BLUE LAKE RANCHERIA

Draft Quality Assurance Project Plan for Water Quality Sampling and Analysis

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Blue Lake Rancheria
Quality Assurance Project Plan
Water Quality Sampling and Analysis

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Region 9 Quality Assurance Manager

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A. PROJECT MANAGEMENT

1.0 Project/Task Organization

This Quality Assurance Project Plan (QAPP) is to be used in conjunction with the *Draft Blue Lake Rancheria Sampling Analysis Plan (SAP)* (BLREP, 2005). The *Draft SAP* specifically defines the water quality parameters to be sampled, site selection, sampling methods, equipment calibration and sample chain of custody. The Blue Lake Rancheria Environmental Program (BLREP) is completing this *QAPP* to define how quality control (QC) procedures defined in the *Draft SAP* are implemented and to define how the BLREP and its staff will work together on quality assurance (QA) to insure that data are properly collected and analyzed, data managed and stored for on-going use, and results published in a timely fashion. Because of the systematic planning process documented in the *Draft SAP* and this *QAPP*, the BLREP Water Quality Monitoring Program will supply quality assured data for management decisions related to the aquatic environment within BLR jurisdiction and the Mad River watershed.

The BLREP Water Quality Monitoring Program is organized as shown in Figure 1. The BLREP Director has ultimate control over and responsibility for the WQ program, but delegates to the QA Officer for program coordination, schedule and budget management, technical oversight, report preparation, and overall program quality.

The QA Officer will have responsibility and authority for:

- Ongoing review of monitoring methods and equipment calibration,
- Auditing field notebooks, databases, chain of custody forms, and
- Insuring adherence to field and laboratory QA/QC programs.

In short, the QA Officer will insure that QC procedures developed herein and in the *Draft SAP* are carried out. The WQ Technician will work under the supervision of the QA Officer and follow procedures as defined in the *Draft SAP* and in this *QAPP*. The WQ Technician will:

- Collect field samples
- Fill out forms to record results and field conditions,
- Care for and calibrate equipment,
- Properly fix and ship samples needing laboratory analysis,
- Transfer results from the field or laboratory into databases,
- Properly store data and archive to insure against loss,
- Run preliminary analysis of data, and provide charts for reports, and
- Assist with report preparation.

Any time there are problems perceived by the WQ Technician with any part of the WQ Monitoring Program, they are to notify the WQ Officer so they can work collaboratively on resolving them. The QA Officer will also periodically conduct audits to detect QA/QC problems or deficiencies. Any problems identified

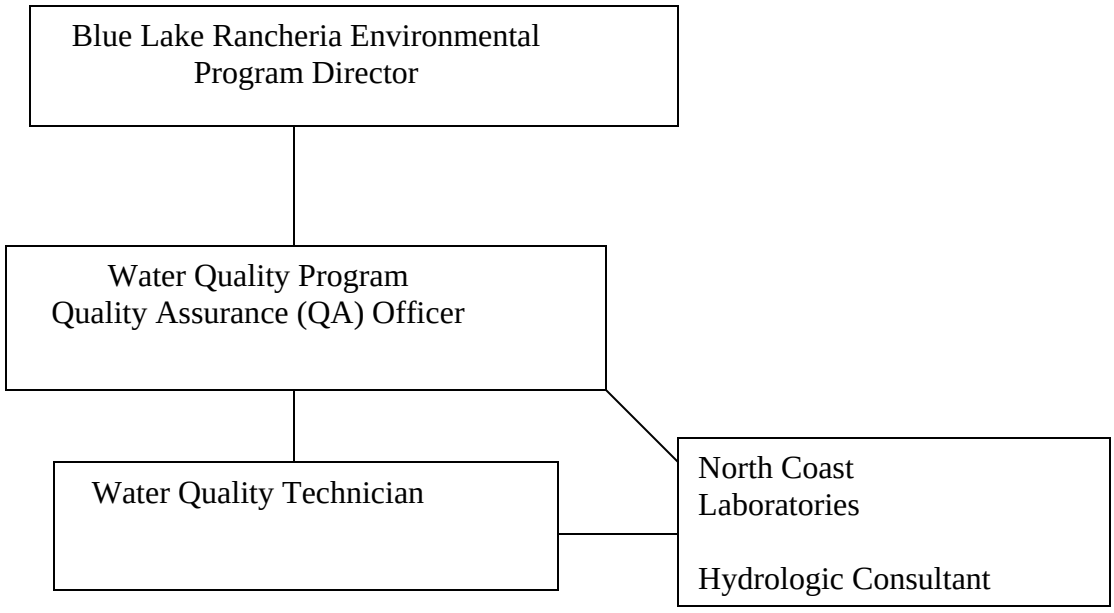

Figure 1. BLREP Water Quality Program flow chart of organization and authority.

during the review, monitoring, and auditing processes will be brought to the attention of the BLREP Director. If QA/QC problems or deficiencies requiring corrective action occur, such action will be documented by the WQ Officer so that similar problems can be avoided in the future. Any notes pertinent to data quality will be included in metadata associated with affected data sets.

If any tests of surface or groundwater exceed action levels, then the BLREP Director will be notified so that he can inform the BLR Tribal Council. The BLREP would then inform the North Coast Regional Water Quality Control Board staff and work cooperatively with that agency for abatement of problems.

The BLREP will send all water quality samples needing laboratory analysis to North Coast Laboratories in Arcata, California, an accredited laboratory by the U.S. EPA and the California Department of Health Services. A hydrologic or geologic consulting firm will provide technical assistance in installation and operation of the continuous data logger in the Mad River on BLR land.

2.0 Background/ Problem Definition

The Blue Lake Rancheria is contained within the Mad River watershed in Northwestern California (Figure 2). The Mad River is recognized by the State Water Resources Control Board North Coast Region (NCRWQCB, 2001) as sediment impaired and a Total Maximum Daily Load (TMDL) study to plan sediment abatement is to be completed by 2007. The headwaters of the Mad River are in Trinity County near the town of Mad River and it flows into the Pacific Ocean 90 miles to the northwest in the town of McKinleyville.

Figure 1. The location of the Blue Lake Rancheria in the Mad River watershed with reference to location in northwestern, California.

The watershed is long and narrow, covering approximately 500 square miles. The upper portion of the basin is in the Six Rivers National Forest and the remaining portion is in private ownership, containing large areas of industrial timberlands and ranchlands. There are no major roads that follow the river and middle

reaches are readily inaccessible to the public. The lower Mad River basin includes the communities of Blue Lake, McKinleyville, and Arcata, CA. Recreational use is concentrated in the lower reaches and at Ruth Reservoir at its headwaters. The latter is the water storage facility for the HBMWD that withdraws drinking water for 80,000 customers 75 miles downstream below the City of Blue Lake.

The BLREP is concerned with the health of the Mad River overall, but has as its priority the health of the aquatic resources within all BLR Tribal Lands. A recognized potential problem is an abandoned land fill formerly used by the City of Blue Lake that is adjacent to Powers Creek not far upstream of the BLR, but preliminary groundwater tests did not detect significant pollution (GeoEngineers, 2002). Although the City of Blue Lake does provide sewage treatment, many households in the lower Mad River watershed use septic systems, which also pose a potential threat of water pollution. Non-point source pollution from the streets of Blue Lake may also be impacting lower Powers Creek and the wetland contained with the BLR, although no data have yet been collected.

There are significant non-point source pollution problems in the Mad River watershed that have given rise to its listing as impaired for sediment by the NCRWQCB (2001). Shannon (1955) noted significant decline of Mad River salmon poplulations due to habitat loss related to logging after WWII. A second wave of timber harvest began about 1985 and harvest continues at a rapid rate (Figure 3). The BLR would like to see Mad River sediment problems abated and fisheries resources restored to where there is a harvestable surplus of salmon and steelhead for Tribal members and the public. In order for the BLR to participate as co-managers of Mad River water quality and watershed health, the BLREP must demonstrate data collection, management and analysis capabilities.

The first step to attainment of this long-term goal is baseline data collection for water bodies within the Reservation, which is the focus of this *QAPP* and the *Draft BLREP SAP* (2005). Quality assured water quality data collected by the BLREP will be used in management of the Mad River watershed. Data will be shared with the U.S. EPA and NCRWQCB staff through timely reports on findings, including for use in TMDL studies. Other agencies and entities cooperating in Mad River management may also receive BLRRP data after it has undergone QA/QC and analysis. The BLREP will also share data with the public through annual reports

3.0 Project/Task Description

The BLREP will implement a Water Quality (WQ) Monitoring Program to collect quality assured (QA) water quality data for management decisions related to the aquatic environment within the BLR and the Mad River watershed. Monitoring is scheduled to begin in Fall 2005 upon U.S. EPA approval of this *QAPP*. Water quality data collection will help establish baseline water quality conditions and quantitatively assess the quality of BLR water resources and initiate long-term

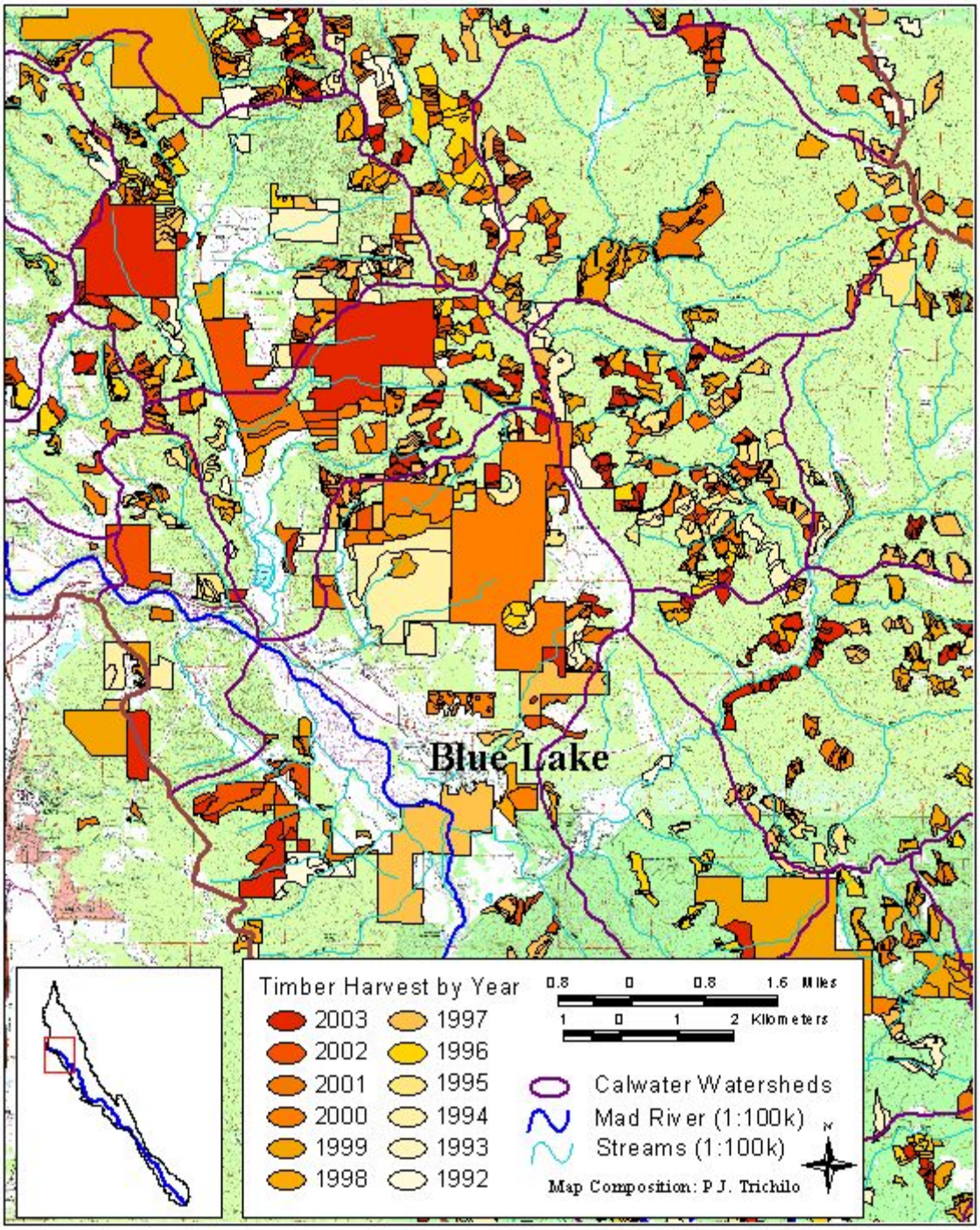

Figure 2. Timber harvests in the Mad River watershed in the vicinity of the Blue Lake Rancheria from 1992 to 2002 according to California Department of Forestry data. CDF, Santa Rosa, CA.

trend monitoring. After one year of sampling in October 2006, a report will be issued to U.S. EPA. To the degree they are useful, these quality assured data will be provided for TMDL development.

Water quality sampling will take place in four major water bodies with varying numbers of stations in each (Figure 3):

1. The **Mad River** (MR) will at 3 locations including at the Hatchery Road Bridge in Blue Lake, on the BLR below Powers Creek and at the railroad trestle near the mouth of Lindsey Creek,
2. **Powers Creek** (PC) will be sampled at 2 locations, at its mouth and at the Stewart property further upstream,
3. The **wetland** (W) within the BLR will be sampled where flow enters and 100 feet west in the same waterbody, and
4. **Groundwater** (GW) will be sampled at the Stewart property within the BLR 4 that were established for previous groundwater studies.

Water quality and quantity parameters to be sampled for each water body are listed in Table 1. These include hand held instrument readings, stage and flow gauges, and continuous automated probe sampling. The periodicity of sampling at each location by parameter can be found in Table 2. Water quality sampling may not be feasible at the mouth of Powers Creek (PC-1) or at either wetland station because of loss of surface flow or standing water, respectively, late in summer and before fall rains. The continuous data recorder on the BLR near the mouth of Powers Creek (MR-2) will be fixed to a boom that will suspend the probe to avoid damage to equipment posed by powerful Mad River flows during winter.

Monitoring will help discover whether there are water quality problems with waters within or adjacent to the BLR and the BLREP will report any findings of action levels of contaminants and work to abate any identified problems as described above. Turbidity monitoring data will likely be useful for TMDL development and in the long term for tracking recovery of water quality for the TMDL implementation.

4.0 Data Quality Objectives

The primary goal of this *QAPP* is to ensure that the data generated by the BLREP WQ program is of sufficient quality to be used to answer questions about the quality of waters within the BLR and to foster their protection or improvement over time. The *Draft BLREP SAP* (2005) documents quality assurance (QA) measures that specify standard data collection techniques, clear field notes, correct sample handling and proper data management, storage and analysis. These follow U.S. EPA (1995; 1998; 2002) guidance closely. This *QAPP* insures that BLREP staff or contractors will meet those standards because of an organized quality control (QC) system. The BLREP will implement procedures for obtaining and evaluating data in an accurate, precise, and complete manner so that field measurements, sampling procedures, and analytical data provide information that is comparable over time and representative of actual field conditions.

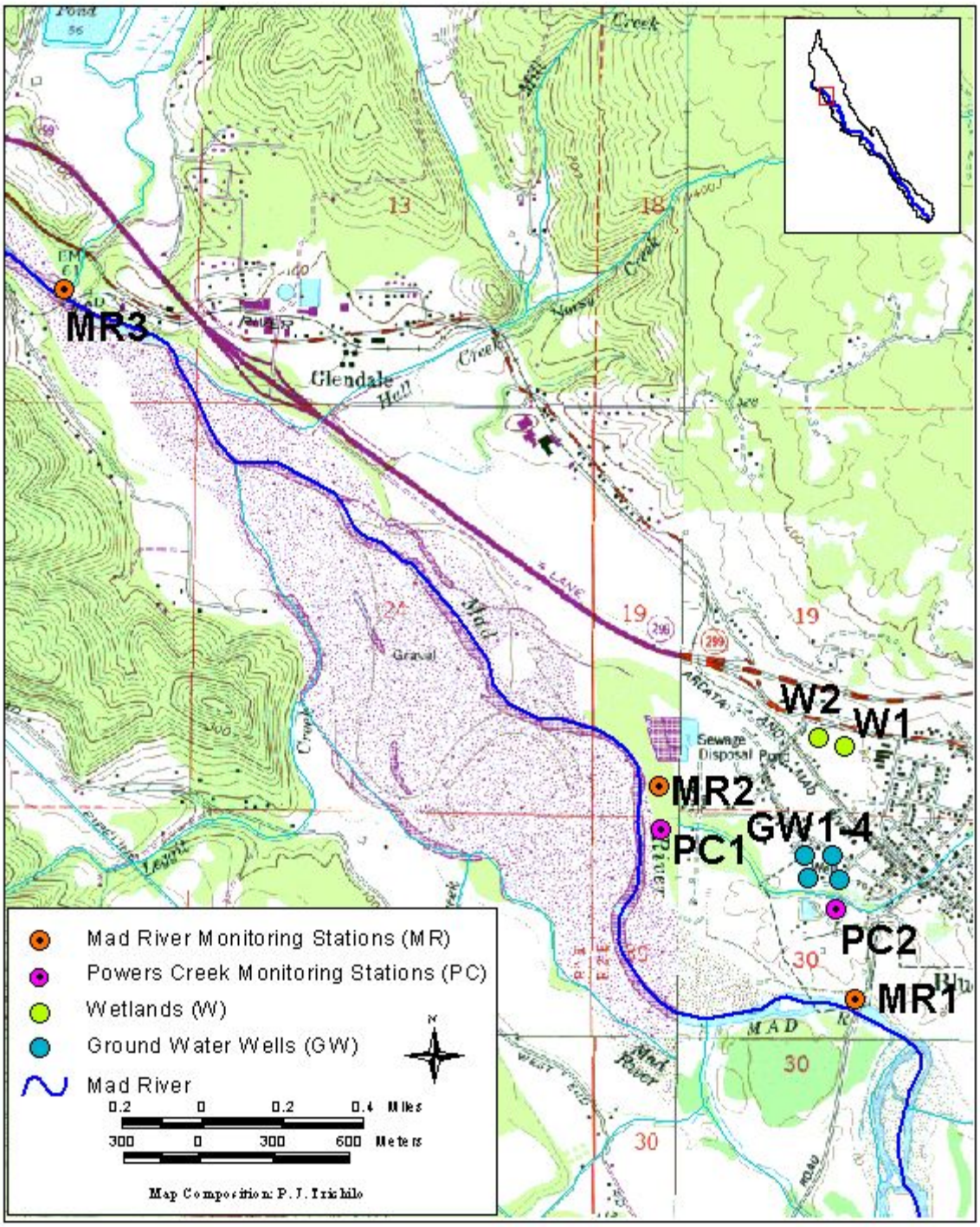

Figure 3. Location of the BLREP water quality monitoring stations on the Mad River (MR), Powers Creek (PC), the wetland (W) contained within the BLR, and groundwater wells (GW) on the Stewart property within the BLR adjacent to Powers Creek.

Table 1. Water quality parameters and data uses included in the BLREP Water Quality Sampling and Monitoring Program.

Parameter	Units	Water Body	Data Uses
Stage (Water Level)	ft	W-1	Baseline Long-term TMDL
Discharge	cfs	PC-1 W-1	Baseline Long-term TMDL
Temperature	°C	MR-1, MR-2*, MR-3 PC-1, PC-2 GW 1-4 W-1, W-2	Baseline Long-term TMDL
pH	pH	MR-1, MR-2*, MR-3 PC-1, PC-2 GW 1-4 W-1, W-2	Baseline Long-term
Dissolved Oxygen	mg/L	MR 1-3* PC 1-2 W 1-2	Baseline Long-term
Conductivity	µS/cm	MR-1, MR-2*, MR-3 PC-1, PC-2 GW 1-4 W-1, W-2	Baseline Long-term
Turbidity	NTU	MR-1, MR-2*, MR-3 PC-1, PC-2 GW 1-4 W-1, W-2	Baseline Long-term TMDL
Coliform Bacteria	#/100mL	MR-2 PC-2 W-1 GW-1	Baseline Long-term
Total Nitrogen	mg/L	MR-2 PC-2 W-1	Baseline Long-term
Total Phosphorus	µg/L	MR-2 PC-2 W-1	Baseline Long-term
Bis (2-Ethylhexl) phthalate or BEHP	µg/L	Groundwater	Long-term
* Indicates continuous data recorder at MR-2.			

Table 2. Sampling periodicity at each sampling site in the BLREP Water Quality Monitoring Program.

Sample Site	D.O	pH	Temp.	Cond.	Turbidity	Coliforms	Total N	Total P	Discharge	BEHP	Stage
Mad River Site #1	2x week	2x week	2x week	2x week	2x week	N/A	N/A	N/A	2x week	N/A	continuous
Mad River Site #2*	2x week	2x week	2x week	2x week	2x week	4 x year	4 x year	4 x year	2x week	N/A	continuous
* Automated Probes	continuous	continuous	continuous	continuous	continuous						
Mad River Site #3	2x week	2x week	2x week	2x week	2x week	N/A	N/A	N/A	2x week	N/A	continuous
Powers Cr Mouth (#1)	2x week	2x week	2x week	2x week	2x week	N/A	N/A	N/A	2x week	N/A	continuous
Powers Cr Site #2	2x week	2x week	2x week	2x week	2x week	4 x year	4 x year	4 x year	2x week	N/A	continuous
Wetland - Inlet (#1)	2x week	2x week	2x week	2x week	2x week	4 x year	4 x year	4 x year	2x week	N/A	continuous
Wetland - Outlet (#2)	2x week	2x week	2x week	2x week	2x week	N/A	N/A	N/A	2x week	N/A	continuous
Groundwater Well #1	yearly	yearly	yearly	yearly	yearly	yearly			N/A	Every 5 yrs	continuous
Groundwater Well #2	yearly	yearly	yearly	yearly	yearly	N/A			N/A	N/A	continuous
Groundwater Well #3	yearly	yearly	yearly	yearly	yearly	N/A			N/A	N/A	continuous
Groundwater Well #4	yearly	yearly	yearly	yearly	yearly	N/A			N/A	N/A	continuous

5.0 Special Training/Certification

The collection of all surface and ground water samples using hand held equipment will use standard field methods as described in the *Draft BLREP SAP* (2005), which are derived from recognized U.S. EPA (1983; 2004) and U.S. Geologic Survey (USGS, 1998) protocols. However, setting up continuous stage recorders for flow at the inflow to the wetland and deploying an automated water sampling probe in the mainstem Mad River will require technical assistance and training of BLREP staff by a hydrologic or geologic consulting firm. The consultant would oversee installation of the staff gauge in the inlet to the BLR wetland and the automated data probe at MR-2, and instruct the BLREP WQ Technician in their care and maintenance.

The WQ Technician will keep clear records about how instructions from the consultant were followed and make notes about any conditions that might cause anomalies in data. The BLREP QA Officer will inspect the staff gauge and sampling probe at MR-2 and periodically audit the WQ Technician to make sure that proper maintenance is taking place and is being documented.

6.0 Documentation and Records

The *Draft BLREP SAP* (2005) describes the process and responsibilities for generating and maintaining quality data. The *Draft SAP* and this *QAPP*, once approved, will be kept in printed form for ease of reference of the WQ Technician, QA Officer and BLREP's Director. When updated plans are approved, one copy of an older version will be retained in the BLREP library, but clearly stamped to indicate that it is no longer current. In addition, each page of the *SAP* and *QAPP* will be clearly labeled as to the version and date of revision.

Quarterly progress reports and the final report to U.S. EPA will include preliminary and final data results, including charts showing the ranges of values with reference lines indicating "action levels" (NCRWQCB, 2001). Results of QA/QC procedures involving field and laboratory blanks will be documented to verify precision and accuracy in sampling and also noted in metadata. Raw data from the field and lab results will be transcribed or downloaded in standard database form. Subsequently, standard programs such as Excel, Access or the regionally popular Klamath Resource Information System (KRIS) will be used to generate summary charts. Both summary data and raw data will be retained, and archived both at the BLREP and off premises on portable computer external hard drives to guard against data loss.

Each data file will have a metadata set associated with it to trace its provenance and make sure that any irregularities in its collection, such as challenging field conditions or equipment calibration, can be traced back. The metadata shall be based on field notes, equipment calibration logs, chain of custody forms and QA/QC tests described in the *Draft BLREP SAP* (2005).

The quarterly and final reports will include QA/QC Audit Report summaries by the QA Officer, which will reflect findings based on periodic review and oversight. Audits will be of field methods and notes, equipment calibration and associated logs, chain of custody forms, QA/QC sampling results and proper data management, storage and analysis. If the QA Officer finds deficiencies or departures from protocols established by the *Draft SAP* or this *QAPP*, the QA/QC Audit Reports should not only clearly define problems, but also describe the corrective action that has been applied. The report will document that use or release of bad data was prevented. This insures that only sound data will be used by BLREP, NCRWQCB and U.S. EPA for decision support.

B. DATA GENERATION AND ACQUISITION

1.0 Sampling Process Design

The sampling procedure under this *QAPP* is described fully in the *Draft BLREP SAP* (2005). The BLREP WQ Monitoring Program was designed through consultation with the U.S. EPA staff, Kier Associates and North Coast Laboratories. The sample collection is intended to detect any impairment of groundwater or surface waters on BLR lands. Turbidity data collected by continuous water quality recorders to be installed on the mainstem Mad River (MR-2) may also be of use in answering questions related to the upcoming Mad River TMDL technical report.

Table 2 above showed the types of water quality parameters to be sampled and the frequency of sampling by location. Sampling station locations are shown in Figure 2 and are strategically placed to help answer key BLREP questions regarding water quality. The *Draft BLREP SAP* (2005) describes how each suspected impact or source of pollution can be checked. The parameters to be measured are listed in Table 1 above and the action levels indicating impairment are listed in Table 1 of the *Draft BLREP SAP* (2005). The number of samples and location afforded by this study design will help establish baseline conditions for waters of the BLR and provide trustable data for decision support. After QA/QC and publication of results, high quality data generated by the BLREP WQ Monitoring Program will also be contributed for use in other analytical activities conducted by cooperating agencies and entities in the Mad River watershed.

2.0 Sampling Methods Requirements

The *Draft BLREP SAP* (2005) documents completely all equipment and methods for field sampling in order to comply with U.S. EPA (1983; 1995; 2004) protocols and standards. Detailed descriptions of these procedures include, in some cases, exact steps extracted from standard methods manuals (*Draft SAP* Section 6.0). The *SAP* also describes steps needed for sample preservation, calibration of equipment, preparation of sample containers, maximum holding times, sample volumes and decontamination procedures needed to insure sampling precision and accuracy. The *Draft BLREP SAP* (2005) and earlier sections of this *QAPP* describe how the QA Officer will insure adherence to QA/QC protocols and take

necessary corrective action should there be any departure from established procedures.

3.0 Sample Handling and Custody

Sample handling and custody procedures are fully described in the *Draft BLREP SAP* (2005) including the nature of the samples and the maximum allowable sample holding times before extraction or analysis. All laboratory samples will be processed through North Coast Laboratories, a U.S. EPA certified lab that is located within a few miles of the BLR. BLREP staff can act as couriers which will insure safe and expeditious handling of samples. The *SAP* also includes custody forms and labels for samples being shipped to laboratories.

4.0 Analytical Methods Requirements

Analytical methods, equipment and performance standards that will be utilized in surface and ground water sampling are describe in detail in the *Draft Blue Lake Rancheria Water Quality Sampling and Analysis Plan (SAP*) (2005). Standard analytical field methods were chosen and these widely accepted field methods are to be followed as part of the *SAP* and this *QAPP*.

The QA Officer will oversee and audit QC procedures as outlined in the *Draft SAP* and will document findings in reports. Corrective actions will also be issued by the QA Officer and their implementation documented. Detailed information on the corrective actions and any samples affected shall be kept in the lab records and in metadata associated with data sets.

5.0 Quality Control Requirements

Sections 6.3.1 and 6.3.2 of the *Draft BLREP SAP* (2005) define specific steps for sampling flow and discharge and various water quality. The *Draft SAP* also specifies quality control (QC) activities for the field and the laboratory in Section 9.0 including the use of blanks, duplicates, matrix spikes, laboratory control samples, and surrogates. Frequency of analysis for each type of QC activity has been defined through consultation of BLREP staff and the U.S. EPA. References and required control limits for each QC activity are defined as is corrective action required when control limits are exceeded. The QA Officer will be responsible for documenting the effectiveness of the corrective action.

Precision and accuracy of all laboratory equipment to be used are listed in Table 2 of the *Draft SAP*. The range of values from the field or laboratory will be statistically compared with all other samples from the field, expected ranges of values for the same parameter from the literature, and previously collected data by other entities such as the State Water Resources Control Board, Department of Water Resources and the Humboldt Bay Municipal Water District. This exercise will provide a procedure to calculate precision and to detect bias. If findings are that equipment calibration or field sampling techniques have created problems related to precision or bias, then suspect data will be discarded and re-sampling will occur. Problems and steps implemented to improve results will be reported

by the QA Officer. Notes regarding any QC problems will also be recorded in associated metadata.

5.1 Field QC Requirements

Field sample collection quality control checks are fully described in Section 9.0 of the *Draft BLREP SAP* (2005) and consist of:

- Equipment blanks;
- Field blanks; and
- Field sample duplicates.

The number of QC samples required for each matrix of samples for both surface and groundwater can be found in Table 5 of the *Draft SAP*.

5.2 Laboratory QC Requirements

Specific requirements and procedures for laboratory QC will be monitored by the BLREP and North Coast Laboratories, where all samples will be processed and analyzed. The procedures and forms for chain of custody for lab samples are included in the *Draft BLREP SAP* (2005) as are all requirements for QC sampling. The QC protocols in the *Draft SAP* define the need and frequency internal blanks, internal duplicates, internal spikes and surrogate spikes. Any departure form QC procedures as defined by the *Draft SAP* noted by the BLREP WQ Technician or QA Officer or staff from North Coast Laboratories will be documented as will steps to improve QC measures in all future samples.

6.0 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

All test equipment will be calibrated and tested as described in the *Draft BLREP SAP* (2005). Calibration will follow requirements defined in the owner's manual of each piece of test equipment and by pertinent U.S. EPA (1983; 2004) and USGS (1998) documents. The WQ Technician will be responsible for maintaining records showing results of calibration for each piece of test equipment (listed in Table 6 of *Draft SAP*) and the records of each calibration will be maintained on file at the BLREP and subject to periodic inspection by the QA Officer.

Any equipment malfunction should be reported immediately by the WQ Technician to the QA Officer and corrective action taken. Repairs will be made or parts replaced before any additional field sampling occurs. Reports of equipment malfunction from the WQ Technician or similar findings from audits by the QA Officer will trigger an equipment QC report from the QA Officer detailing the nature of the problem, the solution and measures taken to improve equipment maintenance in future sampling events.

Devices measuring dissolved oxygen require frequent changes of membranes to maintain accuracy and extra membranes should be kept on hand. Extra batteries

in automated temperature probes should be ordered and changed yearly so that batteries do not wear out during the field season to prevent loss of data

7.0 Instrument Calibration and Frequency

All test equipment will be calibrated and tested before each matrix of field samples is collected as described in the *Draft BLREP SAP* (2005). Instruments used to measure and collect samples in the field for water quantity and water quality testing will be calibrated according to manufacturer's specifications and procedures, or as outlined in this section.

8.0 Requirements For Supplies and Consumables

8.1 Identification of Critical Supplies and Consumables

Supplies and consumables used by BLREP in water quality sampling will be tracked for quality inspection and acceptance using an Inspection/Acceptance Testing Requirements Log and labels affixed to individual pieces of equipment and containers of consumables where appropriate. Disposable containers will be used in many cases to reduce risk of contamination.

8.2 Establishing Acceptance Criteria

Acceptance criteria for supplies and consumables are given in the U.S. EPA (2002) Standard Operating Procedures (SOPs) and will be followed in this *QAPP*. Following this standard, all supplies and consumable used by the BLREP will have labels that provide a record for consumables similar to Figure 4.

Unique identification no. (if not clearly shown)_____
Date received_____
Date opened_____
Date tested (if performed)_____
Date to be retested (if applicable)_____
Expiration date_____

Figure 4. Example of a record for supplies and consumables from U.S. EPA (2002).

8.3 Inspection or Acceptance Testing Requirements and Procedures

All supplies and consumables will be inspected upon receipt by the BLREP WQ Technician or someone under their supervision. Any container or material requiring special criteria, such as sterility, will be checked prior to use.

8.4 Tracking and Quality Verification of Supplies and Consumables

The results of all inspections will be recorded on a Supplies and Consumables Tracking Log (Figure 5) and kept in project binders. All reagents used will be manufacturer-certified to meet or exceed the requirements for their applications.

Critical Supplies and Consumables	Inspection/ Acceptance Testing Requirements	Acceptance Criteria	Testing Method	Frequency	Responsible Individual	Handling/Storage Conditions

Figure 5. Supplies and Consumables Tracking Log taken from U.S. EPA (2002).

9.0 Data Acquisition Requirements

Water quality data are available from various other sources including computer databases and literature files. Existing water quality data sources with relevance to this program include but are not limited to:

- US Forest Service Six Rivers Nation Forest
- US Geological Survey, Quality of Water database (USGS)
- California Data Exchange Center (CDEC) climate database,
- California Department of Water Resources (DWR)
- North Coast Regional Water Quality Control Board (NCRWQCB)
- California Department of Transportation
- Humboldt State University (HSU)
- Humboldt Bay Municipal Water District
- Redwood Community Action Agency
- Green Diamond Resources Industry

Data has been acquired from the Internet from the DWR, NCRWQCB and USGS for comparative purposes in this study to help gauge representativeness of data collected by BLREP. Acceptance criteria for future data will be based on the direct relevance to BLREP projects, which could include involvement in the TMDL and its implementation. Data must be from a recognized source and quality assured, including metadata and other necessary tracking information. For any new data acquired, tests will be conducted by BLREP staff to discern if there is apparent bias or lack of precision and to test whether such data appear to be representative. Summary data for which associated raw data are not provided will not be used in most cases.

Biased data or data deemed questionable in quality will be not be used in studies or for decision support. Preferred data would be acquired from agencies or entities employing an EPA approved QAPP. All decisions regarding data quality and relevance will be made by the BLREP Director.

10.0 Data Management

Procedures for data management and storage are thoroughly described in the *Draft BLREP SAP* (2005).

10.1 Data Recording

Data recording will be performed using data recording sheets as exhibited in the BLREP Draft SAP (2005) (Appendix A). Data will be entered into a standard database form and double checked for accuracy in transcription from field forms. Any field conditions that could bear on data quality or results need to be entered into metadata that will be kept with associated data. Data from automated probes will be downloaded onto computer hard drives and archived in raw form before processing.

10.2 Data Validation

Once entered into an electronic database, data will be checked for checked for outliers and representativeness. The QA Officer will periodically meet with the WQ technician to review charts or tables that show results of such analysis. If outliers are found, they are to be trimmed from the dataset and notes are to be made in associated metadata (automated temperature probe after removal from water). The QA Officer will visually inspect all entered data sets and associated equipment calibration forms to make sure that there are no inconsistencies or departures from QC procedures that could undermine data quality.

10.3 Data Transformation

Any transformations of data will be clearly labeled and explained as necessary on the same data sheet or computer file in which the transformation is performed. Where irreversible data transformations are performed, such as production of a graph from numeric data, the source and location of the original data set will be clearly indicated. Raw data with metadata will be maintained at all times so that scientific transparency is complete for all BLREP reports, model runs or and data used for decision support.

10.4 Data Transmittal

All field and laboratory water quality data generated under the BLREP water quality program will be delivered directly to the QA Officer and BLREP Director. The data manager will be responsible for the incorporation of data into a database form that can be operated in standard software programs such as Microsoft Access and Excel or the regionally popular Klamath Resource Information System (KRIS) software. BLREP data could be transmitted in conjunction with reports to U.S. EPA staff via the Internet. Data entry will be consistent with EPA STORET data format and could be added to on-line resources made available by the US EPA.

10.5 Data Reduction

Data reduction is the process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors,

and collating them into a more useful form (U.S. EPA, 2002). Any transformation or reduction of data will be clearly described in metadata and in reports and raw data retained for purposes of transparency.

10.6 Data Analysis

Standard methods will be used for statistical and graphical data analysis, as described in U.S. EPA (1998): *Guidance for Data Quality Assessment: Practical Methods for Assessment* (EPA QA/G-9). The WQ Technician will consult with the QA Officer on analytical methods, and the QA Officer will review preliminary results of analysis and validate the approach.

10.7 Data Tracking

All data collected by the BLREP will have several mechanisms for tracking that will be on file at the BLREP: field data sheets, equipment calibration forms, sample chain of custody forms, lab results forms, databases and metadata. If the BLREP chooses to use the KRIS software, source data, transformed data, metadata, results of analysis and reports can all be stored in one database. Data will not be given to or shared anyone other than BLREP personnel or BLREP consultants without direct approval of the data manager and the BLREP Director.

10.8 Data Storage and Retrieval

All data will be stored in standard database form in a format that can be read by popularly used software, such as Microsoft Access and/or Excel. These data may also be stored in the KRIS database where retrieval of data, charts, photos or spatial data for reports, slide presentations or posters is easy. External hard drives will be used to store all raw or processed data, reports, or any other product produced under this QAPP or accumulated during future studies as well as hard drives at BLREP. If the hard drives are stored off premises, data loss will be prevented even if BLREP offices were damaged by fire, flood or other unanticipated event.

C. ASSESSMENT/OVERSIGHT

11.0 Assessment and Response Actions

This element gives information concerning how a project's activities will be assessed during the project to ensure that *QAPP* is being implemented as approved (U.S. EPA, 2002). The *BLREP Draft SAP* (2005) and previous sections of this *QAPP* clearly define project oversight and audits whereby the QA Officer will routinely check every aspect of the WQ Technician's work. This involves every project aspect including field forms, equipment calibration, data entry and analysis and report writing. Assessments will be started early in the project to identify potential problems and allow for timely corrective action. Any departures from standard procedures as defined by this *QAPP* or the *SAP* will be documented, corrective actions taken and those corrective measures also reported.

11.1 Assessment Activities and Project Planning

Overall water quality project planning will be overseen by the BLREP Director, but carried out by the QA Officer in cooperation with the WQ Technician. Consultants will be retained, if they have special knowledge about Mad River or BLR water quality, for participation in project planning or implementation.

All assessment activities will follow U.S. EPA (2000) guidelines as defined in the *Guidance on Technical Audits and Related Assessments (G-7).* A log of assessments similar to the one shown in Figure 6 will be kept on file on the BLREP premises with the QC reports themselves.

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person, Title, Organizational Affiliation Responsible For:			
				Performing Assessment	Responding to Assessment Findings	Identifying and Implementing Corrective Actions	Monitoring Effectiveness of Corrective Actions

Figure 6. Form for assessment as taken from U.S. EPA (2000)

11.1.1 Assessment of the Subsidiary Organizations

Management Systems Review (MSR) techniques will be used as described in *Guidance for the Management Systems Review Process, 1998* (EPA QA/G-3) to review organization, policies and procedures used by the BLREP water quality program.

11.1.2 Assessment of Project Activities

Project activities, including water quality sampling and continuous monitoring, handling and transport of samples, laboratory analysis and data entry and analysis, will be assessed on an ongoing basis by the QA Officer, who will issue monthly reports to the BLREP Director.

At the end of the first year of water quality monitoring performed under this *QAPP*, the BLR will hire a consultant to perform a Technical Systems Audit (TSA) to review all facilities, equipment, personnel, training, procedures, and record keeping involved in BLREP water quality assessment.

Peer review may also be performed by environmental staff of other Tribes, consultants, and local university science natural resources faculty and graduate students, as described in Section 12.2.2 below.

11.2 Documentation of Assessments

11.2.1 Number, Frequency, and Types of Assessments

MSR and surveillance of the water quality program by the QA Officer and BLREP Director will be performed on an ongoing basis over the life of the water quality program, with initiation as soon as sampling begins. Assessment will be documented as in Table 6 and scheduled as defined above in this *QAPP*. Oversight audits by the QA Officer will be at least once a month and reports to the BLREP Director filed monthly.

The TSA will be performed by a qualified outside consultant at the end of the first year of water quality monitoring performed under this QAPP. If the initial TSA finds that the water quality program requires major improvements or reorganization to meet BLREP DQOs, then a second TSA will be scheduled for the end of year two, with needed changes to be implemented in the interim. If the initial TSA calls for few programmatic changes, subsequent TSAs will take place at two-year intervals.

Peer review will take place as needed at the discretion of the BLREP Director subject to the availability of peer reviewers or resources to support review.

11.2.2 Assessment Personnel

MSR and surveillance of the water quality program will be performed by the QA Officer with support from program staff and outside consultants as needed.

TSAs will be performed by qualified outside consultants in order to assure objectivity. Consultant qualifications will include experience in performing TSAs and familiarity with specific water quality parameters being monitored.

To the degree that budget allows or that there is willing or cost-effective participation of professionals, peer review will be performed by outside agencies, environmental staff of other Tribes, paid consultants or university faculty.

11.2.3 Schedule of Assessment Activities

Assessment activities will be scheduled as described in Section 11.2.1 above.

11.2.4 Reporting and Resolution of Issues

All assessment reports prepared by BLREP staff, consultants, or peer reviewers will be provided to the BLREP Director who will provide copies or summaries of these reports to the Blue Lake Rancheria Council and/or the Tribal Administrator on an as-needed basis. The BLREP QA Officer will be responsible for implementation of any corrective action called for by the assessment process. Corrective actions may include, but will not be limited to: substitution of alternative methodologies for

sampling, analysis or reporting; reassignment of task or replacement of staff, consultants, contract laboratory, or other non-Tribal program participants.

12.0 Reports to Management

Monthly reports will be prepared and distributed to summarize the field activities performed, analytical results obtained and QC oversight results. Raw data from field measurements and other sample collection activities will be appended to the report, as appropriate, or file name and location on BLREP computer network reported. Where field data have been reduced or summarized, the method of reduction will be documented in the report. Any needed corrective actions will be the responsibility of the QA Officer, who will request assistance from the BLREP Director, if unable to resolve any problems.

D. DATA VALIDATION AND USABILITY

13.0 Data Review, Validation, and Verification Requirements

This section is dedicated to describing criteria that should be used for accepting, rejecting, or qualifying project data. This information is contained in Sections 9.0 and 10.0 above of this *QAPP*

14.0 Validation and Verification Methods

Data verification and validation will follow standard SOPs (U.S. EPA, 2002) as described above in this and in the *Draft BLREP SAP* (2005). The WQ Technician will be responsible for most procedures carried out under this program but the QA Officer will verify and validate different components of the project. If the QA Officer discovers problems, they will identify the issue resolution process and method of response. No data will be released to data users outside the Tribe until all questions regarding data quality have been resolved, associated metadata are complete and analysis has been completed. Release of data is at the discretion of the BLREP Director and the Tribal Council.

15.0 Reconciliation with Data Quality Objectives

When the data validation indicates that a control parameter is not within limits specified in this *QAPP*, the impact of the outlier on the usability of the associated data will be assessed. The usability of data associated with QC results outside of data quality objectives is dependent on the degree of the exceedence, whether the potential bias is high or low, and whether the uncertainty implied by the exceedence is significant. On the basis of the results of the data validation, qualifiers will be applied to analytical data to indicate the usability of the data. Any limitations on data use will be detailed in associated metadata, reports, and other documentation as needed.

E. REFERENCES

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