Quality Assurance Project Plan
for
Nonpoint Source Pollution Program Water Quality Monitoring

Prepared by:

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Region 6
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Document Review and Revision Record

NOTE: Actions older than 5 years may be removed from this record.

Date	Revision No.	Record of Activity
3/10/2014	0	Initial document approved.
3/9/2015	1	Supervisor and Coordinator of Contractors and Watershed Coordinators for NPS is now Crisalda Adams. Updated the NPS Habitat Assessment. Updated SOPs referenced in this document.
2/14/2016	2	Randy Creighton is now Environmental Scientist Senior. Melissa Benfer is now the Project Officer for EPA. Updated the NPS Habitat Assessment Form and renamed NPS Site Characterization Form. SOPs have been removed from the appendices and will be sent directly to EPA every year and as they are updated.
12/1/2016	3	Sandy Bateman is now Sandy Coon. Crisalda Adams is now the NPS Manager. All references to NPS supervisor have been incorporated into the NPS Manager Sections.
2/5/18	4	John Sheehan replaced Karen Vidrine as Environmental Scientist Senior. Office is now Office of Environmental Assessment. Division is now Water Planning and Assessment Division. Inspection Division is now Surveillance Division. Updated address. Reformatted Project Organization Chart (page 9). QTRAK # 18-220 2/5/18 – 2/5/2020
2/5/2020	5	TeAndra Taylor is now EPA Project Officer, Barbara Schrodt is now EPA Acting Section Chief State/Tribal Programs, Shanna Mason, QA Representative, replaced Gregory Waldron, QA Officer. Document rewritten for clarity. Q-TRAK# 20-093
10/5/2020	6	QC sample collection process formalized in document added to Table 3; referenced in QAPP. Nelly Smith is now Section Chief State/Tribal Programs.

SECTION A - PROJECT MANAGEMENT

A1 Title and Approval Sheet

QAPP for Nonpoint Source Pollution Program Water Quality Monitoring

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LDEQ, Water Planning and Assessment Division
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Date: 7/24/2020

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Signature: TeAndra Taylor
Date: 10/5/2020

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Signature: Nelly Smith
Date: 10/5/2020

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A3 Distribution List

The official version of this document will be posted on LDEQ's Intranet. The following LDEQ personnel will be notified via email that the latest version is posted:

Louisiana Department of Environmental Quality (LDEQ)

Office of Environmental Assessment

- Water Planning and Assessment Division/NPS Pollution Control
  Crisalda Adams, Environmental Scientist Manager
  John Sheehan, Environmental Scientist Senior
  Shanna Mason, Environmental Scientist, QA Representative
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  Lisa Miller, Contracts/Grants Reviewer

- Assessment Division/Water Surveys Section
  David Greenwood, Environmental Scientist Manager
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Office of Environmental Compliance (OEC)

- Surveillance Division
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  Randy Creighton, Environmental Scientist Senior

Project-specific sampling plans will identify any additional personnel to receive this document. The following personnel do not have access to LDEQ intranet and will receive the latest version via email.

US EPA, Region 6

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List of Acronyms

CAS	Chemical Abstract Service (registry number)
CFR	Code of Federal Regulations
COC	Chain of Custody
EDD	Electronic Data Deliverable
EDMS	Electronic Document Management System
GRTS	Grants Reporting and Tracking System
LAC	Louisiana Administrative Code
LCS	Lab Control Sample
LCSD	Lab Control Sample Duplicate
LDEQ	Louisiana Department of Environmental Quality
LEADMS	Louisiana Environmental Analytical Database Management System
LELAP	Louisiana Environmental Laboratory Accreditation Program
MB	Method Blank
MDL	Method Detection Limit
mg/L	Milligrams per Liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ND	Non-detect
NPS	Nonpoint Source
PDF	Portable Document Format
PM	Project Manager
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QAR	Quality Assurance Representative
QC	Quality Control
QMP	Quality Management Plan
RL	Reporting Limit
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SP	Sampling Plan
USEPA	United States Environmental Protection Agency
WQX	Water Quality eXchange
WS	Water Surveys

Introduction

This document serves as a "programmatic" or "umbrella" Quality Assurance Project Plan (QAPP) for water quality sampling to be conducted on behalf of LDEQ's Nonpoint Source Pollution (NPS) Program. These activities will be conducted in support of Clean Water Act Section 319 activities under the LDEQ NPS Management Plan. This QAPP is intended to provide QA information applicable to all NPS Program sampling projects, and to provide an overarching framework for project-specific documents. Project-specific information, such as data quality objectives, water quality and geographic background, sampling locations and frequency, laboratories, parameters, etc. augmenting this QAPP will be provided in separate sampling plan (SP) documents, submitted to EPA for approval prior to sampling.

A4 Project / Task Organization

This activity falls under the Nonpoint Source Pollution Program, which is under the Water Planning and Assessment Division. Key project roles are identified in Table 1 below. The project organizational chart is shown in Figure 1 and includes relationships and lines of communication among all participants. All projects may not include all roles. Project-specific SPs will identify roles relevant to that project, individuals performing those roles, and will reference this QAPP. All participating personnel will receive the relevant quality assurance documents (including SOPs, SPs, and this QAPP). Note the QA Representative (QAR) works in the Aquifer Protection unit, and thus maintains independence from the Nonpoint Unit under this QAPP. Project-specific sampling plans will identify any additional personnel and roles.

Table 1. Key Roles and Responsibilities

Title	Organizational Affiliation	Role	Responsibilities
319 Program Manager	LDEQ	NPS Manager	Supervision of LDEQ Project Manager, ensuring staff training, maintains official QAPP document
Environmental Scientist	LDEQ	NPS Project Manager	Overall project management, coordination of meetings and personnel, SP development and revisions, maintenance of approved SP, review of data and deliverables, assurance of data upload into LEADMS and EDMS, data analysis and summaries, reporting in GRTS, resolving sampling issues
Watershed Support Staff (if applicable)	Identify in SP	Principal Investigator	To be identified in SP if applicable
Environmental Scientist	LDEQ	QAPP Preparer	QAPP preparation, updating QAPP as required
Geologist	LDEQ	Project QA Representative (QAR)	Reviewing QAPP, planning and implementation of QA activities, resolution of data issues
Environmental Scientist Senior	LDEQ	LDEQ QA Manager (QAM)	Initial review of contract lab data for QA
Water Surveys Manager	LDEQ	Water Surveys Manager	Field activities including assigning personnel, sample collection, equipment calibration, sample delivery, storage and management of survey data in LEADMS and EDMS, coordination with PM
Section Chief State/Tribal Programs	USEPA	Section Chief State/Tribal Programs	Reviewing QAPP
Project Officer State/Tribal Programs	USEPA	Project Officer State/Tribal Programs	Reviewing and approving QAPP, SPs, semi-annual and final deliverables
Laboratory Manager	Identify Lab in SP	Laboratory Manager	Analysis of water quality samples, reporting results
Laboratory QA/QC Manager	Identify Lab in SP	Laboratory QA/QC Manager	Planning, implementation, and tracking QA activities within the lab, ensuring compliance with QAPP and SPs

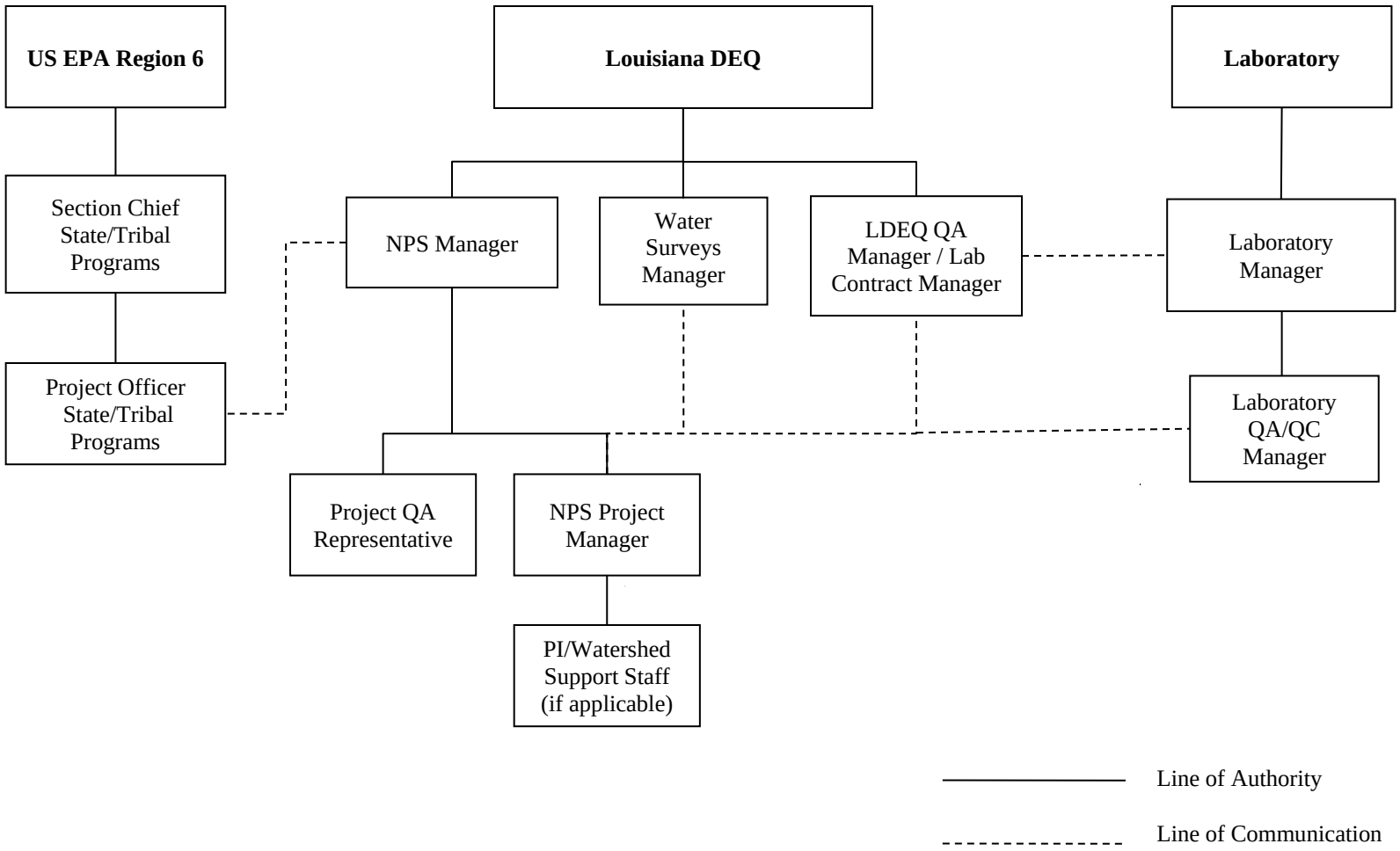

Figure 1. Project Roles: Lines of Authority and Communication

A5 Problem Definition / Background

LDEQ is entrusted through the Clean Water Act to monitor the quality of the surface waters of Louisiana and institute water quality based controls where technology based controls are not sufficient to preserve the designated uses of a waterbody. At the present time, the Office of Environmental Assessment is tasked with monitoring all state water bodies for NPS pollution issues (See the Water Quality Integrated Report at https://deq.louisiana.gov/page/water-quality-integrated-report-305b303d). Each waterbody that is identified as impaired in the assessment represents a watershed or portion of a watershed system, by subsegment, as defined in the Surface Water Quality Standards of the Louisiana Revised Statutes, Chapter 33, located online at: https://deq.louisiana.gov/assets/docs/Legal_Affairs/ERC/33v09WQ.docx. The Nonpoint Source Pollution unit focuses restoration efforts to address NPS runoff in those subsegments identified as suspected as being impaired by nonpoint sources in the IR. This water quality monitoring activity supports those activities.

This sampling will monitor water quality parameters throughout specified impaired subsegments to support activities described in the LDEQ NPS Management Plan, which is located online at: https://www.deq.louisiana.gov/page/nonpoint-source. Results will be used to identify areas with high pollutant concentrations at locations within the subsegment, and track water quality changes over time as NPS pollution reduction efforts are implemented. Data will be compared to water quality criteria defined in the statutes referenced above. In addition, data will also be compared to previous data collected in the watershed, and with concurrent results from other sites in the subsegment.

Each project SP will define sampling frequency and other sampling design parameters for that subsegment(s). Selected monitoring site locations and pollution reduction efforts are specific to the geography of the subsegment, the designated use impairment, and suspected sources and causes. These will be identified and described in the project-specific SPs.

A6 Project Task / Description

LDEQ will perform baseline and long-term sampling of the identified watershed(s). This sampling includes in situ readings of field parameters and collection of water samples for sediment, nutrient, and/or bacteria analysis. After baseline sampling is completed, locations will be selected for long-term monitoring. LDEQ will then monitor at those locations for the duration of the project unless otherwise indicated in the SP. Specific field and water chemistry parameters, locations, and frequency for each sampling project will be listed in each project's SP.

The purpose of baseline monitoring is to characterize conditions in the watershed and to identify areas of high pollution concentrations. The purpose of long-term monitoring is to track water quality changes during and after pollution abatement activities. Timeline for data collection: baseline monitoring will begin prior to any BMP implementation; if time and budget constraints allow, one year prior. Baseline ends as implementation begins. Long-term monitoring will begin with BMP implementation and will continue for one year beyond implementation's end. Timelines are further detailed in each SP.

A frequency of twice monthly sampling is preferred for characterizing baseline conditions and identifying areas of high pollution runoff, along with a monthly flow measurement at one site in the subsegment to be used for calculating loads. Once-per-month sampling is acceptable for monitoring water quality changes over time after implementation begins, unless special conditions exist that justify more frequent sampling.

Field staff will collect data in accordance with approved SOPs (see Table 3). LDEQ staff will scan and upload hard copy documents to LDEQ EDMS and will upload field results to LEADMS. Lab results will be reported to the QAM, who will examine the data for proper formatting, perform a cursory QC check and upload into LEADMS. The project manager will examine both lab and field data for completeness and accuracy, and upload the data into USEPA's WQX database.

All field and analytical data collected for the project by non-agency personnel will be submitted to the project manager in an electronic data deliverable format. Information regarding the Electronic Data Deliverable format and submittals can be found at: https://www.deq.louisiana.gov/page/leadms-resource-page.

The project manager will:

- Examine the data for completeness,
- Examine data for proper EDD formatting,
- Examine the data for accuracy and quality,
- Determine data usability,
- Assure data upload into LEADMS,
- Upload data into USEPA's WQX database.

Data will be examined in comparison to water quality criteria, to previous concentrations measured, and to other monitoring data within the subsegment. In addition, data will be shared with stakeholders and may be used for watershed assessment of use support.

The LDEQ project manager will report on sampling activity to EPA semi-annually through EPA's GRTS database. Activities will be summarized annually in the LDEQ NPS Annual Report, submitted to EPA. After each sampling project concludes, LDEQ will submit a final report to EPA, and a success story if applicable. This QAPP and its associated SPs will cover the following tasks (see Table 2):

Table 2. Summary of Tasks

Summary of Tasks
Sampling: Water quality samples will be collected. Parameters, frequency, timeline, geographic area, and detailed quality objectives are specified in each project-specific sampling plan.
Analysis: Laboratory analysis follows standard methods or EPA-approved methods for parameters specified in each project-specific sampling plan. The SP will also identify the laboratory performing the analysis. All laboratories will follow approved analytical methods, the LDEQ QMP, and this QAPP.
QC Tasks: Field staff will comply with SOPs and specified guidance documents, labs will comply with reporting requirements, the PM, QAM, and QAR will review data, and PM will determine usability.
Other data: Site characterization forms will be completed and site photos taken during initial reconnaissance. Site characterization forms will be updated quarterly or as specified in each SP.
Data management: All field and analytical results and associated data will be assessed against the quality control requirements and DQOs and entered into both the Louisiana Environmental Analytical Data Management System (LEADMS) and the EPA WQX system. Field and hardcopy documents will be scanned and uploaded into LDEQ's electronic document management system (EDMS).
Assessments: Periodic procedural assessments will be conducted in the field (QA visits), and lab and field documentation will be assessed.
Data Review: Validation of lab data will occur according to tasks and measures outlined in Section D and Appendix A.
Reporting: LDEQ will submit semi-annual updates via GRTS, annual summaries in the NPS Annual Report, and a final report after each sampling project concludes.

A7 Quality Objectives and Criteria for Measurement Data

Objective

The objective of targeted watershed monitoring is to determine where within a subsegment NPS pollutants occur and in what concentrations, and to measure water quality changes that occur during and following implementation of pollution reduction measures, although expanding data usefulness to other agency functions such as water quality assessment is beneficial. Section D outlines criteria used to evaluate the quality of data collected.

The goals of monitoring include:

- Characterize current water quality conditions for each site within a subsegment for the parameters of interest as specified in the SP;
- Identify the sites with the highest concentrations of those pollutants, and compare to water quality standards and to concentrations at other sites within the watershed;
- Characterize pollutant loading at the ambient monitoring location or at least one representative site in the watershed;
- Determine if there is a geographical or temporal component to the impairment; and
- Quantify water quality changes in the waterbody during and after pollution reduction efforts.

To achieve these goals, LDEQ will delineate a sampling design for each subsegment, the sampling plan, describing the site selection process for that subsegment, spatial boundary, site

locations, parameters of concern, water quality criteria, and sampling frequency. If at any point during the monitoring, the subsegment meets the applicable water quality standards (LDEQ, 2019) and the subsegment is assessed as no longer impaired, the watershed is considered restored, and sampling will cease one year after the last implementation efforts end to account for water quality response lag. These action limits can be found in the Louisiana Administrative Code 33:IX Chapter 11 (LAC 33, 2018), and will be described in each SP.

Data Quality Indicators

Standard processes and numeric metrics will be used to ensure and quantify data quality. Data quality indicators are discussed below.

Sensitivity: LDEQ will require a parameter-specific reporting limit that exceeds the method detection limit and is less than the water quality standard for that parameter.

Completeness: 100% based on the sampling design in the SP is the target completeness level. Any field conditions preventing sample collection will be indicated on the field data form for that site. Resampling will not be done.

Representativeness: Instrument calibration pre- and post-sampling, and adherence to SOPs (collection, preservation, chain-of-custody, holding times) and SPs (sampling location) will assure samples represent environmental conditions. Sampling site locations will be selected to represent runoff process in the subsegment accounting for geographic variability. The selection process will be explained in detail in each SP.

Precision: Lab control and matrix samples/duplicates will be analyzed to determine precision using recoveries and relative percent difference (RPD) (see Appendix A). Field duplicates may be run and results compared using RPD.

Accuracy: Calibration (pre- and post-sampling), lab and field blanks, and preservation and holding time adherence help ensure accuracy. Matrix spikes, lab control samples, and method blanks will measure accuracy.

Comparability: Adherence to standard/EPA methods, SOPs, and SPs will assure comparability.

Sampling

Standard processes for sample collection ensure data quality. Sampling is conducted either by LDEQ Water Surveys (WS) staff or by watershed support groups. All water quality samples will be collected according to approved LDEQ SOPs and specified guidance documents listed in Table 3, as applicable. These documents identify method, containers, preservation, holding time, QC samples, etc. for measuring in situ and for sample collection and transport. SOPs are reviewed annually as per LDEQ's Quality Management Plan. SOPs are available on LDEQ's intranet. The project manager will provide SOPs to non-agency personnel.

Table 3. Field Measurement and Sample Collection Documents

SOP Document	Standard Operating Procedure for:
SOP_1134_r09	Water Sample Collection, Preservation, Documentation and Shipping; Sonde Deployment and Continuous Monitoring
SOP_1277_r02	*in situ* Water Monitoring Using Electronic Instruments
SOP_1595_r03	Stream Cross Sections using Stream Discharge Equipment
SOP_1597_r02	Stream Discharge Measurements
SOP_1599_r03	Stream Gage Height Measurement with Portable Measuring Devices
SOP_1958_r00c	Instructions for the Use of a Spherical Densiometer
SOP_1982_r02	Secchi Depth Measurement
QC Sampling Document	"Water Surveys QC Sample Collection for Non-Point Projects", stored on NPS file share
LDEQ intranet location for SOPs: https://intranet.deq.louisiana.gov/intranetdeq/TOOLSRESOURCES/SOPS.aspx	

Laboratory analysis

LDEQ contract laboratories are required to be certified by the Louisiana Environmental Laboratory Accreditation Program (LELAP) and use approved methods with appropriate reporting limits for sample analysis (see Table 4). Laboratories used for this project may be contracted LELAP-accredited commercial labs as defined in the Louisiana Administrative Code 33:I4503 (2018) or "in-house" (intra-agency) labs. Intra-agency labs should be in compliance with §5301H (LAC 33, 2018), but are encouraged to comply with all sections of LAC 33:I Subpart 3 (2018). The LAC is accessible at: https://www.doa.la.gov/Pages/osr/lac/LAC-33.aspx.

Table 4. Typical Analytical Methods for Common Water Quality Parameters

CAS Number	Analytical Parameter	Valid Methods*	Reporting Limit
FECCOLIFORM	fecal coliform bacteria	SM 9222D 2006	Varies, "Too Numerous to Count" not acceptable
NH3N	ammonia nitrogen	EPA 350.1 Rev 2, SM4500-NH3 B&D	0.1 mg/L
TKN	total Kjeldahl nitrogen	EPA 351.2 Rev 2, SM4500-NH3-C	0.5 mg/L
NO3NO2N	nitrate-nitrite nitrogen as N	EPA 353.2 Rev 2, SM4500-NO3-F	0.1mg/L
PDORTHO	orthophosphate PO43-	EPA 365.1 Rev 2, SM4500 P-E	0.05 -0.25 mg/L
7723-14-0	total phosphorus	EPA 365.4, EPA 365.3, SM4500 P-E	0.05 mg/L
TDS	residue-filterable total dissolved solids	SM2540 C-2011	10 mg/L
TSS	residue-non-filterable total suspended solids	SM2540 D-2011, EPA 160.2	4 mg/L
TURB	turbidity	EPA 180.1 Rev 2, SM2130 B	1 NTU

* 40 CFR §136.3 lists additional valid methods for analysis, as does EPA. LDEQ and each laboratory will agree on approved methods and reporting limits prior to analysis, and these are specified in the laboratory contract.

Method and equipment determine minimum detection limit.

Labs will analyze water samples for nutrients, sediment, bacteria, or other parameters as indicated in each SP (data template is shown in Appendix B). All labs will follow methods listed in the most current Code of Federal Regulations (40 C.F.R. Section 136, 2018), and EPA-approved methods (USEPA, 2019) for analysis. Labs will comply with method-specific procedures and quality control, storage/holding time requirements, and documentation policies as determined by contract or agreement. Laboratories will qualify data to provide QC information, including accuracy and precision data. If minimum lab QC requirements are not met, the lab will provide a statement describing the issue. Values that are flagged will be evaluated on a case-by-case basis for usability.

Measurement Performance Criteria

All quality assurance protocols specified in the SOPs will be followed in the collection of the samples and in collecting field measurements. Laboratory QA manuals, SOPs, and standard methods outline laboratory quality control including spike and duplicate analyses, calibration with standards, analysis of external standards and data acceptance criteria for each analysis. The analysis of equipment blanks should be less than the quantitation limit or reporting limit, or "non-detect." Numeric acceptance criteria are explicitly set in the analytical method requirements with acceptance ranges set by the lab or in SOPs.

Laboratories will maintain control charts for representative quality control sample analyses to monitor system performance. This provides verification that the system is in statistical control, and indicates when performance problems occur, so that problems can be documented and corrected as soon as possible. When reporting results, the laboratory is required to provide the results of associated QC samples. Each lab will provide data qualifiers with the data and in PDF reports to indicate laboratory quality control information. On reviewing the data, the project manager or QAM may assign QC qualifiers. LDEQ will use that information to evaluate the performance of the analytical process and to help the PM and data users determine usability.

Secondary Data

Secondary data will be examined to help characterize the watershed and assist with sample site selection. This data includes geospatial and non-spatial data, as shown in Table 5.

Table 5. Secondary Data Sources

Description	Source	Format
Road-waterbody intersections	LDEQ derived from LDOTD or TomTom Roads and USGS National Hydrography Dataset (NHD)	Geospatial
Elevation data	USGS LiDAR DEM, LOSCO 2007, or more recent	Geospatial
Land use data	USDA Cropland Data Layer historical or most current	Geospatial
Soils data	USDA NRCS STATSGO data	Geospatial
Aerial/satellite	As available	Geospatial
Historical monitoring data	LDEQ primary data	Geospatial
Watershed background	Narrative statements, documents, photos from watershed partners or stakeholders	Narrative, documents, imagery

A8 Special Training / Certification

LDEQ staff training is discussed in the LDEQ Quality Management Plan and in position descriptions. All personnel operating water quality monitoring equipment, collecting, or recording data will be trained by LDEQ staff. Training includes proper sample collection techniques, handling, preservation, delivery, and holding times of samples; and operation, maintenance, and calibration of electronic in situ instruments according to SOPs 1277 and 1134. Training documentation is kept by LDEQ WS supervisors, the LDEQ NPS manager, and project managers.

A9 Documents, Records, and Data Management

Usefulness of data gathered for this project depends on adequate documentation of all activities, including sample collection, analysis, data management, and quality control information. All data management and documentation will be performed in accordance with written SOPs, this QAPP, and the project-specific SP. Key elements of project documentation and record keeping are:

QAPP and SOPs
The USEPA-approved version of this QAPP document and any associated SPs and SOPs will be made available to all personnel via electronic format. The current QAPP and SPs are available electronically by LDEQ with older versions kept in an electronic archive folder. The official QAPP and SOPs are stored on the LDEQ intranet site. The NPS manager will distribute the approved QAPP via email to everyone on the distribution list (Page 3). The project manager is responsible for assuring all project personnel receive and comply with current QAPP, SPs, and SOPs.

Field Data Sheets/Site Characterization Forms
Sampling personnel complete site characterization forms initially and as needed, and field data sheets at the time of each sample collection. Field data sheets capture in situ field measurements, date and time of sample collection, names of the persons conducting the activity, sample number, equipment/method used, climatic conditions, unusual observations, and any changes in planned activities, such as site inaccessibility. Project managers are responsible for assuring these records are uploaded into LDEQ's EDMS. Field data and site characterization forms are stored electronically by LDEQ in the WS-surveys shared drive. See Appendix C.

Calibration Record
Calibration records are completed with each sampling event and document calibration of equipment pre- and post-sampling, according to the manufacturer's recommendations and instructions. Project managers are responsible for assuring these records are uploaded into LDEQ's EDMS. See Appendix D.

Chain-of-Custody Form
Chain-of-custody (COC) forms will be used to document all transfers of custody of samples from the sampling site to the laboratory. These forms contain information on sample preservation, holding times and handling (ice). Project managers are responsible for assuring these records are uploaded into LDEQ's EDMS. See Appendix E.

Semi-Annual and Final Reports
Project manager or watershed support group staff prepare semi-annual and final reports summarizing project activities. Final reports are submitted to EPA for approval. LDEQ will submit a success story to EPA for approval if water quality data from the project indicate any use support has been fully or partially restored. The project manager will enter all report documents into EDMS and summarize in GRTS.

Data Handling Records
All field and lab data are submitted in EDD format along with scanned hardcopy records (field data sheets, calibration records, chains-of-custody forms, and narrative lab reports) in PDF format. PDF records contain information on data results, quality control, methods, and validation. Field data recorded on field data sheets will be checked for initial QC review, and uploaded to LEADMS and WQX. All data, including derivatives such as graphs and maps, will be backed up electronically. All hard copy records produced from this project will be stored by LDEQ for five years after a project ends. Electronic data will be stored indefinitely.

Laboratory Quality Control Sample Records
Lab records will document the generation of quality control samples, such as blanks and duplicate samples, including lab statements on qualified QC samples and data. LDEQ will store lab QC information as it accompanies the data package in EDMS. Each laboratory will maintain its records on instrument maintenance and calibration.

SECTION B – DATA GENERATION AND ACQUISITION

B1 Sampling Process Design

The sampling process is designed for the collection of chemical and physical data that characterizes water quality conditions in the watershed. These data will be used to target conservation practices, education/outreach, or other NPS pollution reduction activities, and to evaluate the water quality changes over time. The sampling design includes baseline and long-term sampling.

Baseline sampling will be conducted initially to determine where the highest concentrations of pollutants (nutrients, bacteria, and sediment) occur. Sites from LDEQ's Ambient Water Quality Monitoring Network that are located in the watershed being sampled should be selected as sampling sites if at all possible. Monitoring will help determine high priority areas for targeting pollution reduction efforts, including but not limited to BMP implementation. Baseline sampling will be conducted for as long as necessary to characterize water quality conditions, generally for a year to account for seasonality in runoff. Bi-monthly sampling, when possible, will provide more opportunity for a wide range of flow conditions (critical flow to bank full) for evaluation of water quality, including post-rainfall runoff events.

Long-term sampling will begin concurrent with initiation of reduction efforts. In this phase, LDEQ may continue sampling all sites, or may select a subset of the sampling locations to monitor for the duration of the project. Any change in sampling locations and justification will be documented

in the SP. In cases of BMP implementation, long-term sampling ideally continues for one year beyond the end of implementation in order to account for a lag in water quality response.

To identify sampling locations, LDEQ WS, NPS staff, agency partners, and/or watershed support groups will conduct one or more reconnaissance surveys to identify safe, accessible sites throughout the subsegment for sample collection and field observations. Sites ideally will be representative of water quality conditions in the watershed, capturing different land use and soil combinations, with consideration for potential NPS sources. Additional data may be used to characterize the watershed and assist in site selection, such as land use, existing water quality data, flow, soils, elevation, and partner input (Table 5, page 16). In most cases, sampling locations will be bridge access points for monitoring at the stream center, although any safe access point will be considered. In lakes, sites will generally be at tributary outfalls. Sites are listed and mapped in the SP, and any changes to those sites due to accessibility or other reason will be documented in a SP revision prior to the change. The SP will list parameters to be sampled with rationale, contextual information, and decision limits.

B2 Sampling Methods

NPS Site Characterization
Site characterizations will be conducted by the sampling team initially at each site, and repeated as needed. See Appendix C for site characterization form.

Baseline and Long-term Monitoring
Both in situ and grab samples will be collected at each monitoring location at a frequency specified in the SP. SOPs describe in detail sampling procedures (see Table 3, page 15). These procedures apply to both baseline and long-term monitoring. Water sample handling requirements are outlined in SOP 1134. Flow measurements, which are generally taken monthly at the ambient location, may be done with electronic flow measurement equipment or manually estimated using USGS methods (see SOP 1597).

Specialized equipment may be required to collect samples from appropriate depths and locations. If the necessary equipment is not available, discretion and professional judgment is relied upon in collection of representative samples. Any deviations from these sampling procedures are communicated verbally to the project manager and documented on the field data form.

B3 Sample Handling and Custody

All samples must be traceable from time of collection until results are verified and reported. Adherence to this procedure will help prevent inconsistencies in labeling, transport, delivery, and reporting. Sample handling specifics are described in the SOP, and also are summarized below:

Sample IDs
Prior to collection, all water samples must be assigned a unique sample ID number i.e. 123-131008-01-0, where 123 denotes the sample collector's ID, 131008 is the date of collection in YYMMDD format, 01 is the sampling location as an ordinal number, and -0 indicates the sample

taken at that location. SOP 1134 provides more detail on sample IDs. Format may vary with approval of the project manager and QAR.

Sample Labels
Each sample container will be labeled with the sample ID number, date and time of collection, site number, parameter requested, and preservative (if required). Samples may be labeled with actual waterproof labels or written directly on the sample containers with permanent marker. An example label is shown below:

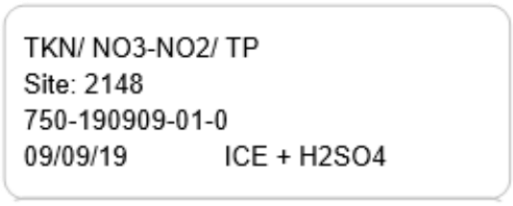

Figure 2. Container Label Example

Chain of Custody
All sample shipments will be accompanied by the COC record. The original record will accompany the shipment, to be returned to the LDEQ with analytical results data package. The original COC is maintained by the contract laboratory. See Appendix E.

Handling and Delivery
Sample handling will comply with all method-specific requirements such as ice, preservatives, and holding times. All samples will be transported in appropriate containers. When samples are required to be stored at 6°C or less, ice will be packed with the samples. The ice will be of sufficient volume and will be distributed in the coolers so that the proper storage temperature will be maintained throughout until the samples reach the laboratory. Laboratory check-in staff will place the samples in appropriate storage after sample log-in.

B4 Analytical Methods

Analytical methods are discussed in Section A7 and listed in Table 4.

B5 Quality Control

Field Sample Collection and in situ Measurements
Quality control procedures for sample collection and in situ measurements are described in the documents in Table 3. Personnel are trained to collect representative samples according to SOPs. The SOPs dictate how equipment is used and calibrated (including acceptance criteria), how samples are collected, preserved, handled, transported and how information will be documented.

Lab Analysis
The contracted or intra-agency laboratory used for analysis of water quality data will follow its internal QA manual and SOPs for laboratory quality control including blank, spike and duplicate analyses, method blanks, calibration with standards, analysis of external standards, data acceptance criteria for each analysis, and documentation and data transfer. Approved analytical methods will

be followed. Laboratory personnel are trained to implement procedures according to their internal QA manuals and SOPs, which describe how laboratory quality controls are implemented. The lab will qualify data that does not meet QC criteria and include qualifiers and related statements in the data deliverable.

Data Review

QC measures implemented during data management include: completeness review (field data forms or lab reports should indicate reasons for any unsampled sites or parameters); range checking for conventional parameters (within expected average range); checking for manual data entry errors; checking holding times; and researching questionable data with the laboratory. Review procedures are adapted from SOP 1976 (LDEQ, 2017) and are found in Appendix A. The agency QAM, NPS project manager, and QAR may qualify data as needed. Qualifiers are listed in Appendix F. Additional qualifiers may be used as needed, in accordance with LDEQ LEADMS database reference values. A more detailed description of data review is found in Section D.

B6 Instrument / Equipment Testing, Inspection, and Maintenance

Field personnel will consult with the manufacturer operation manuals for all field equipment for inspection, testing, and maintenance as per SOP 1277. Lab personnel will consult with the manufacturer operation manuals for all laboratory equipment for inspection, testing, and maintenance. All maintenance activities will be recorded in either field notebooks or laboratory notebooks, as appropriate.

All personnel using equipment will know the maintenance schedule and be trained on maintenance procedures. The maintenance program will follow the schedule recommended by the manufacturer; however, other maintenance will be performed as necessary. Whenever operation or preventative maintenance reveals equipment failure or imminent failure, repairs will be undertaken as prescribed by the manufacturer.

Whenever internal quality assurance procedures or performance audits indicate an equipment deficiency or failure, the project manager is notified, and corrective action is taken immediately. Laboratory QA failures are documented and corrective actions taken according to their QA manual and applicable SOPs.

Managers of the lab and field personnel are responsible for ensuring that the instrumentation operated by their respective personnel is repaired or replaced in a timely manner. LDEQ keeps spare parts in stock for rapid, in-house repair or replacement. If necessary, equipment may be sent to the manufacturer or other contractor for repair as needed.

B7 Instrument / Equipment Calibration and Frequency

Field personnel calibrate equipment prior to and after each sampling event as per SOP 1277. LDEQ trains both agency and non-agency personnel on proper calibration techniques, according to manufacturer recommendations. In situ data is collected between calibrations each day. Field staff record each calibration on calibration forms, and submit with the field data package. Project

managers will ensure they are uploaded into EDMS. The frequency of calibrations for laboratory instrumentation is defined in laboratory SOPs and by the manufacturer's recommendations.

B8 Inspection / Acceptance of Supplies and Consumables

All purchased and prepared chemicals will be marked with the lot, received/prepared date, expiration date, project and initials of receiving person. Certificates of analysis shall accompany commercially available standards, and will be placed in the chemical information file.

Field personnel will inspect sampling containers. Preservatives, standards, and buffers will not be used past the expiration date and will be discarded when expired or when contamination is suspected.

The laboratory shall follow its QA manual for standards, supplies, and consumables. LDEQ-contracted labs will meet LELAP requirements for standards, supplies, and consumables.

B9 Non-Direct Measurements

This project will generate new water quality data. It may also use historical data to assist selecting site locations and data analysis.

B10 Data Management

<u>in situ Measurements</u>
Field personnel record measurements and observations on field data forms at the time of sampling. Team leads perform a completeness review, and technical staff review for QC before documents and data are uploaded. Field data is uploaded to EDD in the proper format, and field data forms, COC forms, and calibration records are uploaded to EDMS.

<u>Laboratory Analysis</u>
Labels and COC forms with unique identifiers (sample ID) accompany samples from the field to the lab. Contract labs provide analytical data in the form of a narrative PDF report and Microsoft Excel formatted electronic data deliverables to LDEQ's QAM. Analytical results in EDD format can be associated via unique lab identifier and/or sample ID to COC forms and field data forms. The QAM reviews the data to ascertain it meets QC requirements, qualify, comment, or research issues where necessary, and uploads it to LEADMS.

In the case of intra-agency labs, the data package is sent to the NPS PM. The PM for that subsegment will review for completeness against the COC, which documents any issues with sample collection. The PM will check QC information according to Appendix A, qualify data and comment when necessary, before uploading. In case of QC issues, the PM decides on usability of the data. The PM will store the PDF reports on a backed-up file server, upload the EDD to LEADMS, and the field data forms/COCs to EDMS. LEADMS uploading includes an automated process that checks for missing values and checks data against reference tables for adherence to domain values.

Data Availability

Data from LEADMS will be formatted and submitted to USEPA's WQX data warehouse through the WQX Web tool. Two files, one containing laboratory results and the other containing field results will be submitted to WQX in batches twice annually. All data are available to the public and can be obtained by following Public Records Request procedures as stated in LDEQ Policy 0005-90.

Figure 3 graphically depicts this workflow from collection through storage.

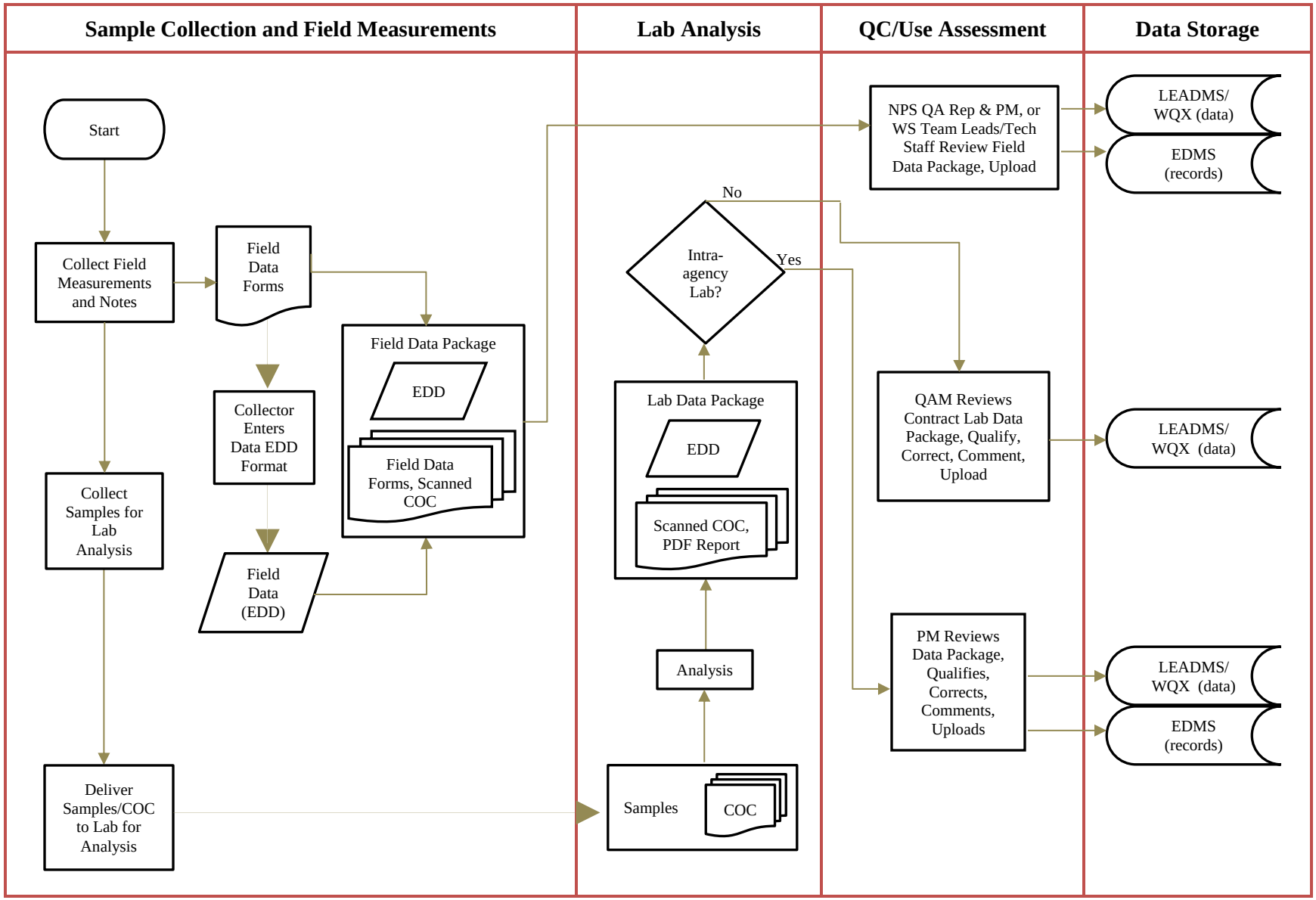

Figure 3. Data Processes Flowchart

SECTION C - ASSESSMENT AND OVERSIGHT

C1 Assessments and Response Actions

Oversight

The PM will provide oversight and direction for the project overall. Periodic meetings will be conducted as needed to discuss concerns, problems, solutions or corrective actions to be taken and milestone achievement. Sampling team leads and supervisors are responsible for ensuring sampling activities occur in compliance with the SOPs, SP, and QAPP. The LDEQ QAM provides oversight to contract labs for compliance with analysis and reporting requirements. Any of the oversight personnel may identify issues or initiate corrective action with the coordination of the NPS PM.

Assessment

Assessment provides for independent assurance that project activities are carried out as prescribed. This activity is planned, performed, or delegated by the project QAR, who reports to the PM. Formal corrective action procedures ensure that quality problems, when detected, are corrected in a timely and effective way (Figure 4). Any data compromised by quality issues is flagged as such, and the PM determines usefulness for the project.

The PM will assist with assessments (reviewing data) of the targeted watershed monitoring project. These assessments may include reviews of: procedures used in collection of water samples and field data; documentation associated with sample collection; the calibration and maintenance log books used for the various instruments used in collecting data; sample collection and data collection process; data management processes and records; and data quality.

Results of assessment reviews are typically handled through informal mechanisms such as internal meetings and other forms of communication. Formal reports may be developed if informal mechanisms do not resolve identified issues. The formal reports are sent to the PM, supervisor(s) and manager(s) involved in the project when issues are identified. Formal reports will be generated with written responses addressing the issues and any corrective actions taken.

When non-agency staff are collecting data, the QAR or designee will conduct periodic on-site field visits to ensure correct processes are followed. Generally, these visits occur quarterly during the first year a field team collects data, and after that, twice yearly or as needed. QA visits include checking containers, labels, and sample collection and handling. Deficiencies will be reported to the NPS PM, who will initiate corrective action.

Audits

The QAR or designee will audit data in LEADMS quarterly to verify compliance with sample numbering, that data is complete and qualified, and that records are properly stored in EDMS. The QAR will coordinate these activities with the PM, and report back to the PM and NPS Manager for any necessary corrective action.

Analytical processes undergo periodic audits by the lab manager or designated lab personnel according to the lab's internal QA manual and SOPs. Preset quality control limits, review of data packages, and approval of reports are designed to catch errors and problems prior to data being reported to LDEQ and uploaded into LEADMS. The laboratory is responsible for initiating any corrective actions deemed necessary by the lab manager.

LDEQ's QAM performs periodic audits on data packages submitted by contract labs. When corrective action affects previously reported data, the PM is notified in writing describing the problem and resolution. The QAM will initiate any corrective action required on the part of the lab. The QAM will also review the internal laboratory QA/QC procedures.

An overview of assessments and audits is seen in Table 6.

Table 6. Assessments and Audits

Assessment/ Audit Type	Frequency	Entity	Responsible Person(s)	Responding Person(s)	Corrective Action Initiator
Field Audit*	Initially, then quarterly first year, then bi-annually or greater	LDEQ	QA Rep or designee	NPS PM	NPS PM
Data Audit	Initially, then quarterly or greater	LDEQ	QAM, QA Rep or designee	NPS PM	NPS PM, QAM
Data Assessment	Quarterly or greater	LDEQ	NPS PM	Field team lead, lab manager	Field team lead, lab manager
QAPP and SP Documents	Annually or more frequently as needed	LDEQ	NPS Manager, NPS Senior Scientist, QAM, WS Manager	NPS PM	NPS Manager
QAPP Implementation	As needed	USEPA	EPA Project Officer	NPS Manager	NPS Manager
*LDEQ WS conducts its own internal field audits as necessary; non-LDEQ teams are subject to NPS field audits.					

The lab manager will report all failures and corrective actions to the QAM (for contract labs) or NPS Manager (for intra-agency labs). Any occurrence or analysis that fails to meet the laboratory QA/QC standards or project plan is considered an out-of-control event. In the laboratory, factors that affect data quality such as inadequate record keeping, or improper storage or preservation of samples, require investigation and corrective actions. In order to address the situation that lead to an out-of-control event, a formal corrective action method may be implemented and documented.

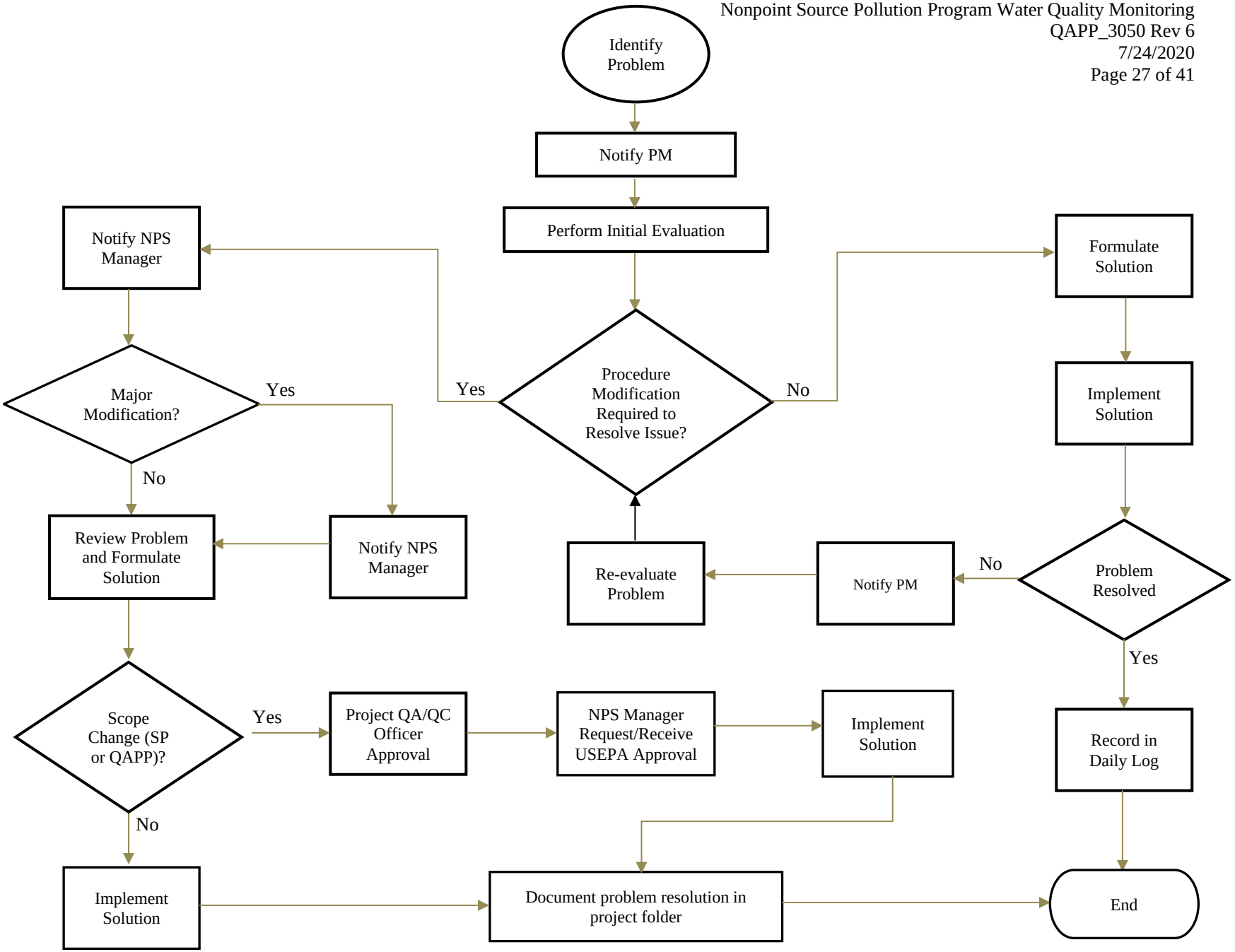

Figure 4. Corrective Action Procedure

C2 Reports to Management

LDEQ NPS unit holds quarterly meetings with agency partners working in the watershed to discuss the status of sampling activity and results. Additionally, the PM and senior scientist may attend stakeholder meetings periodically to provide updates on sampling activity and results.

The NPS PM will complete semi-annual reports documenting sampling activities and submit them to GRTS in April and October each year of the project, or as specified in 319 grant requirements. Sampling contractors will submit to LDEQ quarterly reports that include a summary of sampling progress, assessment of data quality objectives, and a description of any problems encountered and corrective actions taken. All sampling activities will be summarized for inclusion in LDEQ's NPS Annual Report.

Upon completion of the project, the PM will submit a draft final report to USEPA for review, comment and approval. The report will include raw data when requested, data analysis, and a description of activities completed for the project. The report also will include results, findings, and PM recommendations. The PM and other NPS staff will address any USEPA comments, incorporate agreed upon revisions, and two copies of the final report will be submitted digitally to USEPA.

SECTION D - DATA VALIDATION AND USABILITY

D1 Data Review, Verification, and Validation

Data review will allow for identification of problems or anomalies in sample collection, analysis, and reporting procedures. Data review includes checking field documentation, lab packages, and examining measurement and analytical results.

Data review will ascertain:

- Adherence to sampling design (specified in each SP),
- Compliance with SOPs for sample collection and handling, including sample IDs, instrument calibration, sample holding time, containers, labeling, and documentation;
- Correct QC samples were analyzed,
- Blank results show no contamination,
- Precision and accuracy (see Appendix A),
- Validity of any extreme or unusual high and low values,
- Data qualifiers reflect limitations found, and
- Data usability on a case-by-case basis.

The following procedural or QC deficiencies may result in data being qualified, and/or noted with explanations in reports to management.

- Incomplete sample collection,
- Holding time exceedance,
- Failure to use preservative,
- Failure to maintain sample temperature,
- Improper analytical method, and
- QC issues such as unacceptable recoveries or blank contamination.

D2 Verification and Validation Methods

The PM will be responsible for reviewing items in Appendix A for non-contract labs. The LDEQ QAM will review QC data for contract labs. All data is ultimately received by the PM, who will verify correct procedures were used and that data is valid according to expectations of this QAPP and the SP. Section C describes corrective action procedures. Data will be QC qualified as limitations are identified. Data qualifiers include but are not limited to those shown in Appendix F. A summary of data verification and validation processes is shown in Table 7.

Table 7. Verification and Validation Criteria and Processes

Criteria	Description of Process	Responsible Person(s)
Traceability	Use chain of custody forms, sample IDs, lab IDs, and results to trace data from collection through reporting.	LDEQ QAM, NPS QAR, PM
Measurement/Analysis	Use field and lab reports to ascertain adherence to SOPs, analytical methods.	LDEQ QAM, NPS QAR, PM
Handling	Compare sample time and analysis time to ensure no holding times were violated.	LDEQ QAM, NPS QAR or designee
Reporting	Ensure all documentation is complete.	PM
Chain of Custody	Check each submission for completeness, against lab reports, against field data (EDD).	LDEQ QAM (contract labs), NPS QAR (intra-agency labs), PM (field data)
EDD and Field Data Form Match	Check each submission against field data form for correct reporting/errors in transcription.	PM
Analytical Data Package	Check all data packages for completeness: all sites sampled, all analytes reported	PM
QC Report	Check for completeness upon receipt: all QC samples run as expected, qualify data as needed (Appendix A).	LDEQ QAM (contract labs), NPS QAR or PM (intra-agency labs)

D3 Reconciliation with User Requirements

The PM determines suitability of all data for purposes of each sampling project under this QAPP. Completeness target of this sampling project is: 100 percent of planned data is available for use. Because deficiencies will occur such as inaccessibility of sites, lost samples, or invalid data, completeness of less than 100 percent will not invalidate assessments based on results. The PM should consider qualifiers related to holding time violations, improper preservation or temperature, and QC analysis when exercising discretion on using this data to identify areas with high pollutant concentrations within the subsegment, for watershed planning, or to track water quality changes over time using statistical methods. Results from analyses occurring outside holding time limitations should not be used to compare to water quality criteria defined in the statutes. Rejected data will not be used.

REFERENCES

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APPENDICES

Appendix A: Water Quality Data Evaluation

The following review will be used for evaluating water quality data, as adapted from LDEQ SOP 1976 Rev 7.

Data Package Completeness and Accuracy Review

Reporting Consistency: The narrative report, EDD, COC, and other pertinent documents in the laboratory package are reviewed for consistency.

CAS Numbers: The CAS numbers in the EDD are compared to the list found in the LEADMS CAS number reference table.

Qualifiers: The laboratory narrative report and EDD are checked for all necessary laboratory qualifiers.

Reporting Limits: The laboratory narrative and EDD are checked for accuracy and consistency in reporting limits. If a sample was run at a dilution, the reporting limit must be multiplied by that dilution factor. Some parameters may have reporting limits adjusted for the volume used and not change the dilution factor.

Note that reporting limits for ammonia may vary due to initial sample volumes, final sample volumes, or dilutions made. Reporting limits for turbidity may vary for sample results above 40 NTU. Reporting limits for fecal coliform and total coliform samples are determined by the volume used for analysis.

Dilution Factor: When a sample is run at a dilution, the reporting limit is checked to see that it was changed to reflect the appropriate dilution factor.

Note that for fecal coliform and total coliform samples, some laboratories report the dilution factor to match the reporting limit, which is based on volume. Other laboratories report the dilution factor as one (1) because they do not consider the volume change to be a true dilution.

Collection, Preparation, and Analysis Dates and Times: The collection and analysis dates and times in the EDD are checked against the dates and times provided in the laboratory narrative report. The collection dates and times in both documents should match those found on the COC. Any variations are investigated by contacting the lab and/or sample collector.

Column and Row Data Entry: The EDD is examined for correct column headers and entry of data in the correct columns. Each row is examined for the correct data entry values across the row. Sample numbers, dates and times, dilutions, sample results, qualifiers, method numbers, and all other values should be correct for the particular sample and analyte on that row.

Data Package Quality Control Review

The PM will determine if all necessary QC was run for each analyte by reviewing the laboratory narrative report. If no laboratory QC is available, the target samples of that batch may be qualified or rejected. Items reviewed for laboratory and sampling quality control review are outlined below.

Holding Times: Holding times are reviewed to determine if designated holding times outlined in the analytical methods were met. According to EPA, the holding time is until the end of the day (midnight), unless the holding time is specified as hours (for example, turbidity-48 hours). If the holding time is not met, the PM or QAM will qualify the data as "HT" under the Validation Qualifier column, and a comment explaining the qualification is placed under the Validation Comments column on the EDD. Sample collection date/time and analysis date/time should be the same in the EDD and narrative report as well as on the COC.

Blank Contamination: Any type of blank contamination should be investigated and corrective action taken when possible; however, not every situation of blank contamination will result in unusable data. If an equipment blank, field blank, or trip blank exceeds the reporting limit, the blank data records may be qualified with a "B" with a comment stating, "blank result exceeded reporting limit" for all analytes showing contamination. All associated target samples are evaluated and qualified according to the following procedure, outlined in Table 1:

1. If the constituent is not found in the sample, or if it is below levels of concern defined in a given sampling plan, then there is little need for concern. However, data should be evaluated and qualified since data may be used for other purposes, and users need to understand quality of data.
2. If the constituent is found in the target sample, but at least 10x the level in the blank, then there is minimal concern since the likely maximum contribution from contamination is 10% (most analytical methods are no more accurate than this level).
3. If the constituent is found at levels in the target sample at least 5x the blank but less than 10x the blank, then the result should be considered an upper limit and using such data should be done with caution. These may be qualified as an estimate ("J").
4. If the target sample contains the constituent at levels below 5x the blank level, the results are suspect. Traditional EPA Contract Lab Program validation guidelines set the detection level at 5x blank levels; therefore, these results may be qualified as non-detects ("U").

Table 1. Routine rules used in qualifying target sample results associated with blank samples indicating potential contamination.

Sample Result compared to Blank Result	Qualification	Action
Sample Result ≥ (10 x Blank)	Acceptable	No action
(5 x Blank) ≤ Sample Result < (10 x Blank)	Estimate/Upper Limit	Qualify with "J " or use best judgment
Sample Result < (5 x Blank)	Non-detect	Qualify with "U" or use best judgment

Method Blank: Any MB exceeding the reporting limits will be noted, QC qualified, and will also cause any associated samples to be QC qualified, unless their result is ND, in which case no QC qualifier is needed.

Sample Temperature: Samples should be received and stored at a temperature within the acceptable range of the method. However, there are instances where samples are received "on ice" but have not reached their required temperature due to quick delivery; based on information from the COC and/or laboratory report, best professional judgment must be used to determine if samples have been properly preserved and will meet temperature preservation requirements within acceptable timeframes. If the samples are not properly iced, causing the temperature to exceed the method's temperature range, the data is "J" qualified. A comment explaining the "J" qualifier is placed under the Validation Comments column on the EDD.

Laboratory Control Samples: Any LCS/LCSD and related RPD outside the control limits will be noted and will cause any associated samples to be QC qualified, unless their result is ND, in which case no QC qualifier is needed. The LCS/LCSD outside the control limits also needs to be QC qualified.

Laboratory Matrix and Duplicate QC Samples: Any QC values outside the limits for MS/MSD and related RPD are noted, but no QC qualifiers are added.

Laboratory and/or Sampling Precision: RPD is calculated for all analytes that have duplicate sample data using the percent RPD. RPD for the sample and sample duplicate is calculated using the following equation:

$$RPD = \frac{(S1 - S2)}{(S1 + S2)/2} \times 100$$

RPD = relative percent difference
S1 = sample concentration
S2 = sample duplicate concentration

A general goal is field duplicate RPD < = 30%, and lab QC samples RPD <= 20%. The PM can exercise judgment on qualifying data based on RPD

Appendix B: Data Plan Template

Information will be provided in each SP.

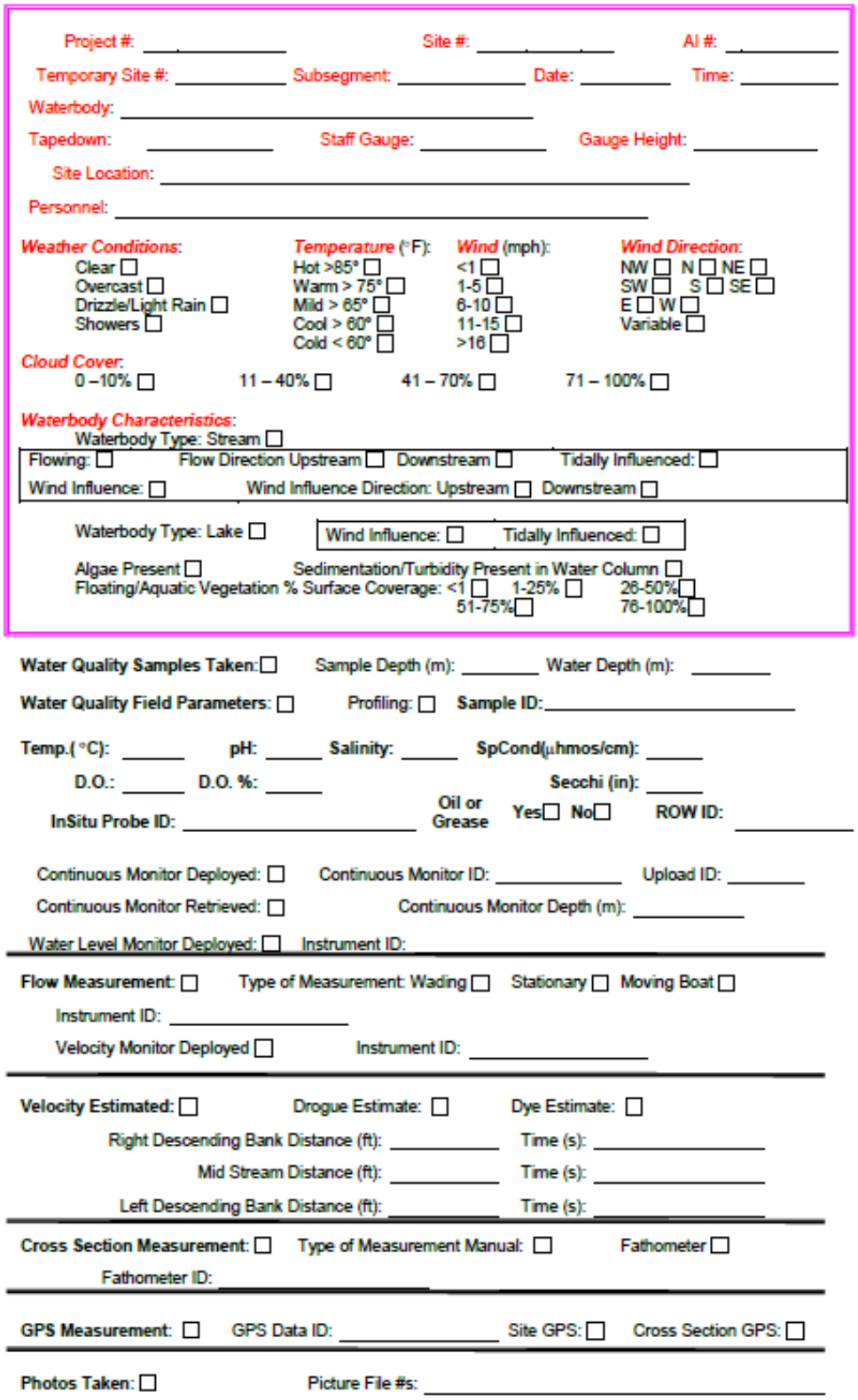
The most current version of the data plan template is available on the LDEQ server, Nonpoint shared drive, in the "Guidance Documents\Sampling Plan Templates" subdirectory. Each SP template Word doc contains a data plan template.

LEAU Site No.	Waterbody Name	Site description	Latitude	Longitude	Parish	Water Quality[2,3]		NPS Site Characterization With Photos[1]	Sample Frequency
						Lab	In Situ	Initially and as needed	

1) **Field Data Sheets will be completed at each sampling event and a NPS Site Characterization Form will be conducted initially and as needed.**
2) **The in situ parameters to be measured are pH, temperature, DO, DO percent saturation, specific conductance, salinity, depth, Secchi disk and tapedown measurements. Discharge will be collected at the ambient monitoring site, or other representative site if required, with each sampling event when possible.**
3) **The water quality parameters to be collected for laboratory analysis are [parameters].**

Monthly:
*The sampling event will occur no less than three weeks apart and no more than five weeks apart unless there are unforeseen prohibitions (i.e. weather/schedule conflicts); however, every attempt will be made to maintain scheduling integrity.
Bi-Monthly:
*The first sampling event will occur during the same week each month unless there are unforeseen prohibitions (i.e. weather/schedule conflicts); however, every attempt will be made to maintain scheduling integrity.

Appendix C: Field Data Form and Site Characterization Form



Project #: _____ Site #: _____ AI #: _____

Temporary Site #: _____ Subsegment: _____ Date: _____ Time: _____

Waterbody: _____

Tapedown: _____ Staff Gauge: _____ Gauge Height: _____

Site Location: _____

Personnel: _____

Weather Conditions:
Clear ☐
Overcast ☐
Drizzle/Light Rain ☐
Showers ☐

Temperature (°F):
Hot >85° ☐
Warm > 75° ☐
Mild > 65° ☐
Cool > 60° ☐
Cold < 60° ☐

Wind (mph):
<1 ☐
1-5 ☐
6-10 ☐
11-15 ☐
>16 ☐

Wind Direction:
NW ☐ N ☐ NE ☐
SW ☐ S ☐ SE ☐
E ☐ W ☐
Variable ☐

Cloud Cover:
0 –10% ☐ 11 – 40% ☐ 41 – 70% ☐ 71 – 100% ☐

Waterbody Characteristics:
Waterbody Type: Stream ☐
Flowing: ☐ Flow Direction Upstream ☐ Downstream ☐ Tidally Influenced: ☐
Wind Influence: ☐ Wind Influence Direction: Upstream ☐ Downstream ☐

Waterbody Type: Lake ☐ Wind Influence: ☐ Tidally Influenced: ☐

Algae Present ☐ Sedimentation/Turbidity Present in Water Column ☐
Floating/Aquatic Vegetation % Surface Coverage: <1 ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-100% ☐

Water Quality Samples Taken: ☐ Sample Depth (m): _____ Water Depth (m): _____

Water Quality Field Parameters: ☐ Profiling: ☐ **Sample ID:** _____

Temp.(°C): _____ **pH:** _____ **Salinity:** _____ **SpCond(µhmos/cm):** _____

D.O.: _____ **D.O. %:** _____ **Secchi (in):** _____

InSitu Probe ID: _____ **Oil or Grease** **Yes** ☐ **No** ☐ **ROW ID:** _____

Continuous Monitor Deployed: ☐ Continuous Monitor ID: _____ Upload ID: _____

Continuous Monitor Retrieved: ☐ Continuous Monitor Depth (m): _____

Water Level Monitor Deployed: ☐ Instrument ID: _____

Flow Measurement: ☐ Type of Measurement: Wading ☐ Stationary ☐ Moving Boat ☐

Instrument ID: _____

Velocity Monitor Deployed ☐ Instrument ID: _____

Velocity Estimated: ☐ Drogue Estimate: ☐ Dye Estimate: ☐

Right Descending Bank Distance (ft): _____ Time (s): _____

Mid Stream Distance (ft): _____ Time (s): _____

Left Descending Bank Distance (ft): _____ Time (s): _____

Cross Section Measurement: ☐ Type of Measurement Manual: ☐ Fathometer ☐

Fathometer ID: _____

GPS Measurement: ☐ GPS Data ID: _____ Site GPS: ☐ Cross Section GPS: ☐

Photos Taken: ☐ Picture File #s: _____

Site 0132 Date: 06/12/19

Tapedown Established: ☐ Tapedown Location: _____

Benchmark Established: ☐ Benchmark Location: _____

Survey Equipment Used: ☐

Time of Travel Measurement: ☐ Type of Site: Injection ☐ Collection ☐

Amount of Dye Injected (ml): _____

Physical Site Characteristics: Natural Waterbody: ☐ Man Altered Waterbody: ☐

Man-Made Waterbody: ☐

Waterbody Dry/Intermittent: ☐

Waterbody Bottom: Sandy ☐ Clay ☐ Gravel ☐ Hard Clay ☐ Soft Silt ☐

Sand/Silt ☐ Rock/Gravel/Silt ☐ Concrete ☐

Control Structure Present: ☐ Location: _____

Type: Man Made Dam ☐ Flow Regulation Device ☐ Beaver Dam ☐ Log Jam ☐

Land Use: Agriculture ☐ Forestry ☐ Municipal ☐ Industrial ☐ Field/Pasture ☐ Wetland ☐

Percent Tree Canopy Cover 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-100% ☐

Recon Information:

Discharge Measurement: Wading ☐ Boat ☐ Stream Depth (ft): _____

Continuous Monitor Deployment: Fixed: ☐ Bouy: ☐

Boat Accessible: ☐ Nearest Launch: _____

Bridge ☐ **Bridge Safe:** ☐ Bridge Height: _____

Profiling Measurements:

Time: _____ **Temp.(°C):** _____ **pH:** _____ **Spcond(µhmos/cm):** _____
D.O.: _____ **D.O. %:** _____ **Salinity:** _____ **Depth (m):** _____

Time: _____ **Temp.(°C):** _____ **pH:** _____ **Spcond(µhmos/cm):** _____
D.O.: _____ **D.O. %:** _____ **Salinity:** _____ **Depth (m):** _____

Time: _____ **Temp.(°C):** _____ **pH:** _____ **Spcond(µhmos/cm):** _____
D.O.: _____ **D.O. %:** _____ **Salinity:** _____ **Depth (m):** _____

Comments: _____

References

Convert Feet to Meters	Convert Celsius to Fahrenheit	
0.5 ft = 0.15 m	20 = 68	25 = 77
1.0 ft = 0.30 m	21 = 69.8	26 = 78.8
1.5 ft = 0.45 m	22 = 71.6	27 = 80.6
2.0 ft = 0.60 m	23 = 73.4	28 = 82.4
2.5 ft = 0.75 m	24 = 75.2	29 = 84.2

Site Info
Revision 10
Revised 2/22/2010

NPS Site Characterization Form (Updated 01/2016)			
Project Name:		**Project Number:**	
Water Body Name:		**Site Location:**	
Crew Member(s):		**Site Number:**	
Subsegment:		**Date/Time:**	

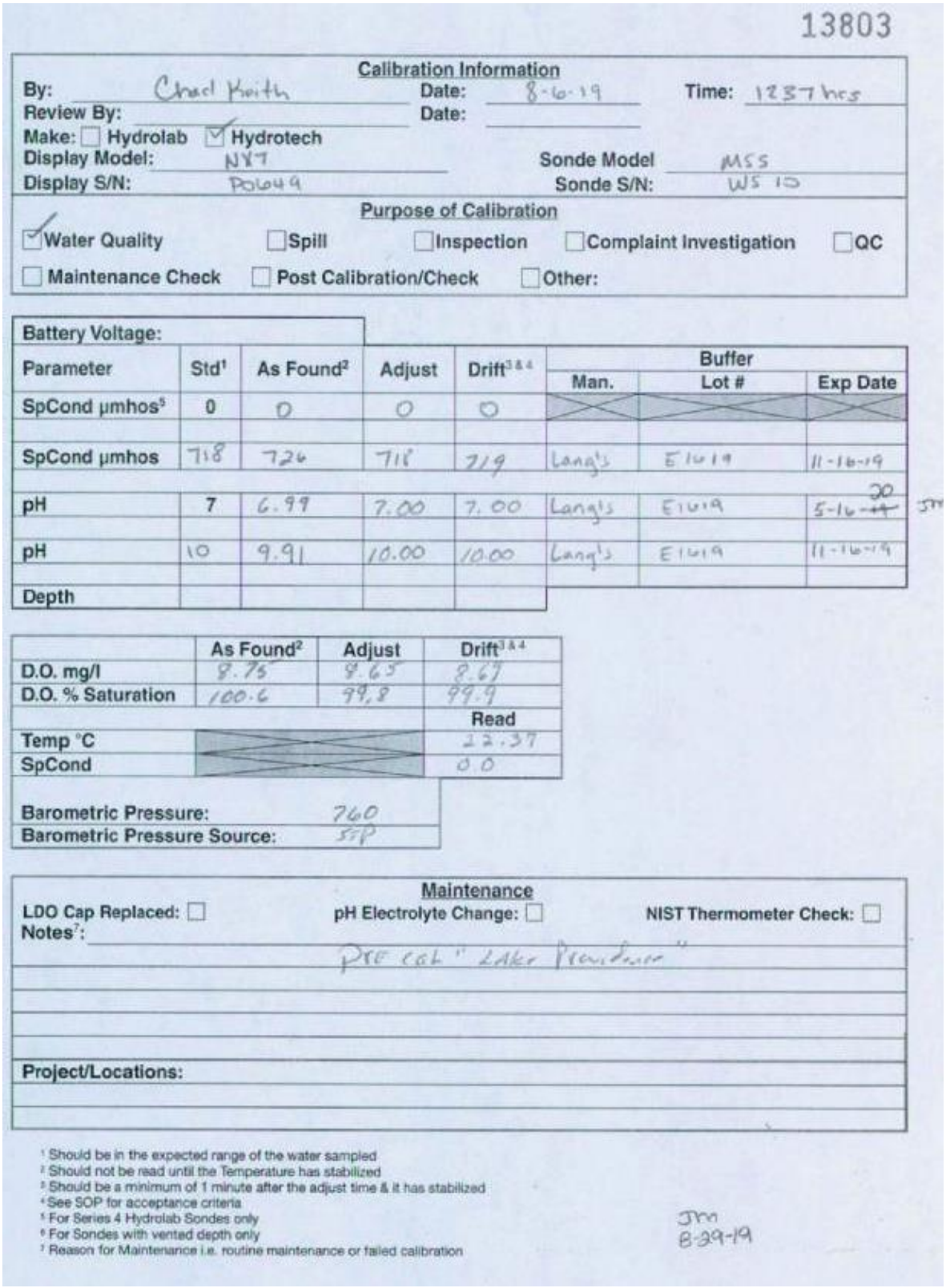
Watershed Features (check all that apply)		
Surrounding Land Uses:	☐ Forest ☐ Field/Pasture ☐ Agriculture ☐ Residential ☐ Industrial ☐ Other:	
Visible Erosion:	☐ None ☐ Slight ☐ Moderate ☐ Heavy **Comments:**	
Nonpoint Pollution (NPS):	☐ No Evidence ☐ Some Potential Sources ☐ Obvious Sources	**Sources of NPS**:
Streamside Cover:	☐ Predominantly Shrubs ☐ Predominantly Trees ☐ Predominantly Grasses/Forbs ☐ Little or No Vegetation	
Bank Coverage:	Percentage of Vegetative Coverage: ☐ Greater Than 90% ☐ 70 – 89% ☐ 50-69% ☐ Less Than 50%	
Riparian Vegetative Zone:	☐ Greater Than 50 meters ☐ 25 – 50 meters ☐ 10 – 25 meters ☐ Less Than 10 meters	
Canopy Coverage:	☐ Mixture (Areas of Full Shade and Open) ☐ Sparse Canopy (Filtered Light) ☐ Full Canopy ☐ No Canopy	

Stream Features			
Stream Parameters:	Stream Width: _____ Stream Depth: _____		
Stream Odor:	☐ Normal/None ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ Other:		
Turbidity:	☐ Clear ☐ Slightly Turbid ☐ Opaque	**Water Color:**	
Visible Surface Oils:	☐ None ☐ Minor ☐ Heavy	**Algae Present:**	☐ None ☐ Minor ☐ Heavy
Flow:	☐Flowing ☐ Non-flowing ☐ Pooled ☐ Dry	**Water Body Type:**	☐ Natural ☐ Man-made

Physical Characteristics			
Control Structure:	☐ No ☐ Yes (☐ Upstream ☐ Downstream)	**Hydromodification(s):**	
Stream Bottom:	☐ Clay ☐ Sand ☐ Silt ☐ Gravel ☐ Mixture		

Notes:

Appendix D: Example Calibration Record



13803

Calibration Information

By: Chad Keith Date: 8-6-19 Time: 1237 hrs
Review By: Date:
Make: ☐ Hydrolab ☑ Hydrotech
Display Model: NXT Sonde Model MS5
Display S/N: P0649 Sonde S/N: WS 15

Purpose of Calibration

☑ Water Quality ☐ Spill ☐ Inspection ☐ Complaint Investigation ☐ QC
☐ Maintenance Check ☐ Post Calibration/Check ☐ Other:

Battery Voltage:

Parameter	Std[1]	As Found[2]	Adjust	Drift[3&4]	Buffer Man.	Buffer Lot #	Buffer Exp Date
SpCond µmhos[5]	0	0	0	0			
SpCond µmhos	718	726	718	719	Lang's	E1019	11-16-19
pH	7	6.99	7.00	7.00	Lang's	E1019	5-16-20
pH	10	9.91	10.00	10.00	Lang's	E1019	11-16-19
Depth							

	As Found[2]	Adjust	Drift[3&4]
D.O. mg/l	8.75	8.65	8.67
D.O. % Saturation	100.6	99.8	99.9
			Read
Temp °C			22.37
SpCond			0.0

Barometric Pressure: 760
Barometric Pressure Source: SP

Maintenance

LDO Cap Replaced: ☐ pH Electrolyte Change: ☐ NIST Thermometer Check: ☐
Notes[7]: Pre cal " Lake Providence "

Project/Locations:

[1] Should be in the expected range of the water sampled
[2] Should not be read until the Temperature has stabilized
[3] Should be a minimum of 1 minute after the adjust time & it has stabilized
[4] See SOP for acceptance criteria
[5] For Series 4 Hydrolab Sondes only
[6] For Sondes with vented depth only
[7] Reason for Maintenance i.e. routine maintenance or failed calibration

JM 8-29-19

Appendix E: Chain of Custody Form

AI: 91395 Site: Boston Canal

Location Name:

Address:

Sample Collector(s): Jane Sampler (750),

Sample ID	Location ID	Collection Date	Collection Time	Matrix	Sample Type	Filtered – **Y**es or **N**o	# of Containers	**G**rab or **C**omposite	Parameters Requested with Method Reference and Preservative: TDS/Turbidity ICE	TKN/NO3-NO2/TP ICE + H2SO4							Remarks
750-190909-01-0	2148	09/09/19	08:32 am	W	N	N	2	G	X	X							Project # NP2013006

Additional Comments:

Relinquished by:	Date:	Time:	Received by:

Appendix F: Common Data Qualifiers

Qualifier	Description
B	The sample result is an estimated quantity between the method detection limit and the reporting limit. May indicate blank contamination for organics.
D	Indicates that result is reported from a dilution
GT	Result was originally reported as a greater than value.
HT	Holding time violation
J	The result is an estimated quantity.
J+	The result is an estimated quantity, result may be biased high.
J-	The result is an estimated quantity, result may be biased low.
MI	Matrix Interference caused problems
NE	Analyte determined by a non-EPA approved method.
QC	Required Quality Control limits were not met
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.
SC	Quality control outside of statistical limits, but inside required limits
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.