRE TABLE”)**

1 PROJECT MANAGEMENT 5

1.1 Contact Information 5

1.2 Project Objectives and Approach 6

1.3 Data Quality Objectives 7

1.4 Quality Assurance Objective Criteria 8

1.5 Documentation and Records 10

2 DATA ACQUISITION 10

2.1 Sampling Information 10

2.2 Sample Handling Procedures 12

3 ANALYTICAL REQUIREMENTS 14

3.1 Chemistry Analyses 14

3.2 Laboratory Standards and Reagents 14

3.3 Sample Preparation Methods 14

4 QUALITY CONTROL REQUIREMENTS 14

4.1 Measurement Performance Criteria 15

4.2 Internal Quality Control 16

4.3 Field Quality Control 17

4.4 Laboratory Quality Control 17

5 INSTRUMENTATION AND EQUIPMENT PREVENTIVE MAINTENANCE 18

5.1 Sample Equipment Cleaning Procedures 18

5.2 Analytical Instrument and Equipment Testing Procedures and Corrective Actions 18

5.3 Instrument Calibrations and Frequency 19

6 DATA MANAGEMENT 19

6.1 Data Assessment Procedures 20

6.2 Data to be Included in QA Summary Reports 20

6.3 Reporting Format 21

7 DATA VALIDATION AND USABILITY 21

7.1 Laboratory Data Review, Verification, and Reporting 21

7.2 Self-Assessment, Data System Audits 22

8 REFERENCES 22

9 Appendices 23

**[Verify numbering here and against text at completion of QAPP]**

# PROJECT MANAGEMENT

## Contact Information

[Please provide the name and phone number of project personnel. Include an Organization Chart if your project team is comprised of multiple project partners and/or more than five (5) team members. Only include project partners if they are involved in project activities discussed in the QAPP]

All personnel listed below in Table 1 will receive copies of this Quality Assurance Project Plan (QAPP), and any approved revisions of this plan. Once approved, this QAPP will be available to any interested party by requesting a copy from the project management.

**Table 1: Project Team Contact Information**

|  |  |  |
| --- | --- | --- |
| **Title** | **Name (Affiliation)** | **Phone Number/E-mail** |
| Project Manager |  |  |
| Primary Field Sampler |  |  |
| Laboratory Manager |  |  |
| Laboratory Quality Assurance/Quality Control (QA/QC) Officer |  |  |
| Environmental Scientist |  |  |
| National Fish and Wildlife Foundation (NFWF) Program Manager  | Lynn Dwyer, NFWF | Lynn.Dwyer@NFWF.org |
| QA Officer **[This person should not be involved in data collection. If title does not apply to anyone on the Project Team then add “ / QA Officer” after the Project Manager Title and delete this line]** |  |  |

Describe the roles and responsibilities of key project team members. Key project team members would actively work on one or more phases of your project. If volunteers or students are part of the project team, summarize their role and reference to later sections of the QAPP that discuss training details (i.e., Section 1.5, 2.0). Include the names, duties, and responsibilities of all parties and/or groups involved in the key aspects of your project. Clarify the intended data user(s) for each data collection activity as applicable.

**[EXAMPLE ONLY – EDIT AS APPLICABLE TO YOUR PROJECT**

PROJECT MANAGER (Name) has the overall responsibility for ensuring that the project meets the project objectives and quality standards. The Project Manager will be the responsible for overseeing all activities conducted on this project including schedule adherence, budgeting, and oversight of all scope-related activities. Scope-related activities include assigning project tasks to personnel, data collection, data analysis, interpretation, communication, and final reporting. The Project Manager will also coordinate all program/project needs related to project personnel and convene periodic project-planning meetings.

Laboratory Information

**[Please provide the name, contact information and documentation of state certification for the laboratory employed to conduct sample analysis. Add information for all labs included on the project, even if they do not have a lab certification number. If you do not have a lab certification, or are only certified for some parameters, please add an explanation and why it is appropriate for your project.]**

|  |
| --- |
| Name |
| Address |
| Phone  | Contact Name |
| Organization/Laboratory Certification No.  | Expiration Date  |

## Project Objectives and Approach

**[Insert your condensed proposal narrative here, modify according to your project specific objective, and address the following information:**

* Clearly state or list the objectives of your project and what the project is intended to accomplish.
* What methods/surveys/data collection activities will be implemented to achieve these objectives?
* What is the geographic scope for your project? Add a map of the project area as an Appendix and reference in this section.
* Provide background to support the project objectives, including previous work/grants, team experience, and relevant context for your project.
* Discuss whether the project must comply with agency legislation, permits, comprehensive management plans, or organizational goals
* If applicable, discuss actions under different grants or regional programs that may have provided supporting framework or strategy for your project objectives]

The objective of this document is to identify the quality assurance components that are necessary to implement the project activities under the **[Insert project name]**. This objective will be achieved by using the following accepted methodology [**Specify methodology, survey type, or any other data collection activities associated with the project** **– make sure to attach documents to QAPP and reference as appendix or provide details on how the reader can access the information as needed**) to collect and/or measure, analyze and/or interpret **[Insert measurement type. i.e.: water and biota]** samples.

**[Briefly list/discuss the sites to be sampled as part of this project. Explain the process for site selection here or in section 1.3 if certain decision criteria were or will be applied to select sites for sampling****. If sites are not selected yet, discuss the criteria you will use to choose sampling sites and why.]**

The overall project timeline is [**Insert dates**]. Required monitoring or measurements will begin **[Insert dates data or measurements will be taken, start/stop dates for this activity, etc. If timeline is not determined yet, discuss the potential timeline or that it will be determined at a later date]** Table 2 lists the constituents that are required to be monitored.

[**Include tables and discussion for both primary and secondary/existing data to be collected. Make sure that you identify your measurement units. If you have more than one matrix type, add a column for matrix and identify each unit type**.]

[**\*\*\*EXAMPLE ONLY –** **EDIT AS NEEDED TO REFLECT YOUR PROJECT\*\*\*]**

Table 2: Constituents to be Measured

| **Constituent** | **Unit** |
| --- | --- |
| Flow | CFS (Ft3/Sec) |
| PH | pH units |
| Temperature | 0F |
| Dissolved Oxygen | mg/L |
| Turbidity | NTU |
| Total Dissolved Solids | mg/L |
| Total Suspended Solids | mg/L |
| Chloride  | mg/L |
| Ammonia | mg/L |
| Nitrate-Nitrogen | mg/L |
| Phosphate | mg/L |
| Sulfate | mg/L |

**[Note: If you are collecting secondary data (ex. literature review), conducting a GIS analysis, public opinion assessment, or modeling assessment then please create sub-sections describing non-field data collection activities and metrics and use a separate table for each data collection activity as applicable]**

**[Clarify whether volunteers, students, or other individuals that require training and would be involved in data collection activities. Describe training for these individuals, as applicable, including methodology, timing, and primary responsibility for training.]**

## Data Quality Objectives

**[READ THROUGH HIGHLIGHTED INSTRUCTIONS BEFORE COMPLETING]**

[Data quality objectives (DQOs) will define your data collection design, including

1) when and where to collect samples (if identified in section 1.2, state here and reference section 1.2),

2) the acceptable level of data uncertainty and decision errors for the study (also discussed in section 1.4),

3) how many samples to collect (what is the conceptual site model), why is this the appropriate sampling/study design to meet project objectives

4) why the data type you are collecting is appropriate to meet your project objectives, and

5) who is making these decisions, how, and when were they made?

Questions to consider when completing this section:

* How is the quality of your data being ensured? Examples may include
	+ an explanation of the experience of the project team,
	+ proper training and oversight of data collectors,
	+ adherence to accepted methods and protocols to achieve project objectives, including citations for methods and protocols, or
	+ using lessons learned from successful past projects that were similar to this project design, providing a summary of past projects.
* How were sites selected for this project? (May be discussed in section 1.2 and referenced to here or vice versa – but MUST be discussed in one of the sections and reference to in the other)
	+ Why are the sites selected for sampling appropriate to achieve the project objectives?
	+ What was the decision criteria to select sites for sampling (if discussed in section 1.2, reference to that here or vice versa – but MUST be discussed in one of the sections and reference to in the other)? Who made these decisions and when?
* Why was the data being collected chosen to address the project objectives and what information will it be providing?
* If the data is not collected as planned, how will that affect the project/project objectives?

**MAIN THEME FOR THIS SECTION and SECTION 1.4: When completed, these sections will identify the required data and criteria which will support developing quality data collection designs or processes. These sections should discuss how the project will ensure that the type, quantity, and quality of environmental data used in decision-making will be appropriate for the intended application. It should help the reader understand why this data provides the information necessary to answer study questions and meet project objectives.]**

## Quality Assurance Objective Criteria

The Quality Assurance Objectives (QAOs) define a tolerable level of potential decision error for data collected on a project. They help to define the DQOs and clarify the project objectives further. The QAOs are then used as comparison criteria during data quality review by [explain the group that is responsible for collecting data] to determine if the minimum requirements have been met and the data may be used as planned.

* How will the project team know data collected in the field is “fit for use” on the project and not an error or unacceptable for reporting? This section must support text in sections 1.3, 4.0 and 6.0
* What are the decision criteria in place to determine data collected for this project meets the project objectives? What/who is the source for these criteria?
* Identify key indicators of data quality associated with your data: PARCC: Precision, Accuracy/bias, Representativeness (may be identified in section 1.2 or 1.3, reference to it here), Comparability, and Completeness**.** **Identify data quality indicators for your dataset as follows:**
	+ Precision: Precision is an expression of agreement between two measurements. It provides a measure of reproducibility of sample results/measurements.
	+ Accuracy: Accuracy is used to identify the agreement between an observed value and a reference or true value.
	+ Representativeness: Refers to how well the data collected is representing the area of interest. This may be a discussion of why sampling points were chosen as a representation for your study.
	+ Comparability: A qualitative discussion and refers to the equivalency of data sets.
	+ Completeness: Completeness is a project/study level metric. it identifies the measure of the amount of valid data collected as compared to the amount of data planned. Comparability is typically a qualitative discussion on how data being collected will be comparable to other datasets.
	+ Sensitivity: Sensitivity identifies the capability of a method or an instrument to detect a given analyte at that concentration.
* **Typical ways that these indicators may be presented in lab data:**
	+ Precision: Precision is typically measured through Duplicates/Replicates, Matrix Spike Duplicate, Laboratory Control Spike Duplicate (as represented by RPD, RSD, %D).
	+ Accuracy/bias: Matrix Spike, Laboratory Control Sample, Performance Evaluation Samples, Standards Checks, Calibration Verification (commonly represented by % recovery range); Bias is also identified with blank contamination in this case identify the criteria surrounding the blank acceptance (i.e. ≤RL).
	+ Comparability: The use of standard or similar techniques for sample collection or analysis. For secondary data this may be identification of data quality aspects that allows for comparison.
	+ Completeness: Completeness is typically seen as a number below 100% (although certain circumstances or regulatory requirements could dictate that 100% is needed) to account for unplanned events or data issues, but should represent the amount of valid data acceptable to the project/study for a usable dataset.
	+ Sensitivity: Typically, sensitivity is related to the detection limits that are being met by a particular method or instrument. Your lab should be able to provide this information.

The quality assurance objectives are listed in Table 3a and 3b**.** **[Add more discussion as applicable to explain the source for the QAOs outlined in Table 3a and 3b. NOTE: Comparability and Representativeness are not listed in these tables – make sure these indicators are addressed in the text. Detection and reporting limits should be added to the QAPP as applicable. If detection and reporting limits are extensive, they may be added as an appendix and referenced here**]

Table 3a: QAOs for Field-Related Measurements [EXAMPLE ONLY – EDIT AS NEEDED]

| **Parameter** | **Method** | **Sensitivity** | **Precision** | **Accuracy** | **Completeness** |
| --- | --- | --- | --- | --- | --- |
| EXAMPLE |
| Dissolved Oxygen | YSI Field Meter | .5 mg/L | Field and Laboratory Duplicates: 10%RPD[[1]](#footnote-1)  | Adherence to sampling protocols mfg instructions | 90% |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 3b: QAOs for Laboratory-Related Measurements [EXAMPLE ONLY – EDIT AS NEEDED]

| **Parameter** | **Method** | **Sensitivity** | **Precision** | **Accuracy** | **Completeness** |
| --- | --- | --- | --- | --- | --- |
| EXAMPLE |
| Nitrate | EPA Method 353.3 | .5 mg/L | 10% RPD[[2]](#footnote-2)  | 90-110% recovery[[3]](#footnote-3) | 90% |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

[All columns may not apply to all parameters. The term “N/A” may be added for certain parameters; however, reasoning for use of the term “N/A” must be clarified with an explanation after Tables 3a and 3b. Accuracy and completeness should apply to all parameters. When completing Tables, make sure to identify all acronyms in a footnote and make sure that values in the table are clearly identified as to what they represent (for example, 10% RPD for field duplicates). This can be identified in the cell of the table (see dissolved oxygen) or footnoted at the bottom of the table (see Nitrate) If you have both field measurements and lab related methods, make sure that these are separate tables and the title of the table defines this. If it is clearer to the reader to include an individual table per analysis, please create additional tables.]

## Documentation and Records

**[Include the following in this section:**

* **Description of Staff/Volunteer/Intern/Student Training documentation and records as applicable.**
* **Explain how data and information will be transferred between project partners (ex. secure file share).**
* **Describe or list permits or reports to be prepared as part of this project, including information to media outlets or government agencies, and how reports or media would be distributed. If no reports or media will be developed as part of this project then clarify here**.]

All records generated by this project will be stored at **[Insert name here**] main office. Records stored for this project will include all laboratory records pertinent to this project. Copies of records held by the laboratory will be provided to project manager and maintained in the project file.

Copies of this QAPP will be distributed to all parties involved with the project, including signatories and field sampling and laboratory personnel. Any future changes or amendments to the QAPP will be held and distributed in the same fashion. Copies of previous versions of the QAPP will be clearly marked as “superseded by Revision #” so as not to create confusion.

The records of all project information and data used to complete the activities of the project will be retained for at least seven years from the date of sampling, measurement, report, or application.

# DATA ACQUISITION

[**Edit as applicable to your project. Describe data collection staff and staff training if not described in Section 1]**

## Sampling Information

Information on sample locations can be found in Appendix A. Methods for sample collection in the field will be done according to **[list methods/procedures for each sampling type or refer to discussion in section 1.2**. The project team will ensure that a representative sample is collected by adhering to [**discuss or reference sampling techniques, protocols, and methods**]. **Expand on this discussion and address the following:**

* **Discuss any preparation required by the sampling team before the data collection event, including weather checks, equipment preparation, site determination, or team meetings.**
* **Clarify which team members will participate in sampling events and who provides sampling equipment to team members.**
* **Explain how site locations are selected for each sampling event, when the sites are selected, and who on the project makes this decision (reference previous QAPP section if already discussed).**
* **Discuss your methods for any non-laboratory related data in this section. Secondary data review steps, observations or assessment methods.**

Field Measurements and Observational Data

**This section should discuss any field measurements that you will be taking in the field to support your sampling. For example:**

Water quality parameters including **[Insert project-specific information, such as weather, GPS, flow rate, pH, dissolved oxygen, and temperature]** will be measured prior to collecting samples for laboratory analyses. [**Describe measurements to be collected in the field, or reference discussion in another section. If visual or photo documentation will occur on your project, note procedure for taking photos or recording visual observations here. Note: If you will be collecting geospatial points then please note in this section and in Table 2**]

QC SAMPLE COLLECTION

**E**quipment blanks, field duplicates, and matrix spikes will be collected at a frequency of about 1 per 20 normal samples, or 1 per sampling event, whichever is greater. Matrix spikes will be collected as normal samples and will be spiked at the laboratory prior to sample preparation. [**Edit to be specific to your project. If you are not collecting QC Samples then note this section is not applicable, explain why, and remove references to QC samples in the boilerplate text in other sections.** **Alternatively, only discuss types of QC samples being collected. Identify the type of QC sample, frequency of collection, and reference to either Table 3 or Section 3.0 and discuss QC acceptance criteria.]**

FIELD INSTRUMENT CALIBRATION

Routine field instrument calibration will be performed at least once per day prior to instrument use to ensure instruments are operating properly and producing accurate and reliable data. Calibration will be performed at a frequency recommended by the manufacturer. [**Explain what instruments will be used on this project, or reference discussion elsewhere in the QAPP (e.g. section 5.0), and attach or provide a reference for the manufacturer’s instructions. Note who on the project team will perform calibration and whether a calibration log or records will be kept.**]

DECONTAMINATION PROCEDURES

All field and sampling equipment that will contact samples will be decontaminated after each use in a designated area. [**Edit as applicable to your project. Describe decontamination area location, how decontamination would occur, and who would determine the placement for this site. If decontamination procedures are not required (i.e. all equipment is one time use/not used for additional samples or project does not require formal decontamination procedures) then clarify here and briefly state cleaning procedures as applicable.]**

FIELD DOCUMENTATION

All field activities will be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation. **[If boilerplate text is used, explain how the project team is ensuring adequate and consistent documentation. Reference other sections as appropriate. Be sure decision-making processes are explained in section 1.2 and 1.3** **and reference any QA discussion (section 4.0) or data management procedures (section 6.0) for this documentation.**]

Pertinent field information, including (as applicable), the **[Insert field project-specific sampling/measurement parameters, such as width, depth, flow rate of the stream, the surface water condition, crop and cultivation practices and evidence of pesticide/fertilizer or sediment management, and location of the tributaries]** will be recorded on the field datasheets [**Provide field datasheets as an appendix and reference here. Explain whether data would be recorded electronically and on what device, or in hard copy (e.g., data sheets or a logbook), and who would do this.**

## Sample Handling Procedures

[**Revise and expand on this section as applicable to your project and sampling process**]

Sample containers will be pre-cleaned and certified to be free of contamination according to the [**Insert specification**] specification for the appropriate methods.

[**Discuss how sampling devices and sample bottles will be rinsed as applicable prior to sampling. Also discuss post-sampling sample storage, including whether refrigeration or freezing is required.**]

The following table describes sample holding container, sample volume, and maximum holding time for each parameter.

[EXAMPLE ONLY – EDIT AS NEEDED]

Table 4: Sampling Collection and Container Requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Sample Bottle** | **Typical Sample Volume** | **Preferred / Maximum Holding Times** |
| Dissolved oxygen | Glass bottle and device to enable sampling without contact with air | 150 mL | Immediately / for wet chemistry fix per protocol instructions, continue analysis within 8 hr. |
| pH | Plastic Bottle or sample directly | 150 mL | Immediately |
| Turbidity | Plastic Bottle | 150 mL | Immediately / store in dark for up to 24 hr. |
| Total Dissolved Solids | Plastic Bottle | 1000 mL | 7 days at 4°C, dark |
| Total Suspended Solids | Plastic Bottle | 1000 mL  | 7 days at 4°C, dark |
| Chloride, Sulfate | Plastic Bottle | 300 mL | 28 days at 4°C, dark |
| Ammonia | Plastic Bottle | 500 mL | Immediately/8 hours if sample acidified with sulfuric acid to less than 3.0 pH |
| Nitrate | Plastic Bottle | 150 mL | 48 hours at 4°C, dark |
| Phosphate | Plastic Bottle | 150 mL | 8 hours at 4°C, dark |

SAMPLE IDENTIFICATION

All samples will be identified with a unique number and samples labeled with the following information.

* Sample ID
* Location ID
* Date
* Time
* Initials of sample collector
* Sample type (normal or QC) **[NOTE: If you are not collecting QC samples, remove reference to QC here and in sections below**]
* Preservative method (if any)

SAMPLE CUSTODY PROCEDURES

Sample Custody will be traceable from the time of sample collection until results are reported. The primary field sampler [**Make sure this title is the same as identified in Table 1**] will be responsible for ensuring that the field sampling team adheres to proper custody and documentation procedures. Field datasheets will be maintained for all samples collected during each sampling event.

CHAIN-OF-CUSTODY FORM

When samples are transferred from one sampler to another member of the same organization or from the monitoring group to an outside professional laboratory, then a Chain of Custody (COC) form should be used **[Add COC Form as an Appendix and reference here**]. This form identifies the site name, sample location, sample number, matrix, date and time of collection, sampler’s name, sampling equipment and sample type (i.e., normal field or QC sample), and method used to preserve sample (if any). It also indicates the date and time of transfer, and the name and signature of the sampler and the sample recipient. It is recommended that when a sample leaves the custody of the monitoring group, the COC form used will be the one provided by the outside professional laboratory. Similarly, when QC checks are performed by a professional lab, their samples will be processed under their COC procedures with their labels and documentation procedures. Chain of Custody forms should have both a relinquish and receipt signature completed. Any errors on the COC will be addressed by crossing out the error and initialing the cross out.

SAMPLE SHIPMENTS AND HANDLING

[**Please note the timeframe for shipments of samples to the lab and which team member is responsible for this. If samples need to be shipped, identify the shipping procedures and the address for delivery (i.e. lab).**]

All sample shipments are accompanied with the COC form, which identifies the contents. The original COC form accompanies the shipment, and a copy is retained in the project file.

[**Example text – modify as applicable for your project**] All shipping containers will be secured with COC seals for transportation to the laboratory. The samples will be placed with ice to maintain the temperature between 2-4 degrees C. The ice packed with samples will be sealed in zip lock bags and contact each sample and be approximately 2 inches deep at the top and bottom of the cooler. Samples will be shipped to the contract laboratories according to U.S. Department of Transportation (US DOT) standard.

LABORATORY CUSTODY PROCEDURES

**[Check with your laboratory to ensure the bullets below are accurate for their custody process. Adjust bullets as appropriate]**

The following sample control activities will be conducted at the laboratory:

* Initial sample login and verification of samples received with the COC form
* Document any discrepancies noted during login on the COC
* Initiate internal laboratory custody procedure
* Verify sample preservation (e.g., temperature)
* Notify the project coordinator if any problems or discrepancies are identified
* Proper samples storage, including daily refrigerator temperature monitoring and sample security.

# ANALYTICAL REQUIREMENTS

**[This section should discuss project testing that will occur. Either add a summary description of those procedures or reference to appended laboratory SOPs]**

## Chemistry Analyses

[**Revise example boilerplate text to be project specific**]

Prior to the analyses of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method. Initial demonstration of laboratory capabilities includes the ability to meet the project specified quantitation limits (QL), the ability to generate acceptable precision and recoveries, and other analytical and quality control parameters as stated in this QAPP. Analytical Methods used for chemistry analyses must follow a published method (US EPA or Standard Method for the Examination of Water and Wastewater) and document the procedure for sample analyses in a laboratory Standard Operating Procedure (SOP) for review and approval. This applies to project and field personnel conducting field sampling/measurements/analysis of media not analyzed by the laboratory. Training records for field staff should be maintained under the documentation requirements noted in Section 1.5 of this QAPP. [**Make sure this section is addressing ALL analytical testing for your project. Even when appending SOPs, a brief synopsis of the chemistry to be performed and the matrix it will be performed on is required]**.

##  Laboratory Standards and Reagents

All stock standards and reagents used for extraction and standard solutions will be tracked through the laboratory or the field sampling/measurement manager. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard. [**This information can typically be found in the Laboratory QA Manual. If that is the case, you may append the manual and reference where information can be found in the Appendices)**.

##  Sample Preparation Methods

[**Revise example boilerplate text to be project specific**] Surface water samples will be prepared in solvent or via other extraction techniques prior to sample analyses as noted in Table 4. All procedures must follow a published method.

Ground water samples will be prepared according to published methods as noted in Table 3.

# QUALITY CONTROL REQUIREMENTS

The types of quality control assessments required for this project are discussed below. Detailed procedures for preparation and analysis of quality control samples are provided in the SOPs for the sample type.

## Measurement Performance Criteria

**[Text should be adjusted to meet project specific requirements]**

The overall QA objective for this project is to develop and implement procedures for field sampling, COC, laboratory analysis, and reporting that will provide results that are scientifically defensible. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in the other sections of this QAPP.

### Precision

A measure of agreement among repeated measurements of the same property under identical, of substantially similar, conditions; expressed generally in terms of the standard deviation (USEPA, 2002).

#### **Field Precision**

**[Confirm based on actual fieldwork. Remove what does not apply (i.e., if you are only evaluating with RPD, remove references to RSD]**

Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per 10 analytical samples. These analyses measure both field and laboratory precision. The results, therefore, may have more variability than laboratory duplicates that measure only laboratory performance. See Table 3a for details on precision objectives in the field. [Adjust text below as needed to match project specifics]

Precision will be assessed through the calculation of the relative percent difference (RPD) for two replicate samples and relative standard deviation (RSD) for three or more replicate samples. RPD is the absolute difference between two results expressed as a percentage of the average result. It is calculated according to the following formula:

RPD = S – D X 100

**(S + D) / 2**

Where: S = Original sample value;

D = Duplicate sample value.

The acceptance criteria for RPD will be less than or equal to 20%. Percent RSD is calculated according to the following formula:

**%RSD = Standard Deviation X 100**

**Mean**

#### **Laboratory Precision**

**[CONFIRM WITH LABORATORY]**

The precision of laboratory analyses are assessed by comparing laboratory replicate analyses or by comparing MS with MSD as prescribed by the specified analytical method for each parameter. Laboratory duplicates are conducted at a frequency of 1 per 20 samples and MSDs are conducted at a frequency of 1 per batch of up to 10 samples. Laboratory precision is measured as the absolute value of the RPD for laboratory duplicate samples:

**RPD=[(Result2 – Result1)/Mean]\*100**

See Table 3b for details on precision objectives in the laboratory.

### Accuracy

Accuracy is a measure of the overall agreement of a measurement to the known value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations (USEPA, 2002).

#### **Field Accuracy**

**[Confirm based on actual fieldwork. Remove what does not apply (e.g., remove discussion of trip blank samples if not being collected)]**

Accuracy of the field sample collection procedures ensures that samples are not affected by sources external to the sample, such as sample contamination by ambient conditions. Field sampling accuracy will be assessed by the data from equipment and trip blank samples.

Trip blank samples will provide [**Add explanation**].

Trip blank samples should not contain target analytes. Accuracy also will be ensured by adhering to all sample handling procedures, sample preservation requirements and holding time periods.

[**If GPS or geospatial information is being collected for your project, discuss field accuracy here**]

#### **Laboratory Accuracy**

**[CONFIRM WITH LABORATORY]**

Laboratory accuracy is assessed through the analysis of SMC, LCSs, MS/MSD, or Standard Reference Materials (SRM) and the determination of percent recoveries (%R). The data generated demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. The (%R) is calculated according to the following formula:

**%R = Spiked Sample Concentration – Unspiked Sample Concentration X 100**

**Concentration of Spike Added**

Laboratory accuracy is measured as the percent difference from true value of certified target for reference materials and /or method analyte spikes and surrogates where applicable. The laboratory accuracy data quality objectives can be found in Table 3b.

## Internal Quality Control

Internal QC is achieved by collecting and/or analyzing a series of duplicate, blank, spike, and spike duplicate samples to ensure that analytical results are within the specified QC objectives discussed in section 1.4. The QC sample results are used to quantify precision and accuracy and identify any problem or limitation in the associated sample results. The internal QC components of a sampling and analyses program will ensure that the data of known quality are produced and documented. The internal QC samples, frequency, acceptance criteria, and corrective action must meet the minimum requirements presented in section 1.4 and in the following sections.

**[Add reference text explaining how QC is achieved internal to the project team during field work and during desktop work]**

## Field Quality Control

**[The subsections below are examples. Confirm text that is appropriate for your project and remove text that does not apply.** **Explain how QC will be ensured during fieldwork, referencing previous sections as applicable.]**

Field QC samples are used to assess the influence of sampling procedures and equipment used in sampling. They are also used to characterize matrix heterogeneity. For basic water quality analyses, quality control samples to be prepared in the field will consist of equipment blanks, field duplicates, and matrix spikes (when applicable).

Equipment Blanks

Equipment blank samples will be collected and analyzed for all analytes of interest along with the associated environmental samples. Equipment blanks will be collected by routing lab grade water (certified contaminate free) through decontaminated sampling equipment using the same procedures as for environmental samples. The Equipment Blank samples will be analyzed to determine if field procedures have introduced contaminants into the samples. Equipment blank samples will be collected at a rate of 1 per 20 normal samples, and should not contain analytes of interest above project defined reporting limits.

Field Duplicates

Field duplicates will be collected at the rate of 1 per 20 normal samples, or 1 per sampling event, whichever is greater. Field duplicates will be collected at the same time as environmental samples or of two grab samples collected in rapid succession, and will be analyzed along with the associated environmental samples. If the relative percent difference (RPD) of field duplicate results in greater than 25% and the absolute difference is greater than the reporting limit (RL), both samples should be reanalyzed. [**Reference to Table 3a (QAOs) as applicable and discuss acceptance criteria from the table**].

 Matrix Spikes and Matrix Spike Duplicates

Matrix spikes and matrix spike duplicates will be analyzed at the rate of one pair per sample batch. Matrix spike samples are collected at the same time as the environmental samples and are spiked at the laboratory to provide information on matrix effects. The sample chosen for the MS/MSD will be collected in triplicate volume and noted on the COC next to that sample as ‘for MS/MSD’. **[Note the acceptance criteria for MS/MSD samples here or reference up to Table 3 and provide the information there]**.

Method Blanks

Method blanks will be prepared and analyzed by the contract laboratory with each batch of samples. If any analyte is detected in the blank, the blank and the associated samples must be re-extracted and re-analyzed.

## Laboratory Quality Control

**[Confirm based on actual project work. Remove text that does not apply. Explain how QC will be ensured at the laboratory for each analysis, referencing previous sections as applicable. Obtain this information from your lab and request they provide information in a table. The table should identify the key QC samples and criteria for each analyses. This includes calibration details and evaluation criteria. Discuss the key Laboratory QC samples briefly and then reference to the table below**.]

Laboratory Control Samples

Laboratory control sample/Laboratory control sample duplicates (LCS/LCSD) are samples prepared in the laboratory and contain analytes representative of the analytes of interest in the submitted samples. Known concentrations of analytes are added to DI water and processed in the same manner as the project samples. Results obtained from LCS/LCSD samples demonstrate that the laboratory is in control of the processes involved in the preparation and analysis of the method. Both accuracy (LCS %recovery) and precision/reproducibility (LCSD % RPD) are obtained. LCS/LCSD samples should meet the acceptance criteria outlined in the laboratory SOP (reference to SOP here) or analytical method. Table 5 identifies the frequency and acceptance criteria for LCS/LCSD samples. Overall, laboratory acceptance criteria are shown below.

[**Request this information from the laboratory and complete the Table 5. For multiple analysis or varying lab QC frequency and acceptance criteria – make an individual table for each analysis**.**]**

Table 5: Analytical Quality Control [Only keep Lab QC pertinent to your project/method, remove if not needed and add information not currently represented in the table below]

| **Laboratory QC** | **Frequency/Number** | **Acceptance Criteria** |
| --- | --- | --- |
| Method Blank |  |  |
| Reagent Blank |  |  |
| Storage Blank |  |  |
| Instrument Blank |  |  |
| Lab. Duplicate |  |  |
| Lab. Matrix Spike |  |  |
| Matrix Spike Duplicate |  |  |
| Lab. Control sample |  |  |
| Surrogates |  |  |
| Internal Standards |  |  |
| Others: |  |  |

# INSTRUMENTATION AND EQUIPMENT PREVENTIVE MAINTENANCE

## Sample Equipment Cleaning Procedures

Equipment used for sample collection must be cleaned and maintained in accordance with proper field practices. [**Explain what these field practices are and reference other sections of the QAPP (such as the Decontamination discussion in section 2.1) and SOPs as appropriate**]

## Analytical Instrument and Equipment Testing Procedures and Corrective Actions

All instrument and equipment testing will be performed according to manufacturer recommendations and documented in the [**Specify how the project team will document testing and where these records will be located. Explain what instruments and equipment will be used for this project, or reference section where this is already discussed in the QAPP.** **How often will equipment be tested and when? What will happen to equipment that fails testing procedures – what are the corrective actions? Laboratory instrument and equipment testing will be as prescribed under the laboratory QA manual or may be contained in the lab SOP – make sure to identify how instrumentation is maintained and any calibration or corrective action procedures in place for issues with that instrumentation.]**

## Instrument Calibrations and Frequency

**[Retain or Edit as Needed]**

Analytical Procedures and Calibration

This section briefly describes analytical methods and calibration procedures for samples that will be collected under this project.

Analytical methods that will be used in this program will need to follow the general guidance of any of the following methods:

* *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater* (EPA-600/4-85 054)
* *U.S. EPA Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020, third edition, 1983)
* *Methods for Determination of Organic Compounds in Drinking Water* (EPA-600/4-88/039)
* *Standard Methods for the Examination of Water and Wastewater* (APHA 1998)

For this program, only linear calibration with either an average response factor or a linear regression is acceptable for organic analyses. Non-linear calibration is not allowed since using this calibration option creates a potential for poor quantitation or biased concentration of compounds at low or high concentrations (near the high and low ends of the calibration range).

Laboratories shall prepare an initial 5-point calibration curve, where the low-level standard concentrations is less than or equal to the analyte quantitation limits.

# DATA MANAGEMENT

[**Elaborate on this process as appropriate]**

Copies of field data sheets, a copy of COC forms, original preliminary and final lab reports, and electronic media reports will be kept for review by the **[Insert organization name].** The field crew will retain original field data sheets. The contract laboratory will retain COC forms. The contract laboratory will retain copies of the preliminary and final data reports.

Field data sheets are checked and signed in the field by the project **[Insert “leader”, “manager”, etc.]**. They will identify any results where holding times have been exceeded, sample identification information is incorrect, samples were inappropriately handled, or calibration information is missing or inadequate. Such data will be marked as unacceptable by and will not be entered into the electronic data base and/or otherwise used for project analysis, reporting or other purpose. **[Clarify timeframe for completing this check, post-fieldwork and whether there would be a need to repeat fieldwork and/or re-train data collectors if results are unacceptable. If consensus is required by the project team for decision-making, explain the consensus process here. Describe how problems will be resolved, including chain-of-command, and documentation process. Include examples of types of corrective actions that might be implemented.**]

Independent laboratories **[update with lab name]** will report their results to the project **[“leader”, “manager”, etc.]**. The **[“leader”, “manager”, etc.]** will verify sample identification information, review the chain-of-custody forms, and identify the data appropriately in the database. [**Make sure that this is an accurate process for your lab]**

Concentrations of chemicals and all numerical biological parameters will be calculated as described in the referenced method document for each analyte or parameter, or a laboratory operating procedure. The data generated will be [**Identify how data will be stored and used, uploaded into a database, entry into a spreadsheet, etc.**] maintained by **[who will be responsible for data entry and management?]** and available for NFWF staff review when requested. This review is for QA/QC purposes only and will not be used for any other purpose. All project information will remain confidential. See Section 6.2 for additional information on this data reporting requirement.

After data entry or data transfer procedures are completed for each sample event, data will be inspected for data transcription errors [**How long after data collection and by whom? How are errors determined (reference sections 1.3-1.4)? What happens to data found to have errors****?],** and corrected as appropriate. After the final QA checks for errors are completed, the data will be added to the project database. [**Specify who would do this and the timeframe, post-data collection. Describe how data will be used for reporting as applicable]**

## Data Assessment Procedures

Data must be consistently assessed and documented to determine whether project QAOs discussed in section 1.4 have been met, quantitatively assess data quality and identify potential limitations on data use. Assessment and compliance with quality control procedures will be undertaken during the data collection phase of the project. [**Reiterate, describe or reference the QC procedures for this project]**

## Data to be Included in QA Summary Reports

During the project, NFWF may require periodic reporting, as noted below. Table 6 summarizes the types of data to be reported and the method in which that information will be delivered to NFWF staff.

**[Remove lines not applicable to your project (e.g. remove the line for BMPs if you are not using). Please be sure this table matches the table in Appendix F]**

|  |
| --- |
| **Table 6: QA Summary Reporting Data** |
| Data | Data Description | Reporting Method | Frequency |
| Best Management Practice (BMP) Data | Raw data from project reports in units of miles, linear feet, acres, individuals, etc. | Metrics uploaded to NFWF online system. | Annually and at NFWF Request during the closeout procedure |
| Monitoring Data | Raw data on project effectiveness, ambient water quality in priority watershed, stormwater flow, project conclusion data, etc. | Raw data, reports, and/or spreadsheets submitted through NFWF online system through the Final Programmatic Report. | At NFWF Request during the closeout procedure |
| Geospatial Data | Google polygon maps, latitude/longitude info, watershed segment | Uploaded via NFWF online system map page | At NFWF Request at application, during any Map Update Tasks, and during the closeout procedure |

At project completion, the field team will provide copies of the field data sheets (or relevant pages of field logs) and copies of the COC forms as a representative sample subset submittal of analysis as discussed in section 6.0 [**Be sure to discuss data verification here or in the beginning of section 6**]. At a minimum, sample-specific information must be provided for each sampling type to NFWF staff according to the QA Summary Report template, included as Appendix F.

## Reporting Format

All results meeting data quality objectives and results having satisfactory explanations for deviations from objectives will be reported in the QA Summary Report. The final results will include the results of all field and laboratory quality control samples. Results will be reported to NFWF at project completion as noted in Section 6.2 above. Reports may be submitted electronically along with the final programmatic report.

# DATA VALIDATION AND USABILITY

**[Discuss here how the project team will determine that data is fit for use. Address how all data will be reviewed following the processes outlined in this QAPP and any changes, qualifiers, and notations recorded based on the decision rules/criteria appropriate for the data set, also outlined in the QAPP. For instance, data sets may have missing or unclear entries that can be filled in or modified based on other available records such as photographs or other documentation.]**

## Laboratory Data Review, Verification, and Reporting

The laboratory quality assurance manual will be used to accept, reject or qualify the data generated by the laboratory. The [**laboratory management]** will be responsible for validating the data generated by the laboratory.

The [**laboratory personnel]** will verify that the measurement process was “in control” (i.e., all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with analysis of a subsequent batch. In addition, each laboratory will establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

Only data, which have met DQOs described in section 1.3, or data, which have acceptable deviations clearly noted, will be submitted by the laboratory. When QA requirements have not been met, the samples will be reanalyzed when possible and only the results of the reanalysis will be submitted, provided they are acceptable.

**[If you have lab reports being issued or are performing additional chemistry data validation then discuss here. Discuss if your lab will qualify or flag data so it is clear how this information is presented and how the data used will interpret results.]**

## Self-Assessment, Data System Audits

**[Explain how project will ensure the data is collected consistently. EPA asks that you describe how the project will periodically assess consistency of data collection during project delivery. Write a short paragraph or synopsis on how this will be accomplished by the project team.**

**Examples of self-assessments are things like periodic training updates comparing how volunteers or others are collecting data for the same project question, spot checks on data to document consistency, comparisons of photos taken to make sure they are the same type of photo, blind double data collection etc. Don’t create anything new, just describe what you will be doing as it works within project.]**

# REFERENCES

**[EXAMPLE ONLY] [Edit to meet your** **project and remove example references below not used for this project. Be sure all references listed in this section are cited in the main body text of the QAPP]**

U.S. EPA 2001. Laboratory Documentation Requirements for Data Evaluation (R9QA/004.1)

U.S. EPA 1983. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, third edition

U.S. EPA 1988. Methods for Determination of Organic Compounds in Drinking Water (EPA-600/4-88/039)

EPA/600/R-99/080 2000. Guidance on Technical Audits and Related Assessments for Environmental Data Operations

# Appendices

 **[UPDATE AS NEEDED]**

A) Project Site Map(s)

1. Standard Operating Procedures
2. Laboratory Certification
3. Chain of Custody Form
4. Field Data Sheet
5. QA Summary Report

**[Attach all SOPs, methods, COC forms, and laboratory procedures mentioned in your QAPP. Contact your lab and have them provide a copy of the certifications they possess (e.g., U.S. EPA, State Department of Environmental Protection (DEP)/Department of Environmental Quality (DEQ), etc.)]**

APPENDIX F – At Project Close Out

[Insert Project Name]

QA Summary Report - Components

This project resulted in **[Insert deliverable description]**. This work product received the required nature and scope of QAPP oversight appropriate for the intended use of the data.

The data sets, data products and other supporting QA documentation is/are maintained on file with the assigned research staff as noted in the QAPP until **[Insert date].**

All QAPP elements were met and completed according to the procedures and methods outlined therein.

**NFWF QA Summary Reports will be submitted to NFWF annually and at project completion as requested. The QA Summary reports will include the following information, as appropriate –**

1. QA Summary Closeout reports include the extent to which projects are implemented according to the stated scope of work and the methodologies specified in this QAPP in their final programmatic reports.
2. Significant changes to the objective, scope, or methodology of environmental data collection or use of environmental technology require the review and approval of the NFWF Program Manager and the NFWF QA reviewer. Therefore, if needed, appropriate revisions to this QAPP will be completed and submitted to the NFWF Program Manager for review and approval prior to implementation of changes.
3. Additionally, periodic QA Summary Reports will be submitted to NFWF annually, if requested, according to the table, below.

**The following table summarizes the types of data to be reported and the method in which that information will be delivered to NFWF staff.**

|  |  |  |  |
| --- | --- | --- | --- |
| Data | Data Description | Reporting Method | Frequency |
| Best Management Practice (BMP) Data | Raw data from project reports in units of miles, linear feet, acres, individuals, etc. | Metrics uploaded to NFWF online system. | Annually and at NFWF Request during the closeout procedure |
| Monitoring Data | Raw data on project effectiveness, ambient water quality in priority watershed, stormwater flow, project conclusion data, etc. | Raw data, reports, and/or spreadsheets submitted through NFWF online system through the Final Programmatic Report. | At NFWF Request during the closeout procedure |
| Geospatial Data | Google polygon maps, latitude/longitude info, watershed segment | Uploaded via NFWF online system map page | At NFWF Request at application, during any Map Update Tasks, and during the closeout procedure |

1. RPD – Relative Percent Difference [↑](#footnote-ref-1)
2. Nitrate precision is 10% RPD for field and lab duplicates. [↑](#footnote-ref-2)
3. Nitrate accuracy is 90-110% recovery for matrix spike and laboratory control samples. [↑](#footnote-ref-3)