

Generic Quality Assurance Project Plan for Water Program Staff Sampling & Analysis Activities

Alaska Department of Environmental Conservation
Division of Air and Water
Water Program

Date: May 16, 2003

Approval of QAPP:

Lynn J. Tomich Kent

Lynn Kent
Water Programs Manager

6/4/03

Date

Joyce Beelman

Joyce Beelman
Water Quality Assurance Officer

6/4/03

Date

TABLE OF CONTENTS

A	PROJECT MANAGEMENT ELEMENTS.....	3
A.1	TITLE PAGE.....	3
A.2	TABLE OF CONTENTS.....	3
A.3	DISTRIBUTION LIST.....	3
A.4	PROJECT/TASK ORGANIZATION.....	3
A.5	PROBLEM DEFINITION/BACKGROUND AND PROJECT OBJECTIVES.....	4
A.5.1	<i>Background</i>	4
A.5.2	<i>Project Objectives</i>	4
A.6	PROJECT/TASK DESCRIPTION AND SCHEDULE.....	4
A.6.1	<i>Project</i>	4
A.6.2	<i>QAPP Sampling Plan Checklist (Appendix 1)</i>	5
A.6.3	<i>Schedule</i>	7
A.7	DATA QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA.....	7
A.8	SPECIAL TRAINING REQUIREMENTS/CERTIFICATION.....	9
A.9	DOCUMENTS AND RECORDS.....	10
B	DATA GENERATION AND ACQUISITION.....	11
B.1	SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN).....	11
B.2	SAMPLING METHOD REQUIREMENTS.....	11
B.2.1	<i>Representativeness of Samples</i>	11
B.2.2	<i>Samples types</i>	12
B.2.3	<i>Sample containers and equipment</i>	12
B.2.4	<i>Sampling techniques</i>	13
B.3	SAMPLE HANDLING REQUIREMENTS.....	13
B.3.1	<i>Sampling Procedures</i>	13
B.3.2	<i>Sample Custody Procedures</i>	14
B.3.3	<i>Shipping Requirements</i>	14
B.4	ANALYTICAL METHODS REQUIREMENTS.....	14
B.5	QUALITY CONTROL REQUIREMENTS.....	14
B.6	INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS.....	15
B.7	INSTRUMENT CALIBRATION AND FREQUENCY.....	16
B.8	INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES.....	16
B.9	DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS).....	16
B.10	DATA MANAGEMENT.....	16
C	ASSESSMENT/OVERSIGHT.....	17
C.1	ASSESSMENT/OVERSIGHT.....	17
C.2	REPORTS TO MANAGEMENT.....	17
D	DATA VALIDATION AND USABILITY.....	18
D.1	DATA REVIEW, VERIFICATION AND VALIDATION REQUIREMENTS.....	18
D.2	VERIFICATION AND VALIDATION METHODS.....	18
D.2.1	<i>Verification</i>	18
D.2.2	<i>Validation</i>	18
D.3	RECONCILIATION AND USER REQUIREMENTS.....	19
E	GLOSSARY OF TERMS.....	20
TABLE 1:	GENERIC QAPP DATA QUALITY OBJECTIVES SUMMARY.....	22
APPENDIX 1:	WATER PROGRAM QAPP SAMPLING PLAN CHECKLIST.....	
	Find at: http://www.dec.state.ak.us/water/wqsar/pdfs/QAPPChecklist.pdf	

A PROJECT MANAGEMENT ELEMENTS

A.1 Title Page

A.2 Table of Contents

A.3 Distribution List

Copies of this approved Quality Assurance Project Plan (QAPP) and subsequent QAPP revisions will be distributed to all Water Program staff.

A.4 Project/Task Organization

All ADEC Water Program staff members who perform field tests, collect samples, and transport or ship samples to analytical laboratories are responsible for Quality Assurance and Quality Control. Water Program staff members who perform these duties include:

- Those who respond to water pollution complaints or investigate potential water pollution problems using a suite of basic water quality parameters,
- Those who set up or perform baseline water quality monitoring,
- Those who develop discharge permits, review data reports, provide technical assistance to facilities, and perform routine inspections and water quality monitoring,
- Those who administer Clean Water Act Section 319 grants and TMDL projects, etc.

Water Program staff members, under the requirements of this generic QAPP, are responsible for planning the sampling event, developing the sample design, collecting physical and documentary samples, coordinating with the subcontracted laboratory, reviewing data results, and preparing reports. QAPP requirements also apply to sampling activities undertaken on behalf of the department by contractors.

Whenever ADEC Water Program staff members perform field tests, collect samples and transport or ship samples to analytical laboratories, they will follow the requirements of this generic QAPP for sample collection, sample handling and analysis. Departures from the requirements of this generic QAPP must be documented in the site-specific QAPP Sampling Plan Checklist (Appendix 1) and approved by the Water Quality Assurance Officer (WQAO).

Water Program staff members using this generic QAPP prepare the site-specific QAPP Sampling Plan Checklist (QAPP Checklist) for each sampling event. The WQAO is available to assist Water Program staff members fill out this QAPP Checklist. The WQAO randomly selects and reviews approximately 5% of the QAPP Checklists annually to ensure that they are complete and that QA/QC processes are followed.

Note: This generic QAPP is used by all Water Program staff in their monitoring activities, unless a program-specific QAPP is developed (e.g., by the Wastewater Discharge Permits Program) and approved by the specific Water Program Manager and the WQAO.

A.5 Problem Definition/Background and Project Objectives

A.5.1 Background

The Water Program is committed to developing and integrating Quality Assurance (QA) and Quality Control (QC) practices into data collection and measurement activities within its purview in order to generate and process data of known and appropriate quality in a cost-effective manner.

This QAPP is prepared with the intent to provide all Water Program staff members with basic guidelines for the collection of samples, proper sample documentation, sample handling and transport, and the use of correct sampling and analytical methodologies.

As required by the Water Program Quality Management Plan, approved by ADEC and EPA June, 2001, this generic QAPP is prepared in compliance with the *EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans, Final Version, March 2001*. EPA QA/R-5 is available at: <http://www.epa.gov/r10earth/offices/oea/epaqar5.pdf>.

When approved, this generic QAPP becomes a part of the Water Program Quality Management Plan.

A.5.2 Project Objectives

This generic QAPP is developed for the purpose of supporting all sampling and analysis activities by ADEC Water Program staff.

By following the requirements of this generic QAPP and completing the QAPP Sampling Plan Checklist, the ADEC Water Program ensures the quality of its environmental data. ADEC thus ensures that data generated or processed are appropriate for their intended use, scientifically valid, are of known precision, and accuracy, of acceptable completeness, representativeness, comparability, and where appropriate, legally defensible.

The intent of this generic QAPP is to provide consistency in the application of QA and QC practices whenever ADEC Water Program staff members collect and test water samples in the field, and/or handle, transport or ship water samples to subcontracted laboratories for analysis.

A.6 Project/Task Description and Schedule

A.6.1 Project

The Water Program staff members, whether in the Air and Water Data and Monitoring Program, Wastewater Discharge Permits Program, or the Non-Point Source Pollution Control Program, follow the requirements of this generic QAPP and fill in the information required in the QAPP Sampling Plan Checklist for each sampling event. A *sampling event* is defined as the suite of samples taken at the same time and place for the same purpose. The suite of samples at several locations at a wastewater facility during a routine inspection is considered a sampling event. Similarly, the suite of samples taken in response to one water quality complaint is considered a sampling event.

Samples may be analyzed in the field or in an ADEC-approved laboratory. (Note: ADEC approves Alaskan laboratories for drinking water analysis. At the present time, ADEC does not approve laboratories for wastewater analysis. However, an ADEC drinking water-approved laboratory lends credibility to a laboratory's quality assurance and quality control processes.)

A list of ADEC drinking water-approved microbiological laboratories is available at: <http://www.state.ak.us/dec/deh/water/labs.htm> and ADEC drinking water-approved laboratories providing chemical analysis at: <http://www.state.ak.us/dec/deh/water/chemlabs.htm>.

If an ADEC-approved laboratory is not available, for example in remote locations, a non-approved laboratory can be used. This laboratory use must be documented on the QAPP Sampling Plan Checklist.

Table 1, *Generic QAPP Data Quality Objectives Summary*, lists the usual parameters of concern. This table lists the EPA-approved methods of analysis, method detection limits, minimum reporting limits, quality control requirements of precision, accuracy, and completeness, the volume of sample needed, and preservation and holding times required.

The list in Table 1 may be expanded in the future to include other parameters of concern to Water Program staff. In the meantime, approved methods and other information for parameters not listed in Table 1, can be found in 40 CFR 136.3. Code of Federal Register documents can be found at: <http://www.access.gpo.gov/nara>.

A.6.2 QAPP Sampling Plan Checklist (Appendix 1)

The QAPP Sampling Plan Checklist is a summary of site-specific sampling and analysis requirements of a sampling event. The QAPP Checklist is designed to be used in conjunction with this generic QAPP. The generic QAPP describes QA/QC information such as sampling methods, sample containers, holding times, and EPA-approved analytical methods. The site-specific Sampling Plan Checklist contains:

- Site information such as facility or project name, address, water body, latitude/longitude, file number, permit number (if applicable), contact person, contact person's phone number and/or email address,

- Sampling date/s and sampling location/s such as the effluent or river reach,
- Name/s of the ADEC staff setting up and conducting the monitoring activities, reviewing data and preparing reports,
- The list of parameters that will be sampled for and analyzed in the field and those that the laboratory will perform,
- List of QA/QC measures such as duplicate samples, blind samples, etc.,
- Description and rationale for any departures from the generic QAPP,
- QA/QC problems encountered in the field and/or laboratory and any QA/QC corrective actions taken,
- Water Program staff member responsible for the sampling event - signature and date.

Whenever samples are collected and/or analyzed in the field, the Water Program staff member fills out the site-specific QAPP Sampling Plan Checklist for each sampling event. As much of the Checklist as possible is filled out prior to the event. Items that may be known prior to sampling are the facility name, sampling dates and locations, parameters, subcontracted laboratory, etc.

Because a sampling event involves unknowns, the QAPP Sampling Plan Checklist is taken into the field and filled out as necessary. Items which are required to be completed in the field include:

- Any new sampling locations
- Any new parameters
- QA/QC problems identified in the field such as malfunctioning equipment, broken vials, etc., as well as QA/QC corrective actions taken,
- Any changes or departures from the QA/QC protocols described in this generic QAPP, such as using non EPA-approved methods as well as the rationale for these changes or departures.

Back in the office, the QAPP Checklist can be completed only after ADEC receives all laboratory data results and reviews these data for QA/QC. When all verified and validated data are available and a Water Program staff member has checked the data and completed any required reports, the QAPP Checklist is reviewed for completeness, and signed and dated by the Water Program staff member responsible for the sampling event. The completed, signed and dated QAPP Checklist then becomes a part of the permanent record of the facility or project.

Note: A Program, e.g., the Wastewater Discharge Permits Program, may elect to develop a separate QAPP Checklist as part of its Inspection Checklist. This is acceptable if the required site-specific Checklist elements are included and the substituted QAPP Checklist is approved by the WQAO. In this case, the generic QAPP would continue as the basis for QA and QC practices in the field, unless the Program develops its own generic QAPP. (See Section A.4. for discussion on developing a program-specific QAPP in lieu of this generic QAPP.)

In summary, the site-specific QAPP Sampling Plan Checklist must include:

- Name of the facility, project or event,
- Physical location (GPS) and address if applicable,
- Permit Number, Folder names, if applicable,
- Site contact person, phone number, email address, if applicable,
- Name of ADEC Water Program staff person(s),
- Sampling date/s and sampling locations,
- Parameters to be sampled or analyzed,
- List of QA/QC measures such as duplicate samples, blind samples, etc.,
- Field or lab QA/QC problems identified and QA/QC corrective actions taken,
- Departures taken from the generic QAPP and rationale,
- Name of Data Reviewer/s
- Dated Signature of Water Program staff member responsible for sampling event.

A.6.3 Schedule

Activity	Estimated Start Date	Estimated Completion Date
Water Program QAPP Sampling Plan Checklist	At least 1-2 days before the sampling event when sampling is anticipated.	As soon as possible at completion of sampling event, after laboratory data results are available.
Mobilize to Site	See Water Program QAPP Sampling Plan Checklist and Chain-of-Custody or Transmission Form	
Sample Collection		
Laboratory Receipt of Samples		
Laboratory Analyses		Analyses within Holding Time requirements
Data Review by Water Program Staff		Within 2 weeks of data receipt by ADEC Water Program staff, if possible.
Target Completion Date	Within 2 months of the sampling event, if possible.	

A.7 Data Quality Objectives and Criteria for Measurement Data

Data Quality Objectives (DQOs) are the quantitative and qualitative terms that Water Program staff members use to describe how good the data need to be in order to meet the project's objectives. DQOs for measurement data (also known as data quality indicators) are precision, accuracy, representativeness, completeness, and comparability. The overall QA objective for analytical data is to ensure that data of known and acceptable quality are provided. To achieve this goal, the Water Program staff must review the data for representativeness, comparability, precision, accuracy and completeness. These are

necessary attributes to ensure that analytical data are reliable, scientifically sound, and defensible.

Precision: Precision is the degree of mutual agreement among independent measurements as a result of repeated application of the process under specified conditions.

Field precision is measured by collecting field duplicate samples for each matrix collected and measured, and/or for each sampling event. Field precision is evaluated by the relative percent difference (RPD) between field duplicate samples. RPD should be <20% or better. Although the purpose of duplicate sampling is to check the precision of the sample collection, it also checks laboratory precision if the duplicate samples are "blind" to the laboratory and are given distinct identification numbers.

RPD is defined as the absolute value of the difference (range) of each duplicate set times 100, divided by the mean value (average of the duplicate set).

The equation to calculate RPD is as follows:

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

The Water Program ensures field precision by collecting and analyzing one field duplicate for every 10 samples collected. For example, if 1-10 samples are collected per sampling event, 1 field duplicate is required. If 10-20 samples are collected per sampling event, 2 field duplicates are required.

A *sample* is defined as the portion of a population taken from one place at one time even if collected for several analyses. For example, samples taken for pH, total suspended solids, total residual chlorine and fecal coliform bacteria at three locations (influent, effluent and edge of mixing zone) at a wastewater treatment facility would be considered 3 samples. Samples taken in response to a possible pollution event (upstream, downstream and at a discharge) would also be considered 3 samples.

A duplicate at the wastewater treatment facility sampling event described above would consist of one duplicate set of sample parameters (pH, total suspended solids, total residual chlorine and fecal coliform bacteria) at one of the three sampling locations.

Laboratories measure precision by analyzing Method Blanks, Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples and by the analysis of laboratory duplicate samples. Laboratories usually perform the analysis of one set of MS/MSD and duplicate samples per matrix measured. Laboratory precision is evaluated by the relative percent difference (RPD) between MS/MSD or between duplicate laboratory samples. RPD is usually <20% but can vary widely depending on the analytical method. Laboratory precision requirements are method-specific and are available in laboratory Quality Management Plans, (QMPs), which are kept on file at the Water Quality Assurance Officer's office.

Accuracy: Accuracy is the degree of agreement of a measured value with the true or expected value of the quantity of concern.

The Water Program ensures field accuracy by field instrument calibration according to the manufacturers' instructions and by using standards and chemicals that are current (prior to expiration dates), and by following proper sampling, sample handling and field analysis protocols.

Laboratory accuracy is evaluated by the percent recovery (%R) of the target analyte in spiked samples and also by the recoveries of the surrogates in all samples and QC samples. The laboratory accuracy ranges are specified in the laboratory QMP and depend upon the parameter being measured.

Representativeness: Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix that is being tested. *The Water Program staff member designs the sampling scheme, including sampling locations and the number of samples to ensure representativeness of samples of each matrix or product of chemical processes being sampled. The Water Program staff also ensures representativeness of samples by adherence to standard field sampling and analysis protocols and by using standard laboratory protocols.*

Completeness: Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Since sampling during inspections, complaint response and technical assists are usually grab samples and limited in number of samples, *the Water Program expects the number of valid results from the analyses to be equal to or better than 85%.*

Comparability: Comparability is a qualitative term that expresses the measure of confidence that one data set can be compared to another and can be combined for the decision(s) to be made. *The Water Program ensures Comparability by using standard sample collection, preparation and handling procedures, EPA-approved analytical methods and holding times, and by following the QA/QC protocols described in this generic QAPP.*

A.8 Special Training Requirements/Certification

Water Program staff are required to have training in sampling, sampling handling and transport, sample documentation, filling out the Chain-of-Custody or Transmission forms, field analysis, and filling out the QAPP Sampling Plan Checklist. It is recommended that this be formal training. However, training may also be obtained by "mentoring" provided by senior staff, and by coordination with the subcontracted laboratory. Training records are kept on file by the WQAO.

Subcontracted laboratories performing analytical work for ADEC have extensive knowledge and skill in execution of the analytical methods being requested. Information

on laboratory staff competence is usually provided in the Quality Management Plan (QMP) of each laboratory.

A.9 Documents and Records

The Water Program staff member fills out the QAPP Sampling Plan Checklist, and a field logbook or field data sheets with “write in the rain” ink or pencil, as appropriate. Changes are made by crossing out errors and adding correct information. The QAPP Checklist, logbook or data sheet should not be erased. Logbooks should be bound with numbered pages.

The completed QAPP Checklist is required for each sampling event. A Chain-of-Custody or Transmission form must be filled out if a subcontracted laboratory performs sample analysis. This completed form will accompany all data sheets and summaries from the subcontracted laboratory back to the Water Program staff.

In addition to the Checklist, field logbooks, field data sheets, and Chain-of-Custody or Transmission Forms, Laboratory Analysis and Laboratory QC reports, the project documents may include:

- Investigation Summary (CATS)
- Inspection Checklist
- Record of Sampling
- Inspection Report
- Laboratory raw data,
- Discharge Monitoring Reports (DMRs)
- MSDS sheets, chemical labels, photographs, drawings
- Permits, certifications, authorizations,
- Workplans, monitoring plans
- Correspondence with affected/involved parties, agencies, or others.

All documents, records, data collected, final QAPP Sampling Plan Checklist, and final report will be kept in a facility or project file. Pertinent data, which has been verified and validated, must be STORET compatible, and entered into the STORET database system, when available.

The subcontracted laboratory will store all sample receipt, sample log-in, extraction documentation and laboratory instrument documentation according to its own QMP and SOP documents. This information may be requested by the Water Program staff. The laboratory is responsible for verification and validation of its laboratory analysis results prior to release to ADEC. The Chain-of-Custody or Transmission form and laboratory QC sheets will accompany all laboratory data results back to the Water Program staff and the laboratory will provide information to the Water Program staff on any qualified data results.

B DATA GENERATION AND ACQUISITION

B.1 Sampling Process Design (Experimental Design)

Prior to the inspection or sampling event, the Water Program staff member should review available files to determine such things as:

- Facility/project or water body background information,
- Historical ownership and use of the facility/project for waste and wastewater generation,
- Maps depicting general geographic location, property lines, surrounding land uses,
- Groundwater monitoring wells,
- A summary of all possible sources of contamination and of the wastewater stream flow,
- A summary of past permits, certifications or authorizations requested and/or received,
- Any enforcement actions and subsequent responses,
- A list of documents and studies prepared for the facility/project,
- Monitoring records, such as Discharge Monitoring Reports (DMRs),
- Inspection reports from previous site inspection or sampling events,
- Safety issues.

Based on the information on hand, and the visual inspection of the facility or project, the Water Program staff will collect samples and analyze samples on an “as needed” basis to characterize or verify possible water quality pollutants. When Water Program staff respond to water pollution complaints or set up baseline monitoring projects, sampling locations and sampling frequency should be representative of the objectives of the sampling event or monitoring project. For wastewater facility inspections, samples may be collected to characterize and verify the constituents of the wastewater effluent, the edge of the mixing zone, and the ambient receiving water quality. Influent samples may also be taken at those facilities with NPDES and pre-treatment requirements. This sample information is gathered to determine if permit, certification or authorization requirements are being met, to develop new or revised permits, certifications or authorizations, or to support enforcement actions for non-compliance.

The Water Program staff follows the requirements of this generic QAPP in setting up the sampling plan for any of the above scenarios. The site-specific information for the sampling event should be detailed in the QAPP Sampling Plan Checklist (Appendix 1).

B.2 Sampling Method Requirements

B.2.1 Representativeness of Samples

When water samples are taken in response to water pollution complaints, care should be taken to ensure the sampling sites are representative of the pollution event; e.g., at the pollution site, and above and below it.

In baseline monitoring, sample site locations should be determined to ensure both temporal and spatial representativeness. If possible, samples should be taken directly from the water body, rather than from a container filled from the water body.

When a sample is taken at a wastewater facility discharge line, a volume of water equal to at least ten times the volume of the sample discharge line will first be discharged into a bucket or similar container, to clear the line of standing water and possible contamination. Since many wastewater treatment facilities do not have a discharge line faucet, it is acceptable to take the sample from the last effluent chamber, while taking precautions to avoid sample contamination.

B.2.2 Samples types

Samples will be listed as “composite” or “grab” on the Chain-of- Custody or Transmission Form and in field logbook or field data sheets.

Grab Samples – Sample bottles will be filled sequentially, normally being filled to the shoulder of the bottle, leaving a small space for expansion and mixing. Note that some sample types such as volatile organic compounds and fecal coliform bacteria have specific bottle filling requirements. The laboratory will provide sampling instructions with the sample bottles. If necessary, the Water Program staff will consult with the laboratory regarding sampling procedures.

Composite Samples – Samples will be composited directly into the sample bottles and collected sequentially. Between composite aliquots, bottles will be kept in a cooler with ice, to reach and maintain a sample temperature of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The time of the initial portion of the composite, composite intervals, and the final compositing time will be noted in the field logbook or data sheets. The sample time listed on the Chain-of- Custody or Transmission Form and the sample bottle will be the time of the final sample composite portion.

B.2.3 Sample containers and equipment

All sampling equipment and sampling containers must be certified clean by the laboratory providing them, or cleaned according to the manufacturer's equipment specifications or the analytical laboratory. Bottles supplied by a laboratory are pre-cleaned and must never be rinsed, and will be filled only once with sample.

All previously used sampling equipment must be properly decontaminated before sampling and between sampling locations to prevent introduction of cross-contamination. Washwater and rinsate solutions must be collected in appropriate containers and disposed of properly in accordance with federal, state, and local regulations.

Individual sample containers will be placed immediately into a cooler containing ice, to reach and maintain a sample temperature of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. All samples will be collected

and transported to the analytical laboratory with proper sample custody and/or transmission documentation.

Details of the analytical methods, method detection limits, quantification limits (minimum reporting limits), containers, preservation, volumes, and holding times are specified in Table 1, “*Generic QAPP Data Quality Objectives Summary*”. For parameters not listed in this table, see 40 CFR 136.3 for EPA-approved methods, minimum detection levels, etc. 40 CFR 136.3 is available at: <http://www.access.gpo.gov/nara>.

B.2.4 Sampling techniques

Surface Water Samples, Streams -

Because stream waters are usually well mixed vertically, subsurface sampling at a convenient depth is adequate for collection of representative samples at a given point. Subsurface samples are taken within the upper meter or may be a composite of two or more strata. The sampler should take into account thermal stratification due to discharges or tributaries when the sampling plan is being developed.

Lakes, Ponds, Reservoirs-

A sufficient number of stations should be established in random locations to define adequately the parameters of concern. For baseline studies, the deepest part of the lake should be included as one of the stations. Where concentrations of chemical or physical parameters can vary with depth, samples should be collected from all major depth zones, or water masses. In shallow waters (2 to 3 m), samples shall be collected at 0.5 to 1 m. In deeper water, samples should be collected at regular depth intervals.

Ground Water Wells-

Only grab samples may be obtained. The well should be purged of at least three casing volumes of water before sample collection, and the purged well should be allowed sufficient time to equilibrate and fines to settle. If a bailer is used, it should be slowly lowered and raised to minimize disturbances. Samples should be taken as close as possible to the water level, unless analysis indicates that contamination is at a different depth. An equipment blank, a portion of rinsate, should be collected into a separate container and analyzed along with the other groundwater samples. Bailing strings and wires and other disposable sampling tools must be properly disposed of after use at each well. For more information on groundwater monitoring and monitoring wells, see the ADEC SPAR Underground Storage Tank Procedures Manual, Section 4, Nov. 7, 2002 at: <http://www.state.ak.us/dspar/csites>.

B.3 Sample Handling Requirements

B.3.1 Sampling Procedures

The Water Program staff member collecting samples should wear disposable gloves and safety eyewear if needed, and observe precautions while collecting samples, remaining

aware of the potential chemical and biological hazards present. The Water Program staff member collecting samples will take care not to touch the insides of bottles or lids/caps during sampling. Also see Section B.2 of this QAPP – Sampling Method Requirements.

B.3.2 Sample Custody Procedures

Samples will be kept in the custody of the Water Program staff. Chain-of-Custody or Transmission forms will accompany all samples to subcontracted laboratories. Custody seals will be placed on shipping containers if the Water Program staff decides seals are necessary.

B.3.3 Shipping Requirements

Packaging, marking, labeling, and shipping of samples will comply with all regulations promulgated by the U. S. Department of Transportation. Staff should receive the necessary training for shipping samples or consult with the sub-contracted laboratory for shipping instructions.

Holding time limitations will be considered when decisions are made regarding sampling and shipping times.

B.4 Analytical Methods Requirements

Monitoring will be conducted in accordance with EPA-approved analytical procedures and in compliance with 40 CFR Part 136, *Guidelines Establishing Test Procedures for Analysis of Pollutants*. See Table 1 of this generic QAPP for usual compounds of concern, approved analytical methods, method detection limits, minimum reporting limits, and accuracy and precision values applicable to this project. Water Program staff should consult 40 CFR, Part 136.3 for parameters not listed in Table 1. (See webpage previously cited.)

The Water Program will ensure that all equipment and sampling kits used by Water Program staff in the field meet EPA-approved methods. Each office (Fairbanks, Anchorage and Juneau, etc.) where Water Program staff members are involved with collecting, analyzing and transporting or shipping samples, will designate a storage location for sampling equipment and kits used during sampling events. For safety and to avoid contamination, the storage will be in a lockable cabinet.

B.5 Quality Control Requirements

Quality Control measures in the field include but are not limited to:

- Proper cleaning of sample containers and sampling equipment,
- Maintenance, cleaning and calibration of field equipment/ kits per the manufacturer's and/or laboratory's specifications,
- Use of chemical reagents and standard reference materials prior to expiration dates,

- Proper field sample collection and analysis techniques,
- Correct sample labeling and data entry,
- Proper sample handling and shipping or transport techniques,
- One field duplicate per set of 10 samples (minimum of 1).

Quality Control in laboratories includes the following:

- Laboratory instrumentation calibrated with the analytical procedure,
- Laboratory instrumentation maintained in accordance with the instrument manufacturer's specifications, the laboratory's (QMP) and Standard Operating Procedures (SOPs),
- Method Blanks, Matrix spike/matrix spike duplicates, sample duplicates, etc. per the laboratories QMP.
- Laboratory data verification and validation prior to sending data results to ADEC.

Subcontracted laboratories should provide analytical results to the Water Program staff only after verification and validation by the laboratory QA Officer. The laboratory will provide QC information with its summary of data results. If a value is reported and flagged as outside the acceptable laboratory QA/QC range for precision and/or accuracy, the laboratory will explain this anomaly to ADEC.

A Water Program staff member performs the field data verification and validation, and reviews the laboratory reports. The Water Program staff member reviews these data to ensure that the required QA/QC measurement criteria have been met. If a QA or QC concern is identified in the review process, the Water Program staff member may seek additional information from the subcontracted laboratory, and/or may consult with the WQAO and program-specific Water Program Manager.

If relevant to their analyses, subcontracted laboratories will be provided with information about QA/QC problems in the field. Space is usually provided on the Chain-of-Custody or Transmission form for this information.

B.6 Instrument/Equipment Testing, Inspection and Maintenance Requirements

Water Program staff in each office will ensure that instruments and kits are in good working order. Prior to a sampling event, all sampling instruments and equipment will be tested and inspected in accordance with manufacturers' specifications. All standard reference materials and kit chemicals will be inspected to ensure that expiration dates have not been exceeded. For each sampling event, a Water Program staff member will document on the QAPP Checklist (Appendix 1) that required testing, inspection and maintenance have been performed.

Subcontracted laboratories will follow the testing, inspection and maintenance procedures required by EPA-approved methods and as stated in the laboratory's QMP and SOPs.

B.7 Instrument Calibration and Frequency

Field instruments will be calibrated according to the manufacturer's instructions prior to using the instruments. For example, pH meters will be calibrated according to the manufacturer's specifications using pH buffers at 4.0, 10.0 and mid-range. If equipment and/or kits require calibration immediately prior to the sampling event, the calibration dates will be noted on the QAPP Checklist. When field instruments require only periodic calibration, the record of this calibration will be kept with the specific instrument. Water Program staff in each office will ensure that instruments are calibrated correctly.

The laboratory will follow the calibration procedures found in its QMP (on file at ADEC) and the laboratory's Standard Operating Procedures (SOPs). SOPs and calibration records will be made available to ADEC upon request.

B.8 Inspection/Acceptance of Supplies and Consumables

All sample containers, provided by a laboratory, used for this project will be certified clean. The Water Program staff will ensure that containers they use to sample are contaminant-free.

No standard solutions, buffers, or other chemical additives will be used if the expiration date has passed. A space is provided on the QAPP Checklist for this documentation. Water Program staff will keep appropriate records, such as logbook entries or checklists, to verify the inspection/acceptance of supplies and consumables, and restock these supplies and consumables when necessary.

B.9 Data Acquisition Requirements (non-Direct Measurements)

Non-direct measurements include data from previous studies, information gathered about the facility, maps and GPS to determine sampling locations, etc. The Water Program staff will determine when and how previously collected data will be used, and will document the data quality objectives for their use.

B.10 Data Management

For each sampling event, the QAPP Sampling Plan Checklist must be completely filled out (Appendix 1). Field logbooks and data sheets, photos, maps, and GPS location data as well as field sample labels and Chain-of-Custody or Transmission forms will be used as required to document sampling and inspection activities.

Field duplicates will be identified as such only in the QAPP Checklist, field logbook or in field data sheets. For laboratory analyses, field duplicates will be assigned separate unique sample identifier numbers and will be submitted "blind" to the analytical laboratory.

If possible, laboratory data will be transferred electronically to the Water Program staff to reduce transcription errors, to allow for graphing information, and to allow data to be imported into the statewide STORET database system.

Final reports will be developed according to Water Program procedural guidance documents. All reports, including those for potential enforcement cases, will be completed within 2 months of the sampling event date, if possible. Validated laboratory results and interpretation (as applicable) will be appended. Photographs and other supporting data along with the final report will be used to determine permit, certification, authorization or other water quality compliance.

All data generated during this project will be processed, stored, and distributed according to Water Program guidance documents and the laboratory's QMP and SOP documents.

C ASSESSMENT/OVERSIGHT

C.1 Assessment/Oversight

As required by the Water Program Quality Management Plan, an internal assessment of Water Program monitoring activities will be performed annually by the WQAO. The WQAO will accompany the Water Program staff on sampling events and perform audits of field activities and/or laboratory activities on at least 5% of the Water Program monitoring projects. Project assessments and audits may include performance checks using specific blind check standards. Results of such assessments or audits will be reported to Water Program Managers with recommendations for QA/QC improvements. This information will be included in the Annual QA Report to EPA.

EPA performs assessments and audits of Water Program monitoring activities as per the Water Program Quality Management Plan and EPA/ADEC Performance Partnership Agreement.

C.2 Reports to Management

Only data that have been validated and qualified, as necessary, shall be entered into Water Program databases. If, for any reason, the inspection schedules, sampling and analytical procedures specified in this generic QAPP cannot be followed, the Water Program staff will describe these departures along with any QA/QC corrective actions in the QAPP Sampling Plan Checklist and relay this information to the WQAO for resolution. Database entries will be flagged as appropriate if they are outside QA/QC acceptable ranges. If necessary, the final report will discuss any QA/QC issues raised during the project, as well as QA/QC resolution of these issues.

D DATA VALIDATION AND USABILITY

D.1 Data Review, Verification and Validation Requirements

The criteria for data validation will follow those specified in this QAPP or as specified in the EPA-approved methods. An in-depth data review audit may be performed using the EPA QA/G-8, *Guidance on Environmental Data Verification and Data Validation*, June 2001. See <http://www.epa.gov/quality>. This data review and audit may be internal or external to the Water Program.

D.2 Verification and Validation Methods

D.2.1 Verification

The primary goal of verification is to document that applicable method, procedural and contractual requirements were met in field sampling and laboratory analysis. Verification checks to see if the data were complete, if sampling and analysis matched QAPP requirements, and if Standard Operating Procedures (SOPs) were followed.

Verification of data compiled for a sampling event is the responsibility of the Water Program staff. The WQAO will verify at least 5% of the data generated within the Water Program each year.

D.2.2 Validation

Data validation determines whether the data sets meet the requirements of the project-specific intended use as described in the QAPP. That is, were the data results of the right type, quality, and quantity to support their intended use? Data validation also attempts to give reasons for sampling and analysis anomalies, and the effect that these anomalies have on the overall value of the data.

All data generated will be validated in accordance with the QA/QC requirements specified in the methods and the technical specifications outlined in this QAPP. Raw field data will be maintained by the Water Program staff who collected it. Raw laboratory data will be maintained by the laboratory. The laboratory may archive the analytical data into their laboratory data management system. All data will be kept a minimum of 3 years.

The summary of all laboratory analytical results will be reported to the Water Program staff. Data validation will be performed by the laboratory for all analyses prior to the release of data. All data will be validated according to the laboratory's QMP and SOPs. The rationale for any anomalies in the QA/QC of the laboratory data will be provided to the Water Program staff with the data results. Completed Chain-of-Custody or Transmission forms will be sent back from the laboratory to the Water Program staff.

Data will be qualified as necessary. Sampling may need to be repeated. Unacceptable data (i.e., data that do not meet the QA measurement criteria of precision, accuracy, representativeness, comparability and completeness) will not be used or if used, the problems with the data will be clearly noted in the final report. Any actions taken to correct QA/QC problems in sampling, sample handling, and analysis will be noted. The Water Program staff will keep the record of any QA/QC issues and QA/QC corrective actions taken in the space provided in the QAPP Sampling Plan Checklist.

The Water Program staff is responsible for reviewing field log notebooks and field data sheets for accuracy and completeness within 48 hours of each inspection, if possible. Water Program staff will calculate the Relative Percent Difference (RPD) between field duplicate samples to determine if QA/QC objectives for field precision have been met.

Sample results provided to the Water Program staff by the laboratory, after these data have been verified and validated by the laboratory QA Officer, will become part of the permanent file for each facility or project. Water Program staff will compare the sample information in the field log notebooks and/or data field sheets with the laboratory analytical results to ensure that no transcription errors have occurred, and to check the Relative Percent Difference (RPD) between duplicate samples sent "blind" to the laboratory.

Laboratories calculate and report the RPD of analytical duplicate samples and MS/MSD samples and report this information to ADEC in the QC data sheets which accompany the data results.

RPD's greater than the project requirements will be noted. Water Program staff, along with Water Program Managers and/or the WQAO if necessary, will decide if any QA/QC corrective action will be taken if the RPDs exceed project's goals. If evidence of QA/QC non-compliance is observed with the data, additional sampling and analysis may be required.

D.3 Reconciliation and User Requirements

All data and related information obtained during the course of a project, such as the final report, data report package or inspection report, will be filed in the permanent facility or project file.

The Water Program staff will check the original DQOs against the information obtained and determine if the DQOs meet the original intent. If there are discrepancies, these will be addressed before the next sampling event.

E Glossary of Terms

Blind Sample – A sample submitted for analysis whose composition is known to the submitter but unknown to the analyst. A blind sample is one way to test proficiency of a measurement process.

Detection Limit - The smallest concentration/amount of some component of interest that can be measured by a single measurement with a stated level of confidence.

Duplicate Samples - Two samples taken at the same time from one location. Field duplicates are a measure of the precision of field sampling.

Equipment Blank – This blank is a sample of the contaminant-free media used to rinse sampling equipment. It must be completed after the completion of decontamination procedures and before sampling. Equipment blanks are not needed if disposable bailers are used for each sample taken. An equipment blank is used to determine if contamination occurred from sampling equipment such as pumps and bailers and checks to make sure equipment decontamination procedures have been effective.

Quality Assurance - a system of management activities to ensure that a process, item or service is of the type and quality needed by the user.

Quality Assurance Project Plan (QAPP) – a plan which integrates all technical and quality aspects of a project, including planning, implementation and assessment. The QAPP documents how quality assurance and quality control are applied to an environmental data operation to assure that the results obtained are of the type and quality needed and expected.

Quality Control –all the scientific precautions, such as calibrations and duplications, that are needed to acquire data of known and adequate quality.

Quality Management Plan - A plan which documents how an organization structures its quality system and describes its quality policies and procedures, criteria for and areas of application, and roles, responsibilities. It also describes an organization's policies and procedures for implementing and assessing the effectiveness of the quality system.

Sample – A *sample* is a portion of a population taken from one place at one time even if collected for several analyses.

Sampling Event - A sampling event is defined as the suite of samples taken at the same time and place for the same purpose.

Standard – A substance or material with properties believed to be known with sufficient accuracy to permit its use to evaluate the same property of another. In chemical measurements, it often describes a solution or substance commonly prepared by the analyst to establish a calibration curve or the analytical response function of an instrument.

Standard Operating Procedure (SOP) – A detailed written description of a procedure designed to systematize the performance of the procedure.

Laboratory Quality Control Samples –Laboratory Quality Control (QC) samples typically accompany the field samples during laboratory preparation and analysis. The number of laboratory QC samples is dependent of the Standard Operating Procedures of the method used.

- **Method Blank** - A sample of clean water that is spiked with surrogate compounds, extracted and fractionated along with the analytical batch of samples.
- **Matrix Spike or Matrix Spike Duplicate** – An actual sample that is spiked with a known amount of analyte. This sample can give valuable information about the behavior of analytes in this sample and may be extrapolated to other samples from the same area.
- **Laboratory Control or Laboratory Control Duplicate (LCS/LCSD) samples** are used to determine precision and accuracy of the analytical results through the percent recovery and relative percent difference. Quantities of stock solutions of the target contaminant(s) are added to laboratory matrix before it is extracted/digested and analyzed.

Generic QAPP
 Water Program Staff Sampling & Analysis Activities
 April 16, 2003, Revision 1.0

Table 1: generic QAPP Data Quality Objectives Summary

Parameter	EPA-Approved Method	Method Detection Limit	Minimum Reporting Limit (mg/L)	Accuracy (% Rec.)	Precision (RPD)	Completeness	Preservation	Volume	Container	Holding Time
Bacteria, (total fecal coliform)	SM9221 or 9222	1 FC/100 ml	1 FC/100 ml	NA	NA	85-100 %	Na ₂ S ₂ O ₃ ^a 4° C	100 ml	Sterile plastic	6 Hours
Biological Oxygen Demand (BOD ₅)	EPA405.1 or SM5210B	2 mg/L	2 mg/L	80-120	<30%	85-100 %	4° C	1 L	Plastic	48 Hours
Chemical Oxygen Demand (COD)	EPA 410 or SM 5220	Lab control chart	5 mg/L	85-115	<20%	85-100 %	Analyze immediately or add H ₂ SO ₄ to pH <2	125 ml	Plastic	28 days
Chlorine, Total residual	EPA330.1 – 330.5 or SM4500	0.1 mg/L ^b	0.1 mg/L ^b	NA	<30%	85-100 %	N/A	NA	NA	Do in the field
Dissolved Oxygen	EPA 360.2 or SM4500	0.05 mg/L	0.05 mg/L	85-115%	<30%	85 – 100 %	N/A	300 ml	Plastic	Do in the field
Total Nitrogen (ammonia, nitrate, nitrite, TKN)	SM 4500 or EPA 350 series	0.06 mg/L	0.06 mg/L	70-130	<30%	85-100 %	Analyze immediately or add H ₂ SO ₄ to pH <2 Cool to 4°C	500 ml	Plastic or Glass	28 days
pH	EPA150.1	0.1 standard units	0.1 standard units	0.1 pH units	0.1 pH units	85 – 100%	N/A	NA	NA	Do in the field
Total Phosphate or o-Phosphate	EPA 365 series or SM 4500	0.01 mg/L	0.01 mg/L	70-130%	<30%	85 –100%	Analyze immediately or filter and add H ₂ SO ₄ to pH <2 Cool to 4°C	100 ml	Plastic or Glass	48 hours

Generic QAPP
Water Program Staff Sampling & Analysis Activities
April 16, 2003, Revision 1.0

Parameter	EPA-Approved Method	Method Detection Limit	Minimum Reporting Limit (mg/L)	Accuracy (% Rec.)	Precision (RPD)	Completeness	Preservation	Volume	Container	Holding Time
Specific Conductance	EPA120.1 or SM2510B	0.07 uS/cm	0.07 uS/cm	85-115%	10%	85-100%	N/A	N/A	Plastic, glass	Do in the field
Total Organic Carbon	EPA 415.1 or SM 5310	1 mg/L	1 mg/L	85-115%	<20%	85-100%	Cool to 4°C, add HCl, H ₂ SO ₄ or H ₃ PO ₄ to <pH2	125 ml	Amber Glass	28 days
Turbidity	EPA180.1 or SM2130B	0.1 NTUs	0.1 NTUs	85-115%	<20%	85-100%	Cool to 4°C	100 ml	Plastic or Glass	48 h. or do in the field
Temperature ° C	EPA170.1 or SM2550B	0.1°C	0.1°C	90-110%	<10	85-100%	N/A	N/A	N/A	Analyze in field
Total Suspended Solids	EPA160 series or SM2540	0.2 mg/L	4 mg/L	85 – 115	<20%	85-100%	Cool 4° C	1 L	Plastic or glass	7 days
Total Settleable Solids	EPA 160.5 or SM 2540	0.2 ml/L/hr	0.2 ml/L/hr	85 – 115	<20%	85-100%	Cool 4° C	1 L	imhoff cone	analyze as soon as possible
Total Recoverable Metals	EPA 200 series or SM 3100 series	see specific metal	see specific metal	see specific metal	<20%	85-100%	Add HNO ₃ to <pH 2 except for Hg and Cr VI	100 ml	Plastic	28 days
Volatile Organic Compounds (VOCs)	SM 8260B or 6400	see specific VOC	see specific VOC	see specific VOC	<20%	85-100%	Na ₂ S ₂ O ₃ to pH <2	40 ml	special 40 ml glass vial	14 days

EPA = *Methods for Chemical Analysis of Water and Wastes*, Environmental Protection Agency, Environmental Monitoring Systems Laboratory – Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1979 and 1983 where applicable.

SM = Standard Methods for the Analysis of Water and Wastewater, 19th Edition, 1995, APHA/AWWA/WEF.

SW 486 = 40 CFR 503.8

a = Should only be used in the presence of residual Chlorine, b = AWQS (18 AAC 70) is 0.002 mg/L, but the detection limit for monitoring purposes is 0.1 mg/L