Susitna-Watana Hydroelectric Project Document
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Notes: *Attachment 2:* Guidance document for writing a Tier 2 Water Quality Monitoring Quality Assurance Project Plan (QAPP). -- Draft, Rev. 0.	

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DEPARTMENT OF NATURAL RESOURCES

OFFICE OF PROJECT MANAGEMENT AND PERMITTING

17 January 2013

Ms. Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street
Washington D.C. 20426

Subject: **Comments on Revised Study Plan for Susitna-Watana Hydroelectric Project, FERC No. 14241**

Dear Ms. Bose:

Following please find consolidated comments from the Alaska Resource Agencies on the Revised Study Plan for the Susitna-Watana Hydroelectric Project (Project No. 14241).

The State of Alaska is committed to working with AEA and other stakeholders through out the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP). As such, the State's agency staff is available to work collaboratively with FERC, the Project Proponent, and other agencies and stakeholders in achieving quick resolution to any remaining identified information needs prior to this season's fieldwork. Please do not hesitate to contact my office if I can be of service in facilitating resolution on any outstanding issues prior to this field season.

The state remains a strong proponent of timely decision-making and looks forward to working collaboratively with FERC and all stakeholders through this process, as well as any subsequent permitting of the proposed project.

Sincerely,

Tom Crafford, Director
Office of Project Management and Permitting

cc:

Daniel Sullivan, Commissioner, Department of Natural Resources
Cora Campbell, Commissioner, Department of Fish and Game
Larry Hartig, Commissioner, Department of Environmental Conservation
Ed Fogels, Deputy Commissioner, Department of Natural Resources
Joseph Balash, Deputy Commissioner, Department of Natural Resources
Kelly Hepler, Special Projects Coordinator, Department of Fish and Game

The Alaska Departments of Environmental Conservation (ADEC) and Fish and Game (ADFG) provide the following comments on the Revised Study Plan (RSP) for the Susitna-Watana Hydroelectric Project (FERC No. 14241).

I. ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

The Baseline Water Quality Monitoring Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) for the Susitna Hydro Project provided for review would not be acceptable for approval by ADEC at this time. Attached please find ADEC's Quality Assurance Plan Review Checklist with specific comments indicating which elements require revisions before the Baseline Water Quality Monitoring Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) for the Susitna Hydro Project can be considered for approval by the ADEC Division of Water (DOW). A draft guidance document for writing a Tier 2 Water Quality Monitoring Quality Assurance Project Plan (QAPP) is also attached to provide guidance to the project proponent for submitting the SAP/QAPP to ADEC.

A sample of the additional information needed for ADEC approval of the QAPP is summarized below. Please refer to the attached QAPP Review Checklist for the Susitna Hydro Project Baseline WQ Monitoring Sampling and Analysis Plan QAPP for the complete list of comments providing details and further guidance.

QA Management

It is important to note the submitted QAPP is not clear as to which single individual is ultimately responsible for the QAPP. The information as presented does not clearly characterize responsibilities of project personnel; it also appears QA management is not independent from project management. QA management should be completely independent from project management in order to maintain the integrity of the process. Clear lines of management authority must be defined, including: 1) line of management authority, 2) line of data reporting responsibility (this includes relevant sampling and/or lab contractors/sub contractors), and 3) independent line of quality assurance authority. See example in attached *"Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.4."*

Data Management Process

Since this is a complex project with multiple individuals responsible for various components, it is also critical that the data management process be described in sufficient detail to ensure all responsible individuals are fully knowledgeable of their individual duties and responsibilities and how they integrate with the overall project data management scheme. The QAPP needs to characterize in detail the project's data management process tracing the path of the data from generation to their final use or storage [e.g., from field measurements and sample collection/recording through transfer of data to computers (laptops, data acquisition systems, etc.), laboratory analysis, data validation/verification, QA assessments and reporting of data of known

quality to the respective ADEC Division of Water Program Office]. Additionally, data management must also discuss the control mechanisms for detecting and correcting errors.

Data Acquisition

The QAPP is missing strong justification for the proposed very limited temporal data set of analytes to be measured in various sample matrices (water, groundwater, soil/sediment and fish tissue). The QAPP should provide clear rational for monitoring project design and the assumptions used to develop the design. Please provide sufficient justification that the data set is adequate to reliably characterize the Susitna drainage for development of a model for damn construction and post damn construction impacts.

Site Selection

Site selection rationale is generally addressed but better clarity is needed in characterizing the specific rationale for each type sample matrix/analyte. Table format would be easier to follow than a narrative description of sites, analytes and sample matrixes to be measured.

Sample Frequency

Sample frequency is also addressed but is unclear how many total samples are planned, besides stating "monthly, each sampling event, one survey-summer," etc. This is confusing as it does not identify the number of samples scheduled for collection per site/analyte and whether the number of planned samples is adequate to characterize the watershed sufficient for reliable model development. Please revise accordingly before submitting the QAPP for approval.

Criteria for Measurement

The QAPP should state and characterize the Measurement Quality Objectives (MQOs) as to applicable action levels or criteria for each parameter measured (precision, bias, comparability, detectability (mdl and pql) and data completeness) and provide appropriate definition and algorithms for each. Some project MQOs are missing or are not adequately defined as well as the applicable most restrictive AWQS for each analyte/sample matrix.

Include measurement method (note, must be EPA CWA approved for water/wastewater work for all water quality methods, unless the applicable drinking water method has the more restrictive AWQS than the applicable water/wastewater AWQS. Some of the methods are specified in the QAPP's section of Quality Control; however a number of the proposed methods are not acceptable for water/wastewater analysis under the EPA CWA and ADEC AWQS regulations. Examples of proposed methods that would not be acceptable are given below; please refer to the attached QAPP Review Checklist for more detailed comments and guidance.

- Proposed Metal Analytcial methods 6010B and 6020A are not acceptable EPA CWA water wastewater work. Select only EPA CWA water/wastewater methods of analysis with adequate sensitivity.

- Fecal coliform method EPA 1604 is DW approved but not EPA CWA approved for water/wastewater. Clarify what is the applicable method and for what compliance purpose.
- Mercury in water – method 7470A not acceptable for EPA CWA water/wastewater analysis
- Missing specific analysis methods for DO, pH, temperature, turbidity, redox potential, color, residues. Provide specific EPA CWA approved method of analysis for each of these parameters
- Radionuclides – specify what method is for what specific radionuclide.

Before submitting the QAPP to ADEC for approval, it is recommended a review all the proposed methods of analysis selection is completed to ensure the methods are appropriate methods of analysis for the applicable sample matrix and adequate measurement sensitivity. Ensure the appropriate precision and accuracy acceptance criteria are specified.

Additionally no specific numeric regulatory or guidance standards are specified for each pollutant and sample matrix for which sample results will be compared against to assess compliance with or with which to assess future measurement results against during and/or after post damn construction. These must be specified for all analytes/sample matrices.

Please clarify that Project Precision is to be assessed via replicate sample measurements, not sample duplicate measurements and revise precision acceptance criteria limits as applicable.

Historical Data/Nondirect Measurements

The QAPP mentions it will be using some USGS data from stations along the Susitna drainage. QAPP needs to define how it will assess the reliability of this data for use in the project.

It appears that some historical data may be used for qualitative assessment only. The terms and conditions of how, when, where and why must be defined if data is to be used, especially if data is of unknown or questionable reliability.

The issue of historical data and how reliable the data is needs to be adequately addressed. Section 2.0 of the QAPP provides an overview of the project and mentions that large amounts of data were collected in the 1980s as well as availability of other data (USGS, etc) data that will/may be used to augment proposed project monitoring data to develop a model. However, no summary data is provided in the QAPP. The QAPP states, "*A comprehensive data set for the Susitna and tributaries is not available."* It would appear critical that if historical data is intended to be used that development of a comprehensive data set be a key component of this QAPP as well as a critical data quality assessment on the reliability of the historical data for use in the project's goals.

Assessments and Oversight

Frequency and occurrence of all assessments must be specified in the QAPP. Responsibility for scheduling and conducting audits, issuing report findings and monitoring corrective actions lies with Project QA Officer (QAO). The Project QAO must have sole responsibility for all

assessments performed. The TT Technical lead may neither perform audits nor direct audits. QAO must be completely independent from direct management of project monitoring operations and the TT Technical Lead and TT PM. The Project QAO may delegate specific QA duties to other staff, however such staff work only under his/her direction. Please revise the QAPP accordingly.

The QAPP mentions audits but provides no specifics. This section must identify assessment types, frequency and acceptance criteria. Please refer to the attached QAPP Review Checklist for assessment requirements.

Additional Comments

Please refer to the attached QAPP Review Checklist for the Susitna Hydro Project Baseline WQ Monitoring Sampling and Analysis Plan QAPP for the complete list of ADEC comments providing details and further guidance.

II. ALASKA DEPARTMENT OF FISH AND GAME

The Alaska Department of Fish and Game's (ADF&G) reviewed the Revised Study Plan (RSP) provided by the Alaska Energy Authority (AEA) on December 18, 2012. On December 31, 2012, the Federal Energy Regulatory Commission (FERC) stated that 13 of the 58 RSPs needed additional information and issued a modified schedule for completing the requested information.

The following comments are submitted on all the RSPs pertinent to the mandate of ADF&G. We look forward to reviewing the additional information on the 13 RSP's when available.

7.6 Ice Processes in the Susitna River Study

Overall, we agree with the general approach.

7.6.4.7. The study indicates "The model will also predict ice cover stability, including potential for jamming, under load-following fluctuations." It is not clear if the results will describe the depth of ice under project operations compared to baseline conditions or the potential to induce ice scour (and where) under load-following fluctuations. These effects may have profound impacts on available fish habitat and successful incubation.

From the study description, it appears the model will primarily predict physical conditions (e.g. ice decay, ice cover formation, potential for break up jams) which may indirectly provide information on potential impacts to fish and aquatic resources but may lack a direct causal relationship. For example, how will winter load-following fluctuations impact burbot which have fairly specific winter spawning and over-wintering habitat needs?

8.5. Fish and Aquatics Instream Flow Study

8.5.1.2. Sufficient time and discussion should be planned to select study areas and sampling procedures with the Technical Working Groups (TWG) due to the large study areas, number of affected resources and variety of sampling methods to be evaluated.

In addition to water velocity within study areas subdivisions over a range of flows during seasonal conditions metric, we also recommend water depths for the same areas of information.

The Decision Support System-type framework that is proposed to conduct a variety of post-processing comparative analyses should also include information/ linkages to other pertinent ecological data, such as water temperatures and turbidity. This would enable comparison of different project operation scenarios to baseline conditions.

8.5.2.1. This section provides a good summary of existing instream flow, fish habitat, and aquatic resource information for the Susitna River basin.

8.5.4.1. While Stalnaker (1995) is an excellent resource on instream flow assessments, it is a primer that provides an introduction to the science. A more thorough report that would be better applicable as a reference guide would be Bovee et al. (1998) "Stream Habitat Analysis Using the Instream Flow Incremental Methodology" USGS/BRD Information and Technology Report-1998-0004.

It will be important for the Instream Flow System (IFS) framework to have the ability to compile information for both cumulative evaluations as well as provide for independent habitat-specific evaluations (e.g. for a specific location, target species, etc.).

8.5.4.2.1.2. We support the selection of and location of the ten intensive study areas also called focus areas for the evaluation of multiple resource disciplines, with the intent to further evaluated for appropriateness based on results of the habitat mapping. We also support the selection of additional transects outside of the focus areas for evaluation flow-habitat response characteristics.

8.5.4.4.1.1. We concur with proposed methods and techniques following accepted USGS guidelines including the use of a Standard Operating Procedure (SOP) to provide uniform survey methods across all controls, maintenance of USGS local datum offsets to enable incorporation of USGS gage data, and stream discharge measurements.

8.5.4.5.1.1. We support the use of site-specific habitat suitability criteria (HSC) collected for identified target species and life stages. We encourage discussion on appropriate sample sizes, contingencies, and other factors important to criteria development. Bootstrap analysis should be used in situations with a confidence that the sample is representative of the true population. One measure of these criteria is whether samples collected are representative of habitats across the surveyed area.

8.5.4.5.1.2. A summary of the pilot 2012-2013 winter habitat sampling results and recommendations for future winter sampling methods is needed for review and discussion of future winter habitat sampling methods.

Further discussion is needed on the stranding and trapping study and analyses to clarify procedures and expected results. We support the general approach but we are not clear on how the referenced equation would be used to analyze affected resources.

We agree with the approach to develop fish species periodicity table. After completion of the field studies it is likely new information on fish species and life stages timing will learned that will needed to be incorporated into the tables prior to final analyses.

8.5.4.7.1.2. We support the spatial analysis approach outlined as a starting point. Further discussion will be needed on the details and how the data from multi-thread channels will be compiled and aggregated.

8.5.4.7.1.3. Sensitivity analysis of the habitat modeling efforts will be a key to understanding habitat response parameters and uncertainty and we support a thorough analysis. We look forward to working cooperatively on the development of a Decision Support System.

9.5 Study of Fish Distribution and Abundance in the Upper Susitna River

In general, additional details regarding statistical design and analytical methods would strengthen this study plan and enhance the ability to review and provide high-quality feedback. Plans should identify the specific questions driving each main objective and detail how and to what level of accuracy and precision these investigations are expected to inform questions of fish periodicity, distribution, and abundance. Lacking the details of how field data will be reviewed and analyzed, it is difficult to have confidence that the final results will provide reliable information. Adequately detailed study plans will increase the likelihood that data collected will provide robust information to predict potential project impacts and understand baseline conditions.

9.5.4.3.1 Objective 1: Fish Distribution, Relative Abundance, and Habitat Associations, Page 9-12

How will relative abundance data be used (what usable information will it provide above presence/absence)? Given the current sampling scheme, how will the extent of variability in CPUE be assessed in order to determine the effort required to detect differences in relative abundance by species, habitat, season, etc.? At what precision are differences in relative abundance between sites, habitats, and species and life stages likely to be detectable?

9.5.4.3.1 Task B: Relative Abundance, Page 9-13

Capture efficiency varies by species/life stage, habitat and gear type. Comparisons of CPUE between gear types will not provide reliable information. Collecting CPUE using multiple gear types will make comparisons between habitat types (or species, sites or life stages) unrealistic, if each habitat type (or other factor) is sampled with different gear.

If relative abundance efforts are unlikely to provide robust information, perhaps resources should be reallocated to increase radio tagging efforts, which are likely to result in high quality information.

9.5.4.3.1 Task C: Fish-Habitat Associations, Page 9-13

What statistical methods are proposed for the "… *analysis of fish presence, distribution, and density by mesohabitat type by season*." Will the current sampling scheme provide adequate sample sizes for meaningful comparisons, appropriate statistical power and accurate results?

9.5.4.3.2 Task B: Describe seasonal movements using biotelemetry, Page 9-14

"…*Up to 30 radio transmitters will be implanted in selected species*…" Please clarify if this is 30 per species or 30 total.

ADF&G suggests directing as much efforts as possible towards radio tagging efforts as they are likely to provide more usable information on fish habitat use than PIT tagging and relative abundance estimates

9.5.4.3.2 Task C: Describe juvenile Chinook salmon movements, Page 9-14

"…*All juvenile Chinook salmon of taggable size need to be tagged to obtain sufficient sample size*." What is the sample size goal? For what analytical method? Are there alternative analytical methods if sample size goals are not met?

9.5.4.4.5 Trot Lines, Page 9-17 states:

"Trot lines are typically… with a multitude of baited hooks… anchored at both ends."

Trotlines are lethal. Hoop traps are a preferable method of fish capture where they can be used effectively. For clarification and details on trotline methods, please visit ADF&G's website at: http://www.adfg.alaska.gov/index.cfm?adfg=anglereducation.burbot

9.5.4.4.6 Snorkel Surveys, Page 9-18

The use of snorkel surveys to develop accurate, reliable calibration factors for comparison between capture methods is likely to require large sample sizes and long term datasets. How will meaningful calibration factors be developed in this study?

9.5.4.4.7 Fyke/Hoop Nets, Page 9-18

3-4 foot diameter fyke nets are routinely used for juvenile salmon, even in small tributaries. One-foot diameter seems small.

9.5.4.4.10 Out-Migrant Trap, Page 9-19

Why 48 hours on, 72 hours off? What are the information and sample size goals for out-migrant capture? Is this to be used for timing of out-migration only or will abundance estimates be generated as well (mark/recapture)? Might attendance of the trap be altered as the out-migration progresses in order to maximize sampling during peak out-migration?

9.5.4.4.11 Fish Handling, Page 9-20

This section states that five fish per species/age class per sampling site will be sampled for stomach contents, and refers readers to 9.8.4.7 for details. 9.8.4.7 contains no information. 9.8.4.11, Page 9-120 in the river productivity plan states that a total of eight fish per species/age class will be sampled for stomach contents. Will stomach contents be sampled in five fish per species/age class in each of the 18 river productivity sites (144 total stomachs per species/age class)? Or five fish per species/age class in each of 27 fish distribution sites (135 total stomachs per species/age class). Clarification is needed.

9.5.4.4.12 Remote Fish Telemetry, Page 9-22

Suggest the use of long-life tags where possible, in order to maximize information return per tag.

9.6 Study of Fish Distribution and Abundance in the Middle and Lower Susitna River

In general, additional details regarding statistical design and analytical methods would strengthen this study plan and enhance the ability to review and provide high-quality feedback. Plans should identify the specific questions driving each main objective and detail how and to what level of accuracy and precision these investigations are expected to inform questions of fish periodicity, distribution, and abundance. Lacking the details of how field data will be reviewed and analyzed, it is difficult to have confidence that the final results will provide reliable information. Adequately detailed study plans will increase the likelihood that data collected will provide robust information to predict potential project impacts and understand baseline conditions.

9.6.1 Study Goals and Objectives 1), Page 9-39

How will relative abundance data be used (what usable information will it provide above presence/absence)? Given the current sampling scheme, how will the extent of variability in CPUE be assessed in order to determine the effort required to detect differences in relative abundance by species, habitat, season, etc.? At what precision are differences in relative abundance between sites, habitats, species and life stages likely to be detectable?

9.6.4.3.1 Task B: Relative Abundance, Page 9-45

Capture efficiency varies by species/ life stage, habitat and gear type. Comparisons of CPUE between gear types will not provide reliable information. Collecting CPUE using multiple gear types will make comparisons between habitat types (or species, sites or life stages) unrealistic, if each habitat type (or other factor) is sampled with different gear.

If relative abundance efforts are unlikely to provide robust information, perhaps resources should be reallocated to increase radio tagging efforts, which are likely to result in high quality information.

9.6.4.3.1 Task C: Fish Habitat Associations, Page 9-46

What statistical methods are proposed for the "… *analysis of fish presence, distribution, and density by mesohabitat type by season*." Will the current sampling scheme provide adequate sample sizes for meaningful comparisons, appropriate statistical power and accurate results?

9.6.4.3.2 Task B: Describe seasonal movements using biotelemetry, Page 9-46 & 47

This section indicates that up to 1,000 PIT tags per species will deployed (8 resident spp + 3-5 salmon spp. = 11,000-13,000 tags total). How were tagging goals developed?

ADF&G suggests directing as much efforts as possible towards radio tagging efforts as they are likely to provide more usable information on fish habitat use than PIT tagging and relative abundance estimates.

9.6.4.3.3 Task C: Determine juvenile salmonid diurnal behavior by season. Page 9-47

Working in open leads is likely to be much more dangerous than working through holes drilled in stable ice. Extreme caution should be used when planning for any work in open leads.

9.6.4.3.4 Objective 4: Document Winter Movements and Timing and Location of Spawning for Burbot, Humpback Whitefish, and Round Whitefish, Page 9-48

How many fish per species per site will be targeted for capture to determine gonadal development?

9.6.4.4.4 Trot Lines, Page 9-51

Trotlines are lethal. Hoop traps are a preferable method of fish capture where they can be used effectively. For clarification and details on trotline methods, please visit ADF&G's website at: http://www.adfg.alaska.gov/index.cfm?adfg=anglereducation.burbot

9.6.4.4.6 Snorkel Surveys, Page 9-52

The use of snorkel surveys to develop accurate, reliable calibration factors for comparison between capture methods is likely to require large sample sizes and long term datasets. How will meaningful calibration factors be developed in this study?

9.6.4.4.7 Fyke/Hoop Nets, Page 9-52

3-4 foot diameter fyke nets are routinely used for juvenile salmon, even in small tributaries. One-foot diameter seems small.

9.6.4.4.10 Out-Migrant Traps, Page 9-53

Why 48 hours on, 72 hours off? What are the information and sample size goals for out-migrant capture? Is this to be used for timing of out-migration only or will abundance estimates be generated as well (mark/recapture)? Might attendance of the trap be altered as the out-migration progresses?

9.6.4.4.14 Fish Handling, Page 9-58

This section states that five fish per species/age class per sampling site will be sampled for stomach contents. Section 9.8.4.11, Page 9-120 in the river productivity plan states that a total of eight fish per species/age class will be sampled for stomach contents. Will stomach contents be sampled in five fish per species/age class in each of the 18 river productivity sites (144 total stomachs per species/age class)? Or five fish per species/age class in each of 27 fish distribution sites (135 total stomachs per species/age class). Clarification is needed.

9.6.4.5 Minnow Traps, Page 9-61

Species/age classes targeted by minnow trapping are likely to occupy different habitats than those targeted by trot lines. Co-locating minnow traps and trot lines in the same hole is likely to be less effective than locating each method separately in targeted locations.

9.7 Salmon Escapement Study

9.7.4.1 Fish Capture, Page 9-86

Removing fishwheels at Curry in early September likely misses a substantial portion of the coho and chum runs. Should consider operating fishwheels through September.

9.7.4.1.1 Fish Capture, Page 9-87

Regarding the newly planned fishwheel(s) to be located in Devils Canyon (RM150-151). What are the tagging and other goals at this location? Are the tagging goals listed for all middle river fishwheels (Curry + Devils Canyon) combined?

What hours will fishwheels be operated daily?

9.7.4.2.6 Boat and Ground Surveys, Page 9-95

What is the purpose for obtaining 2 meter resolution for locations of individual salmon "suspected" to be spawning?

9.7.4.4 Objective 4: Use available technology to document salmon spawning locations in turbid water in 2013 and 2014, Page 9-96

How will net sampling salmon to determine the degree of sexual maturation reduce confusion between holding sites and spawning locations? Holding salmon could still be ripe. Is pumping eggs from gravel to confirm spawning necessary? If so, why? Is it worth disturbing spawning salmon, potentially influencing the outcome of their spawning, to obtain this information?

9.8 River Productivity Study

9.8.4.3 Benthic Macroinvertebrate Sampling, Page 9-112

How were the number of replicates and total sample size (5 reps x 18 sites) determined and at what level are differences over time within and among sites likely to be detectable?

9.8.4.7 Conduct a trophic analysis, using trophic modeling and stable isotope analysis to describe the food web relationships in the current riverine community within the middle and upper Susitna River, Page 9-116

This section is missing.

9.8.4.11 Characterize the invertebrate compositions in the diets of representative fish species in relationship to their source, Page 9-119 & 120

Clarification on sampling strategy for stomach contents is needed (see comments above). Additionally, methods for obtaining and preserving stomach contents are not described, but will likely determine the attainable level of taxonomic resolution for prey items.

9.9 Characterization and Mapping of Aquatic Habitats

In general, we agree with the approach but would like to further discuss some details on the protocols. For example, it is not clear how runs would be identified compared to a riffle or a glide. What is the definition for the active channel surface?

Regarding the following statement: *"In addition, Susitna River mean daily discharge will be obtained from the nearest downstream USGS stream gauge and entered onto each day's survey forms."* We recommend inclusion of the Susitna River mean daily discharge at the Gold Creek streamgage to provide a means for comparison across different sampling areas and days.

For tier data collection classification protocol, due to the description of a Tier I and III but no description of Tier II, we are unclear whether there are 2 or 3 categories. How will it be determined whether a site will be selected for a Tier I versus a Tier III? Will Tier I data also be collected under the Tier III approach? If not, further discussion on these protocols will be needed; for example, gradient was not included in the Tier III protocol and we recommend that it be included.

It is also unclear what is meant is by the following description "To check the general replicability of the habitat type identification, an independent reviewer conducted video mapping of randomly selected ground-verified segments representing 20 percent or more of three PHABSIM reaches." Also, we were not aware that PHABSIM reaches have been identified.

9.11 Study of Fish Passage Feasibility at Watana Dam

9.11.4 Task 4: Develop Concepts, Page 9-188

Explain "fatal flaw analysis" and list the "basic criteria" for fish passage concepts.

10.5. Moose Distribution, Abundance, Productivity, and Survival

10.5.4. Study Methods

Continuous amendments of the study plan as this project was underway resulted in inconsistent wording and errors in tense (i.e. planned future work vs. actual completed work). Although awkward, these errors are not considered to be significant.

As the principle investigator for this project, DWC has found it necessary to modify the methods as follows:

- Page 10-7: *"aerial surveys will be conducted weekly"* – Please correct. Surveys will be conducted every two weeks during this time as shown in Table 10.5-1. Strike "weekly" and replace it with "every two weeks".
- Page 10-10: *"daily monitoring during calving (May 15-31) each year"* Strike the dates May 15-31. We are still working on determining specific dates of peak calving.

10.17 Population Ecology of Willow Ptarmigan in Game Management Unit 13

10.17.4. Study Methods

As the principle investigator for this project, DWC has found it necessary to modify the methods as follows:

- Page 10-146: Use 4-6 capture sites versus the 3 mentioned in the first paragraph of this section.
- Page 10-147: Will not use mist nets to capture ptarmigan. Will use the Coda net gun as listed in addition to noose carpets.
- Page 10-147 Strike the sentence that reads: "Radios will transmit in the frequency range of 148.000 Mhz." As it turns out, ADF&G will be using a different frequency range. But since the Department is statutorily required to keep telemetry radio frequencies of monitored species confidential, simply striking the entire sentence is preferred.

14.5.4.4 Subsistence Mapping

RSP Section 14.5.4.4 lists eight communities to be included in subsistence mapping efforts: Cantwell, Chase, Healy, Talkeetna, Lake Louise, McKinley Park, Trapper Creek, and Petersville. However, as a component of the baseline subsistence harvest survey ADF&G Division of Subsistence will map one year of subsistence activities in the communities of Cantwell, Chase, Chitna, Gakona, Kenny Lake, McCarthy, Skwentna, Susitna, Talkeetna, and Trapper Creek (2013) and Copperville, Glennallen, Gakona, Lake Louise, Nelchina, Mendeltna, Paxson, Tazlina, Tolsona, and Tonsina (2014).

When conducting baseline subsistence harvest surveys it is standard practice for ADF&G Division of Subsistence to map all subsistence activities which occurred during the study year. Division of

Subsistence baseline surveys map search areas by month and map harvest locations for all subsistence resources. As a component of its mapping activities for Susitna-Watana Division of Subsistence will also be mapping access routes for subsistence activities.

RSP Table 14.5.5 Communities Selected for Traditional Knowledge, Subsistence Mapping, and Household Survey should be revised to acknowledge the mapping component of the baseline harvests surveys in the ADF&G identified study communities. Mapping done as a component of the baseline subsistence harvest surveys should be labeled as "one-year mapping" to differentiate it from the historical mapping being done in the communities already listed.

It should also be noted that the Census Designated Place of Susitna North located between Talkeetna and Trapper Creek, with a population of 1,260 as of the 2010 Census, has not been included in the study.

14.5.4.5 Traditional and Local Knowledge Interviews

RSP Section 14.4.5 lists eight communities to be included in tradtional and local knowledge interview efforts: Cantwell, Chickaloon, Chitna, Copper Center, Eklutna, Gakona, Gulkana, and Tyonek. However, as a component of the baseline subsistence harvest survey ADF&G Division of Subsistence will conduct local traditional knowledge (LTK) interviews in the communities of Cantwell, Chase, Chitna, Gakona, Kenny Lake, McCarthy, Skwentna, Susitna, Talkeetna, and Trapper Creek (2013) and Copperville, Glennallen, Gakona, Lake Louise, Nelchina, Mendeltna, Paxson, Tazlina, Tolsona, and Tonsina (2014).

When conducting baseline subsistence harvest surveys it is standard practice for ADF&G Division of Subsistence to select approximately 5 households in each community for participation in LTK interviews. These interviews are necessary for providing a deeper context to the harvest survey results.

RSP Table 14.5.5 Communities Selected for Traditional Knowledge, Subsistence Mapping, and Household Survey should be revised to acknowledge LTK interview components of the baseline harvests surveys in the ADF&G identified study communities.

It should also be noted that the Census Designated Place of Susitna North located between Talkeetna and Trapper Creek, with a population of 1,260 as of the 2010 Census, has not been included in the study.

Appendix 2, Public Comment Letters Part 2

Regarding *Glennallen Field Office of the Bureau of Land Management comments on Subsistence; Comments SUB-04, SUB-05, and SUB-06*

RSP Attachment 14-3 Household Harvest Survey Key Informant Interview Protocol (Draft) will be modified to include questions about perceived impacts of added users as a result of any increased access opportunities that may occur. A question will be added to the Cantwell interview protocol to address community population growth and its perceived impacts on subsistence hunting.

Regarding *The Center for Water Advocacy comments SUB-01 and SUB-02*

Attachment 14-3 Household Harvest Survey Key Informant Interview Protocol (Draft) will be modified to include a question that inquires about local knowledge of in-stream water flows.

General Response to Public Comments Regarding the Role of Baseline Subsistence Harvest Surveys in Facilitating Impact Analysis

Data obtained from ADF&G Division of Subsistence baseline subsistence harvest surveys establishes baseline indicators to help facilitate impact analysis. Tools to facilitate impact analysis include subsistence use area mapping, assessment questions, and the community comments and concerns questions in the Household Harvest Survey Instrument (RSP Attachment 14-2).

Appendix 3, Informal Comment Response Table, Section 14 Subsistence Resources

ADF&G Division of Subsistence has no additional comments.

Health Impact Study

RSP should note that ADF&G Division of Subsistence baseline subsistence harvest surveys will also include a Health Impact Component.

Attachments:

Attachment 1: ADEC Water Quality Monitoring Quality Assurance Project Plan (QAPP) Review Checklist for the Susitna Hydro Project Baseline WQ Monitoring Sampling and Analysis Plan QAPP

Provides additional comments, detail and guidance from the ADEC review of the Susitna QAPP for Water Quality Monitoring.

Attachment 2: ADEC Draft Guidance for a Tier 2 Water Quality Monitoring QAPP, Rev. 0.

Provides formal guidance for submitting a QAPP to ADEC for approval.

ATTACHMENT 1

ADEC Water Quality Monitoring Quality Assurance Project Plan (QAPP) Review Checklist

For

Susitna Hydro Project Baseline WQ Monitoring Sampling and Analysis Plan QAPP

(13 pages)

ADEC Water Quality Monitoring
Quality Assurance Project Plan (QAPP) Review Checklist

The applicant must develop a QAPP for use in a proposed monitoring project. The QAPP will be used by all parties involved in the monitoring project as a road map to collecting valid monitoring data. Failure to follow the provisions in the QAPP may likely result in the invalidation of monitoring data and may result in the requirement for additional monitoring. Responsibility for conducting field monitoring, laboratory and data analysis in compliance with the QAPP rests with the respective project managers for sampling, laboratory and data analysis (Note: this responsibility extends to any contracted field monitoring, lab or data analysis vendor). Responsibility for diligent project oversight rests with the lead project manager/organization.

Project Title: Susitna Hydro Project Baseline WQ Monitoring Sampling and Analysis Plan QAPP **Date:** November 7, 2012

Reviewed By: Richard Heffern, DEC WQ QA Officer **Date:** January 8, 2013

QA Summary Review Comment: This QAPP addresses each of the EPA 24 QAPP Elements but follows its own format in providing the required project plan information. At times this can be confusing to review since different critical elements are addressed under different headings. Some categories are described in depth. However, some key critical categories are minimally defined or not at all. This QAPP requires some significant revisions before it can be considered for regulatory approval. Specific comments provided in the table below.

ELEMENT	STATUS	COMMENTS
A. Project Management Elements		
Each page of document numbered and includes revision date and document title	✔	
1. Title and Approval Sheet		
Title	✔	
Organization's name(s) implementing project	✔	
Effective date of plan	✔	November 7, 2012
Printed name and dated signaturse of Organization's Overall Project Manager	?	Appears there are multiple individuals of authority but not clear which single individual is responsible for overall fiscal management and project management. Clarify. Page not signed/dated
Printed name and dated signature of Organization's Project QA Officer/Manager	?	Page not signed/dated
Printed name and dated signature of ADEC DOW QA Officer	?	Missing
Printed names and dated signatures of Regulatory Agency/s Project Managers	?	Missing

ELEMENT	STATUS	COMMENTS
2. Table of Contents		
Table of contents follows 24 Element format	✔ ⓘ	Follows EPA recommended format. However, some topics addressed in different sections which made QA review more complicated as was constantly cross referencing throughout document. I.e., MQO elements addressed in different sections of section B instead of in section A7., etc. When QAPP is revised it would be helpful to follow DEC guidance document attached to this QA review, "*Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0*."
3. Distribution List		
In table format list name, person's job title, organization, email, and phone # of all who receive the approved QAPP and subsequent revisions (e.g., Project Manager, Project QA Officer, DEC Project Manager, DEC QA Officer, Laboratory Project Manager or contact, lead field sampler(s), and others involved with the sampling as needed)	🛠	Missing following Name, title and contact information: • All Laboratories involved and primary contacts • Regulatory review agencies primary contacts/project managers (state, local and federal) • All lead sampling staff • All QC lead staff • All QA managers • Single QA manager with ultimate QA authority over project and with sole responsibility for QA project management in charge of all QA managers • DEC Water QA Manager/Officer • End data users
4. Project/Task Organization		
In table format, identify key individuals and their responsibilities: (data users, decision-makers, project manager, project QA officer, ,laboratory manager, lead sampling supervisor, contractor/s, subcontractor/s, etc.)	🛠 ?	Information presented appears confusing in clearly characterizing overall project management: who reports to whom, who is ultimately in charge and how various responsible staff identified are managed, who they manage. QA appears to be managed for different project parts by different staff, however it is unclear who they report to and who is ultimately responsible for QA. This person must be independent of any direct project management responsibilities except Project QA. Clarify.
Organizational chart showing: 1) line of management authority, 2) line of data reporting responsibility (this includes relevant sampling and/or lab contractors/sub contractors), and 3) independent line of quality assurance authority	✘	Org chart missing. Description of project management is confusing. It is unclear who is ultimately responsible fiscally and for project management. QA management is confusing. Appears QA management is not independent from project management. Must be completely independent. Clear lines of management authority must be defined, who reports to whom. Likewise for QA as well as data reporting. See example org chart in attached , "*Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.4.*"
5. Problem Definition/Background and Project Objective/s		
Clearly states problem(s) and/or decision(s) to be resolved	✔	
Provides sufficient historical, background and regulatory perspective	🛠?	Section 2.0 of the QAPP provides an overview of

ELEMENT	STATUS	COMMENTS
relevant to the proposed monitoring project. If previous monitoring data exists, results are summarized and made relevant to proposed monitoring project.		the project and mentions that large large amounts of data were collected in the 1980s as well as availability of other data (USGS, etc) data that will/may be used to augment proposed project monitoring data to develop a model. However, no summary data is provided in the QAPP. The QAPP states, "*A comprehensive data set for the Susitna and tributaries is not available*." It would appear critical that if historical data is intended to be used that development of a comprehensive data set be a key component of this QAPP as well as a critical data quality assessment on the reliability of the historical data for use in the project's goals. The issue of historical data and how reliable the data is needs to be adequately addressed. Suggest include table summarizing historical data. See attached document, "*Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.5.2.*"
Provides overall objective(s) for study	✔	
6. Project/Task Description (SUMMARY ONLY)		
Lists measurements to be made (in Table format)	?	Would be helpful to include table of measurements to be made identifying both field and lab measurements and in what type of sample matrices. See attached document, "*Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.6, Table 4.*"
Briefly describe monitoring location/s	✔	Monitoring locations adequately described
Provide large scale introductory map showing relevant region of AK and overall monitoring/sampling locations.	✔	
Lists sampling locations/frequency (in Table format)	?	Sample locations and frequency are addressed in table format (QAPP Tables B1-1 and B1-2. Sample frequency also addressed but is confusing since it is unclear how many total samples are planned, besides stating "monthly, each sampling event, one survey-summer," etc. This is confusing as it does not identify the number of samples scheduled for collection per siite/analyte and whether the number of planned samples are adequate to characterize the watershed sufficient for reliable model development. Revise accordingly. Site selection rationale is generally addressed but better clarity is needed in characterizing the specific rationale for each type sample matrix/analyte. Table format would be easier to follow than just a narrative description of sites, analytes and sample matrixes to be measured.
Are special personnel or equipment requirements necessary?	?	Would be helpful to clarify specialty equipment needed and specialized personnel educational/training needed, e.g., QA and QC specialists, special types of sampling equipment, etc
Provides work schedule for implementation of project tasks (in Table format)	✔	
Summarizes required project & QA records/reports (in Table format)	?	Would be helpful to provide better clarity in describing specific types of QA project

ELEMENT	STATUS	COMMENTS
		records/reports in table format.
7. Quality Objectives and Criteria for Measurement (in table format as possible)		
States overall Data Quality Objectives (DQOs). References applicable regulatory/guidance documents (Alaska Water Quality Standards, etc.) governing DQOs.		This section needs clarification. For each analyte/sample matrix to be measured, provide the applicable most restrictive AWQS for which the sample analytes will be measured. This defines t the DQOs are for the project. This is generally discussed but is unclear what specific AWQS applies for each sample matrix analyte.
States and characterizes Measurement Quality Objectives (MQOs) as to applicable action levels or criteria for each parameter measured (precision, bias, comparability, detectability (mdl and pql) and data completeness) in Table format. Provides appropriate definition and algorithms for each. Note: Representativeness to be fully characterized in section B1, Sampling Process Design. (Note: See *Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.7*).		Some project MQOs are missing or are not adequately defined as well as the applicable most restrictive AWQS for each analyte/sample matrix so as to assess whether measurement method of choice has sufficient detectability to measure reliably below the applicable most restrictive AWQS. Revise MQO Table A4-1.to include the following: • Most restrictive/controlling AWQS for each analyte/sample matrix • Specify detectability for each analyte/sample matrix method of analysis [both method detection limit (MDL) and practical quantitation limit (PQL)]. • Precision - Clarify that Project Precision to be assessed via replicate sample measurements, not sample duplicate measurements and revise precision acceptance criteria limits as applicable. • Project Accuracy acceptance criteria limits should be defined by results of Matrix spike and matrix spike duplicate results (MS/MSD). In lieu of MS/MSD, lab control standards (LCS) may be used to define analyte/method accuracy acceptance criteria limits, but only for those analytes where MS/MSD analysis is not practicle. Revise accordingly • Missing algorithm for calculation of accuracy. Revise accordingly. • Precision criteria for temperature should be not as ± 10% but as an absolute numerical value, e.g., ± 0.2°C. Revise accordingly • Accuracy criteria for turbidity (5 NTU) is not acceptable at lower measurement range. Specify numerical acceptance criteria (e.g., ± ?NTU) based upon measurement range. For example from 0 – 10 NTU, acceptance criteria of ± 1.0 NTU. Revise accordingly for different measurement ranges expected in the field. • Detectability for Turbidity of 5 NTU not acceptable. Since AWQS is 5 NTU above background, must be capable of measuring turbidity sufficiently reliably below 5 NTU, especially since this study is to document baseline water quality conditions and depending upon time of year when glacial melt water is minimal, turbidity would likewise be low.

ELEMENT	STATUS	COMMENTS
		Revise accordingly. Most portable turbidimeters (Hach, etc) reliably measure turbidity at 1 NTU and below. • Include measurement method (note, must be EPA CWA approved for water/wastewater work for all water quality methods, unless the applicable drinking water method has the more restrictive AWQS than the applicable water/wastewater AWQS. Some of these methods are specified in QAPP section of Quality Control. However, a number of the proposed methods are not acceptable for water/wastewater analysis under the EPA CWA and ADEC AWQS regulations. Revise accordingly. • Some parameters listed are missing one or more of the required MQO criteria for analyte matrix and measurement method. Additionally no specific numeric regulatory or guidance standards are specified for each pollutant and sample matrix for which sample results will be compared against to assess compliance with or with which to assess future measurement results against during and/or after post damn construction. These must be specified for all analytes/sample matrices. • TAH and TAqH proposed of analysis should only be methods 624 and 625. Remove methods 602 and 610. These can not adequately speciate/quantify TAH and TAqH analytes. Detectablility of 31 µg/L does not have adequate sensitivity (TAH AWQS is 10 µg/L and TAqH AWQS is 15 µg/L with some specific analytes having lower regulatory limits. Must list individual components for both TAH aand TAqH as well detectability, precision and accuracy for all specific TAH and TAqH analytes. Revise accordingly. • Proposed Metal Analytcial methods 6010B and 6020A are not acceptable EPA CWA water wastewater work. Select only EPA CWA water/wastewater methods of analysis with adequate sensitivity. Revise accordingly. • Missing specific analysis methods for DO, pH, temperature, turbidity, redox potential, color, residues. Provide specific EPA CWA approved method of analysis for each of these parameters. • Fecal coliform method EPA 1604 is DW approved but not EPA CWA approved for water/wastewater. Clarify what is the applicable method and for what compliance purpose. Must use the most restrictive applicable AWQS standard for the appropriate method selection. Revise accordingly. • Radionuclides – specify what method is for what specific radionuclide. Specify all MQO criteria

ELEMENT	STATUS	COMMENTS
		and applicable regulatory standards to be compared against. • Recommend review all methods of analysis selection to ensure they are appropriate methods of analysis for applicable sample matrix and adequate measurement sensitivy. Ensure appropriate precision, accuracy acceptance criteria are specified. Revise accordingly. • Mercury in water – method 7470A not acceptable for EPA CWA water/wastewater analysis. Suggest use 1631E or other method of analysis with adequate sensitivity. • Project data completeness- proposed is 95% DC. This needs clarification that 95% is per analyte per project. Since the proposed number of samples to be collected is very limited, the question should be posed if 95% is adequate? • Better clarity is needed in the rationalization/justification for such a limited temporal data set and why what is proposed is adequate to reliably characterize exiting/pre-project WQ, sediment, fish bioaccumulation conditions.
Included in MQO table for each measurement parameter the applicable numeric Alaska Water Quality Standard (e.g., recreational/drinking water, aquatic life fresh water, etc).		Missing. Include in MQO table as mentioned above.
8. Special Training Requirements/Certification Listed		
In table form**at i**dentifies specific training and/or certifications for key personnel and how/when it will be provided, documented, and assured. Identifies location where records will be maintained.	?	Would be helpful to clarify what specific training is required and will be provided and for whom. Suggest use table format similar to, *Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section A.8, Table 7."* In the proposed QAPP only a few people are included in the distribution list. All key leads personnel, Sample team leads, QA staff, QC staff, managers, labs, etc must have a copy available at all times as the QAPP lays out the requirements for sample collection, sample analysis, data analysis, etc. Revise QAPP accordingly
9. Documentation and Records (in table format as possible)		
Itemizes all documents and records to be produced (interim progress reports, final reports, audits, QAPP revisions, etc.	✔	Provides general description of types of information to be documented and retained.
Lists information to be included in specific types of reports (e.g., field reports, lab reports, QA reports, DMR (permitted facilities only), etc). Examples are: • Final report – Summaryfield reports, lab reports, • Field reports – field logs, field equipment calibrations, QC checks. • Lab reports – sample receipt log, sample prep and lab analysis logs, instrutment printouts, sample results, results of QC checks, sample result summary, etc. • QA reports – Performance Evaluation (PE) Sample Reports, DMRQA, field audit reports, lab audit reports, data audit reports.	?	This section does not address lab reports and the required content in all lab reports. Need to include requirement in lab reports to provide summary QA data page, all lab results, data validation flags and explanation, all QC sample results with each sample analysis batch and their analyte specific QC acceptance criteria limits, etc.
States requested lab turnaround time, if applicable	✔	Not addressed
Identifies written and electronic (CD/DVD/email) data reports to be provided to ADEC	?	Not addressed. Provide specifics.

ELEMENT	STATUS	COMMENTS
Gives retention time and storage location of records and reports	?	Retention time and location is 5 years at TetraTech Seattle office central file following expiration of contract. Revise to also specify documents retention time/location for project records with the primary company/agency commissioning the study, AIaska Energy Authority (AEA). Since project will be used to determine background pre-0damn construction conditions and data will be used to model projected impact in years to come, retention time should be significantly longer. Revise accordingly.
B. Measurement and Data Acquisition		
1. Sampling Process Design (in table format when possible)		
Provides a clear rational for monitoring project design and assumptions used to develop the design.	🛠?	Missing strong justification for the proposed very limited temporal data set of analytes to be measured in various sample matrices (water, groundwater, soil/sediment and fish tissue) is adequate to reliably characterize the Susitna drainage for development of a model for damn construction and post damn construction impacts. Sample data sets vary from 1 sample/site for some analytes (fish and sediment) to 6 to 8 samples/site for surface waters and a more limited data set for ground water monitoring.
Defines the parameters to be measured	?	QAPP needs to clarify what specific radioncleides will be measured following which applicable method. TAH and TAqH samples must also be speciated to show applicability to regulated AWQS.
Defines the type and number of samples required	?	Would be helpful to clarify in table format all sample analytes, frequency of measurement and total samples/analyte required for the project. Much of this information already presented but missing total number of samples each site/sample analytes/sample matrix.
Defines when, where, and how samples will be collected	?	Generally addressed and some information in great detail. However, better clarity is needed in addressing specific sample temporal and special frequency, time of day, time of month, under what type of flow conditions, sampling for each sample analyte/matrix, whether samples are composite, grab, etc. A table summarizing all this info rather than extensive narrative would help in review and approval of this QAPP.
Identifies sampling locations and frequency	✔	Sample locations identified and characterized.
Uses photos to characterize sampling locations (photos should be included either in the QAPP if known prior and/or in final report-4 cardinal directions or others as appropriate.)	✔	
Characterizes sampling locations (include detail map/s of local project area identifying sample sites, topographic/bathymetric map of area if available, , site specific latitude and longitude, GPS coordinates, etc.).	✔	
Provides site specific GPS coordinates, latitude and longitude, altitude.	✔	
Defines appropriate validation study for non-standard situations		
2. Sampling Methods Requirements (in table format)		

ELEMENT	STATUS	COMMENTS
Identifies specific sample collection procedures and methods. (Includes equipment preparation and decontamination, sample containers and sample volumes). Demonstrates compliance with appropriate referenced method/s. For each parameter/method describe applicable sample preservation methods, maximum holding times and temperatures	🛠?	Missing required sample bottle types and preservation criteria for all sample analytes. Some proposed sample hold times not appropriate. Refer to 40 CFR 136.3 for required sample analyte containers, preservation criteria and holding times. Specific sample collection procedures such as field filtration of metals for dissolved metals not addressed and specific sample collection procedures for metals where WQS near method detection limits not addressed (Hg, Cu, etc). Revise accordingly. Recommend provide in table format. Refer to example table in attached document, *Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section B.2.2 Table127."*
Specifies calibration procedures for field measurements.	🛠?	Generally described. However, needs better clarity. Needs to address: • standards used for calibrations and QC checks to bracket expected range of measurements. • Frequency of temperature calibrations against in-cert NIST Traceable over temperature range that bracket expected field measurements. • Specify frequency of DO meter calibrations and by what calibration method. Clarify that DO meters will be pressure corrected for atmospheric pressure changes due to weather and/or altitude for each site. • Specify frequency of calibration of Conductivity meter, over what measurement range, with what type certified traceable standards s and what calibration acceptance tolerances. • Provide same type information (as above) for calibration criteria of pH meters and turbidimeters.
Applicable field measurement SOPs and operator Manuals are referenced and located in QAPP appendices.	✗	Missing. Also provide SOPs, any sample collection/field measurement forms, calibration forms, etc to be used in QAPP appendices.
3. Sample Handling and Custody Requirements		
Describes sample handling, labeling, collection and transportation requirements.	🛠?	Not adequately addressed. Missing all sample collection container types, sample preservation criteria, sample hold time criteria.
Notes chain-of-custody procedures, if required. Appropriate chain-of-custody forms are referenced in the QAPP appendices.	?	It appears that chain of custody will be followed but unclear if required. Need to clarify if COCwill be followed and include applicable COC forms in QAPP appendices.
4. Analytical Methods Requirements (in table format)		
Identifies specific analytical methods to be followed. Identifies required equipment and compliance with appropriate method name and reference number (e.g., fecal coliform, 9222D Standard Methods 20 edition). This section provides more detail than in section A7 MQOs..		This item addressed in Element A.7 above. Missing some analyte method analytical method references. Some other referenced analytical measures are not acceptable for EPA CWA and ADEC water/wastewater monitoring. Must be revised with appropriate methods having adequate measurement sensitivity.
Lists method detection limits (mdl) and practical quantification limit	🛠?	Detectability minimally addresseed. Need better

ELEMENT	STATUS	COMMENTS
(pql) for each analytical method and provides procedure/algorithm on how pql determined.		clarity and also include both MDL and PQL for measurement methods. This is already addressed in Element A.7 above. Revise accordingly.
Specifies calibration and maintenance procedures. Identifies performance requirements. For laboratories, a current signed approved QAPP can be referenced if on file with ADEC DOW.	🛠?	Laboratory certifications not addressed. Lab QA manuals not addressed. Specific calibration procedures for field measurements minimally addressed. See Element B.2.above for more specific comments. Revise accordingly.
Applicable SOPs and QA Manuals are referenced and located in QAPP appendices.	✗	Missing.
5. Quality Control Requirements (in Table format)		
Lists Quality Control requirements for field measurements. Identifies QC procedures and frequency, acceptance criteria limits, corrective actions, and standards traceability for each measurement technique. Examples of QC sample measurements and criteria are: duplicate/replicate precision measurements, field blanks, and QC "calibration" check standards, **This information to be provided as much as possible in table format**. See example table and information in, *Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0.* section *B5.1 Field Quality Control Meeasures."*	🛠?	QC procedures not adequately addressed. QAPP does not adequately address required QC types (temp blanks, field blanks, calibration checks, sample replicates, etc), frequency of analysis and acceptance criteria limits for each field measurement of interest. This is critical criteria that must be included in QAPP so that all project staff with responsibilities for analysis, data validation, data verification and QA assessments have the required information to reliably evaluate the quality of project data. Revise accordingly.
Lists Quality Control requirements for field sample collection with subsequent laboratory analysis. Identifies QC procedures and frequency, acceptance criteria limits, corrective actions, and standards traceability for each sample analysis technique. Examples of QC samples and criteria are: field duplicate/replicate sample analysis, laboratory duplicate/replicate sample analysis, matrix spike duplicates, field blank samples, lab blanks, 3rd party QC samples (commercially prepared QC samples as verification for lab calibration standards, etc), calibration verification standards and continuing calibration verification standards. **This information to be provided as much as possible in table format.** See example table and information in, *Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0.* section *B5.2 Laboratory Quality Control Meeasures."*	🛠?	Same comments apply as above but for all Field/Lab Quality Control Measures (temp blanks, field blanks, lab blanks, sample replicates, lab dublicates, lab fortified blanks, internal standards, continuing calibration standards, MS/MSD, etc).. Revise accordingly.
6. Instrument/Equipment Testing and Inspection and Maintenance Requirements (in table format). For laboratories, a current signed/approved QAPP can be referenced if on file with ADEC DOW (provide reference location).		
Identifies acceptance testing of sampling process and of field and lab measurement equipment/standards	🛠	Describes instrument testing, inspection and maintenance for field instruments. Missing lab portion of Instrument/Equipment testing inspection and maintenance. May make t reference applicable approved Lab QA Manual section. Revise accordingly.
Describes equipment preventive and corrective maintenance	🛠	Same as above. Field equipment preventive and corrective maintenance described. Missing lab portion. Revise accordingly.
Checklists and worksheets documenting testing, inspection, and maintenance are included in the QAPP appendices.		No check lists provided
7. Instrument Calibration and Frequency (in table format when possible). For laboratories, a current signed/approved QAPP can be referenced if on file with ADEC DOW. Please summarize as much of the information below in table format:		

ELEMENT	STATUS	COMMENTS
Specifies calibration (frequency, range, control criteria, etc) for each instrument or piece of equipment needing calibration.	?	Generally described. See element B.2 above that addresses concerns for calibration of field measurement instruments.
Specifies calibration/certification/traceability (certification date, expiration date, range, accuracy, etc.) for calibration standards used and shows compliance with appropriate method.	?	
Specifies calibration standards and/or equipment		Generally described. See element B.2 above that addresses concerns for calibration of field measurement instruments.
Cites calibration records and manner traceable to equipment/instrumentation		
Calibration forms		Calibration forms only provided for temperature. Provide forms for DO, pH, Conductivity, turbidity
8. Inspection/Acceptance Requirements for Supplies and Consumables (presented in table format). For laboratories, a current signed/approved QAPP can be referenced if on file with ADEC DOW.		
States acceptance procedure and criteria for supplies & consumables	✔	
States how and where records are kept	?	Not addressed. Revise accordingly.
Notes responsible individual(s)	✔	
9. Data Acquisition Requirements for Nondirect Measurements (presented in table)		
Identifies type of data needed from nonmeasurement sources (e.g., computer databases, literature files, historical data bases, NOAA weather data, etc.), along with acceptance criteria for their use.	🛠?	QAPP mentions it will be using some USGS data from stations along the Susitna drainage. QAPP needs to define how it will assess the reliability of this data for use in the project. It appears that some historical data may be used for qualitative assessment only. The terms and conditions of how, when, where and why must be defined if data is to be used, especially if data is of unknown or questionable reliability.
Describes any limitations on use of such data	✘	Not addressed other than stating, "*Assessment of applicability for historical data is outside the scope of this document and is not addressed further in this data collection QAPP*." If this data is to be used, then the reliability of this data must be evaluated and applicable limitations /restriction of use applied depending upon quality of data.
10. Data Management (presented in table format when possible)		
Describes project data management process and traces path from sample collection and field measurements, lab analysis, data validation/verification, QA assessments and reporting of data of known quality to the respective ADEC Division of Water Program Office. It also shows and describes control mechanisms for detecting and correcting errors. **Include flow chart**. See, "*Guidance for Tier 2 Water Quality Monitoring QAPP Rev 0. Section B.10,*" for specific types of info to include in this section as well as an example Data Management Flow Chart.	🛠ⓘ	The QAPP provides a general description of data management, but it does not adequately describe the overall process from data collection thru to reporting of data to the intended data users. Since this is a complex project with multiple individuals responsible for various components, it is critical this section be described in sufficient detail to ensure all responsible individuals are fully knowledgeable of their individual duties and responsibilities and how they integrate with the overall project data management scheme. This section needs to characterize in detail the project's data management process tracing the path of the data from generation to their final use or storage [e.g., from field measurements and sample collection/recording through transfer of data to

ELEMENT	STATUS	COMMENTS
		computers (laptops, data acquisition systems, etc.), laboratory analysis, data validation/verification, QA assessments and reporting of data of known quality to the respective ADEC Division of Water Program Office]. Additionally, data management must also discuss the control mechanisms for detecting and correcting errors. Missing Data Management Flow Chart. Must provide.
Describes standard record-keeping, including data storage and retrieval requirements	?	Generally described, missing details. Data retrieval requirements not described. Revise accordingly.
Checklists or standard forms are included in QAPP appendices	?	Not provided. Provide.
Describes data handling equipment and procedures used to process, compile, & analyze data	?	Sort of described. Revise to provide specifics.
C. Assessments and Oversight		
1. Types of Project Assessments & Response Actions (in table format). Indicate which types of assessment to be performed, at what frequency and number and the criteria used to ensure performance or effectiveness.	✗	The Project QAO must have sole responsibility for all assessments performed. The TT Technical lead may neither perform audits nor direct audits. QAO must be completely independent from direct management of project monitoring operations and the TT Technical Lead and TT PM. The Project QAO may delegate specific QA duties to other staff, however such staff work only under his/her direction. Revise accordingly
Specify Assessment types, frequency and acceptance criteria – **Note:** Frequency and occurrence of all assessments must be specified in the QAPP. Responsibility for scheduling and conducting audits, issuing report findings and monitoring corrective actions lies with Project QA Officer.	✗	QAPP mentions audits but provides no specifics. This section must identify: <u>Field Assessments (each pollutant)</u> • Precision (replicate) sample measurements. Project should have at least a bare minimum of three paired measurements/project/analyte or 15% of project samples, whichever is greater. Replicate measurements should be evenly spaced over project timeline. Precision criteria are specified in the project's Measurement Quality Objectives (MQO) table, see section A7. <u>Field samples collected for subsequent laboratory analysis (each pollutant)</u> • Blind replicate samples for each pollutant to be measured. Project should have at least a bare minimum of three paired measurements/project/analyte or 15% of project samples, whichever is greater. Replicate samples should be evenly spaced over project timeline. Precision criteria are specified in project's MQO table, see section A7. • Matrix spike duplicates (MSD) (assesses total measurement bias for project – both precision and accuracy). Frequency of MSDs is usually specified by the analytical method. Accuracy and precision of criteria for each pollutant and

ELEMENT	STATUS	COMMENTS
		analytical method are specified in the project's MQO table, see section A7. • Third party performance evaluation samples (PE samples also called performance test (PT) samples) for wastewater analytes of interest. PT water/wastewater sample participation is at a frequency of 1/year from a NELAC certified vendor (http://www.nelac-institute.org/PT.php#pab1_4). For APDES permit monitoring, these are called DMRQA samples. On-Site Assessments • Inspection of field monitoring operations for compliance with QAPP requirements. • Laboratory Audit (if concerns arise regarding laboratory data quality) • Audit of project field measurement data results. Project Data Assessments • Audits of Monitoring Data for reproducibility of results from recalculation/reconstruction of field/lab unprocessed data. • Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals.
Corrective Action Report(s) and Corrective Action Response(s)	✔	
QAPP Revisions – describes process to revise QAPP (if monitoring methods, criteria, or other elements change).	✔	
2. Quality Assurance Reports to Management (in Table format)		
For the following QA reports describe the frequency, content, responsible position or individual for issuing each report and distribution of each to management and others (summarize in table format):	?	General QA reports are mentioned in QAPP section C 2.0. However, some key information needs clarification for each type of assessment report (e.g., on-site field assessment, on-site lab assessment, 3rd party PT/DMRQA Data Quality Assessments, Corrective action report, Annual/End of Project QA Summary Report (including overall assessment of project precision, accuracy, data completeness, problems encountered and how resolved, did project achieve DQO and MQO goals/requirements): • Description of Assessment report content • Presentation method, and • Position responsible for issuance of report and frequency of reporting.
D. Data Validation and Usability		
1. Data Review, Validation, and Verification Requirements (in table format if possible)		
States method-specific criteria for accepting, rejecting, or qualifying data. Data Validation Tables summarizing these criteria should be referenced and may be located in QAPP appendices.	?	Generally addressed. Some key performance info missing in QAPP that has been addressed above sections. These performance criteria must also be

ELEMENT	STATUS	COMMENTS
		included in the data review, verification and validation process.
Includes project-specific calculations or algorithms	?	Except for precision and data completeness, no other project specific calculations/algorithms provided. Missing calculation for assessing accuracy. If other project specific calculations/algorithms will be used, revise as appropriate. Provide accuracy calculation.
2. Validation and Verification Methods		
Describes process for data validation and how criteria will be used to validate, qualify and/or invalidate data. Include validation forms/checklists in the QAPP appendices.	✔ ?	No data validation forms/checklists provided. If forms will be used, provide in QAPP appendices.
Describes process for data verification and how conclusions can be correctly drawn from the validated data. Include verification forms/checklists in the QAPP appendices.	✔ ?	No data verification forms/checklists provided. If forms will be used, provide in QAPP appendices.
Identifies issue resolution procedure and responsible individual(s)	✔	
Identifies method for conveying results to data users	✔	Addressed in an earlier section.
3. Reconciliation with User Requirements		
Describes process for reconciling project results with project objectives and reporting any limitations on use of data	✔	

These elements, when adequately completed, meet the State and Federal QAPP requirements.
For further guidance see EPA QA/R-5 (http://www.epa.gov/r10earth/offices/oea/epaqar5.pdf), EPA QA/G-5 (http://www.epa.gov/r10earth/offices/oea/epaqag5.pdf) and Elements of a Water Quality Monitoring QAPP rev 1

✔ Acceptable- no other information needed.

Information must be changed or fixed.

✘ Not acceptable: major additions or changes required.

ⓘ Information is provided for benefit of applicant.

? Information is incomplete: some clarification is necessary.

ATTACHMENT 2

ADEC Draft Guidance for a Tier 2 Water Quality Monitoring QAPP, Rev. 0.

(37 Pages)

DRAFT

GUIDANCE DOCUMENT FOR WRITING A TIER 2 WATER QUALITY MONITORING QUALITY ASSURANCE PROJECT PLAN (QAPP)

June 2012

Alaska Department of Environmental Conservation
Division of Water

Suitability: This document is to be used as a guidance for writing a project specific Quality Assurance Project Plans (QAPPs) along with *Template For A Water Quality Monitoring Tier 2 Quality Assurance Project Plan, June 2012* for: Alaska's Clean Water Actions (ACWA) Grants, Total Maximum Daily Load (TMDL)s, Domestic Wastewater, Alaska Pollutant Discharge Elimination System (APDES) and Compliance Permits. Tier 2 water quality monitoring QAPPS are to be designed with a necessary level of rigor to demonstrate compliance with Alaska Water Quality Standards (AWQS). Providing the prescribed requested information and following this format as defined will assure that sufficient quality assurance and quality control procedures are designed into the project to lead to reliable and defensible monitoring data sufficient for showing compliance with AWQS.

Note: Red font is used throughout this document to provide direction on information to include in specific areas and sections.

A PROJECT MANAGEMENT ELEMENTS

A.1 TITLE AND APPROVALS:

In this section include title of the plan, the name of the organization(s) implementing the project, and the effective date of the plan. It must have printed name, signature and date lines for the following individuals: overall Project Manager and Project QA Officer, ADEC Project Manager, and the ADEC Division of Water QA Officer.

Title: Date:

Name: Project Manager Phone:
Organization Name: email:

Signature: _____ Date: _____

Name: Project QA Officer Phone:
Organization Name: email:

Signature: _____ Date: _____

Name: ADEC DOW Project Manager Phone:
ADEC DOW Program Name: email:

Signature: _____ Date: _____

Name: ADEC DOW QA Officer Phone:
ADEC DOW WQSAR Program email:
Signature: _____ Date: _____

A.2 TABLE OF CONTENTS

In this section include the table of contents following the prescribed detailed format. Table of Tables, Table of Figures and abbreviations may be modified to be consistent with QAPP contents. If QAPP contains pictures, include Table of Pictures.

TABLE OF TABLES

TABLE OF FIGURES

LIST OF ABBREVIATIONS

ACWA	Alaska's Clean Water Actions
ADEC	Alaska Department of Environmental Conservation
APDES	Alaska Pollutant Discharge Elimination System
ASTM	American Society for Testing and Materials
AWQMS	Ambient Water Quality Monitoring System
BETX	Benzene, Ethylbenzene, Toluene, Xylenes (m, p, o)
CWA	Clean Water Act
COC	Chain of Custody
cfu/100mL	coliform forming units/100 milliliters
DMR	Discharge Monitoring Report
DMRQA sample	Discharge Monitoring Report Quality Assurance sample
DQO	Data Quality Objective
DO	Dissolved Oxygen
DOW	Division of Water
DROPS	Discharge Reporting and Online Permitting System
EPA	Environmental Protection Agency
GPS	Global Positioning System
ICIS-NPDES	Integrated Compliance Information System – National Pollutant Discharge and Elimination System
IDL	Instrument Detection Limit
MQO	Measurement Quality Objective
MDL	Method Detection Limit
MSDS	Material Safety Data Sheet
mS/cm	microsiemens/centimeter
mg/L	milligrams/liter
µg/L	micrograms/liter
ND	Non Detect
NELAC	National Environmental Laboratory Accreditation Counsel
PE Sample	Performance Evaluation Sample
PT Sample	Performance Test Sample
PQL	Practical Quantification Limit
QA	Quality Assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SPAR	Spill Response and Recovery
SOP	Standard Operating Procedure
STORET	Storage and Retrieval System
TAH	Total aromatic hydrocarbons
TMDL	Total Maximum Daily Load
VOC	Volatile Organic Compounds
WA DOE	Washington State Department of Ecology

WQS Water Quality Standards

A.3 DISTRIBUTION LIST

List the names and addresses of those who receive copies of the approved QAPP and subsequent revisions in Table 1. Distribution list at a minimum must include all those involved with management direction, QAPP approvals, data management, and senior staff directing monitoring operations in the field, key laboratory staff, key data management staff and the end data users. Modify Table 1 as appropriate for the project.

Table 1: Distribution List

NAME	POSITION	AGENCY/ Company	DIVISION/ BRANCH/SECTION	CONTACT INFORMATION
	Project Manager			Phone: Email:
	Project Quality Assurance Officer			Phone: Email:
	Sampling Manager			Phone: Email:
	Lab Manager			Phone: Email:
	Data Manager			Phone: Email:
	Lab QA Manager			Phone: Email:
	Project Manager	ADEC	Division of Water/	Phone: Email:
	QA Officer	ADEC	Division of Water/ WQSAR/QA	Phone: Email:
				Phone: Email:

A.4 PROJECT TASK/ORGANIZATION

List the duties and responsibilities of key individuals and organizations participating in the monitoring project in Table 2: Modify Table 2 as appropriate for the project.

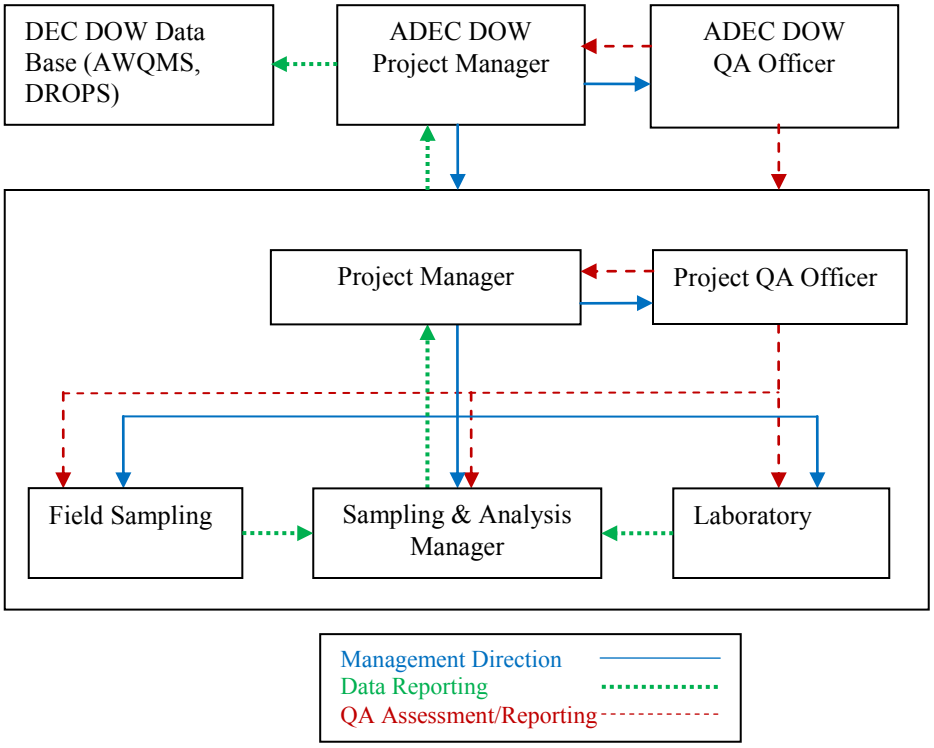
Table 2: Project Organizational Responsibilities

Position Title	Agency or Company	Division Branch/Section	Responsibilities
Project Manager	Add project info	Add project info	Revise as appropriate Responsible for overall technical, financial and contractual management of the project and subsequent reporting of QA reviewed (validated and verified) data to DEC.
Project QA Officer	Add project info	Add project info	Revise as appropriate Responsible QA review and approval of plan and to ensure all monitoring complies with the QAPP specified criteria. This is accomplished through routine technical assessments of the sample collection, analysis and data reporting process. Assessments may include, but are not limited to: on-site field audits, data audits, QA review of blind lab performance evaluation samples, lab audits, etc. These assessments are performed independent of overall project management.
Sampling & Analysis Manager	Add project info	Add project info	Add project responsibilities
Field Sampling staff	Add project info	Add project info	Add project responsibilities
Laboratory Manager	Add project info	Add project info	Responsible for the overall review and approval of contracted laboratory analytical work, responding to sample result inquiries and method specific details. Responsible for QA/QC of laboratory analysis as specified in the QAPP and reviews and verifies the validity of sample data results as specified in the QAPP and appropriate EPA approved analytical methods.

Position Title	Agency or Company	Division Branch/Section	Responsibilities
Laboratory Quality Assurance Manager/Officer	Add project info	Add project info	Laboratory Quality Assurance Manager/Officer – Responsible for QA/QC of water quality laboratory analyses as specified in the QAPP. Along with Laboratory Manager, the Lab QA Officer reviews and verifies the validity of sample data results as specified in the QAPP and appropriate EPA approved analytical methods.
Project Manager	ADEC	Division of Water	Responsible for overall technical and contractual management of the project. For Permit related monitoring projects, responsible for ensuring permittee complies with permit required water quality monitoring as specified in the approved QAPP
Water Quality Assurance Officer	ADEC	Division of Water	Responsible for QA review and approval of plan and oversight of QA activities ensuring collected data meets project's stated data quality goals

Revise Figure 1, Project Organizational Structure, as appropriate for the monitoring project. Be sure to use separate identifying lines to discriminate from each other the following: management direction, data reporting and QA assessment/reporting.

Figure 1: Example Project Organizational Structure



A.5 PROBLEM DEFINITION/BACKGROUND AND PROJECT OBJECTIVES

A.5.1 Problem Definition

In this section clearly state the specific problem to be solved, decision to be made, or outcome to be achieved.

A.5.2 Project Background

Provide a brief background summary for the purpose of the monitoring project. Include sufficient information to provide historical, scientific and regulatory perspective. If previous monitoring data exists and is relevant to proposed monitoring project, provide summary of results in Table 3 along with the appropriate numeric ADEC water quality standard/s (pollutant concentration: e.g., ground water, surface water, aquatic life freshwater, aquatic life marine water, etc). Explain how this data was used to rationalize the proposed monitoring plan.

Revise Table 3 as appropriate for the monitoring project.

Table 3: Example Summary Table of Previous Project Relevant Monitoring Data

Site Location	Date	Measurement Parameter			Alaska WQS	
		Analyte	Conc.	Meas. units	Aquatic Life	Recreational/ Drinking Water

A.5.3 Project Objective(s)

In this section define the overall objectives for this monitoring project. Clearly state what is the purpose for collecting monitoring data, why it is being collected and how this data will be used to support the project's purpose? If there are regulatory requirements governing the reason/s for collecting monitoring data, cite the specific federal and/or state statue/s. State how the proposed monitoring plan fulfills this requirement.

A.6 PROJECT/TASK DESCRIPTION and SCHEDULE

A.6.1 Project Description

In this section provide a summary paragraph describing the work to be performed.

In Table 4, list the parameters to be measured and recorded. Use the appropriate column to list samples analyzed in the field and samples analyzed in the laboratory.

Table 4: Parameters to be Measured

Field Measurements	Laboratory Measurements

The following information is provided as a guide to selecting laboratories for the analysis of project samples. Before selecting a laboratory, consider the following:

Note 1: ADEC certifies laboratories for drinking water and contaminated sites analysis only. At the present time, ADEC does not certify laboratories for water/wastewater analyses. However, an ADEC drinking water-approved laboratory lends credibility to a laboratory's quality assurance and quality control processes. A list of ADEC-approved microbiological laboratories is available at: http://www..state.ak.us/dec/deh/water/labs.htm and for laboratories providing chemical analysis at: http://www.state.ak.us/dec/deh/water/chemlabs.htm.

Note 2: For microbiological analyses, only a laboratory with current ADEC drinking water certification that resides within Alaska may be used. Due to the short sample holding time (< 8 hours), labs outside of Alaska would not reasonably be able to receive and start the analysis as specified by the EPA water/wastewater approved microbiological method.

Note 2: For labs contracted outside of Alaska, it is strongly recommended that the contracted laboratory have either NELAC and/or State certification (e.g., Washington State Department of Ecology, http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html) for the respective water/waste water analytical methods.

In this section insert a large scale map showing the overall geographic location/s of field tasks. (Note in section B1, Sampling Process Design, include larger scale topographic map(s) identifying specific geographic location(s) of sampling sites).

A.6.2 Project Implementation Schedule

Revise Table 5 as appropriate to describe the project implementation schedule.

Table 5: Example Project Implementation Schedule

Product	Measurement/ Parameter(s)	Sampling Site	Sampling Frequency	Time Frame
QAPP Preparation				
Field Sampling	DO, pH, Temp, Cond. Turbidity, Fecal Coliforms	River Road Mile 3 Site #1, upstream side of culvert, above outfall	Weekly	June – Sept
	DO, pH, Temp, Cond., Turbidity, Fecal Coliforms, TAHs	River Road Mile 3 Site #2, downstream side of culvert below outfall	Weekly randomized sample timeframe	June – Sept
	DO, pH, Temp, Cond., Turbidity, Fecal Coliforms, TAHs	Site # 3, Mile 3 River Road, Downstream of bridge	Weekly, randomized sample timeframe	June – Sept
Lab Analysis	Fecal Coliforms	All sites	Analyses within sample holding time requirements	June - Sept

Product	Measurement/ Parameter(s)	Sampling Site	Sampling Frequency	Time Frame
Field Audit	Audit of field monitoring operations	All sites	< 30 days of project start-up	1/project
Data Analysis				
Data Review				
Data Report				

A.7 DATA QUALITY OBJECTIES AND CRITERIA FOR MEASUREMENT DATA

A.7.1 Data Quality Objectives (DQOs)

Data Quality Objectives (DQOs, EPAQA/G4). DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Clarify the monitoring objectives (i.e., determine water/wastewater pollutant concentrations of interest and how these values compare to water quality standards regulatory limits).
- Define the appropriate type of data needed. In order to accomplish the monitoring objectives, the appropriate type of data needed is defined by the respective AWQS. For pollutants, compliance with the AWQS is determined by specific measurement requirements. The measurement system is designed to produce water pollutant concentration data that are of the appropriate quantity and quality to assess compliance.

In this section define the project's DQOs. Include a brief paragraph stating what the project's data quality objectives are. For most Tier 2 QAPPs, the DQOs may be to capture data of sufficient quality to demonstrate compliance with Alaska's Water Quality Standards.

A.7.2 Measurement Quality Objectives (MQOs)

Measurement Quality Objectives (MQOs) are a subset of DQOs. MQOs are derived from the monitoring project's DQOs. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. MQOs define the acceptable quality (data validity) of field and laboratory data for the project. MQOs are defined in terms of the following data quality indicators:

- Detectability
- Precision
- Bias/Accuracy
- Completeness
- Representativeness
- Comparability

Detectability is the ability of the method to reliably measure a pollutant concentration above background. DEC DOW uses two components to define detectability: method detection limit (MDL) and practical quantification limit (PQL) or reporting limit (RL).

- The MDL is the minimum value which the instrument can discern above background but with no certainty to the accuracy of the measured value. For field measurements, the manufacturer's listed instrument detection limit (IDL) can be used.
- The PQL or RL is the minimum value that can be reported with confidence (usually some multiple of the MDL).

Note: The measurement method of choice should at a minimum have a practical quantification limit or reporting limit 3 times more sensitive than the respective DEC WQS and/or permitted pollutant level (for permitted facilities).

Sample data measured below the MDL is reported as ND or non-detect. Sample data measured ≥ MDL but ≤ PQL or RL is reported as estimated data. Sample data measured above the PQL or RL is reported as reliable data unless otherwise qualified per the specific sample analysis.

Precision is the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations and as soon as possible to limit temporal variance in sample results. Overall project precision is measured by collecting blind (to the laboratory) field replicate samples. Laboratory precision is determined similarly via analysis of laboratory duplicate samples. For paired and small data sets, project precision is calculated using the following formula:

$$RPD = 100 * \frac{(A-B)}{\left((A+B)/2\right)}$$

Where: RPD = relative percent difference
A = primary sample
B = replicate field sample or laboratory duplicate sample

For larger paired precision data sets (e.g. overall project precision) or multiple replicate precision data, use the following formula:

$$RSD = 100*\sigma/\text{mean}$$

$$\sigma = \int \frac{\Sigma d^2}{2k}$$

Where: RSD = relative standard deviation
σ = standard deviation
k = number of paired replicate samples (A and B)
d = A - B
A = primary sample

B = replicate field sample or laboratory duplicate sample

Bias (Accuracy) is a measure of confidence that describes how close a measurement is to its "true" value. Methods to determine and assess accuracy of field and laboratory measurements include, instrument calibrations, various types of QC checks (e.g., sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, sample blank measurements (field and lab blanks), external standards), performance audit samples (DMRQA, blind Water Supply or Water Pollution PE samples from American Association for Laboratory Accreditation (A2LA) certified, etc. Bias/Accuracy is usually assessed using the following formula:

$$Accuracy = \frac{MeasuredValue}{TrueValue} \times 100$$

Completeness is a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence. As with representativeness, data completeness is determined during project development and specified in the QAPP. Project completeness is determined for each pollutant parameter using the following formula:

$$\frac{T - (I+NC)}{T} \times (100\%) = \text{Completeness}$$

Where T = Total number of expected sample measurements.
I = Number of invalid sample measured results.
NC = Number of sample measurements not completed (e.g. spilled sample, etc).

Project % Data Completeness Goal = Insert numeric % here /analyte for all project analytes

Representativeness is determined during project development and specified in the QAPP. Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection.

Comparability is a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis. ***Comparability is shown by referencing the appropriate EPA CWA approved measurement method as specified in federal and/or state regulatory guidance documents for the parameter/s to be sampled and analyzed*** (e.g., Alaska Water Quality Standards (http://www.dec.state.ak.us/water/wqsar/wqs/index.htm), *EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; National Primary Drinking Water Regulations; National Secondary Drinking Water Regulations; and Analysis and Sampling Procedures (*http://www.access.gpo.gov/nara/cfr/waisidx_05/40cfr136_05.html), etc). As with representativeness and completeness, comparability is determined during project development and must be specified in the QAPP.

For each parameter to be sampled/measured, list the measurement method to be used and the MQOs to meet the overall data quality objectives. This applies to both direct field measurements (e.g., field pH meters, DO meters, etc.) as well as samples collected for subsequent laboratory analyses.

Use Table 6 on the following page to present MQO information **along with the appropriate WQS numerical value**! Revise Table 6 as appropriate for the monitoring project.

Table 6: Project Measurement Quality Objectives (MQOs)

Group	Analyte	Method	MDL (µg/L)	PQL (µg/L)	Alaska WQS		Precision (RPD)	Accuracy (% Recovered)
					Aquatic Life	Recreation/Drinking Water		
VOCs	Benzene	EPA 602[a]	0.33	1.0	10 µg/l[b]		10	86-126
	Toluene	EPA 602[a]	0.46	1.5			15	52-148
	Ethylbenzene	EPA 602[a]	0.35	1.2			20	60-140
	Xylene, total	EPA 602[a]	0.82	3.0			20	60-140
Settleable Solids	Settleable Solids	EPA 160.5	0.2 ml/L/hr	0.2 ml/L/hr	No measureable increase above natural condition	<5% increase in 0.1 mm to 0.4 mm fine sediment for waters with anadromous fish; <30% by weight of fines in gravel beds	NA	NA
Water Quality	DO (dissolved oxygen)	In situ (electronic probe) EPA 360.1	NA	±0.01 mg/L	>4.0 mg/L	>7 mg/l for anadromous fish; >5 mg/l for non-anadromous fish; < 17 mg/L	±20%	NA
	pH	In situ (electronic probe) EPA 150.1	NA	±0.01 pH units	6.5 - 8.5; not vary by 0.5 from natural condition	6.5 - 8.5	±0.1 pH units	±0.1 pH units
	Temperature	In situ (electronic probe) EPA 170.1	NA	0.1°C	<20°C Migration routes < 15°C Spawning areas < 13°C Rearing areas < 15°C Egg /fry incubation < 13°C	<30°C	±0.2°C	±0.2°C
	Conductivity	In situ (electronic probe) EPA 120.1	NA	0-1: 0.001 1-10: 0.01 10-100: 0.1 (mS/cm)	NA	NA	± 10%	± 10%
Total Recoverable Inorganics	Aluminum	EPA200.8	0.33	1.0	750 µg/L Acute; 87 µg/L chronic	NA	20	80-120
	Iron	EPA200.7	2.7	50	NA Acute; 1000 µg/L chronic	NA	20	80-120
Dissolved Inorganics	Arsenic	EPA200.8	0.044	0.15	340 µg/L Acute; 150 µg/L chronic	0.018 µg/L	20	80-120
	Cadmium	EPA200.8	0.062	0.20	Hardness Dependent[c]	NA	20	80-120
	Copper	EPA200.8	0.034	0.10	Hardness Dependent[c]	1300 µg/L	20	80-120
	Lead	EPA200.8	0.030	0.10	Hardness Dependent[c]	NA	20	80-120
	Mercury	EPA245.1	0.05	0.2	1.4 µg/L Acute; 0.77 µg/L Chronic	NA	20	80-120
	Zinc	EPA200.8	0.08	0.25	Hardness Dependent[c]	7400 µg/L	20	80-120
Hardness	Hardness	2340B	1000	1000	NA	NA	5	100
Nutrients	Nitrogen, Total Kjeldahl	4500-NH3C	112	400	NA	NA	30	80 - 120
	Total Phosphorous	4500 PE/4500-PB	25.7	51.4	NA	NA	8	80 - 120
Fecal Coliforms	Fecal Coliforms	EPA1604	1cfu/100mL	1cfu/100mL	NA	100 FC/100 mL	5	95 - 105

NA = None available.

[a] EPA Method 602 for screening BETX. If BETX measured, confirm with EPA method 624 (GCMS).

[b] Total Aromatic Hydrocarbons are BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) only.

[c] Metal standards for the protection of aquatic life are hardness dependent, the formulas for calculating the appropriate standard are:

	Acute	Chronic	Total to Dissolved conversion Factor
Cadmiume	$e^{1.0166(\ln \text{hardness}) - 3.924}$	$e^{0.7409(\ln \text{hardness}) - 4.179}$	1.136672-[(*ln*hardness)(0.041838) for acute 1.101672-[(*ln*hardness)(0.041838) for chronic
Copper	$e^{0.9422(\ln \text{hardness}) - 1.700}$	$e^{0.8545(\ln \text{hardness}) - 1.702}$	0.960 acute and chronic
Lead	$e^{1.273(\ln \text{hardness}) - 1.460}$	$e^{1.273(\ln \text{hardness}) - 4.705}$	1.46203 -[(ln hardness)(0.145712)] for acute 1.46203 -[(ln hardness)(0.145712)] for chronic

A.8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

In this section, describe any specialized training or certifications needed by personnel in order to successfully complete the project. Describe how training is to be provided and how the necessary skills are assured and documented, as well as how the organization implementing the data collection is qualified and competent. Training may be formal or obtained by "mentoring" provided by senior staff, and by coordination with the sub-contracted laboratory. Revise Table 7 as appropriate to summarize project training.

Contracted and sub-contracted laboratories performing analytical work must have the requisite knowledge and skills in execution of the analytical methods being requested. Information on laboratory staff competence is usually provided in each lab's Quality Assurance Plan (QAP). The agency and/or organization implementing the monitoring project is responsible to ensure that the contracted lab maintains on file with the Project QA Officer and the ADEC DOW QA Officer a current copy (electronic preferred) of the laboratory's QAP.

Table 7: Project Training/Certification

Specialized Training/Certification	Field Staff	Lab Staff	Monitoring Supervisor	Lab Supervisor	Project QA Officer
Safety training	X	X	X	X	X
Water sampling techniques	X		X		X
Instrument calibration and QC activities for field measurements	X		X		X
Instrument calibration and QC activities for laboratory measurements		X		X	X
QA principles			X	X	X
QA for water monitoring systems			X		X
Chain of Custody procedures for samples and data	X	X	X	X	X
Handling and Shipping of Hazardous Goods	X	X	X	X	X
Specific Field Measurement Methods Training	X		X		X
ADEC Microbiological Drinking Water	Certification for microbiological analysis is limited to the				

Specialized Training/Certification	Field Staff	Lab Staff	Monitoring Supervisor	Lab Supervisor	Project QA Officer
Certification	individually certified analyst.				
Lab Analytical Methods Training		X		X	X

A.9 DOCUMENTS AND RECORDS

In this section, list all the project specific documents and records that will be produced, such as interim progress reports, final reports, audits, and Quality Assurance Project Plan revisions, etc. Records should include field logs, sample preparation and analysis logs, laboratory analysis, instrument printouts, model inputs and outputs, data from other sources such as databases or literature, the results of calibration and QC checks. Copies of example data sheets should be included in the appendix. Revise Table 8 as appropriate, including records disposition (location and retention time). Use the following categories to list appropriate documents and records. Record and document types are examples only.

Table 8: Project Documents and Records

Categories	Record/Document Types	Location	Retention Time
Site Information	Network Description		
	Site characterization file		
	Site maps		
	Site pictures		
Environmental Data Operations	QA Project Plan		
	Field Method SOPs		
	Field Notebooks		
	Sample collection/measurement records		
	Sample Handling & Custody Records		
	Chemical labels, MSDS sheets		
	Inspection/Maintenance Records		
Raw Data	Lab data (sample, QC and calibration) including data entry forms		
Data Reporting	Discharge Monitoring Reports (DMRs) for permitted facility		
	Progress reports		
	Project data/summary reports		
	Lab analysis reports		
	Inspection Report		

Categories	Record/Document Types	Location	Retention Time
Data Management	Data management plans/flowcharts		
	Data algorithms		
Quality Assurance	Control charts		
	Data quality assessments		
	DMRQA and PE samples		
	Site audits		
	Lab audits		
	QA reports/corrective action reports		
	Response		
	Performance Evaluation Samples		

*In addition to any written report, data collected for a project will be submitted electronically to ADEC via a CD ROM, ZIP Disk or email ZIP file. All dates are to be formatted as "**MM-DD-YYYY**".*

B. DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN (Experimental Design)

In this section provide a thorough description of the following three major activities:

- Define the monitoring objective(s) and appropriate data quality objectives.
- Characterize the general monitoring location(s).
- Identify the site specific sample collection location/s, parameters to be measured and frequency of collection.

B.1.1 Define Monitoring Objectives(s) and Appropriate Data Quality Objectives

In this section describe in sufficient detail such that a person, knowledgeable with water quality monitoring but unfamiliar with the monitoring site and history, clearly understands the project's breadth, scope, underlying rationale and monitoring plan design assumptions. Describe how these monitoring objectives relate to the appropriate data quality objectives.

Note: If the proposed project plan is as a result of previous monitoring efforts, the previous data is to be summarized in table format including parameters and concentrations measured, methods employed and how the results relate to the Alaska water quality standards criteria. Provide reference to previous data report if available or attach as appendix.

B.1.2 Characterize the General Monitoring Location/s

In this section provide a description of the monitoring locations and the rationale for their selection. Be sure to include a map providing an overview of all monitoring locations. Use Table 9 to identify sample sites and to describe the rationale for their selection.

Table 9: Site Location and Rationale

Site ID	Latitude	Longitude	Site Description and Rationale for Selection

B.1.3 Identify the Site-Specific Sample Collection Location(s), Parameters to be Measured and Frequencies of Collection

In this section describe site specific sampling locations, specific parameters to be measured, type of sample(s) to be collected and frequency of collection and representativeness of scale. Be sure to include topographic map(s) showing each monitoring site with sufficient gradient relief detail to characterize the watershed and how each sample site is representative of the monitoring project's stated goals. Identify any structures or obstructions affecting sample collection and potential sources of pollutant contamination.

Note 1: Consider in the design plan how samples are to be collected to best represent environmental conditions of concern (e.g., consider how the temporal and spatial variables of sample collection may provide differing results based upon sample collection times, sample depth and location within water (stream, lake, etc.) boundaries).

Note 2: 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.

Note 3: When water samples are taken in response to water pollution complaints, care should be taken to ensure the sampling sites are both representative of the pollution event and characterize the extent; e.g., collecting samples at the suspect pollution site, and above and below it.

Note 4: When a sample is taken at a wastewater facility discharge outfall, 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.

Use Table 10 to clarify key "Site Representativeness" criteria for each site selection.

Table 10: Criteria for Establishing Site Representativeness

Site ID	Monitoring Purpose	Criteria for Site Selection

Site ID	Monitoring Purpose	Criteria for Site Selection

Use Table 11 to define the key parameters to be measured, types of samples (in situ measurements, grab, composite, etc), numbers of samples and collection frequency.

Table 11: Sample Schedule (Parameters, Sample Type, Frequency)

Site ID	Parameters to be measured	Sample Type (I, G, C, etc.)	Sampling Frequency	Sample Time	Total number measurements
I ≡ In Situ Measurement		G ≡ Grab Sample		C ≡ Composite Sample	

Insert detailed map(s), (topographic, batholitic, etc.) identifying location of all monitoring sites. Map(s) should be of sufficient clarity and resolution of scale to represent each individual sampling site along with buildings, structures and topographic features (water bodies, elevation change, etc) and point sources of pollution that could possibly influence quality of the water bodies to be monitored.

B.2 SAMPLING METHOD REQUIREMENTS

Project sampling staff should wear disposable gloves and safety eyewear, if needed, and observe precautions while collecting samples. Sampling staff need to be aware of the potential chemical and biological hazards present. The Project Sampling Staff collecting samples must take care not to touch the insides of bottles or lids/caps during sampling.

B.2.1 Sample Types

In this section describe sample types to be collected/measured. Samples will be listed as “composite” or “grab” on the Chain-of- Custody or Transmission Form and in field logbook or field data sheets.

B.2.2 Sample Containers and Equipment

In this section describe specific sample handling and custody requirements (If the results of a sampling program may be used as evidence, a strict written record (Chain of Custody) must be documented tracking location and possession of the sample/data at all times).

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

For samples requiring cooling preservation, a temperature blank shall accompany each cooler (min/max thermometer preferred). Any min/max thermometer used shall be readable to at least 0.2°C.

Use Table 12 to list specific analyte/method criteria for required parameter holding times and preservation methods. Revise Table 12 as appropriate for the monitoring project. For parameters not listed in this table, see 40 *CFR 136 Table II-Required Containers, Preservation Techniques, and Holding Times* (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=50e6d452bc564b99d249b2212375f89f&rgn=div8&view=text&node=40:23.0.1.1.1.0.1.3&idno=40).

Table 12: Preservation and Holding Times for the Analysis of Samples

Analyte	Matrix	Container	Necessary Volume	Preservation and Filtration	Maximum Holding Time
Residue (settleable solids)	Surface Water	P, FP, G	1 L	Cool <6°C, do not freeze	48 hours
BTEX	Surface Water	G with FP lined septum	120 mL (3-40mL)	HCl to pH < 2; < 6°C, do not freeze	14 days
Cu, Cd, As, Pb (Dissolved)	Surface Water	P, FP, G	250 mL	Filtered within 15 minutes of collection using a 0.45 µm filter; HNO_3 to pH < 2	6 months
Cu, Cd, As, Al, Pb (Total Recoverable)	Surface Water	P, FP, G	250 mL	HNO_3 to pH < 2	6 months
Nitrate-Nitrite	Surface Water	P, FP, G	1 L	Cool <6°C; H_2SO_4 to pH < 2, do not freeze	28 Days
Total Phosphorous	Surface Water	P, FP, G	1 L	Cool <6°C; H_2SO_4 to pH < 2, do not freeze	28 Days
Fecal Coliform	Surface Water	G, PA	250 mL	Cool <10°C; do not freeze, 0.0008% Na_2S2O_3	6 hours 2 hrs lab prep (**note:** time not additive)
Hardness	Surface Water	P, FP, G	100 mL	HNO_3 to pH < 2; < 4°C, do not freeze	6 months

Analyte	Matrix	Container	Necessary Volume	Preservation and Filtration	Maximum Holding Time

P = polyethylene, FP = flouropolymer, G = glass, PA = autoclavable plastic

B.2.3 Sampling Methods

This section provides general guidance on how to collect different types of samples. Delete those sections not appropriate for the type of samples to be collected. If specific sample collection methods will be followed, cite the appropriate source/method or else include in this section a detailed description of the sampling method to be followed.

Surface Water Samples, Streams -
Sampling stations should always be located in the main stream channel. Since stream waters are usually well mixed vertically, often 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 be aware of thermal stratification due to discharges or tributaries.

Lakes, Ponds, Reservoirs-
A sufficient number of stations should be established in random locations to define adequately the parameters of concern. Usually 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 (> 3 m), samples should be collected at regular depth intervals.

Groundwater 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. All sampling equipment must be certified clean by the laboratory providing it. An equipment blank, should be collected into a separate container and analyzed along with the other groundwater samples.

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. Bailing strings and wires and other disposable sampling tools must be properly disposed of after use. For more information on groundwater monitoring and monitoring wells, see the ADEC SPAR Underground Storage Tank Procedures Manual, Section 4, Sampling Procedures November 7, 2002 at: http://dec.alaska.gov/spar/ipp/docs/ust_man02_10_07.pdf

Note 1: Bailers should not be used for collecting metal samples due to potential introduction of metal contaminants to the sample.

Note 2: Peristaltic pumps should not be used for collection of volatile organic compounds (VOC) samples due to potential loss of volatile components.

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

Composite Samples – Samples will be composited directly into the sample. Between composite subsets, bottles will be kept in a cooler with ice to reach and maintain a sample temperature of 4 +/- 2°C. The time of the initial portion of the composite, composite intervals, and the final compositing time must be noted in the field logbook or data sheets. Sample time listed on the Chain of Custody (COC) or Transmission Form and the sample bottle must be the time of the final sample composite portion.

Note: Composite samples must be in accordance with analyte specific EPA CWA prescribed preservation and holding time criteria found in 40 *CFR 136 Table II-Required Containers, Preservation Techniques, and Holding Times*.

B.3 SAMPLE HANDLING AND CHAIN OF CUSTODY REQUIREMENTS

B.3.1 Sampling Procedures

See Section B.2 of this QAPP – Sampling Method Requirements

B.3.2 Sample Custody Procedures

In this section describe any chain of custody (COC) procedures if required. Include example COC form and COC SOP as an appendix to the QAPP.

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 in 49 CFR 171-177. Staff should receive the necessary training for shipping samples or consult with the laboratory for shipping instructions.

Temperature preservation method and holding time limitations must be considered when decisions are made regarding sampling and shipping times for time and temperature sensitive sample analytes. Describe any analyte/method specific shipping requirements in this section and how project is designed to meet these requirements.

B.4 ANALYTICAL METHODS AND REQUIREMENTS

In this section reference the laboratory's Quality Assurance Plan (QAP) and applicable SOPs for each method analyte to be measured. If the lab has a current QAP and relevant SOPs on file with ADEC DOW QA Officer, these can be specifically referenced in this section. If not, it is responsibility of the

monitoring project manager to ensure the lab's QAP and relevant SOPs are included (as attachments) to the monitoring project's QAPP.

Monitoring shall 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*. Reference the Project's MQO table (section A7) of this QAPP for list of parameters of concern, approved analytical methods, method-specific detection and reporting limits, accuracy and precision values applicable to this project.

Under direction of the Project Manager, project staff will ensure that all equipment and sampling kits used in the field and laboratories use EPA CWA approved methods. The project's QA officer will verify that only EPA CWA approved methods (or in specific incidences ADEC DOW pre- approved methods) are used.

B.5 QUALITY CONTROL REQUIREMENTS

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the monitoring project's data quality objectives.

In this section define the QC activities that will be used to control the monitoring process to validate sample data. Use separate tables to define field QC measurements and Lab QC measurement and their criteria for accepting/rejecting project specific water quality measurement data.

B.5.1 Field Quality Control (QC) Measures

QC 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 specification, and field SOPs.
- Chemical reagents and standard reference materials used prior to expiration dates.
- Proper field sample collection and analysis techniques.
- Correct sample labeling and data entry.
- Proper sample handling and shipping/transport techniques.
- Field replicate samples (blind to the laboratory), e.g. 1 replicate/10 samples).
- Field replicate measurements (e.g. 1 replicate measurement/10 field measurements).

Field Replicate samples and Field Replicate measurements should generally be equal to 15% of total field and/or lab measurements or at least 1/sampling event, whichever is greater. Use Table 13 and revise as appropriate to define all project field QC types, frequency and acceptance criteria limits.

Table 13: Field Quality Control Samples

Field Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank				

Field Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Trip Blank				
Field Replicate (Blind to Lab)				
Field Replicate Measurement				
Calibration Verification Check Standard				

B.5.2 Laboratory Quality Control (QC) Measures

In this section detail the Laboratory Quality Control Measures including QC samples collected in the field for subsequent laboratory analysis as well as method-specific laboratory QC activities prescribed in each analytical method's SOP and in the monitoring project's QAPP. Modify Table 14 as appropriate for the project.

Laboratory QC includes the following:

- Laboratory instrumentation calibrated with the analytical procedure.
- Laboratory instrumentation maintained in accordance with the instrument manufacturer's specifications, the laboratory's QAP and Standard Operating Procedures (SOPs).
- Matrix spike/matrix spike duplicates, sample duplicates, calibration verification checks, surrogate standards, external standards, etc. per the laboratory's QAP and SOPs.
- Specific QC activities prescribed in the project's QAPP.
- Laboratory data verification and validation prior to sending data results to ADEC and/or permitted facility.

Contracted laboratories will provide analytical results after verification and validation by the laboratory QA Officer. The laboratory must provide all relevant QC information with its summary of data results so that the project manager and project QA officer can perform field data verification and validation and review the laboratory reports. The Project Manager reviews these data to ensure that the required QC measurement criteria have been met. If a QC concern is identified in the review process, the Project Manager and Project QA Officer will seek additional information from the contracted laboratory to resolve the issue and take appropriate corrective action.

Table 14: Field/Laboratory Quality Control Samples

Field/Lab Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank				
Trip Blank				

Field/Lab Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Replicate				
Lab Blank				
Lab Fortified Blank				
Calibration Verification Check Standard				
Continuing Calibration Verification Check Standard				
Matrix Spike/Matrix Spike Duplicate				
Lab Duplicate Sample				
External QC Check Standard				
Surrogate Standard				

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTIONAND MAINTENANCE REQUIREMENTS

In this section describe the procedures and criteria used to verify that all instruments and equipment are acceptable for use.

Prior to a sampling event, all sampling instruments and equipment are to be tested and inspected in accordance with the manufacturers' specifications. All equipment standards (thermometers, barometers, etc) are calibrated appropriately and within stated certification periods prior to use.

Monitoring staff should document that required acceptance testing, inspection and maintenance have been performed. Records of this documentation should be kept with the instrument/equipment kit in bound logbooks or data sheets.

Contracted and sub-contracted laboratories will follow the testing, inspection and maintenance procedures required by EPA Clean Water Act approved methods and as stated in the respective laboratory's QAP and SOPs.

B.7 INSTRUMENT CALIBRATION AND FREQUENCY

Field instruments must be calibrated where appropriate prior to using the instruments. Calibrations must be in accordance with the respective EPA CWA approved method against standards of known traceability and within stated certification (expriation) dates. If equipment and/or kits require calibration immediately prior to the sampling event, the calibration date will be recorded in the operator's field logbook or field data sheets. When field instruments require only periodic calibration, the record of this calibration should be kept with the instrument. The project manager will delegate a field project team member to ensure that instruments are calibrated correctly and appropriate documents recorded and retained.

In this section specify instrument calibration procedures and their frequency for field measurement methods. Reference applicable instrument/method SOPs in QAPP appendices.

Contracted and sub-contracted laboratories will follow the calibration procedures found in its QAP and the laboratory's SOPs. Specific calibration procedures for regulated pollutants will be in agreement with the respective EPA Approved CWA method of analysis. Field and/or laboratory calibration records will be made available to ADEC upon request.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

In this section describe how and by whom supplies and consumables (e.g., standard materials and solutions, filters, pumps, tubing, sample bottles, glassware, reagents, calibration standards, electronic data storage media, etc.) are inspected and accepted for use in the monitoring project.

All reagents, calibration standards, and kit chemicals are to be inspected to ensure that expiration dates are not exceeded prior to use in the monitoring project.

All sample collection devices and equipment will be appropriately cleaned prior to use in the monitoring project.

All sample containers, tubing, filters, etc. provided by a laboratory or by commercial vendor will be certified clean for the analyses of interest. The sampling team will take note of the information on the certificate of analysis that accompanies sample containers to ensure that they meet the specifications and guidance for contaminant-free sample containers for the analyses of interest.

No standard solutions, buffers, or other chemical additives shall be used if the expiration date has passed. The sampling manager or his/her designee is responsible to maintain appropriate records (e.g. logbook entries, checklists, etc.) to verify inspection/acceptance of supplies and consumables, and restock these supplies and consumables when necessary.

Contracted and sub-contracted laboratories will follow procedures in their laboratory's QAP and SOPs for inspection/acceptance of supplies and consumables.

B.9 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

In this section identify the type of data needed for project implementation or decision-making obtained from non-measurement sources such as maps, charts, GPS latitude/longitude measurements, computer data bases, programs, literature files and historical data bases. Describe the acceptance criteria for the use of such data and specify any limitations to the use of the data. If data of known and accepted quality is to be modeled to predict water quality impacts, the specific model of use is to be identified, referenced and justified.

B.10 DATA MANAGEMENT

The success of a monitoring project relies on data and their interpretation. It is critical that data be available to users and that these data are:

- Of known quality,
- Reliable,
- Aggregated in a manner consistent with their prime use, and
- Accessible to a variety of users.

Quality Assurance/Quality Control (QA/QC) of data management begins with the raw data and ends with a defensible report, preferably through the computerized messaging of raw data.

Data management encompasses and traces the path of the data from their generation to their final use or storage [e.g., from field measurements and sample collection/recording through transfer of data to computers (laptops, data acquisition systems, etc.), laboratory analysis, data validation/verification, QA assessments and reporting of data of known quality to the respective ADEC Division of Water Program Office]. Data management also includes/discusses the control mechanism for detecting and correcting errors.

In this section include a flow chart as well as a detailed narrative of the monitoring project's data management process. An example Data Management Flow Chart (Figure 2) at the end of this section provides a visual summary description of the data flow/management process for environmental data collected in support of ADEC's Division of Water. Revise Figure 2 as appropriate for the specific monitoring project.

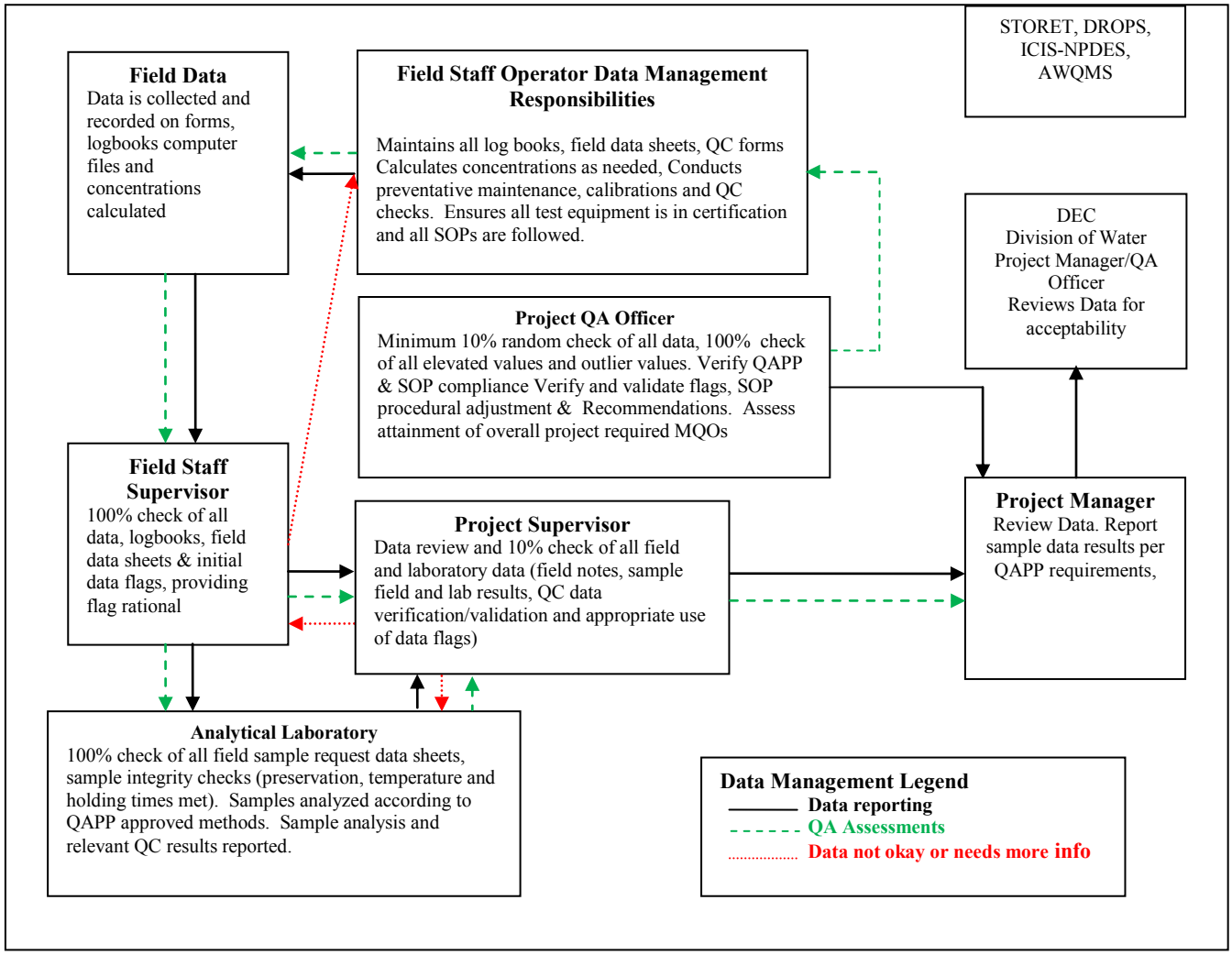
Various people are responsible for separate or discrete parts of the data management process:

- The sampling team is responsible for field measurements/sample collection and recording of data and subsequent shipment of samples to laboratories for analyses. They assemble data files, which includes raw data, calibration information and certificates, QC checks (routine checks), data flags, sampler comments and meta data where available. These files are assembled and forwarded for secondary data review by the sampling manager or supervisor.
- Laboratories are responsible to comply with the data quality objectives specified in the QAPP and as specified in the laboratory QAP and method specific SOPs. Validated sample laboratory data results with respective analytical method QA/QC results and acceptance criteria are reported to the sampling manager or project supervisor.
- Secondary reviewers (sampling coordinator/supervisor/project supervisor) are responsible for QA/QC review, verification and validation of field and laboratory data and data reformatting as appropriate for reporting to STORET, AQMS, ICIS-NPDES, DROPS (if necessary), and reporting validated data to the project manager.
- The project QA officer is responsible for performing routine independent reviews of data to ensure the monitoring projects data quality objectives are being met. Findings and recommended corrective actions (as appropriate) are reported directly to project management.
- The project manager is responsible for final data certification
- DEC DOW Project Manager/WQAO conducts a final review (tertiary review) and submits the validated data to STORET, AQMS, ICIS-NPDES, DROPS as appropriate.

B.10.1 Data Storage and Retention

Data management files will be stored on a secure computer or on a removable hard drive that can be secured. Laboratory records must be retained by the contract laboratory for a minimum of five years. Project records must be retained by the lead organization conducting the monitoring operations for a minimum of five years, preferably longer. Site location and retention period for the stored data will be specified in Section A9, Documents and Records, Table 8.

Figure 2: Example Data Management Flow Chart



C. ASSESSMENTS

C.1 ASSESSMENTS AND RESPONSE ACTIONS

In this section describe in detail the type, number and frequency and acceptance criteria for each type of assessment scheduled for the monitoring project. Revise Table 15 as appropriate to summarize the scheduled project assessment types, number, frequency and acceptance criteria limits.

Use the following guidance to design the appropriate QA assessment activities for a Tier 2 Water Quality Monitoring QAPP. Each monitoring project is different, with different intended data uses, different parameters to be measured and different project budgets. The key is to design an appropriate strategy to evaluate the overall monitoring system (data collection, analysis and reporting) with some level of confidence to independently substantiate the end-use quality data required by the monitoring project.

Assessments are independent (of management) evaluations of the monitoring project that are performed by the Project's QA Officer or his/her designee. For Tier 2 QAPPs, assessments may include, but are not limited to, any of the following: on-site field surveillance, on-site laboratory audits, performance evaluation samples, DMRQA samples, blind sample replicates (precision samples), field split samples, data quality audits, and data reviews. The number and types of assessments are dependent upon the monitoring project's intended data uses.

C.1.1 High Quality End-Use Tier 2 Monitoring Data

Generally, monitoring projects requiring high end-use quality data results for comparison to Alaska's water quality standards (e.g., compliance monitoring, listing/de-listing of impaired waters, etc.) need more frequent and varied assessments to provide a more thorough and independent validation that the monitoring project did actually capture high end-use quality data. Monitoring projects collecting samples for subsequent laboratory analysis need more types of assessments than just project field measurements to independently evaluate the overall monitoring system. Example QA Assessments are:

Field Assessments (each pollutant)

- Precision (replicate) sample measurements. Project should have minimum of three paired measurements/project or 15% of project samples, whichever is greater. Replicate measurements should be evenly spaced over project timeline. Precision criteria are specified in the project's Measurement Quality Objectives (MQO) table, see section A7.

Field samples collected for subsequent laboratory analysis (each pollutant)

- Blind replicate samples for each pollutant to be measured. Project should have minimum of three paired measurements/project or 15% of project samples, whichever is greater. Replicate samples should be evenly spaced over project timeline. Precision criteria are specified in project's MQO table, see section A7.
- Sample splits (one split sent to lab analyzing project samples, other split sent to a reference lab).
- Matrix spike duplicates (MSD) (assesses total measurement bias for project – both precision and accuracy). Frequency of MSDs is usually specified by the analytical method. Accuracy and precision of criteria for each pollutant and analytical method are specified in the project's MQO table, see section A7.
- Third party performance evaluation samples (PE samples also called performance test (PT) samples) for wastewater analytes of interest. PT water/wastewater sample participation is at a frequency of 1/year from a NELAC certified vendor (http://www.nelac-institute.org/PT.php#pab1_4). For APDES permit monitoring, these are called DMRQA samples.

  Microbiological samples should be analyzed by a current DEC Division of Environmental Health Drinking Water certified lab (http://www.dec.state.ak.us/eh/lab/certmicrolabs.aspx) for the methods of interest. For those microbiological methods not covered under the DEC EH Lab DW certification program, the microbiological lab will enroll in an approved PT study for the microbiological method of interest (see above link for approved NELAC PT vendors). Laboratory third party microbiological PT samples results will be submitted directly to the DEC Water QA Officer and the Monitoring Project's QA Officer.

Note 1: It is the laboratory's responsibility to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water QA Officer and the Monitoring Project's QA Officer. Routine laboratory performance in the blind PT sample studies will be used to assess overall laboratory data quality, as well as monitoring project data quality.

Note 2: It is the responsibility of the Project Manager and project QA Officer to ensure the selected laboratory is annually self-enrolled in a NELAC certified PT water/wastewater study for those analytes required in the monitoring project.

On-Site Assessments

- Inspection of field monitoring operations for compliance with QAPP requirements.
- Laboratory Audit (if concerns arise regarding laboratory data quality)
- Audit of project field measurement data results.

Project Data Assessments

- Audits of Monitoring Data for reproducibility of results from recalculation/reconstruction of field/lab unprocessed data.
- Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals.

C.1.2 Lower Quality End-Use Tier 2 Monitoring Data

Generally low quality end-use Tier 2 monitoring projects are not structured for making determinations for compliance with Alaska's WQS or requiring only field measurements (but no subsequent laboratory analysis) need minimal QA oversight. Example projects include: field measurements of DO, pH, conductivity, turbidity, TSS (Imhoff cones) and stream flow measurements. Example QA assessments are:

Field Assessments (each pollutant)

- Precision (duplicate/replicate) sample measurements. Project should have minimum of three paired measurements/project or 10% of project samples, whichever is greater. Replicate measurements should be evenly spaced over project timeline. Precision criteria are specified in MQO table, see section A7.

On-Site Assessments

- Inspection of field measurement activities for compliance with QAPP requirements.

Project Data Assessments

- QA review of project field measurement data results.
- Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals.

Table 15: Project Assessments

Assessment Type	Measurement Parameters		Frequency	Acceptance Criteria Limits
	Analyte	Method		
On-site Field Audit/Inspection	XXXX	XXXX	1/site/monitoring season	Site technicians in compliance with QAPP sampling protocols, sample sites meet sample design criteria
3rd Party Blind PT/DMR QA Sample (Lab)	XXXX	XXXX	annually	Analytes within PT study limits
Field Split Sample (sent to different labs for comparison analysis)				
On-site Technical System Lab audit				
Independent Data Review Audit	XXXX	XXXX	10% of reported data	XXXX
Project Precision, Accuracy and Data Completeness Assessment	XXXX	XXXX	end of project and at least 1/year	Defined in Section A7 and Table 6

C.2 REVISIONS TO QAPP

Annually the QAPP will be reviewed and revised as needed by the project manager and the project QA officer. Minor revisions may be made without formal comment. Such minor revisions may include changes to identified project staff (but not lead project staff:: QA project officer, project manager, sampling manager, contracted laboratories), QAPP distribution list and/or minor editorial changes.

Revisions to the QAPP that affect stated monitoring Data Quality Objectives, Measurement Quality Objectives, method specific data validation *"critical"* criteria and/or inclusion of new monitoring methods must seek review and pre-approval by DEC DOW QA Officer/DEC Project Management before being implemented.

C.3 QA REPORTS TO MANAGEMENT

Use Table 16 to describe assessment types, frequency, content, responsible individual/s, and distribution of assessment reports to management and other recipients and actions to be taken. Revise as appropriate to list project QA assessments.

Table 16: QA Reports to Management

QA Report Type	Contents	Presentation Method	Report Issued by	Reporting Frequency	
				As Required	Year
On-site Field Inspection Audit Report	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
Field Split Sample Report	Evaluation/comparison of result of split sample results from different laboratories, audit method	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
On-site Laboratory Audit Report	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
3rd Party PT (DMRQA, etc.) Audit Report	Description of audit results, methods of analysis and any recommendations	Written text and charts, graphs displaying results	Project QA Officer/auditor	✔	✔
Corrective Action Recommendation	Description of problem(s), recommended corrective action(s), time frame for feedback on resolution of problem(s)	Written text/table	QA Officer/auditor	✔	
Response to Corrective Action Report	Description of problem(s), description/date corrective action(s) implemented and/or scheduled to be implemented	Written text/table	Project Manager overseeing sampling and analysis	✔	
Data Quality Audit	Independent review and recalculation of sample collection/analysis (including calculations, etc) to determine sample result. Summary of data audit results; findings; and any recommendations	Written text and charts, graphs displaying results	Project QA Officer	✔	
Quality Assurance Report to Management	Project executive summary: data completeness, precision, bias/accuracy	Written text and charts, graphs displaying results	Project QA Officer	✔	✔

D. DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATIONAND VALIDATION REQUIREMENTS

The purpose of this section is to define the criteria used to review and validate monitoring data-that is, accept, reject or qualify data in an objective and consistent manner. Data review, verification and validation is a way to decide the degree to which each data item has met its quality specifications (i.e. analyte specific QC criteria and overall project measurement quality objectives).

D.1.1 Data validation

Data validation means determining if data satisfy QAPP-defined user requirements, that is, that the data refer back to the overall data quality objectives. Data validation is an analyte and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set to ensure that the reported data values meet the quality goals of the environmental data operations (analyte and method specific data validation criteria).

D.1.2 Data Verification

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements.

D.1.3 Data Review

Data review is the process that evaluates the overall data package to ensure procedures were followed and that reported data is reasonable and consistent with associated QA/QC results.

D.2 VERIFICATION AND VALIDATION METHODS

In this section describe the project's specific procedures for validating and verifying data. Discuss how issues are resolved and identify the authorities for resolving such issues. Describe how the results are to be conveyed to the data users. This section should reference examples of QAPP forms and checklists, which could be provided in the appendices. Any project-specific calculations are identified in this section.

D.2.1 Validation Methods

Data validation determines whether the data sets meet the project-specific requirements 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 shall be validated in accordance with the QA/QC requirements specified in the methods and the technical specifications outlined in this QAPP. Raw sample data will be maintained by the agency or company responsible for the monitoring project. Raw laboratory data shall 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 seven years.

The summary of all laboratory analytical results will be reported to the project manager. Data validation will be performed by the laboratory for all analyses prior to the release of data. All laboratory data will be validated according to the laboratory's QAP and SOPs and, as specified in the Monitoring Project's QAPP. The rationale for any anomalies in the QA/QC of the laboratory data will be provided to the Project Manager with the data results. Completed COC or transmission forms (if required) will be sent back from the laboratory to the Project Manager.

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 defined, flagged appropriately and data use clearly delimited and justified. Any actions taken to correct QA/QC problems in sampling, sample handling, and analysis must be noted. Under the direction of the Project Manager, project staff will document any QA/QC problems and the respective QA/QC corrective actions taken .

The Project Manager/monitoring supervisor or his/her designee is responsible for reviewing field log notebooks and field data sheets for accuracy and completeness within 48 hours of each sample collection activity, if possible. Sample results provided by the laboratory will be verified and validated

by the laboratory QA Officer prior to issuing the laboratory report. Laboratory results will include the results of all QA/QC results as part of the sample data report. The laboratory report will become part of the permanent file for the monitoring project. The Project Manager or his/her designee 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 verify project QA/QC criteria have been met (e.g., relative percent difference (RPD) results for blind sample duplicates, percent analyte recovery results for matrix spike and matrix spike duplicate (MS/MSD) results, etc).

The Project QA Officer or his/her designee will calculate the RPD between field replicate samples.

Laboratories calculate and report the RPD and percent analyte recovery of analytical duplicate samples and MS/MSD samples.

Analyte specific precision, accuracy and data completeness results greater than project MQO's will be noted by the Project Manager and justified in the final data report. The Project Manager, along with supervisors and/or the Project QA Officer, if necessary, will decide if any QA/QC corrective action is necessary if the precision, accuracy (bias) and data completeness values exceed the project's MQO goals.

D.2.2 Verification Methods

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 is complete, if sampling and analysis matched QAPP requirements, and if Standard Operating Procedures (SOPs) were followed.

Verification of data is the responsibility of the Project QA Officer. The Project QA Officer should verify at least 10% of generated project data in addition to all sample data anomalies and sample results approaching or exceeding AWQS and permit limits.

D.3 RECONCILIATION WITH USER REQUIREMENTS

The Project Manager and the Project QA Officer will review and validate data against the Project's defined MQOs prior to final reporting stages. If there are any problems with quality sampling and analysis, these issues will be addressed immediately and methods will be modified to ensure that data quality objectives are being met. Modifications to monitoring that affect the quality of reported data will require notification to and pre-approval by ADEC as well as subsequent edits to the approved QAPP.

Only data that have been validated, verified and qualified, as necessary, shall be submitted to ADEC Division of Water and entered into the applicable database (STORET, AQMS, ICIS-NPDES, DROPS).