QUALITY ASSURANCE PROJECT PLAN
KLAMATH RIVER WATER QUALITY MONITORING PROGRAM

July 1, 2002
Draft 7

1. Project/Task Organization

The Klamath River Water Quality Monitoring Program (KRWQMP) is being operated out of the Klamath Basin Area Office (KBAO) of the Bureau of Reclamation (Reclamation). This office is responsible for overall field operations, sampling, and monitoring in the upper Klamath basin, from Link River to Keno Dam. PacifiCorp is responsible for overall field operations, sampling, and monitoring in the Lower Klamath basin, from downstream of Keno Dam to Seiad Valley, and at sites in the upper Klamath basin not monitored by Reclamation. The Regional Bureau of Reclamation Office in Sacramento, California (MP-Reclamation) is providing planning and Quality Assurance (QA) support.

2. Problem Definition/Background

Reclamation's water quality monitoring program in 2002 is needed to support Klamath Project long-term operations planning, fish telemetry efforts in the upper Klamath basin, and to meet continuing commitments related to Endangered Species Act biological opinions.

PacifiCorp's water quality monitoring in 2002 is needed to support the Federal Energy Regulatory Commission (FERC) re-licensing process for the Klamath River facilities.

This program provides baseline information on main stem and tributary contributions on the Klamath River for a representative suite of physical, chemical, and biological water quality constituents. These constituents will be used to characterize water quality in the main stem Klamath River, identify water quality constituents of concern within selected river reaches, and estimate input parameters for water quality models. To achieve these objectives selected physical, chemical and biological constituents will be measured at frequencies ranging from sub-daily to monthly.

3. Project/Task Description

Sample Sites and Sub-programs:
The KRWQMP monitors main stem Klamath River and major tributary water quality from Link Dam near Klamath Falls to Seiad Valley downstream of the Scott River approximately one hundred twenty nine river miles from the Pacific Ocean. Multiple sampling sub-programs are included within this program:

? Bi-weekly and monthly grab samples (Grab)

- Instantaneous acquisition of physical parameters with multi-probe instrumentation (Profile or Probe)
- Continuous acquisition of physical parameters with deployment of multi-probe instrumentation (DataSonde)
- Reservoir water quality sampling (Reservoir) by PacifiCorp
- Water Temperature Study.

Table 1 on page 3 identifies site locations and sampling sub-programs. River miles for the main stem locations refer to distance from the mouth (ocean), while river miles on tributaries refer to distance upstream from the confluence with the Klamath River.

4. Data Quality Objectives for Measurement Data

Project Objectives:
The purpose of this program is to gather baseline water quality information for assessment of endangered/threatened fishes and determine data requirements and necessary information for use in water quality models for select reaches of the Klamath River. This information and available tools will be used to assess potential impacts of Reclamation and PacifiCorp operations on main stem Klamath River water quality. The physical, chemical and biological water quality data will establish the conditions that exist in the Klamath River watershed. The parameters were chosen to support, in part, Klamath Project long-term operations planning, fish telemetry efforts, to meet continuing commitments related to Endangered Species Act biological opinions, total maximum daily load studies, and for other analysis purposes.

Scope of Work:
This program is scheduled to run from April to November 2002. Chemical, biological, and physical parameters affecting the water quality for aquatic life in the river will be measured.

Data Assessment:
Table 2 summarizes the acceptance levels for the external check samples submitted to the laboratories with the production samples. All external check samples submitted to the laboratories are double-blind samples (sample is not identified as an external check sample). To evaluate external QA check samples, KBAO and PacifiCorp will follow the protocol outlined in the QA Standard Operating Procedure (SOP) supplied by the MP-Reclamation Environmental Monitoring Branch (EMB) in Sacramento, CA. The Quality Assurance Team from MP-Reclamation will provide QA support. Part of this assessment process may involve the reanalysis of external QA check samples for project parameters or the whole sample set associated with the external QA samples for certain parameters if external QA check sample results are not confirmed upon reanalysis. The laboratory's Quality Control (QC) check samples must also meet certain levels of acceptability when analyzed with the production samples. Part of the data assessment process involves checking these laboratory QC check sample results to ensure they are within

acceptable ranges. In order to ensure data quality, QA personnel will assess laboratory data packages to determine if all samples were analyzed within the holding times.

Table 1 Sample Sites and Associated Water Quality Sub-programs

Site #	Agency	Location	Site ID Code	River Mile	Profile [a]	Sonde [b]	Grab [c]	Probe [d]	Tw [e]	Flow [f]
1	USBR / PPC[g]	Upper Klamath Lake above Link Dam	KLLD	255	X	X	X			X
2	PPC[g]	Link Bypass 1								X*
3	PPC[g]	Link Bypass 2								X*
4	USBR / PPC[g]	Mouth of Link R	KRLR		X	X	X			X
~~5~~	~~?~~	~~Municipal and Industrial Discharge Points~~					~~?~~			~~?~~
6	USBR	Lake Ewauna A	KRS2		X					
7	USBR	Lake Ewauna B	KRS3		X					
8	USBR	Lake Ewauna C	KRS4		X					
9	USBR[j]	Klamath R at Highway 140	KRS5		X					
10	USBR	Lost R Diversion Channel	LRDC		X		X			X
11	USBR	Klamath R at Highway 97	KRS6		X					
12	USBR[j]	Klamath R at Collins Forest Products	KRS7		X					
~~13~~	~~USBR~~									
14	USBR	Klamath R above Miller Island Boat Ramp	KRS8		X					
15	USBR	Klamath R at Miller Island Boat Ramp	KRMI	246	X	X	X			
16	USBR	Klamath R below Miller Island Boat Ramp	KRS9		X					
17	USBR[j]	Klamath R above North Canal	KRS10		X					
18	USBR	Klamath R b/t North Canal and Teeters Lndg	KRS11		X					
19	USBR	Klamath Straits Drain at Highway 97	KSD97	240.5	X	X	X			X
19a	USBR	KSD near Mouth at Klamath River	KSDNM							
20	USBR[j]	Klamath R at Teeters Landing	KRS12		X					
21	USBR	Klamath R below Teeters Landing	KRS12a		X					
22	USBR	Klamath R above Highway 66 Bridge	KRS13		X					
23	USBR[j]	Klamath R at HWY 66 Bridge	KRS14	235	X	X	X			X
~~24~~	~~USBR~~	~~Keno Reservoir~~								
25	USBR	Klamath R at Keno Dam	KRS15		X					X
26	PPC	Klamath R below Keno Dam	23290							
27	PPC	Keno River Accretion								
28	PPC	Klamath R above JC Boyle Reservoir	22750				X	X	X	
29	PPC	Spencer Creek	SPC00				X	X	X	X
~~30~~	~~PPC~~	~~JC Boyle Reservoir upper~~								
31	PPC	JC Boyle Reservoir at Dam	22460	226	X		X	X	X	
32	PPC	Klamath R below JC Boyle Dam	22400				X	X	X	X
32a	PPC	Bypass Reach accretion					?			?
33	PPC	Klamath R Bypass Reach above Powerhouse	22100				X	X	X	X
~~34~~	~~PPC~~	~~Klamath R below JC Boyle Powerhouse~~								
35	PPC	JC Boyle Powerhouse Release	JCP00				X	X	X	X
36	PPC / WC[h]	Klamath R at State Line					X	X		
37	PPC / WC[h]	Klamath R above Shovel Creek	20645			X	X	X	X	X
38	PPC / WC[h]	Shovel Creek	SHC00	208			X	X	X	X
39	PPC	Klamath R above Copco								
~~40~~	~~PPC~~	~~Copco near area of spring flow~~								
41	PPC	Copco Reservoir at Dam	19855	198	X		X		X	
42	PPC	Klamath R above Irongate Reservoir	19630				X	X	X	X
43	PPC	Fall Creek	FLC00				X	X	X	X
44	PPC	Jenny Creek	JNC00				X	X	X	X
~~45~~	~~PPC~~	~~Irongate Reservoir at Basalt Narrows~~								
46	PPC	Irongate Reservoir above Dam	19010	190.2	X		X		X	
47	PPC	Klamath R below Irongate Dam	19000	190.1		X	X	X		X
48	PPC	Klamath R above Shasta at mouth	17670	176.7			X	X	X	

49	PPC	Shasta R	SHR00	176			X	X	[i]	X

[a] Profile = Tw, DO, pH, Spec Cond, ORP, collected with WQ probe at multiple locations
[b] Sonde = Tw, DO, pH, Spec Cond, ORP, collected through a continuously deployed logger
[c] Grab = USBR: TDS, Alkalinity, Ammonia, Nitrate-Nitrite, TKN, Total P, OP, BOD, Chlorophyll-a, Turbidity
PacifiCorp: Ammonia, Nitrate-nitrite, TKN, OP, TP, Alkalinity, Chlorophyll-a, BOD, Turbidity
[d] Probe = Tw, DO, pH, Spec Cond, ORP, collected with WQ probe at one location
[e] Tw = continuously deployed temperature logger
[f] Flow = gage (if *: requires gaging)
[g] During synoptic surveys, PPC will be sampling
[h] During synoptic surveys, WC will be sampling
[i] No temperature logger is included on the Shasta River as other agencies are already monitoring temperature in that river
[j] USBR sites where cross sectional profiles will be obtained

Table 2 Data Quality Objectives (from MP-Reclamation EMB SOP for QA, 2000)

Parameters	Reporting Limit (mg/L)	Accuracy (% Recovery)	Precision (% RPD)	Completeness (%)	Corrective Actions
Ammonia	0.05 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Nitrate + Nitrite as N	0.05 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Total Kjeldahl Nitrogen	0.1 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Orthophosphate	0.05 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Total Phosphorus	0.02 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Total Alkalinity	3 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Total Dissolved Solids	2 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Biological Oxygen Demand	3 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch
Chlorophyll a	2 ? g/L	Not Established	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	90%	Re-analyze sample and if not confirmed Re-analyze the batch

RL = Reporting Limit [ ] = If concentration of determination is....

5. Sampling Design (Experimental Design)

This program is divided into 7 different sub-programs; each designed to provide an overall assessment of the KR watershed water quality and to support scientific studies that are underway as well as those that are planned.

✍ Continuous Deployment of Water Quality Probes (Sonde): Physical parameters are measured hourly with Hydrolab® Datasonde 3 multi-probe units at multiple sites from April to November 2002 (see Table 1). Parameters include temperature, dissolved oxygen, pH, specific conductance, and oxidation reduction potential (redox). Datasondes at sites upstream of Keno Dam are exchanged each week, and transported to the KBAO, where they are downloaded, cleaned, calibrated, and readied for field deployment the following week. Datasondes at sites below Keno dam will be installed for short-term (3-day) deployments in May, July, and September. The KBAO SOP is used for the

calibration, usage, post-calibration, and maintenance of the deployed units. Table 1 outlines the locations and agency in charge.

- Instantaneous Acquisition of Physical Parameters (Profile or Probe): Physical parameters are measured on site every two weeks above Keno Dam and monthly below Keno Dam with multi-probe instrumentation (e.g., Hydrolab® H20 or YSI 600) at multiple sites from April 16 to November 5, 2002 (see Table 1). Parameters include temperature, dissolved oxygen, pH, specific conductance, and/or redox. Turbidity will also be measured at river sites using a portable instrument when a profile is acquired. Measurements are obtained at 0.1m, 0.5m, 1.0m, and at one-meter intervals thereafter until the bottom is reached (profile). The probes of the unit should be approximately 0.1m above the sediment for the bottom reading. Stratification is not present at sites where adequate mixing occurs and a profile of the entire water column is not required. At sites where adequate mixing occurs a measurement is obtained at a convenient location or near the grab sample site. At sites where stratification occurs the measurement is obtained at mid-channel.

  At selected sites, Reclamation will obtain cross sectional profiles. Four other measurements of the water column will be obtained in addition to the mid-channel location. At the selected sites a total of five vertical profiles will be obtained; River left where the depth is approximately one meter, half the distance from river left to mid-channel, mid-channel, half the distance from mid-channel to river right, and river right where the depth is approximately one meter. Table 1 outlines the locations of these selected sites.

- Grab Samples (Grab): Water quality grab samples are collected every two weeks from April to October, 2002 above Keno Dam and every four weeks from March – November below Keno Dam. Total Dissolved Solids (TDS), total alkalinity, ammonia, nitrate + nitrite as N, Total Kjeldahl Nitrogen (TKN), total phosphorous, orthophosphate, chlorophyll a, and Biochemical Oxygen Demand (BOD) are measured. TDS will only be measured at USBR sites. Hydrolab profiles will be obtained, as described above, when a grab sample is collected. Turbidity will also be measured at USBR sites using a portable instrument when a grab sample is collected. Table 1 outlines the locations and agency in charge.

- 3-Day Synoptic Water Quality Surveys: Synoptic monitoring measures the short term changes in nutrient and physical parameters. Three synoptic sampling periods will occur: May 21-23, July 15-17 and September 9-11. Nutrient (referring to those nutrients listed above) levels and physical parameters will be measured at the synoptic sites once a day for a period of three days, as per Table 1. The samples are retained on site until the end of each day and then mailed to the lab. Datasondes at the synoptic sites record physical measurements continuously (hourly) during this program. Appropriate QA samples are included with each day's sampling.

- Water Temperature Study: Water temperature is monitored with remote logging thermocouples at multiple locations in the Klamath River and tributaries between Iron Gate Dam and Seiad Valley (See Table 1). Logger sampling frequency is one hour. These data are intended to augment multi-probe deployments and provide information for temperature analysis and modeling.

- Reservoir Water Quality Sampling: Surveys of the three reservoirs consist of monthly depth profiles of the same physical parameters measured in the rivers at the surface and at 1 meter (3.3 feet) intervals. This will end in November. Water quality sampling of JC Boyle, Copco, and Iron Gate Reservoirs occurs immediately following the physical profile. Nutrient, BOD, chlorophyll-a samples will be collected at three depths corresponding to a representative epilimnion, metalimnion, and hypolimnion sample in Irongate Reservoir and Copco Reservoir. In JC Boyle reservoir, samples will be collected at only two depths, 1 meter from the surface and one meter from the bottom.

- Algae Speciation: Samples will be collected once per month at reservoir, river and tributary sites visited by PacifiCorp. Samples may be collected, as per the SOP, during synoptic surveys as necessary.

- Others (TBD)

6. Sampling Method Requirements

For field sampling protocol, the "Standard Operating Procedure for Water Quality Grab Sampling" (SOP) is used. This document is included as appendix A.

All water samples will be collected using the grab-sample method. Samples will be collected using a clean sample bottle, churn splitter, Van Dorn sampler, or a submersible pump, as appropriate to the site. The SOP instructs how the monitoring and sampling will be performed and associated procedures for documenting the field activities. A multi-probe instrument (i.e. Hydrolab H20 or YSI 600) will be used to measure the physical parameters (pH, specific conductance, dissolved oxygen, and water temperature) of the environmental water. Reclamation will use Hach 2100P turbidimeter to measure this physical measurement.

7. Sample Handling and Custody Requirements

Water samples will be collected in high-density polyethylene (HDPE) bottles and preserved according to EPA, Standard Methods, or other approved analytical methodology. Samples collected in the field will be labeled with:

- sample identification

- preservatives used
- constituent analyses required
- date and time sampled
- samplers initials

Sample volume is based on analytical requirements and is listed in Table 3. After collection, samples are kept in coolers on ice until delivered to the laboratory. All samples collected in the field require a Chain Of Custody (COC) and field data sheet. The COC and field data sheet will clearly document all the samples collected during that sampling period, associated sample identification numbers, and the date and time of collection for each sample. The field data sheet **must** be completed in the field while sampling. The COC may be completed at the end of the day when sampling is finished. The COC sheet is placed in a zip-lock bag and is shipped in the ice chest with the samples. A custody seal is attached across the opening of the ice chest by the field sampler. A commercial package carrier will transport the ice chests. The original COC sheet will be kept on file at the laboratory and the other copy returned to the KBAO or PacifiCorp headquarters.

8. Analytical Method Requirements

The analyses selected were based on previous analyses of basin water and requirements for water quality models. Basic Laboratory Incorporated (Basic) located in Redding, California will be responsible for analyzing the water samples for TDS, TKN, ammonia, nitrate + nitrite as N, total phosphorous, orthophosphate, and BOD. Samples analyzed for chlorophyll-a will be analyzed by Aquatic Analysts of Wilsonville, Ore. or Aquatic Research Incorporated (ARI) located in Seattle, Washington. The following methods are utilized to determine the concentrations of these analyses in the water samples.

Parameters	**Standard Methods**	
Ammonia	4500 NH3	(Basic Lab fax says 350.1(EPA Method))*
Total Kjeldahl Nitrogen	4500 NORG	(Basic Lab fax says 351.2)*
Nitrate + Nitrite, as N	4500 NO3	(Basic Lab fax says 353.2)*
Ortho-Phosphate	4500 P	(Basic Lab fax says 365.1)*
Total Phosphorus	4500 P	(Basic Lab fax says 4500P)
Total Alkalinity	2320	(Basic Lab fax says 2320)_
TDS	2540	
BOD	5210	(Basic Lab fax says 5210)
Chlorophyll *a*	10200H*	

*Final method TBD

*Basic was using the standard methods in 2001 not EPA methods. I was unaware that they had changed analysis methods.

9. Sample Bottle Requirements

The size of high-density polyethylene (HDPE) bottles required is listed in Table 3 for each constituent. All bottles are rinsed three times with the environmental water prior to filling with sample. Any filtration required will be done from the churn splitter in the field. All acid preservation is completed at the sampling site immediately after sample collection. A permanent waterproof-ink marker is used to write information about the sample on the bottle's label.

Table 3 Sample Bottles requirements, preservatives and hold times

Test	Filtered	Container	Preservatives	Hold Time
Biochemical Oxygen Demand	N	1,000 mL HDPE Clear	4°C, none	48 hours
Chlorophyll a -USBR	N	1000 mL HDPE Amber	4°C, keep in dark	7 days
Chlorophyll a - PacifiCorp	N	250 mL HDPE Amber	4°C, keep in dark	7 days
NH4, (NO2+NO3) as N, TKN, total P	N	1,000 mL HDPE Clear	4°C, 2 ml H_2SO_4	28 days
Orthophosphate*	Y/N	500 mL HDPE Clear	4°C, none	48 hours
Total Alkalinity	N	250 mL HDPE Clear	4°C, none	14 days
TDS	Y	250 mL HDPE Clear	4°C, none	7 days
Algae speciation	N	250 ml HDPE Amber	4°C, 5 ml Lugol	7 days

10. Quality Control Requirements

To check laboratory accuracy, precision, and contamination, each field crew will incorporate at least one blank sample, one duplicate sample, and one spike or QA reference sample per sampling event. Field samplers will label these external QA check samples with identifications similar to production samples so they can pass as double blind samples. The QA officer ensures that field personnel properly prepare external QA check samples. The Reclamation field crew will include a rinseate blank of the field sampling equipment at the last site after each sampling event. The laboratory will incorporate their own QC check samples, including spikes, duplicates and blanks, to ensure data reliability. For specific rates of laboratory QC check sample incorporations, refer to the laboratory QA manual. Laboratory QC check sample results are reported to the client as QC summary reports

The specific standard operating procedures used by Basic and ARI to analyze the samples for this project can be found in their QA manuals.

11. Instrument Calibration and Calibration Frequency

The laboratory performs instrument calibrations following the procedures and frequencies stated in the analytical methods for each parameter.

The Hydrolab H20 instrument will be calibrated before it is to be used in the field. The calibrations will follow the KBAO Hydrolab Calibration Protocol (appendix C). Field personnel will record Hydrolab calibrations on calibration sheets, which will be filed at the field office where the calibration is performed. Any other field probes used for this monitoring effort shall be calibrated prior to use in the field following factory specifications and procedures.

12. Assessment and Response Actions

Review of field activities is the responsibility of the project manager, in conjunction with MP-Reclamation's Environmental Monitoring Branch (EMB) located in Sacramento, California.

Prior to selecting a laboratory as a participant in this program, their analytical skill was evaluated through the use of performance samples by MP-Reclamation. After demonstrating acceptable results on these performance samples, a system audit was performed on the laboratories. The system audit consisted of first reviewing the laboratory's QA manual and EPA WP/WS performance study results for the past three years. After reviewing these documents, a MP-Reclamation audit team visited the laboratories to make certain they had everything in place to perform the work.

13. Data Review, Validation and Verification Requirements

KBAO and Watercourse Engineering, Inc. will review and verify all data generated from this program with the assistance of the MP-Reclamation EMB. KBAO and Watercourse Engineering, Inc. (? - please confirm) will follow MP-Reclamation protocol outlined in their QA SOP to review and verify the data from this program.

The laboratory's QC check samples must meet certain levels of acceptability when analyzed with the production samples. These levels of acceptability are set at certain limits found in the methods. Part of the data verification process involves checking these laboratory QC check sample results to ensure they are within acceptable ranges. If a laboratory QC check sample fails to demonstrate an acceptable result, the anomaly must be explained with a footnote or included in the case narrative section of the data report. In order to ensure data quality, QA personnel will assess laboratory data packages to determine if all samples were analyzed within the holding times.

14. Review and Verification Methods

When KBAO or PacifiCorp incorporates external QA check samples into a batch of production samples submitted to a laboratory, the laboratory must meet certain standards of acceptance on these QA check samples for the data to be approved as reliable. For this project, the standards of

acceptability (from MP-Reclamation EMB SOP for QA, 2000)for the external QA check samples are:

Duplicates:	For values > 5X Reporting Limit, %RPD $\leq$ 20% For values $\leq$ 5X Reporting Limit, values may vary $\pm$ Reporting Limit
Spikes:	Recovery should be 80%-120% Limit does not apply when sample value exceeds spike concentration by $\geq$ 5 times
Reference Materials:	Recovery should be 80%-120% of certified value for values $\geq$ 20X Reporting Limit For values < 20X Reporting Limit, recovery should be $\pm$ 2X Reporting Limit from the certified value
Blanks:	Blank concentration should be less than 10% of lowest sample concentration or less than or equal to two times the reporting limit.

Reclamation uses the following equations to validate data:

Relative percent difference: A statistic for evaluating the precision of a duplicate set. For duplicate results X1 and X2:

$$RPD=((X1-X2)/(X1+X2/2))x100$$

Completeness: The amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal operations. It is usually expressed as a percentage:

$$\% \text{ completeness } = V/n \times 100$$

where: V= number of measurements judged valid
n = total number of measurements

Percent recovery: A measure of accuracy determined from comparison of a reported spike value to its true spike concentration:

$$\% \text{ Rec. } = ((\text{observed conc.} - \text{sample conc.})/(\text{true spike conc.})) \times 100$$

Accuracy:	Accuracy is a measure of the bias inherent in a system or the degree of agreement of a measurement with an accepted reference or true value. It is most frequently expressed as percent recovery.
Precision:	A measurement of mutual agreement (or variability) among individual measurements of the same property, usually under prescribed similar conditions. Precision is usually expressed in terms of relative percent difference, but can be expressed in terms of range.
Range:	The difference between the largest and smallest numbers in a set of numbers.

All data entered into tables by KBAO are subjected to a thorough secondary review before being released to clients.

15. Reconciliation with Data Quality Objectives (DQO)

After each sampling event, calculations and determinations for precision, completeness and accuracy will be made immediately and corrective actions implemented if needed. If data quality indicators do not meet the project's specifications, data may be discarded and re-sampling may occur. The cause of failure will be evaluated. If the cause is due to equipment failure, calibration/maintenance techniques will be reassessed and improved. If the problem is determined to be a sampling error, team members will be retrained. If the problem is laboratory related, the laboratory program manager will be contacted and corrective actions implemented. Any limitations on data use will be detailed in both interim and final reports and other documentation as needed.

This QAPP will be revised if DQO failure occurs while following protocol. Revisions will be submitted to the review team, including the quality assurance group and technical advisors for approval.