**Bacteria Testing Quality Assurance Project Plan with Accompanying**

**Depth and Salinity Measurement (QAPP)**

*EPA Citizen Science QAPP Template*

Prefilled by Janice T. Booher, M.S. for *Rising Together* projects.

What follows is an EPA Citizen Science QAPP Template with prefilled information. References to EPA oversight personnel can be deleted or replaced with names of others fulfilling oversight roles. If additional sampling will be done at a professional laboratory, the laboratory can provide answers to the relevant questions in the template. Text in red should be replaced with information specific to each project. Delete

Entries that do not apply to your project.

|  |
| --- |
| Citizen Science QAPP Requirement Summary  |
|  |
| Section 1  | Title and Approval Page  | Template #1  |
| Section 2  | Organization Chart, Project Distribution List  | Template #2A Template #2B  |
| Section 3  | Project/Task Organization  | Template #3  |
| Section 4  | Problem Definition and Project Objectives  | Template #4  |
| Section 5  | Background and History  | Template #5  |
| Section 6  | Project Location  | Template #6  |
| Section 7  | Project Schedule  | Template #7  |
| Section 8  | Existing Data  | Template #8  |
| Section 9  | Quality Objectives  | Template #9  |
| Section 10  | Data Collection Methods, Equipment List/Calibration  | Template #10A Template #10B  |
| Section 11  | Analytical Methods  | Template #11  |
| Section 12  | Field Data Sheet  | Template #12  |
| Section 13  | Training and Specialized Experience  | Template #13  |
| Section 14  | Assessments and Oversight  | Template #14  |
| Section 15  | Data Management  | Template #15  |
| Section 16  | Data Review and Usability Determination  | Template #16  |
| Section 17  | Reporting  | Template #17  |

A quality assurance project plan (QAPP) states the objectives and procedures to be followed for a project that uses or collects environmental information. It keeps all of the information for the project in one location for easy access by all individuals involved with the project. You should be able to give a QAPP to anyone involved with the project and when they are done reading it they will know why the work is being done and what will be done to achieve the established objectives.

On the templates, instructions are highlighted in blue while examples are provided in italics. Replace all italicized examples with the corresponding information from your project. Please complete all relevant tables.

**Citizen Science QAPP Template #1**

**Title and Approval Page**

***Community* Bacteria Testing**

Effective Date of Plan: *Date*

*Project Manager: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature/Date/Name/Title*

*Project QA Manager: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature/Date Name/Title*

*EPA Project Officer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature/Date Name/Title*

*EPA QA Officer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature/Date Name/Title*

Add additional signatures lines as needed. At a minimum, include the personnel listed above.

**Citizen Science QAPP Template #2A**

**Project Organization Chart**

|  |
| --- |
| The organization chart shows the lines of communication and reporting for the project, similar to a chain  |
| of command. Fill in the names of the individuals and their titles (where applicable). If the project does  |
| not have all of the personnel in the chart, put N/A in the box where this applies. If necessary add more  |
| boxes to accurately reflect the communication and reporting structure of the project.  |

Project Manager

*Name*

EPA Project Officer

*Name*

EPA Quality Assurance Officer

*Name*

Lab Personnel

Project/Field

Personnel

*Name*

Project Quality Assurance Manager

*Name*

*Name*

*XYZ University*

*Name*

*XYZ Church*

*Name*

**Citizen Science QAPP Template #2B**

**Project Distribution List**

|  |
| --- |
| The distribution list ensures everyone involved with the project receives a copy of the QAPP and is  |
| aware/clear about the work being conducted. It also provides the contact information for those  |
| involved with the project. For this table, input the names and contact information for all individuals  |
| who will need to get a copy of the QAPP.  |

|  |  |
| --- | --- |
| **Name/Title** | **Contact Information** |
| *Name**Project Manager*  | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_*  |
| *Name**Project Quality Assurance Manager*  | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |
| *Name**EPA Project Officer*  | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |
| *Name**EPA Quality Assurance Officer*  | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |
| *Name**XYZ University Students*Field Samplers, Data Analysts | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |
| *Name**XYZ Volunteers* Field Samplers | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |
| *NameXYZ University Lab Technician*  | *Email: \_\_\_\_\_\_\_\_\_\_\_ Phone: \_\_\_\_\_\_\_\_\_\_\_\_\_* |

**Citizen Science QAPP Template #3**

**Project/Task Organization**

|  |
| --- |
| Fill in the name, title, organization affiliation and responsibilities sections of the table below. For the  |
| responsibilities section, state what work/task each individual will be doing throughout the project. The  |
| responsibilities section provides an outline of the work that will be done for the project. Project specific  |
| details will be addressed in later sections of the QAPP. NOTE: The names and titles should be consistent  |
| in Templates #1, #2A, #2B, and #3.  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Title** | **Organizational Affiliation** | **Responsibilities (specific to this project)** |
| *Name* | Project Manager | *Organization name* | Oversees quality assurance manager, data collection, team organization and training, etc.  |
| *Name* | Project Quality Assurance Manager | *Organization name* | Quality assurance, oversight and assessments, data verification, evaluation and usability, ensuring corrective actions are completed, etc.  |
| University Students (# people) | Field Personnel | *Community* Residents | Field sampling and data analysis  |
| Volunteers (# people) | Field Personnel | *XYZ* University | Field sampling and data analysis  |
| *Name* | Laboratory Personnel | *XYZ Lab* | Sample analysis and data validation  |

**Citizen Science QAPP Template #4**

**Problem Definition and Project Objective**

**Problem Definition**

Clearly state the problem and environmental questions being addressed by the project.

*Residents of Community are experiencing flooding during rain events and King Tides. It is difficult to avoid contact with floodwaters during these events. Residents are concerned about water contamination from pet park flooding, septic field flooding and wet weather sewer overflows. This project will address the following questions:*

*1. Is coliform or E. coli present in floodwaters near or at the pet park?*

*2. Is coliform or E. coli present in floodwaters near or at addresses using septic systems?*

*3. Is coliform or E. coli present in floodwaters near locations that have been identified as contaminated sites or sites of past sewer overflows?*

**Project Objectives** (linking data results with possible actions)

|  |
| --- |
| Describe how the project objectives will answer the problem presented in the problem |
| Definition provided above. Include the tasks that will be completed to provide or collect  |
| information to address the problem.  |

We plan to measure depth and salinity, and to investigate the presence or absence of coliform and E. coli in floodwaters in *Community.*

**Objective 1:** Record King Tide flood depths in *Community.*

**Objective 2:** Record King Tide flood salinity in *Community.*

**Objective 3:** Record King Tide flood coliform presence or absence in *Community*

***Objective 4:***Record King Tide flood *E coli* presence or absence in *Community.*

We will sample water for coliform and E. coli from a series of sampling locations in the Community where concerned residents reside. Depth of the water will be measured in inches using an aluminum measuring stick, and salinity will be measured in parts per thousand with a refractometer in the field. Depth, salinity, narrative information, pictures of the site and of the labeled sample bottle, video and GIS location metadata will be uploaded to a FULCRUM App using cell phones at each sampling site. Samples will be collected, preserved in cold packs, incubated and analyzed using the *EZTM Coliform Cult* (XGAL/MUG) *Test*.

Data Users

|  |
| --- |
| State who will use the data and what decisions or conclusions will be made based on the data. Include  |
| any action levels or standards to which the data will be compared.  |

The data collected from this project will be used by *XYZ University* and *XYZ government agency* as screening level data. *XYZ University* will determine if a more extensive project needs to be completed to more definitively determine if there are significant levels of coliform or E. coli at the sites sampled. *XYZ government* agency will determine if public health advice should be posted on signs in the neighborhood, or communicated directly to residents. In the event of positive *E. coli* samples, the data will also be used to inform the State Department of Environmental Protection of a potential problem in the *Community* in the hope that the state will provide appropriate guidance. Mapped data will be available online, so residents can make informed decisions about their movements within the community, and decide if they will work together to address the *pet park* clean up, or advocate for resources to address cleaning up contaminated sites, converting septic systems to county sewage, or modifying sewage lines to prevent sewage overflows.

**Citizen Science QAPP Template #5**

**Background and History**

**Background**

|  |
| --- |
| In this section, state why this work needs to be done, identifying the reasons for conducting the work  |
| and/or the lack of information relating to the project.  |

*The Community is experiencing predictable King Tide flooding, and flooding during* *rain and storm events. Residents have expressed fear of floodwaters, particularly since accounts of bacteria in hurricane floodwaters have received national attention. Residents complain of a bad smell during flood events, and fear of diseases caused by contaminated floodwaters.*

**History**

|  |
| --- |
| In this section provide any relevant historical information that would help the reader understand the  |
| problem that is being addressed. Discuss any previous work or data that has been collected as they  |
| relate to this project.  |

*Open source water and sewer data show X contaminated sites and Y sewer overflow sites in Community. Department of Health open source septic system mapping shows Z septic systems in the area bounded by landmark to the south, landmark to the north, landmark to the east, and landmark to the west. It is difficult for residents to avoid contact with floodwaters due to the flooding in their parking lots, on their commuting routes, and in their homes. Knowing if there is coliform or E. coli in floodwaters near specific point sources in the community is the first step to determining if the floodwaters contain threats to human health.*

**Citizen Science QAPP Template #6**

**Project Location**

**Project Location**

|  |
| --- |
| Provide a description of the site and sampling locations and how they were chosen. Provide the  |
| rationale for selecting sample locations and what is going to be sampled. Provide a map showing the  |
| location and any other relevant information for the project. Tie this information back to the goals and  |
| objectives of the project.  |

Sampling sites in *Community* are mapped below*.* These sites were selectedbecause either *prior surveys and field studies have documented that these locations flood during King Tides, or because the site is near a documented contaminated site, a documented sewage overflow, or a septic system.* This willprovide initial bacteria screening test information to determine if more testing is needed to quantify the bacterial concentration, or to identify the bacteria present. It will also allow informed residents to make decisions about places to avoid during King Tide Flooding.

**Citizen Science QAPP Template #7**

**Project Schedule**

**Project Schedule**

|  |
| --- |
| In the table below, list all major project activities that will be performed during the course of the project.  |
| Provide estimates of the timeframe expected for the activities to be conducted and/or completed.  |

|  |  |  |
| --- | --- | --- |
| **Activities** | **Organization/Group responsible for activity completion** | **Timeframe work will be done** |
| Preparation of QAPP  | *Name*Project Manager | *Date-* Submit QAPP*Date-* Approved QAPP |
| Review and Preparation of QAPP | *Name*Project Quality Assurance Manager | *Date* |
| Grant Oversight | EPA Project Officer  | *Begin Date – End Date*  |
| Approval of QAPP | EPA Quality Assurance Officer  | *Date Range* |
| Procurement of Equipment | *XYZ University,* *Organization or Name* | *Date* |
| Collection of Existing Data | *Residents,* *XYZ University Students* | *Begin Date – End Date* |
| Sample Collection | *XYZ University Students,**High school volunteers* | *Begin Date – End Date* |
| Sample Analysis | *Name,**XYZ University Ecology Lab* | *Begin Date – End Date* |
| Data Evaluation | *Name,**XYZ University Students,**XYZ School Students* | *Begin Date – End Date* |
| Preparation of Final Report | *Name* | *Date* |

**Citizen Science QAPP Template #8**

**Existing Data**

|  |
| --- |
| For many projects it may be necessary to use data that someone else has already collected, (i.e. existing  |
| data). Just because data was collected by a reliable source, such as a peer reviewed journal article,  |
| doesn’t mean it was collected in a way that your project could use. It is important to perform a check on  |
| the data to see how the data was collected and if it is acceptable for the objectives of your project. You |
| must complete this template if your project will be using existing data. |

|  |
| --- |
| Identify all existing data that will be used for the project, and their originating sources. Specify how the  |
| existing data will be used, and the limitations on their use.  |
| * In the Existing Data section state what existing data you will use.
 |
| * In the Data Source section state where that data will come from.
 |
| * In the How Data Will Be Used section state the need for this data and/or what purpose it will be
 |
| used for.  |
| * In the Acceptance Criteria section state what the requirements are for the data in order for
 |
| them to be used in the project. For example, if you are looking for temperature data for a water  |
| body collected in July, then temperature data collected in June would not be acceptable for the  |
| project. Data collected with a certain instrument or by a certain method are also instances  |
| where the collected data may not be acceptable for the project.  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Existing Data** | **Data Source** | **How Data Will Be Used** | **Acceptance Criteria** |
| *Contaminated Site Records*  | *County Code Enforcement*  | *To determine sampling locations*  | *Record is present in the Miami Dade Code Enforcement search by folio number* [*https://www2.miami-dadeclerk.com/cef/CitationSearch.aspx*](https://www2.miami-dadeclerk.com/cef/CitationSearch.aspx)*Or**Present in the Miami Dade Contaminated Sites records* [*https://opendata.miamidade.gov/Environment/Contaminated-Sites/jcvh-tmn5*](https://opendata.miamidade.gov/Environment/Contaminated-Sites/jcvh-tmn5) |
| *Septic System Records* | *County Water and Sewer Department* | *To determine sampling locations* | *A DOH Septic Permit Number is available for the location at https://gisweb.miamidade.gov/iWASDConnect/* |
| *Sewer Overflow Records* | *County* *Water and Sewer Department* | *To determine sampling locations* | *A sewer overflow has been reported in the past 2 years*  |
| *Past Flooding Reports* | *Source* | *To determine sampling locations* | *Flood data that has previously been collected in the area* |

**Citizen Science QAPP Template #9**

**Quality Objectives**

|  |
| --- |
| Use this template to develop the data quality objectives (DQOs) that define the type, quantity and  |
| quality of data needed to answer specific environmental questions, and support proper environmental  |
| decisions. The examples provided below are neither inclusive nor appropriate for all projects. Fill in all  |
| information appropriate for the project. Complete this template for field, existing data and laboratory  |
| activities, if your project includes these components.  |

|  |
| --- |
| **Precision** is defined as the ability of a measurement to consistently be reproduced. Repeated  |
| measurements are usually used to determine precision. In the case of repeated measurements, one  |
| would see how close those measurements agree. If repeat measurements will be taken state how close  |
| those measurements need to agree by.  |

Precision:Field *– Given the limits of the budget and the screening level nature of the project, only X water samples will be collected at each site.* Laboratory *– Color change determines a positive coliform result. Of the two samples collected at the site, if one sample changes to a blue green color and the other does not, it will be recorded as an ambiguous result. For E coli testing, if one of the two samples fluoresce blue under UV light of approximately 650nm and the other does not, it will be recorded as an ambiguous result.*

|  |
| --- |
| **Bias** is defined as any influence in the project that might sway or skew the data in a particular direction.  |
| Taking samples from one location where a problem is known to exist, instead of taking samples evenly  |
| distributed over a wide area, is one example of how data can be biased. State any biases that could  |
| potentially exist and how they will be addressed in the project.  |

Bias:
Field *- All sampling locations are on public property. Impacted private property will not be documented. Locations where there is no flooding will not be sampled due to lack of water. Geographic distribution of coliform and E.coli in floodwaters is predicated on locating sites where there is flooding. This sampling is biased toward sites that have flooded in the past, including sites that have not been sampled in the past, although flooding was reported.* Laboratory *– Negative samples appear yellow. Any shade on the blue-green spectrum will be recorded as positive. All samples will be photographed for the data record in a manner that makes the color of the sample visible. In comparative studies with membrane filter procedures, the presence-absence test may maximize coliform detection in samples containing many organisms that could overgrow coliform colonies and cause problems in detection.[[1]](#footnote-1)*Existing data*- Existing data will be used to determine sampling locations. The existing data includes sites that have flooded in the past, sites near septic systems, past contaminated sites and sewage overflows. Therefore, one might expect more samples to be positive for coliform or E coli than a sample grid that simply covers the geography indiscriminately.*

|  |
| --- |
| **Representativeness** is how well the collected data depicts the true system. Describe how the collected  |
| data will accurately represent the population, place, time and/or situation of interest.  |

Representativeness:Field*- Sampling will occur during the King Tides. Samples will be collected before, during and after high tide. Therefore, data will not represent daily conditions outside of the King Tide season.* Existing data*- The anecdotal reports of residents regarding where flooding occurs depend on the accuracy of their statements on surveys. Existing government open source data may not be current.*

|  |
| --- |
| **Comparability** is defined as the extent to which data from one data set can be compared directly to  |
| another data set. The data sets should have enough common ground, equivalence or similarity to  |
| permit a meaningful analysis. State if the data is intended to be compared to other data sets and how  |
| this will be achieved.  |

Comparability*:*Field*-* The depth and salinity data will be compared to data in previous studies by *Name the Institution. Bacteria data will be compared to any existing available data.*Laboratory– The coliform and E coli results will be comparable to other EZTM Coliform Cult (XGAL/MUG) Tests and other EPA approved presence/absence tests using Standard Methods 9221D. EPA compliant method published in the Federal Register/Vol. 67, No. 209

Procedure *-* A positive EZTM Coliform Cult (XGAL/MUG) Test means there is a concentration of 1 colony forming unit per 100 milliliter or greater in the sample. Test results can be compared to quantified total coliform results equal to or greater than 1cfu/ml.

|  |
| --- |
| **Completeness** is the amount of data that must be collected in order to achieve the goals and objectives  |
| stated for the project. State how much data will need to be collected in order for the project to be  |
| considered successful. This can be stated as a total number of samples or a percentage of data  |
| collected.  |

Completeness:
Field- Samples will be collected at a minimum of *X* sites. *Y* samples and *Z* duplicates will be collected throughout the project. If weather or other issues impede a sampling event, the event will be rescheduled to another day of the King Tide season.

|  |
| --- |
| Sensitivity is essentially the lowest detection limit of a method, instrument or process for each of the  |
| measurement parameters of interest. State the sensitivity needed for the instruments, methods or  |
| processes used for the project in order to obtain meaningful data.  |

Sensitivity:Field *-* The Agtec Salinity Refractometer with Copper ATC has a detection range of 0 – 100ppt. with 1 ppt demarcations. Depth measurements will be made in inches using a measuring stick with 1/16 inch demarcations.Existing data *- Existing flood data is available in inches.*Laboratory *-* The EZTM Coliform Cult (XGAL/MUG) Test is a presence/absence test for coliform. The E coli test exposes the same sample to UV light at 650nm. The result is visual.

**Citizen Science QAPP Template #10A**

**Data Collection Methods**

**Sampling Design**

|  |
| --- |
| For this section, describe and justify the data collection activities. Include location specific information,  |
| such as GPS coordinates or landmarks, for the data collection locations. Provide information about the  |
| frequency of sampling and the collection of quality control samples. Include information about your  |
| plans for sample identification and transportation.  |

Data collection will occur approximately an hour before high tide, at high tide, and approximately an hour after high tide on the date of the highest King Tide and one other day of the King Tide season. This will allow for observation of temporal changes accompanying the volume of water present. The following locations will be sampled to monitor locations where flooding has been measured in the past: *list addresses and GPS coordinates here*. Addresses can be converted to latitude and longitude on the NASA website.[[2]](#footnote-2)The following locations will be sampled because they may be point sources of bacterial contamination: *list addresses and GPS coordinates here. The following locations will be sampled because residents have reported that flooding occurs there: list addresses and GPS coordinates here.*

At all locations, a measuring stick with 1/16” demarcations will be used to measure depth, an Agtec Salinity Refractometer with Copper ATC with 1 ppt demarcations will be used to measure salinity, and a water sample will be placed in an EZTM Coliform Cult (XGAL/MUG) Test sample bottle. One duplicate water sample will be collected. Sample bottles will be the Industrial Test Systems, Inc. WaterWorks EZTM Coliform Cult (XGAL/MUG) Test 120ml bottles with pre-measured reagents. The sample bottles will be filled with surface water collected in a 120 ml plastic bottle, and poured into the upright Industrial Test Systems, Inc. WaterWorks EZTM Coliform Cult (XGAL/MUG) Test 120ml bottles. Samples will be placed in insulated bags with cold gel packs in the field. Samples will be transferred into a cooler with cold packs. The samples in the cooler will be transported to the laboratory after all samples have been collected. Sampling teams of 4 will include one person logged in to the Fulcrum Community app to serve as the data-entry person, who is also responsible for taking the photos. A second person will serve as water sampler, donning a pair of plastic gloves, measuring the water depth and salinity, collecting the water samples in the plastic collection bottle and pouring the water into the bottles with the chemicals. A third person should hold the plastic sampling kit and its contents, and place trash into a trash bag. A fourth person will serve as bottle manager, holding the cooler bag and placing the water bottles with the chemicals inside it once the water has been added. Samples will be kept on ice packs in the cooler until they are placed in the incubator in the lab. Sample labels will have a unique numerical identifier, a site number and description, and the sampling date printed on them. The word Time will be printed on the label to be filled in by the field investigators. Field Sampling SOP appears in Appendix A.

|  |
| --- |
| Complete all required information in the table below, using additional rows/columns, if necessary. Only  |
| a short reference back to the project objective is necessary in the table.  |
|  | In the **Matrix** section, state what kind of matrix (air, water, soil, animal/organism) is being  |
| sampled during the project.  |
| In the # of Sampling Location(s) section, provide the number of sampling locations.  |
| In the # of Samples per Location section, state if multiple efforts will be made at one location,  |
| such as sampling at different depths or taking repeated measurements over a given amount of  |
| time (i.e. once/quarter).  |
| In the Parameter section, state what substance will be measured/sampled.  |
| In the Field QC Samples section, state how many and what type of quality control samples will be collected.  |
| In the Total Number of Samples section, state the total number of samples that will be collected  |
| for each sampling event or total project including field QC samples.  |

|  |
| --- |
| In the Sampling SOP Reference section, state what specific methods will be used for the  |
| sample/monitoring data collection. Attach any SOPs as necessary.  |
| In the Project Objective for Sampling and Analysis or Monitoring section, state why the data  |
| will be collected at the particular location, frequency and time.  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Matrix**  | **# of Sampling Locations**  | **#of Samples per Location**  | ***Parameter***  | **Field QC Samples**  | **Total Number of Samples/** **Measurements**  | **Sampling SOP Reference**  | **Project Objective for Sampling and Analysis or Monitoring**  |
| Water  | *X* | *1* | *Depth*  | Picture uploaded to Fulcrum | *1* | Field Sampling SOP | Record King Tide flood depths in *Community*  |
| Water  | *X* | *1* | *Salinity*  | Picture uploaded to Fulcrum | *1* | Field Sampling SOP | Record King Tide flood salinity in *Community* |
| Organism | *X* | *2* | *Coliform* | *1 duplicate* | *2* | Field Sampling SOP | Record King Tide flood coliform presence or absence in *Community* |
| Organism | *Y* | *(same bottles as coliform)* | *E coli* | *(same bottles as coliform)* | *2* | Field Sampling SOP | Record King Tide flood *E coli* presence or absence in *Community* |

Attach all SOPs as an appendix to this document.

**Citizen Science QAPP Template #10B**

**Equipment List and Instrument Calibration**

**Equipment List**

Generate a list of all field equipment that will be used for the project.

|  |  |
| --- | --- |
| Waders or boots  | Plastic gloves |
|  Insulated bag with ice gel pack  | Alcohol swabs |
| Cooler with ice gel packs | Agtec Salinity Refractometer with Copper ATC  |
| Cell phone  | Trash Bag |
| Labels  | Hand sanitizer |
| Aluminum meter stick (inches) | Rienar White 3ML Disposable Plastic Eye Dropper Set Transfer Graduated Pipettes (100 PCS) |
| 7 Quart Latch Box  | 4oz/125ml Nalgene Wide Mouth Economy Bottle w 38mm Cap |
| Fine Point Sharpie Pen  | Industrial Test Systems, IncWaterWorks EZ Coliform Cult Bacteria Part No. 487197 |

**Instrument Calibration and Maintenance**

|  |
| --- |
| In the table below, fill in any calibration or maintenance requirements for the equipment that will be  |
| used during the project. State how the calibration information will be documented.  |

|  |  |  |
| --- | --- | --- |
| **Instrument/Equipment** | **Calibration Frequency** | **Maintenance Requirements** |
| Agtec Salinity Refractometer with Copper ATC | Calibrate before each use per manufacturer’s instructions.  | As per manufacturer’ s instructions  |

All calibrations for this project will be documented. Calibration records will be kept on calibration data sheets specific to each piece of equipment. Calibration records will include date, time, name of individual doing calibration, and the calibration results themselves. (Appendix C)

**Citizen Science QAPP Template #11**

**Analytical Methods\***

Identify all laboratory organization(s) that will provide analytical services for the project. Group by matrix, analytical group/parameter, reporting limit, detection limit, analytical/preparation method SOP, sample volume, containers, preservation requirements, maximum holding time and the laboratory contact information.

\*This table only needs to be completed when sample analysis by a laboratory is applicable to the project.

*Laboratory used for Analysis*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Matrix**  | **Analytical Group/Parameter** | **Reporting Limit**  | **Detection Limit**  | **Analytical & Preparation Method/ SOP Reference**  | **Sample Volume**  | **Containers (number, size, type)**  | **Preservation Requirements**  **(chemical, temperature, light protected)**  | **Maximum Holding Time (preparation/ analysis)**  | **Laboratory used for Analysis**  |
| Organism | Coliform | positive  | 1 cfu/100ml | EPA Method 9221 D  | 100ml to 120ml  | *X* 120 mlIndustrial Test Systems, Inc. WaterWorks EZTM Coliform Cult (XGAL/MUG) Test *sample bottles* | Store in insulated container with cold packs. Incubate at (95° F/35° C) as soon as possible.  | 48 hrs  | *XYZ Lab*  |
| Organism | *E. coli* | positive | 1 cfu/100ml |  | 100ml to 120ml  | *X* 120 mlIndustrial Test Systems, Inc. WaterWorks EZTM Coliform Cult (XGAL/MUG) Test *sample bottles* | Store in insulated container with cold packs. Incubate at (95° F/35° C) as soon as possible.  | 48 hrs  | *XYZ Lab*  |

**Citizen Science QAPP Template #12**

**Field Data Sheet**

If a field data sheet will be used for the project, attach it below.

Fulcrum App data entry form app:







**Citizen Science QAPP Template #13**

**Training and Specialized Experience**

 **Training**

|  |
| --- |
| In this section, state any required training that an individual involved with the project would need. Also  |
| include any refresher trainings that may be conducted.  |
|  | In the Personnel/Group to Be Trained section, state who will need the specific training and how  |
| many people will be trained.  |
| In the Description of Training section, state who will perform the training and what kind of  |
| information the trainee will learn.  |
| In the Frequency of Training section, state how many times the training will be conducted  |
| during the project.  |

|  |  |  |
| --- | --- | --- |
| **Personnel/Group to be Trained** | **Description of Training** | **Frequency of Training** |
| *Community* and *University* volunteers  | Proper use of Field Kit, including refractometer, water sampling equipment, and chain of sample custody procedure. Instruction on how to record information with the Fulcrum App using their smart phones in the field.  | One Training Session before field sampling  |

**Specialized Experience**

|  |
| --- |
| If any individuals have specialized experience that will be utilized by the project please complete the  |
| specialized experience table. State who the individual is, what specialized experience they have related  |
| to the project and their years of experience.  |

|  |  |  |
| --- | --- | --- |
| **Person**  | **Specialized Experience**  | **# of Years of Experience**  |
| *Name*  | *Explain Experience*  | *X* |

**Citizen Science QAPP Template #14**

**Assessments and Oversight**

|  |
| --- |
| Assessments and project oversight include various reviews to identify shortcomings or deviations from  |
| the project. For each type of assessment, describe procedures for handling QAPP and project deviations  |
| encountered during the planned project assessments. Fill in all necessary information.  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Assessment Type**  | **Frequency of Assessment**  | **What is Being Assessed**  | **Who will Conduct the Assessment**  | **How Issues or Deviations will be Addressed**  |
| Data Checks and Assessments  | Once after each day of sampling  | Field data entries into Fulcrum App and database photos against sample labels and location metadata | *Name* | Verify with sampling team. Data sets that can not be verified will be eliminated from analysis.  |
| On-Site Field Inspection  | Continuous Field Supervisor spot checks during field sampling  | Undergraduate and community volunteers XYZ University against QAPP/SOPs  | *Name* | Re-train if necessary  |

**Citizen Science QAPP Template #15**

**Data Management**

**Data Management**

|  |
| --- |
| Describe the data management processes used throughout the life of the project. Data management  |
| includes: recording and transcribing field notes, logging and retrieval of instrument data, transmittal of  |
| automated field and laboratory results, data transformation and reduction procedures, compilation of  |
| survey results, and data storage, retrieval and security uses throughout the project. Describe the way  |
| data handling errors will be controlled (i.e. spot checks for transcription and calculation errors).  |

Field Data:
All coliform and *E coli data* will be uploaded into the Fulcrum App using smart phones when the field sampling team synchronizes their data from their smart phones. This will create a spreadsheet of data with pictures included and URLs to video in the *Name* Fulcrum Account. All photographs of salinity readings taken through refractometer oculars will be verified against the numerical data entries made in the field by *Name*. The numerical value in the picture through the ocular will be substituted for the field data numerical entry when there are discrepancies. The Fulcrum spreadsheet will be maintained in the Fulcrum account of *Name or Organization.* The datawill be downloaded and stored in *location.* The data set files will be located on a computer in *XYZ location* and preserved for 5 years on an external hard drive kept at *location.*

Laboratory Analytical Results:
Lab results will be uploaded into the Fulcrum App using smart phones. This will create a spreadsheet of pictures, temporal tracking of the sample bottle, and whether the sample was positive or negative for coliform and for *E. coli* in the *Name or Organization* Fulcrum Account*.* Any coliform or *E coli* data that did not meet the quality control requirements of the laboratory will be eliminated from analysis. The Fulcrum spreadsheet will be maintained in the Fulcrum account of *Name or Organization.* The datawill be downloaded and stored in *location.* The data set files will be located on a computer in *XYZ location* and preserved for 5 years on an external hard drive kept at *location.*

**Citizen Science QAPP Template #16**

**Data Review and Usability Determination**

|  |
| --- |
| Include in this section the types of checks that will be performed at the end of the project to determine  |
| if the data collected is usable for achieving the goals of the project. Examples of data checks are  |
| provided in the table below.  |

**Data Checks**

|  |  |
| --- | --- |
| **Field/Lab** | **Data Management** |
| Monitoring performed per Standard Operating Procedures or QAPP  | Data entry and transcription errors  |
| Field QC samples performed correctly  | Calculation/reduction errors  |
| Measurements performed correctly  | Proper data and document storage  |
| Calibrations performed correctly  | Missing data documented  |
| Data meets acceptance criteria  |  |
| Holding times  |  |
| Evaluate any deviations from QAPP or SOPs to determine the impact to the data and project objectives  |  |

|  |
| --- |
| Describe the process used to determine the usability of your project data. If your data review, based on  |
| the table above, does not uncover any issues and all of your QC criteria are satisfied, then your data will  |
| be assumed to be usable for the intended project objective. However, this is not always the case and so  |
| you will need to lay out a process for determining data usability in the event that all QC criteria are not  |
| met.  |

All data issues identified will be discussed with the QAO to determine data usability on a case by case basis. All decisions to allow data that did not fully comply with QC criteria or QAPP requirements will be explained, and any resultant limitations on data use fully discussed in the final project report.

**Citizen Science QAPP Template #17**

**Reporting**

**Reports**

|  |
| --- |
| Specify the frequency of all reports, the names of the originators and to whom they will be issued.  |
| Itemize what information and records must be included in the report(s). This might include but is not  |
| limited to the following:  |
|  | Sample collection records  |
| QC sample records  |
| Equipment calibration records  |
| Assessment reports  |
| Data reconciliation results and associated recommendations/limitations  |
| Final report of results  |
| Note: If your project will include posting data to a website for public access, state in your description  |
| information about how data limitations will be conveyed.  |

The Project Manager is responsible for submitting an open source, publicly available final report, with the link or copies sent to *Distribution List Here*.The final project report will summarize the quality assurance data check results along with the data usability determinations made. The rational for the use of any data that does not fully comply with the quality criteria requirements of the approved QAPP will be fully explained in the final report. All data sets to be used on an open source data sharing platform will be accompanied by a description of data limitations.

**Appendix A: Field Sampling SOP**

**COMMUNITY MAP DATA COLLECTION PROCESS**

**BEFORE YOU ARRIVE**

1. Wear boots or a pair of shoes that can get muddy
2. Make sure your smartphone is fully charged!
3. Find your assigned group and location (check e-mail)

**WHEN YOU ARRIVE AT THE RENDEZ-VOUS POINT**

1. Meet up at the designated rendez-vous location. You may need to park a block or so away in some cases.
2. Assemble into groups. Some groups may walk from the rendez-vous location to their designated sampling area, and some may want to carpool.
3. Each group will have a data collection kit.
4. Groups will be divided into four or more:
	1. DATA ENTRY - One person should log in to the Fulcrum Community app and serve as the data-entry person. This person will also be responsible for taking the photos.
	2. WATER SAMPLER - One person should don a pair of plastic gloves, measure the water depth and salinity, collect the water samples in the plastic collection bottle and pour the water into the bottles with the chemicals.
	3. KIT MANAGER - One person should hold the plastic sampling kit and its contents.
	4. BOTTLE MANAGER - One person should hold the cooler bag and place the water bottles with the chemicals inside it once the water has been added.
	5. Any remaining team members will help the others.

**IN THE FIELD – BEFORE HIGH TIDE**

1. When you arrive at your water sampling site, the DATA ENTRY person should log into the Fulcrum Community app and make sure the location is accurate. If it is not accurate you can click on it and enter the address manually.
2. The DATA ENTRY person should enter the names of all people on the team in the field provided.
3. The WATER SAMPLER should put on the plastic gloves and do the **salinity measurement** first.
4. The WATER SAMPLER should tell the DATA ENTRY person the reading in the refractometer in parts per thousand (ppt).
5. The WATER SAMPLER should hand the refractometer to the DATA ENTRY person to take a photo of the refractometer reading.
6. The DATA ENTRY person should hand the refractometer back to the KIT MANAGER to put it away.
7. The WATER SAMPLER should use the measuring stick to measure the **water depth**. The WATER SAMPLER should tell the DATA ENTRY PERSON the reading on the stick, and whether the reading is in inches or centimeters.
8. The DATA ENTRY PERSON should take a photo of the measuring stick in the water, showing the depth measurement.
9. The WATER SAMPLER will give the measuring stick to the KIT MANAGER to put away.
10. The WATER SAMPLER will fill the water Sample Collection Bottle with water from the flooded are.
11. The KIT MANAGER will give the WATER SAMPLER a Bacteria Testing Bottle to transfer water from the Sample Collection Bottle. The WATER SAMPLER will fill the Bacteria Testing Bottle to just above the label.
12. The WATER SAMPLER will securely close the Bacteria Testing Bottle and vigorously shake the Bacteria Testing Bottle until the chemicals are fully dissolved.
13. The DATA ENTRY PERSON will take a photo of the **Bacteria Testing Bottle label**.
14. The WATER SAMPLER will give the Bacteria Testing Bottle to the BOTTLE MANAGER, who will place it into the cooler bag.
15. The DATA ENTRY PERSON will take a closeup photo of the flooded area.
16. THE DATA ENTRY PERSON will take a longshot, or a contextual photo, of the flooded area.
17. The DATA ENTRY PERSON may include a video of the flooded area, if it adds to our understanding of the flooded area.
18. The DATA ENTRY PERSON should briefly describe the flooded area in the Description field. Any problems, questions, or issues that arose during the sampling process should be noted here.
19. When all of the information has been added to the app, the DATA ENTRY person should press the SAVE button at the top of the Fulcrum app.
20. After pressing SAVE, the Fulcrum app sends you back to the map. Press the sync button at the upper right-hand corner of the page. It looks like this:

Repeat steps 1-20 at the time of the high tide and one hour after high tide.

**Appendix B: SOP Coliform and *E coli* Presence Absence Testing**

**EZTM Coliform Cult (X-GAL/MUG) Test Process**

*This procedure is based on field water samples placed in numerically labeled, sequenced sample bottles. If the samples are numbered, and the samples are placed in and removed from the incubator in numerical order, the amount of time to process the samples will be greatly reduced.*

Field collection process is explained in steps 11-14 of the Community Map Data Collection Process

1. Collect all sample bottles from field teams, and place them in a cooler with cold gel packs.
2. Transport the cooler with samples to an incubator set at 35° C (95°F).
3. Place the samples in numerical sequence using the number printed on the bottle label.
4. ENTER the date and time the sample was collected in Shorecrest into the FULCRUM app.
5. ENTER the number of the sample that is printed on the label.
6. Place the sample in the incubator.
7. ENTER the date and the time the sample was placed in the incubator.
8. Repeat Steps 4-7 for all samples.
9. Incubate the samples at 95 degrees Fahrenheit for 24 hours.
10. When the samples are removed one at a time from the incubator, make sure that they are placed on a transportable surface in numerical order (like a small table or chair with wheels, so you will be able to transport the samples to a dark room later).
11. ENTER the date and time the sample was removed from the incubator.
12. UPLOAD a picture of the sample. Make sure the color of the sample is visible. The labels may obscure most of the bottle, but be sure that the color of the liquid is visible in the picture.
13. ENTER the answer to the question: Is the coliform test positive after 24 hours of incubation? If the sample is clear yellow it is negative for coliforms, and the answer is NO. If the sample is positive for coliforms it is blue-green, and the answer is YES.
14. If the sample was ambiguous for any reason, you must incubate it for another 24 hours. If this is the case, follow Steps a-e:
	1. ENTER the time and date the sample was placed in the incubator for additional incubation.
	2. Incubate at 95 degrees Fahrenheit for an additional 24 hours.
	3. ENTER the date and time that the sample was removed from the incubator after additional incubation.
	4. UPLOAD a picture of the sample after 48 hours of incubation. Make sure the color of the sample is visible. The labels may obscure most of the bottle, but be sure that the color of the liquid is visible in the picture.
	5. ENTER the answer to the question: Is the coliform test positive after 48 hours of incubation? If the sample is clear yellow it is negative for coliforms, and the answer is NO. If the sample is positive for coliforms it is blue-green, and the answer is YES.
15. Transport the samples to a dark room, maintaining their numerical order.
16. Shine a UV light with a wavelength of approximately 365nm from the bottom of the sample.
17. UPLOAD a picture of the sample with the UV light shining through it.
18. Answer the question: Is the *E. coli* test positive after 24 hours of incubation. If there is bright blue fluorescence the test is positive, and the answer is YES. If there is no bright blue fluorescence the test is negative, and the answer is NO.
19. Press Save in the upper right corner of your screen.
20. Press the Sync button in the upper right hand corner of the screen.

**Appendix C: Calibration Records**

Calibration records will be kept on calibration data sheets specific to each piece of equipment. Calibration records will include date, time, name of individual doing calibration, and the calibration results themselves.

|  |  |  |  |
| --- | --- | --- | --- |
| **Refractometer Identifier** | **Date of Calibration** | **Time of Calibration** | **Individual doing Calibration** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Method of Calibration per Manufacturer’s Instructions

1. Open cover plate and place 2-3 drops of distilled water on the prism. Close the cover plate so that the water spreads across the entire surface of the prism without air bubble or dry spot. Allow the sample to rest on the prism for approximately 30 seconds before the next step.
2. Hold cover plate in the direction of a light source and look into the eyepiece. You will see a circular field with graduations down the center (you may have to focus the eyepiece to see the graduations clearly.) The upper portion of the field should be blue, while the lower portion should be white.
3. Use distilled water as a sample, look into the eyepiece and turn the calibration screw until the boundary between the upper blue field and lower white field meet exactly on the zero scale. That is the end of the calibration.
1. Clesceri, Leonore S. *Standard methods: for the examination of water and wastewater*. 20th ed., American Public Health Ass., 1998. 9-47. https://www.idexx.com/resource-library/water/water-reg-article5J.pdf [↑](#footnote-ref-1)
2. “Latitude/Longitude Finder - MY NASA DATA.” *NASA*, NASA, mynasadata.larc.nasa.gov/latitudelongitude-finder/.

[*https://mynasadata.larc.nasa.gov/latitudelongitude-finder/*](https://mynasadata.larc.nasa.gov/latitudelongitude-finder/) [↑](#footnote-ref-2)