RECLAMATION
Managing Water in the West

Water Quality Monitoring for the CDFW R-4 Wildlife Areas Water Development Project

Quality Assurance Project Plan

U.S. Bureau of Reclamation, Mid-Pacific Region
Quality Assurance and Data Management Branch, MP-156
Environmental Monitoring Branch, MP-157

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Draft

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

A. Project Management

Water Quality Monitoring for the CDFW R-4 Wildlife Areas Water Development Project

Quality Assurance Project Plan

A.1 Title and Approvals

_____ _____

Stuart Angerer Date
Environmental Monitoring Team Project Manager

_____ _____

Russell Clayton Date
Quality Assurance Team Project Manager

_____ _____

Ali Beals Date
Data Management Team Project Manager

A.2 Table of Contents

A.3 Distribution List

Personnel listed in Table 1 will receive an electronic copy of the Quality Assurance Project Plan (QAPP) for the *Water Quality Monitoring for the CDFW R-4 Wildlife Areas Water Development Project* (Program); personnel from the Environmental Monitoring & Hazmat Branch (EMHM or MP-157) and the Quality Assurance & Data Management Branch (QADM or MP-156) will have electronic access to QAPP updates. The QAPP and QAPP updates will be distributed by the Environmental Monitoring Team (EMT) and Quality assurance Team (QAT) project managers (see Table 2).

A.4 Project/Task Organization

MP-410 requested the assistance of the Environmental Monitoring Team (EMT) and the QADM which is composed of two groups [QAT and the Data Management Team (DMT)] to develop this QAPP, conduct sampling, and produce an assessment report.

Personnel from the EMT will:

- maintain and update their sections of the QAPP,
- collect environmental samples,
- assess the data and generate reports to the program manager

Personnel from the QADM will:

- maintain and update their sections of the QAPP,
- incorporate external quality assurance (QA) samples,
- validate the analytical data,
- generate QA summary reports,
- enter data into the Environmental Monitoring database (EMD),
- archive, secure, and store hard copy data, including field logbooks

Individuals from the EMT and QADM responsible for these tasks are listed in Table 2.

Laboratory analysis will be performed by the laboratories identified in Table 3.

A.5 Problem Definition/Background

The United States Bureau of Reclamation (Reclamation) will be monitoring water quality in and around the Los Banos Wildlife Area (WA), and at well heads of groundwater wells located on the China Island, Gadwall and Salt Slough Units of the North Grasslands WA Complex. This monitoring effort was developed in support of a provision in the *Agreement for the Reimbursement of Pumping Costs for Refuge Water Supplies at Department of Fish and Wildlife Region 4 Wildlife Areas between the United States and the State of California* (Agreement). Under the Agreement, Reclamation is responsible for implementing a water quality monitoring plan for water developed by CDFW pursuant to the Agreement as a new source of Incremental Level 4 water supplies. The developed water supplies are comprised of groundwater and recirculated surface water.

Surface and groundwater monitoring is carried out by Reclamation's Environmental Affairs Division, Environmental Monitoring Branch (MP-157) for Reclamation's Resources Division, Program Management Branch (MP-410).

A.5.1 Background

Section 3406(d) of the Central Valley Project Improvement Act (CVPIA), Public Law 102-575, Title 34 (1992), authorizes and directs the Secretary of the Interior, through Reclamation, to deliver firm water supplies of suitable quality to 19 federal, state, and private wetland habitats, wildlife areas and wildlife refuges (collectively referred to as Refuges) located in the Central Valley. These Refuges include the Los Banos Wildlife Area (WA); and the China Island, Salt Slough, and Gadwall Units of the North Grasslands WA. The Gadwall Unit receives CVPIA water supplies as part of the Grassland Resource Conservation District (GRCD), also one of the 19 Refuges. The Los Banos WA and the China Island, Gadwall and Salt Slough Units of the North Grasslands WA (collectively referred to as Wildlife Areas) are owned and managed by the State of California Department of Fish and Wildlife (CDFW).

Section 3406 (d)(2) directs the Secretary, through Reclamation, to supplement those quantities of water (Level 2 water supplies) provided under Section 3406 (d)(1) to full Level 4 quantities of the "Dependable Water Supply Needs" table for those habitat areas as set forth in the *Report on Refuge Water Supply Investigations* (Reclamation, 3/1989) and the full water supply needed for full habitat development for those habitat areas identified in the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (Interior, 12/1989). The quantities of water required to supplement the Level 2 (L2) supplies represent the difference between the L2 allocation and Level 4 (L4) allocation, and must be acquired through voluntary measures, including water conservation, purchase and conjunctive use, which do not require involuntary reallocations of CVP yield. The difference between L2 and full L4 water quantities is referred to as Incremental Level 4 (IL4). Historically, IL4 water has been primarily acquired from willing sellers on the open market. Reclamation has also acquired groundwater as part of its annual IL4 supplies. The amount of IL4 water acquired varies from year to year, depending on annual hydrology, water availability, water market pricing, and available funding, which contribute to constraints that have limited Reclamation's ability to annually provide the full quantities of IL4 supplies to the Refuges. Reclamation continues to explore options for new sources of IL4 water supplies to augment limited available annual quantities.

CDFW has proposed operating their groundwater wells and the Ruth Lake Water Conservation Project (WCP) to develop another source of IL4 water supplies to benefit south-of-Delta Refuges for reimbursement by Reclamation of CDFW's operational costs.

A.5.2 Surface Water Supply

Surface waters to be tested under this program will be from the Boundary Drain entering Ruth Lake, on the Los Banos WA, via Low Lift #12 and the San Luis Canal downstream of Low Lift #13 where water from Ruth Lake enters the San Luis Canal. Additionally

this program will monitor the San Luis Canal upstream and downstream of 2 wells (when these wells are discharging into the San Luis Canal). Of these 2 wells, one is on the Los Banos WA, and the other is on the Gadwall Unit.

A.5.3 Groundwater Supply

Groundwater to be monitored through this Program will be developed from Los Banos WA Deep Wells 1 and 2, Gadwall Unit Deep Well 1, Salt Slough Unit Deep Well 1, and China Island Unit Deep Wells 1 and 4 to determine if these water supplies are of suitable quality as CVPIA supplies for use on the WAs. In addition, groundwater from the Los Banos WA Deep Well 1 and Gadwall Unit Deep Well 1 will be monitored to determine if the developed groundwater is of suitable quality to discharge into the San Luis Canal for delivery to CVPIA Refuges without impacting the quality of existing surface water supplies in the San Luis Canal. Both Los Banos WA Deep Well 1 and Gadwall Unit Deep Well 1 have the flexibility to either discharge into the respective WA's internal distribution system or discharge into the San Luis Canal.

Monitor the quality of groundwater at the wellhead that will be discharged into the internal distribution systems of Salt Slough, China Island, and Gadwall Units of the North Grasslands WA and the Los Banos WA.

A.6 Project/Task Description

This monitoring plan details the monitoring of water quality associated with water supplies conveyed to the internal distribution systems of the specific WA/Units or to the San Luis Canal and how that water may impact the canal.

A.6.1 Project Goals

- Characterizing the constituents of concern from the Boundary Drain as a surface water supply to Ruth Lake on the Los Banos WA.
- Characterizing the constituents of concern from Ruth Lake as a surface water supply entering the San Luis Canal.
- Characterizing the constituents of concern of groundwater supplied for internal use on each WA/Unit (Los Banos, China Island, Gadwall, Salt Slough).
- Characterizing the constituents of concern from groundwater water delivered to the San Luis Canal from Los Banos WA and Gadwall Unit. In addition to wellhead sampling, samples will be collected upstream and downstream of discharge point in the San Luis Canal.

A.6.2 Resource and Time Constraints

Prior to sampling surface and groundwater, verification should be obtained that water is being pumped and whether that water is being discharged for internal use to the specific

WA/Unit or is being discharged into the San Luis Canal. This information will be obtained by consulting with the WA managers.

The WAs administer a hunt program during the fall and winter months. "Hunt Days" are scheduled September 1-15 for dove season. The opening day for waterfowl season generally falls on the 3rd Saturday of October. From the 1st day of waterfowl season through February of the following year, "hunt days" are scheduled for Wednesday, Saturday and Sunday. Because of this, sampling will not commence during these times due to safety concerns.

In order for the collected samples to arrive at the analytical laboratory on a weekday, samples will not be collected or shipped on a Friday or Saturday.

A.6.3 Task Schedule

Chemistry

Ground water samples will initially be collected, for chemical analysis, monthly for six months. Once this baseline is established groundwater will be tested quarterly for one year until reviewed. After review this frequency may change based on findings.

Reclamation staff from MP-157 will coordinate site visits with the respective WA managers.

Physical Characteristics

a. For surface water in the San Luis Canal downstream of the Los Banos WA, a telemetered Sonde will be used to collect hourly physical measurements (pH, EC, temperature). This sonde will be calibrated monthly.

b. At all other ground and surface water sites, physical parameters will be collected using a hand-held Sonde when water samples are collected

Summary reports of the data collected will be produced after the first 6 months of collection for review, then annually or as the program manager refines. See Table 4.

A.7 Quality Objectives and Criteria

This section summarizes acceptance criteria for obtaining field measurements and analytical results that meet the project data quality objectives (DQOs). Reclamation's DQO process parallels the United States Environmental Protection Agency (EPA) DQO process. Data quality indicators (DQIs) for the analysis of samples will include method sensitivity, analytical accuracy and precision, contamination, outliers, and completeness. The acceptable criteria and associated data quality indicators discussed below were chosen to 1) quantify the uncertainty levels (error) associated with the analytical data produced for this project, and 2) ensure that the chosen uncertainty levels will not

compromise study objectives. See Table 5 for a list of quality threshold and reporting limits.

A.7.1 Action Limits (Quality Thresholds)

The detection limit is the ability of a method to detect a parameter to be measured at a level of interest. Target analytes, analytical methods, and their respective reporting limits (RLs) are shown in Table 5 and Table 10.

A.7.2 Method Sensitivity

Laboratory Reporting Limits

The detection limit is the ability of a method to detect a parameter to be measured at a level of interest. Target analytes and their respective reporting limits (RLs) are shown in Table 5. The sensitivities of the methods selected should ideally provide RLs at levels of at least three times below the parameter's lowest quality threshold. However, the technology may not always be in place to achieve the needed level of sensitivity and even if present, may not be fiscally possible. Note that due to sample matrix effects and other analytical issues, the RL values actually obtained may be higher than the anticipated RLs.

Instrument Sensitivity Associated with Field Measurements

Hand held instruments (meters) will be used to measure water characteristics (i.e., temperature, specific conductance (EC), and pH). The detection limits (or sensitivity) for field instruments will conform to the specifications of the manufacturer (Table 6). Hand-held instruments are only intended for immediate results and as a field reference.

A.7.3 Analytical Bias – Accuracy, Precision, and Contamination

To provide an independent assessment of the laboratories' ability to produce data with acceptable levels of precision and accuracy without introducing contamination, the QA specialist incorporates blind, external QA samples into batches of environmental samples prior to submitting them to the laboratory for analysis. QA incorporation rates and types of QA incorporated are discussed in Section B.5.1. Results of external QA analyses are assessed by the QA specialist using the acceptance criteria summarized in Table 7 and the procedures in the QA SOP (Eldredge, 2012).

Precision, accuracy and contamination are also assessed by review of the laboratory (internal) quality control (QC) results. Incorporation rates and acceptance criteria for laboratory incorporated QC samples are established within the applicable analytical methods and/or the laboratory SOPs.

If a QA or QC result does not meet the relevant acceptance criteria, bias and variability of the analytical results will be assessed by the QA specialist following the QA SOP (Eldredge, 2012). Sample results determined to have a bias or variability will be flagged with an appropriate data qualification code indicating the potential bias or variability.

A.7.4 Completeness

Completeness refers to the percentage of project data points that must be successfully collected, validated, and reported in order to proceed with its intended use in decision making compared to the actual number of data points collected. Completeness for this project must be 95%. If samples cannot be collected, or if analytical issues lead to loss of analytical results or compromised data quality, the Program Manager will be notified. The Program Manager will determine if re-sampling and/or reanalysis is necessary.

A.7.5 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, a variation in a physical or chemical property at a sampling point, or an environmental condition. As much as is fiscally and logistically possible, sample sites are selected to maximize the representativeness of the samples.

A.7.6 Comparability

Comparability is achieved by collecting and analyzing samples in the same manner at the same sites. In this study, all samples will be collected by Reclamation personnel using equipment and methods outlined in this QAPP. Collection activities will be carried out in accordance with MP-157 sampling protocols (Benninger and Anderson, 2012). If field conditions require any deviations from anticipated methods, all deviations will be thoroughly documented in field logbooks and discussed in the Assessment Report for the study. Field personnel will receive any needed training prior to sample collection in order to ensure comparable implementation of collection procedures.

Furthermore, comparable methods will be used by the laboratories chosen to analyze the samples.

A.7.7 Historical Outliers

A result is considered to be an outlier if it is greater than three standard deviations from the average. Twelve data points are necessary before a result can be assessed as an outlier. The outlier spreadsheet is routinely updated so that only the 30 most recent results are in the spreadsheet.

A.8 Special Training/Certifications

No special training or certification is required for this program.

A.9 Documentation and Records

The written, illustrated, and photographic recording media for the project will be both paper and electronic. The project will implement proper document and record control procedures for both paper and electronic media, consistent with Reclamation data management procedures. Written records and documents will be legibly recorded in

permanent ink. Language used will be accurate, objective, factual, and free of personal opinion. Corrections will be made by crossing a single-line through faulty entries and entering the correct information. Corrections will be initialed and dated by the person making the correction. The lead Project Manager and QA specialist will have ultimate responsibility for all changes to records and documents.

The QAT, EMT, and DMT project managers will be responsible for approval of the final QAPP and approval of any updates. EMT and QAT project managers will also be responsible for distribution of the current or updated QAPP. The EMHM/QADM shall retain copies of all sample collection documentation, QA incorporation documentation, laboratory reports and correspondence, and any emails associated with project activities.

A.9.1 Documents and Records to be Retained

Procedures and activities performed in conjunction with this project should include the records and documents listed below. All documents and records will be maintained indefinitely.

- Quality Assurance Project Plan
- Field Logbook
- Field Sheet
- Instrument Calibration Sheet
- Chain of Custody (COC)
- Spike/Reference Book
- Laboratory Analytical Reports
- Annual data summary and assessment report
- QA Summary Report

Quality Assurance Project Plan

The QAPP (this document) is used to document the QA plan for the project. The QAPP is to be written and maintained by the EMT project manager, QA specialist, and data management specialist (Table 2).

Field Logbook

A bound field notebook with consecutively numbered pages will be used to record the information listed. Field personnel will maintain the field record book. Entries will be made at the time of sample collection and should be sufficiently comprehensive to reconstruct the field activities of that day. After entering the required information, the field sampler must sign the field logbook entry. The field logbook documents:

- Project name
- Site location/name
- Date
- Names of sampling personnel and record keeper
- Onsite start time

- Offsite end time
- Sample identification (ID) number
- QA samples collected
- Sampling methods
- Parameters and matrices collected
- Physical measurements
- Decontamination procedures
- Unusual conditions that might affect the samples

Unattended continuous sampling will include applicable notes above and:

- File name stopped and downloaded
- New file name created after calibration
- Battery voltage remaining

Field Sheet

A field sheet is generated from the entry in the field logbook. The information listed below will be recorded on the field log sheet(s).

- Project name
- Site location
- Sample ID number
- Analyses to be conducted
- Sample collection date
- Sample collection time (for short hold parameters)
- Name of person who collected the sample
- QA type
- Parameters and matrices collected
- Physical measurements
- Method of sampling (grab, composite etc.)
- Field sampler signature

Instrument Calibration Sheet

The instrument calibration sheet documents the information from an initial calibration, performed prior to instrument use, and information from a verification check, performed after all sampling for that day is completed. Information documented on the instrument calibration sheet should include:

- Project name
- Date
- Time(s)
- Field sampler's name
- Instrument type
- Instrument number
- Standard value
- Initial value
- Adjusted value

- Measured value
- Post calibration value
- Conductivity cell constant
- Barometric pressure (for Dissolved Oxygen (DO))
- DO charge and gain
- Pressure offset (for depth)
- pH mV readings including difference between pH 4 and 7 or pH 7 and 10
- Acceptance criteria.

Chain of Custody

The field sampler generates a COC form. The COC documents legal custody of the samples from the time of collection to the time of delivery to the laboratory. The COC should document the following information:

- Project name
- Project Manager
- Name and signature of sample collector
- Name of analytical laboratory
- List of sample IDs
- Sample collection dates/times
- Sample matrix
- Number of containers per field ID
- Parameters and analyses requested
- Point of contact
- Date, time, and signatures of all parties responsible for receiving and relinquishing the samples from the time of collection to the time of delivery to the laboratory.
- The QAT will add special instructions to the COC per the procedures in the QA SOP (Eldredge, 2012).

Spike/Reference Book

The QA specialist is responsible for documenting the necessary information pertaining to the QA samples in the spike/reference book. A spike/reference book is a bound notebook that contains worksheets. The spike/reference book is bound with numbered pages. Documentation on the worksheet includes the following information:

- Project name
- Number of samples
- Collection date
- Laboratory report number
- Range of sample ID numbers assigned to the batch of samples
- Range of laboratory ID numbers assigned to the batch of samples
- Site name for the selected QA site
- Types of QA samples incorporated
- Field IDs that correspond to the QA samples
- Parameters

- Source ID for reference material used
- Historical background levels for parameters
- Reporting limits for parameters
- Spike solution number used
- Concentration of parameters in spike solution or standard
- Volume of spike solution or standard added
- Volume of sample
- Final concentration of spiked parameter added
- Dated initials of QA personnel incorporating the external QA samples.

Laboratory Analytical Report

The laboratory produces the analytical report, which contains laboratory data results. The analytical report documents the analytical results for each parameter analyzed on each sample submitted. The analytical report generally includes the following information:

- Case narrative
- Analytical results
- Method detection limits (MDL) and RLs for parameters
- Methods used to analyze the sample(s)
- Date sample(s) were collected, prepared, and analyzed
- Laboratory's QC results

A.9.2 Project Deliverables

Written project deliverables and an estimated completion schedule are shown in Table 8. In addition, all reports will be shared with Grasslands Water District (GWD) and the CDFW.

Data Assessment/Data Tables

The EMT specialist identified in Table 8 will create data summary tables that present the analytical data in an organized and easy to follow manner. Interpretation of the analytical data will be limited to comparison of analytical results with water quality standards presented in this QAPP.

Quality Assurance Summary Report

The QA specialist identified in Table 8 will create a QA summary report that discusses the results of the external QA samples, the results of the laboratory's QC samples, completeness, and holding times. The QA summary report will accompany the data tables and data assessment when requested.

A.9.3 Storage of Project Information

Paper copies of project information are stored as outlined in the MP-156 SOP for Data Management (Eldredge, 2014). Electronic versions of project information are stored on secure Reclamation servers. Files are backed up each day by the Mid-Pacific Region's Information Technology (IT) department.

B. Data Generation and Acquisition

B.1 Sampling Process Design

The purpose of this sampling program is to characterize specific analytes in the water supply (Total Dissolved Solids, Boron and Selenium of surface and groundwater), and to characterize the quality of the water in the San Luis Canal. Six wells have been identified on four WA's for water quality monitoring being pumped onsite. Of the six wells, two have the ability to deliver water to the San Luis Canal. When water from these two wells is entering the San Luis Canal (as opposed to being used internally) water samples will be collected upstream and downstream of the discharge point (at a point where mixing has occurred).

Surface water will be sampled from the Boundary Drain adjacent to Low Lift 12. Surface water will again be sampled from Low Lift 13 as it exits Ruth Lake and enters the San Luis Canal. When water from Low Lift 13 is entering the San Luis Canal water samples will be collected upstream and downstream of the discharge point (at a point where mixing has occurred). The upstream sample for this site is the same as the downstream sample of groundwater pumped from DW-1.

Ground water will be collected at each of the six wells when they are pumping (or as directed by the program manager). Wellhead sampling will take place when the pumps are delivering water internally. For wells that can deliver water to the San Luis Canal, in addition to wellhead sampling samples will also be collected in the canal upstream and downstream of the discharge point. The downstream sampling point will be at a point in the canal where mixing has occurred to be representative of the blend of canal and groundwater.

B.1.1 Field Collection Activity Schedule

Surface and groundwater samples will initially be collected monthly for six months. Following review of the initial six months sampling it is proposed to continue sampling quarterly. Actual quarterly sampling times will be coordinated with the on-site project managers but will generally take place in January, April, August and November.

B.1.2 Sampling Sites

Sample locations are listed in Table 9 and depicted in Figure 1

B.1.3 Target Analytes

See Table 5 for a complete list of analytes collected for this program.

B.1.4 Critical Information

All samples and analyses are critical for addressing the objectives of monitoring program.

B.1.5 Sources of Variability and Bias

Matrix interference can introduce variability in to the analytical results. Samples with matrix interferences will have raised reporting limits, raising the magnitude of the concentration(s) at which a non-detection is reported by the laboratory.

Location and depth of the unattended water quality instruments may vary, but it is assumed that the sample locations chosen are well mixed sites.

B.1.6 Sample Program Changes

Program changes will be discussed and authorized by the program manager listed in Table 2.

B.2 Sampling Methods

B.2.1 Continuous Monitoring

One continuous monitoring site has been constructed and is operational for this program. This site has been constructed by and will be maintained by the Grassland Water District. The site is on the San Luis Canal adjacent to the Los Banos WA and downstream of Low Lift 13.

Data collected from this site will be available to Reclamation through the YSI EcoNet web service where the Grasslands Water District hosts their water quality.

B.2.2 Surface and Groundwater Quality

Prior to sample collection, EC, pH, temperature, will be measured in the field using a YSI 6-series Multi-parameter Water Quality Sonde The instrument will be calibrated and operated following standard MP-157 protocol (Benninger and Anderson, 2012).

Surface and groundwater water grab samples will be collected into a churn splitter. Samples will be dispensed from the churn splitter following standard protocol (Benninger and Anderson, 2012).

All samples will be collected and all equipment cleaned (before and after use) following standard MP-157 protocols (Benninger and Anderson, 2012).

Sampling personnel will wear Nitrile® gloves when handling sample bottles or sampling equipment that may come in direct contact with sample water. Sample caps will be held pinched between gloved fingers while bottles are being filled. Samples to be analyzed for mercury analysis will be collected using a modified "clean hands-dirty hands" procedure (Benninger and Anderson, 2012). Airborne contamination will be minimized by uncapping sample containers only when they are being filled.

Immediately after collection, water samples will be labeled and stored in coolers containing frozen "blue" ice.

Samples will be transported to the analytical lab or the Reclamation quality assurance lab as described in Section B3.3.

B.2.3 Sample Containers, Volumes and Preservation

Sample Containers

Sample container requirements are shown in Table 10. Container materials and preservation requirements are determined by the analytical methods. Volume requirements are determined by the analytical laboratory; enough volume will be collected to allow for up to three rounds of analysis.

B.2.4 Decontamination and Waste Disposal

Equipment Cleaning/Decontamination Procedures

Equipment and tools for collecting samples will be cleaned following standard protocols for field decontamination (Benninger and Anderson, 2012).

Waste Disposal

Waste will be disposed of according to state and federal regulations. Liquid waste will be disposed of in a septic or sewer system, or discharged to the ground surface.

B.2.5 Support Facilities and Equipment Needs

There are no special facility needs for this project. Project equipment needs are listed in Table 12.

B.2.6 Contingency Planning

Any changes to the field sampling design or methods described in this QAPP will be documented in the field log book on the day that the change(s) took place including problems and solutions during field activities.

B.3 Sample Handling and Custody

B.3.1 Sample Identification

Each container will be given a permanent, waterproof sample label preprinted or written in waterproof ink. At a minimum, each sample label will include sample ID, sample collection date and time, and a summary list of analysis required. Sample IDs will be chosen following the conventions described in the MP157 SOP manual (Benninger and Anderson, 2012). The alpha-code for this investigation will be LBR (short hand for, "Los Banos Refuge").

B.3.2 Maximum Sample Hold Times

Table 10 shows the maximum times that the water samples can be held between sample collection and extraction and/or analysis. Time-sensitive samples will be collected under this program.

B.3.3 Sample Transportation to the Analytical Laboratory

Samples will be placed in coolers and stored on blue-ice during transport. Samples will be prepared for transportation, packed, and cooled by field personnel following standard

Reclamation procedures (Benninger and Anderson, 2012). Upon delivery to the EMHM/QADM's processing facility, the samples are refrigerated. The QA specialist will ship the samples to the laboratory on blue ice in coolers. The laboratory will store the samples in refrigerators, if needed. Ice and refrigeration keeps the samples between 2 and 6 degrees Celsius.

B.3.4 Chain of Custody Procedures

COC forms document the chain of legal custody of samples from the time samples are collected to the time they are delivered to the laboratory. EMT personnel initiate COC documentation while in the field. Custody of the samples is relinquished to the QAT on the COC. QAT personnel send the COC to the laboratory with the samples; the QAT will retain a copy of the COC. A copy of the COC is also usually returned to MP-156 by the laboratory. COC copies are filed with the field sheets in the MP-156 office.

B.4 Analytical Methods

On-site measurements of EC, pH, and temperature will be measured following applicable EMT SOPs.

Laboratories will follow the protocols for preparation, analysis, and corrective actions stated in the analytical methods and the laboratory SOP documents. Approximate turnaround time requested for analysis will be 3 weeks. Laboratories will follow the analytical methods as listed in Table 10.

B.5 Quality Control

Quality Control requirements are fully documented in the QADM's SOP for QA (Eldredge, 2012). Following is a brief summary of the QA activities that pertain to this project.

B.5.1 External Quality Assurance (QA) Samples

Laboratory precision, accuracy, and contamination will be independently assessed by Reclamation QA staff through the QADM QA process. Blind, external QA samples will be incorporated into sample batches before submission to the analytical laboratories. Analytical results of QA samples will be validated following QA SOP guidelines (Eldredge, 2012). If any of the external QA samples do not meet the criteria stated in section A.7, the samples will be reanalyzed. If the laboratory is unable to confirm the original result upon reanalysis, a bracket of samples or the entire batch of samples will be submitted for reanalysis. The following external QA samples are incorporated:

Accuracy

Certified reference samples, blank spikes, or matrix spikes will be incorporated to assess accuracy (Tables 10 and 11). Where possible, either one reference sample, one blank spike sample, or one matrix spike sample will be incorporated for every ten production

(site) samples. If less than 10 production samples are collected, at least one "accuracy check" sample will be incorporated. Accuracy will be assessed using the +/- RL criterion or the percent recovery (PR) criterion (Table 7).
The PR for a reference sample is calculated as follows:

$$PR = \left(\frac{F}{MPVorMPN} \right)(100)$$

PR = Percent Recovery
F = Reference Sample Result
MPV = Most Probable Value
MPN = Most Probable Number

The PR for a blank spike sample is calculated as follows:

$$PR = \frac{BS}{A}(100)$$

PR = Percent Recovery
BS = Blank Spike Sample Result
A = Amount of Spike Added

The PR for a matrix spike sample is calculated as follows:

$$PR = \frac{(S - R)}{A}(100)$$

PR = Percent Recovery
S = Spike Sample Result
R = Regular Sample Result
A = Amount of Spike Added

Precision

Duplicate samples will be incorporated to assess precision. When possible, duplicate samples will be incorporated at a rate of 10% of the production samples. If less than 10 production samples are collected, at least one duplicate sample will be incorporated (Tables 10 and 11). Precision will be assessed using the +/- RL criterion or the relative percent difference (RPD) criterion (Table 7):
The RPD is calculated as follows:

$$RPD = \frac{|R - D|}{\left((R + D) / 2 \right)}(100)$$

RPD = Relative Percent Difference
R = Regular Sample Result
D = Duplicate Sample Result

Contamination

One blank (DI) water sample will be incorporated for every twenty production samples to assess contamination (Tables 10 and 11). If less than twenty production samples are collected, at least one blank sample will be incorporated.

B.5.2 Laboratory Quality Control (QC) Samples

The laboratory will incorporate QC samples at the frequency specified in the analytical method and the laboratory SOP. The results for the QC samples will be assessed based on the acceptance criteria in the analytical method and the laboratory SOP. If any laboratory QC samples do not meet the established acceptance criteria, the laboratory will follow the corrective action protocol detailed in the analytical methods or the laboratory SOP.

B.5.3 Exceedance of Control Limits

The criteria for deciding to accept, reject, or qualify project data in an objective and consistent manner are discussed in Section A.7.3. If analytical results for any of the external QA samples do not meet their criteria, the environmental samples will be reanalyzed following the process described in Section D.2. If performance limits are still exceeded, the data will be qualified.

B.5.4 Sample Hold Times

The date of the sample extraction/preparation and analysis will be compared to the date the sample was collected to ensure the sample was prepared and analyzed for the parameter within its holding time (Table 10). If the holding times are exceeded, the program manager will determine if re-sampling is required. If re-sampling is not required, the QAT will qualify the data as necessary.

B.5.5 Missing Data

Missing data can occur for a variety of reasons (ex., sampling site is inaccessible, bottles break during shipment, laboratory error). Procedures for handling data anomalies, such as missing data, will be addressed by the QAT and/or EMT project manager. The reasons for missing data will be documented in the case narrative of the analytical report or in the field logbook.

B.5.6 Data Outliers

Outlier analysis is a tool that the QAT uses to determine if a result needs to be reanalyzed due to possible laboratory error. The QAT assesses outliers for long-term, routine monitoring programs where the site locations remain constant and the water quality and/or other environmental conditions are expected to remain in stasis over an extended period of time. When the QAT receives the analytical report, the results for the production samples for each site will be entered into an Excel spreadsheet. The Excel spreadsheets have been developed to flag any result that is an outlier. If a result is flagged, the QAT will use the guidelines in the QAT SOP (Eldredge, 2012) to determine if the sample needs to be reanalyzed for the parameter.

B.5.7 Completeness

If the completeness criterion identified in section A.7 is not met, then appropriate re-sampling will occur. Completeness is determined by calculating the following:

$$\%completeness = \left(\frac{V}{n}\right)(100)$$

V = Number of Valid Results
n = Total Number of Results

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

B.6.1 Field Instruments and Equipment

Maintenance and testing of field sampling equipment is the responsibility of the EMT and will receive preventative maintenance according to manufacturer's recommended schedule. Each item will be inspected before and after each use.

B.6.2 Laboratory Instruments and Equipment

Maintenance and testing of laboratory analytical equipment is the responsibility of the contract analytical laboratory and will be performed according to the laboratory's schedule and protocols.

B.6.3 QA Laboratory Instruments and Equipment

The QAT will check the temperature of the refrigerators at the EMHM/QADM processing facility on a daily basis, if possible. Temperatures of refrigerators should be between 1°C - 6°C. If temperatures are not within the acceptance range, the QAT will follow the corrective actions in the QA SOP (Eldredge, 2012). The temperature checks and any corrective actions are documented in a bound notebook.

B.7 Instrument/Equipment Calibration and Frequency

B.7.1 Field Instruments and Equipment

Each instrument will be calibrated before each day it is used in the field, and a check will be performed at the end of each field day. Calibrations follow the manufacturer's instructions. Field personnel will record instrument calibrations on calibration sheets, which will be filed at the MP-157 office.

B.7.2 Laboratory Instruments and Equipment

Calibration of laboratory analytical equipment is the responsibility of the contract analytical laboratory and will be performed according to the schedule and protocols stated in the analytical methods, laboratory QA manual, or laboratory SOPs.

B.7.3 QA Laboratory Instruments and Equipment

Pipettes are checked for calibration by the QAT on a monthly basis as per the QASOP (Eldredge, 2012). If the pipettes are not within the acceptance range in the QA SOP, the QAT will follow the corrective actions in the QA SOP. The pipette checks and any corrective actions are documented in a bound notebook.

The QAT calibrates the analytical balance each month using National Institute of Standards and Technology (NIST) certified weights per the QA SOP (Eldredge, 2012). If the balance is not within the acceptance range in the QA SOP, the QAT will follow the corrective actions in the QA SOP. The balance calibration, verification and any corrective actions are documented in a bound notebook.

NIST certified weights are re-certified by an outside vendor every three years per the QA SOP.

B.8 Inspection/Acceptance for Supplies and Consumables

All samples will be stored in certified clean containers. Containers will be inspected upon receipt from the supplier to ensure that custody seals are in place. Level 1 certified bottles that have been pre-preserved (when necessary) are used for sample collection. References used for external QA incorporation have certified values from the vendor. Spike solutions used for external QA incorporation will be certified to be within 90%-110% of the expected value prior to use. Solutions used to calibrate field equipment are certified by the manufacturer.

B.9 Non-direct Measurement

Secondary data will not be used in this study.

B.10 Data Management

B.10.1 Recordkeeping and Tracking

Samples collected at a specific site on a specific day are assigned a unique field ID. The alpha-numeric field ID assigned for this project is LBR [*number*]. Numbers are assigned sequentially beginning with 001 (ex. LBR001). Each site is assigned a unique station ID

in the Environmental Monitoring Database (EMD). The station identification assigned for this project is LBR_ followed by the sequential number (ex. LBR_01).

Recordkeeping and tracking of field logbooks, field sheets, instrument calibration sheets, COCs, analytical reports, spike/reference books, and project binders follows standard MP-157 procedures and document control systems.

A binder is created for each project; for long-term monitoring projects, multiple binders are used. The project name and a unique tracking number are assigned to each binder. Project binders are stored in file cabinets. Project binders that are in current use are signed out for use; the following information is documented to sign out the binder: project name, binder number, name of individual who signed out the binder, date signed out, and the date signed back in. Binders are archived in locked file cabinets. The location of each binder is tracked.

Field logbooks, field sheets, instrument calibration sheets, and COCs are generated, inspected and signed by the field sampler (EMT). Field logbooks are stored in file cabinets. Field logbooks that are in current use are signed out for use; the following information is documented to sign out the logbook: logbook name, name of individual who signed out the logbook, date signed out, and the date signed back in. Field logbooks are archived in locked file cabinets.

Field sheets and COCs are relinquished by the EMT to the QA specialist. The QA specialist contacts any field sampler whose paperwork contains significant errors or omissions. After use, the QA specialist turns the field sheet and a copy of the COC to the DMT. The DMT enters information on the field sheet in the EMD. The field sheet and COCs are filed in the project binder.

Instrument calibration sheets are submitted by the EMT to the DMT. The DMT files the calibration sheets in binders. The project name and a unique tracking number are assigned to each calibration sheet binder.

Each spike/reference book is assigned a unique ID number. Spike/reference books that are in current use are assigned to a specific member of the QAT. Spike/reference books are archived in file cabinets. The location of each spike/reference book is tracked.

Analytical reports are validated by the QA specialist; the QA specialist documents the QA metadata on the analytical report. After the laboratory data reports are reviewed by the QA specialist, the data reports are signed and sent to the DMT. The DMT enters the analytical results and the QA metadata into the EMD. Analytical reports are filed in the project binder.

B.10.2 Data Handling and Quality Control

Reclamation computers are used to process, compile, analyze, and transmit electronic data. Hardcopy records are filed.

All data is entered in the EMD following the SOP for Data Management (Eldredge, 2014). As a QC check, all data entered is secondarily reviewed by an additional DMT member; the secondary review is documented with initials. Data cannot be accessed until the secondary review is complete. After all data has been entered into the database, the data is signed by the DMT and filed in the project binder.

B.10.3 Archival and Retrieval

The EMD is archived on secure Reclamation servers. The EMD is backed up each day by the Mid-Pacific Region's IT department. Following QA approval, entry of data into the EMD, and secondary review of data entries, data is then available for use on the Reclamation website: http://www.usbr.gov/mp/mp150/mp157/DM/index.html

C. Assessment and Oversight

C.1 Assessments and Response Actions

C.1.1 Laboratory Audits

Laboratories that analyze samples for this program undergo a three-tiered audit; the audit is conducted by the QAT. The three-tier audit consists of reviewing the laboratory's QA Manual, reviewing the laboratory's performance evaluation (PE) sample results, and conducting an intensive, on-site, system audit of the laboratory. A performance evaluation sample is a sample of known composition that is used to assess the accuracy of analytical results for a given method. The laboratory's expertise in conducting analyses, their capability for producing valid data, their ability to effectively support the data, and the integrity of the QA/QC practices are assessed during the on-site audit. The audit reports are issued to the laboratory. The laboratory then issues a response with corrective actions to Reclamation. At that time, the QAT determines whether or not to approve the laboratory for use and contacts the laboratory with their decision.
If a laboratory is approved for use after the audit, the laboratory is placed on the approved laboratory list. Analysis will be conducted by laboratories on the approved laboratory list (Table 14). Laboratory audits are conducted every 3-4 years.

C.1.2 Field Audits

Field personnel are audited by the QAT for sampling proficiency. During the field audit, the QA auditor accompanies the field sampler into the field and observes their sampling and decontamination techniques. The auditor assesses the field sampler's expertise in collecting representative samples in accordance with the appropriate SOPs for collection, decontamination, and documentation. In addition, PE samples are analyzed by the field sampler to assess their proficiency in calibrating and using field instrumentation.
An audit report is sent to the field sampler and their supervisor; if needed, corrective actions are suggested. The field supervisor is responsible for implementing corrective actions. Field audits are conducted every 2 years.

C.1.3 Documentation Audits

Annually, field logbooks, instrument calibration sheets, and field sheets are audited by the QAT to ensure that all the necessary information is correctly documented. The documentation audit reports are sent to the field sampler and the field supervisor. The field supervisor is responsible for issuing corrective actions.

C.2 Reports to Management

The QAT will write audit reports to the individuals identified in section C.1 at the frequency documented in section C.1.

Sample results will be compiled by the EMT for inclusion in the data summary and assessment report (Tables 4 and 8).

The QAT will write a QA summary report to accompany the data assessment report. QA reports will be issued to the EMT and will summarize all QA/QC findings in regards to the data generated for this project.

D. Data Validation and Usability

D.1 Data Review, Verification, and Validation

The criteria for deciding to accept, reject, or qualify project data in an objective and consistent manner are discussed in Section A.7.3. If all external QA samples and laboratory QC samples meet their acceptance criteria, all results are not outliers, and all samples are analyzed within their holding times, data will be accepted as valid. If a result is confirmed after reanalysis, the result will be accepted as valid. Data will be qualified if results demonstrate unacceptable QA after being reanalyzed, if an outlier is confirmed after being reanalyzed, if the laboratory QC sample results are unacceptable, or if the holding times were exceeded. Data that does not meet QA/QC criteria will be released with qualification.

D.2 Verification and Validation Methods

The QAT will validate the data by following Reclamation SOP guidelines (Eldredge, 2012). Validation consists of reviewing the results of external quality assurance samples and laboratory quality control samples. Holding times, completeness and historical outliers will also be assessed.

If any of the external QA sample results do not meet the acceptance criteria stated in Table 7 or if any result is determined to be a historical outlier, the sample will be submitted for reanalysis. If the laboratory confirms the original result, the original value will be accepted, based on the laboratory demonstrating that sample preparation and instrumentation was performed properly during initial analysis. A result will be considered confirmed if it meets the precision acceptance criteria when the reanalyzed result is compared to the original analysis result. If the original result cannot be confirmed, the laboratory must then analyze a bracket of samples or the entire batch of samples an additional time for the parameter. The bracket of samples or the entire batch of samples that has been analyzed an additional time is then evaluated for the parameter to see if the results meet the acceptance criteria in Table 7 or if any result is an outlier. Professional judgment is used to decide which set of data to accept and whether or not the data should be qualified if both sets of data demonstrate unacceptable external QA sample results or if both sets of data have outlier results.

D.3 Reconciliation with User Requirements

The QAT will identify qualified results to the DMT by completing the "Qualified Results" form per the QA SOP (Eldredge, 2012). The data qualifier flag will be entered next to the result in the EMD. Additionally, if results are qualified, the result will be marked with a footnote on the data table submitted to the data assessor with the footnote detailing the qualification.

D.3.1 Meeting User Needs

Results of the study will be QA reviewed and evaluated to determine data qualifications. Whether or not data meets user needs will be determined by the user at the time that the data is evaluated.

D.3.2 Managing Qualified Data

All data will be stored in the Reclamation database system. Data that has been qualified will be stored in the database with embedded data qualification comments. Standard qualifiers used are: H – result may have a high bias; L – result may have a low bias; T – result obtained past the holding time; U – result determined to be an outlier at the time of data validation; and V – result may vary excessively from the true value.

Appendices

Appendix A: Basic Information for Field Collections

Sampling Schedule

Water collection
Water samples are to be collected monthly for 6 months and then quarterly; January, April, August, November

Equipment List

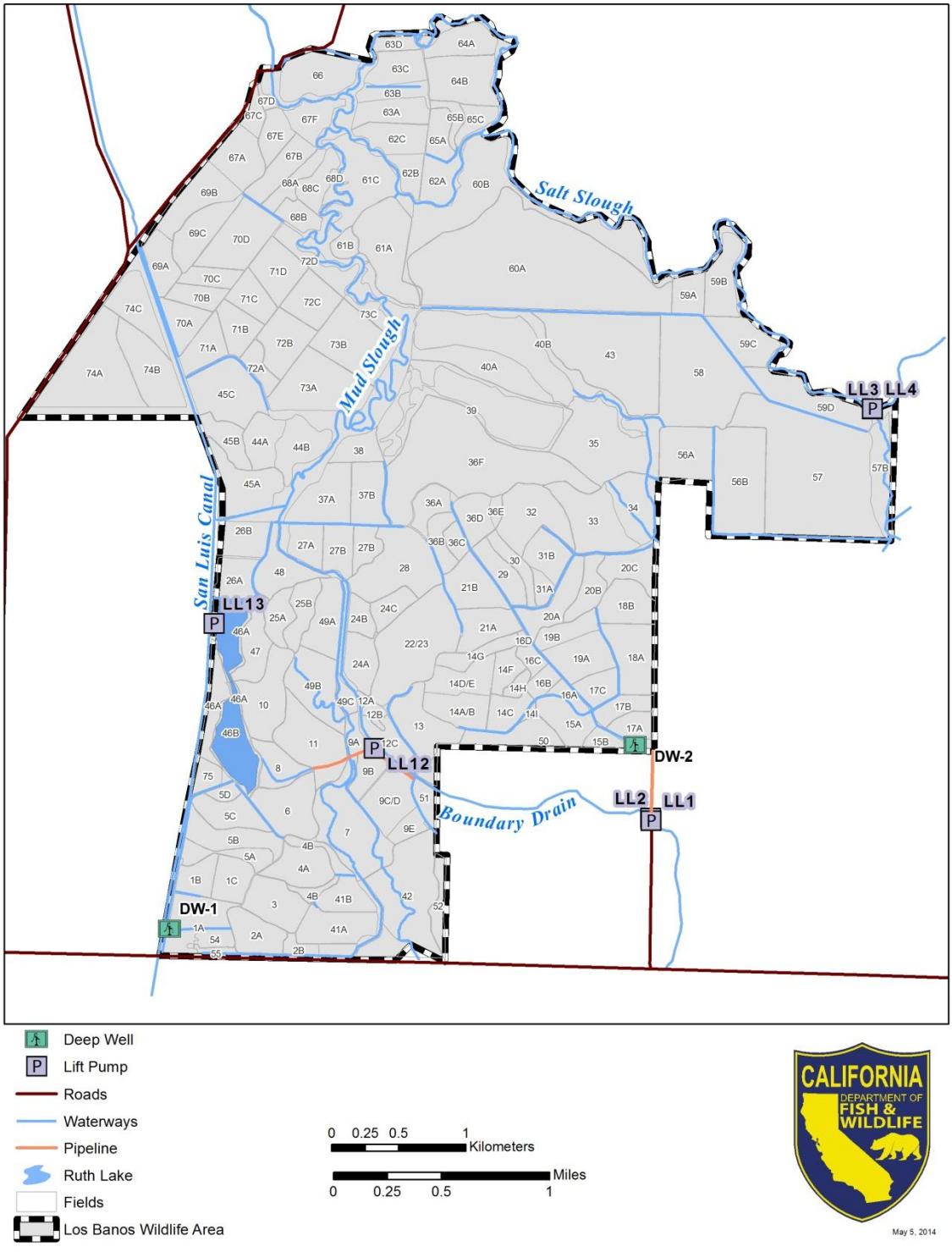
See Table 12.

Driving Directions to Los Banos WA

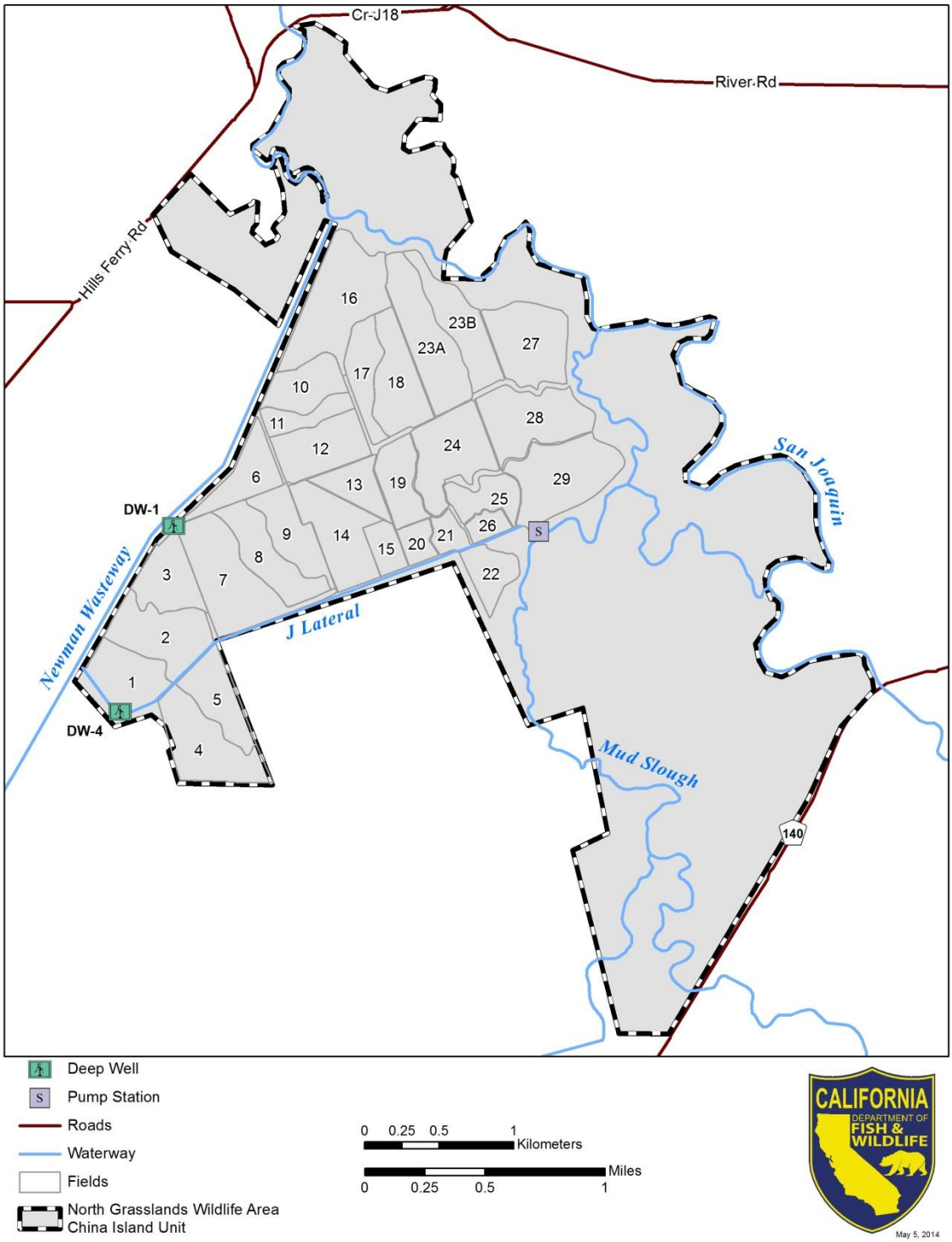
Directions from Cottage Way:
From Sacramento take I-5 South
Exit Santa Nella turn Right
Turn Left on Henry Miller Road (after In and Out Hamburger)
Turn Left on Ingomar Grade in Volta and then Right back onto Henry Miller.
The State Fish and Wildlife office will be on the Left about ½ mile (just over the San Luis Canal)

GROUND WATER and SURFACE WATER SAMPLING

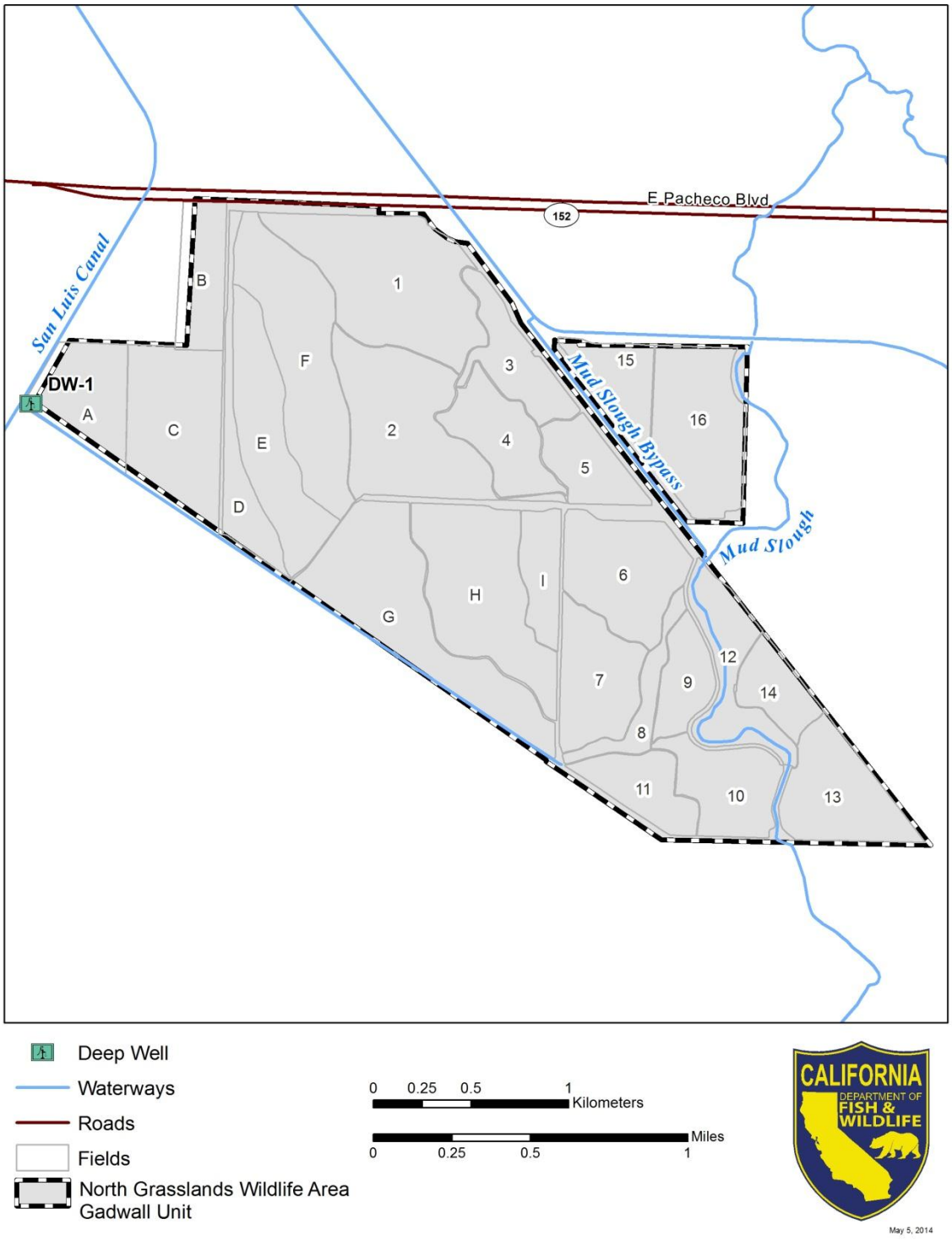
- Plan to take one day to collect all ground water wells.
- Bring: wasp spray, waders, protective shoes



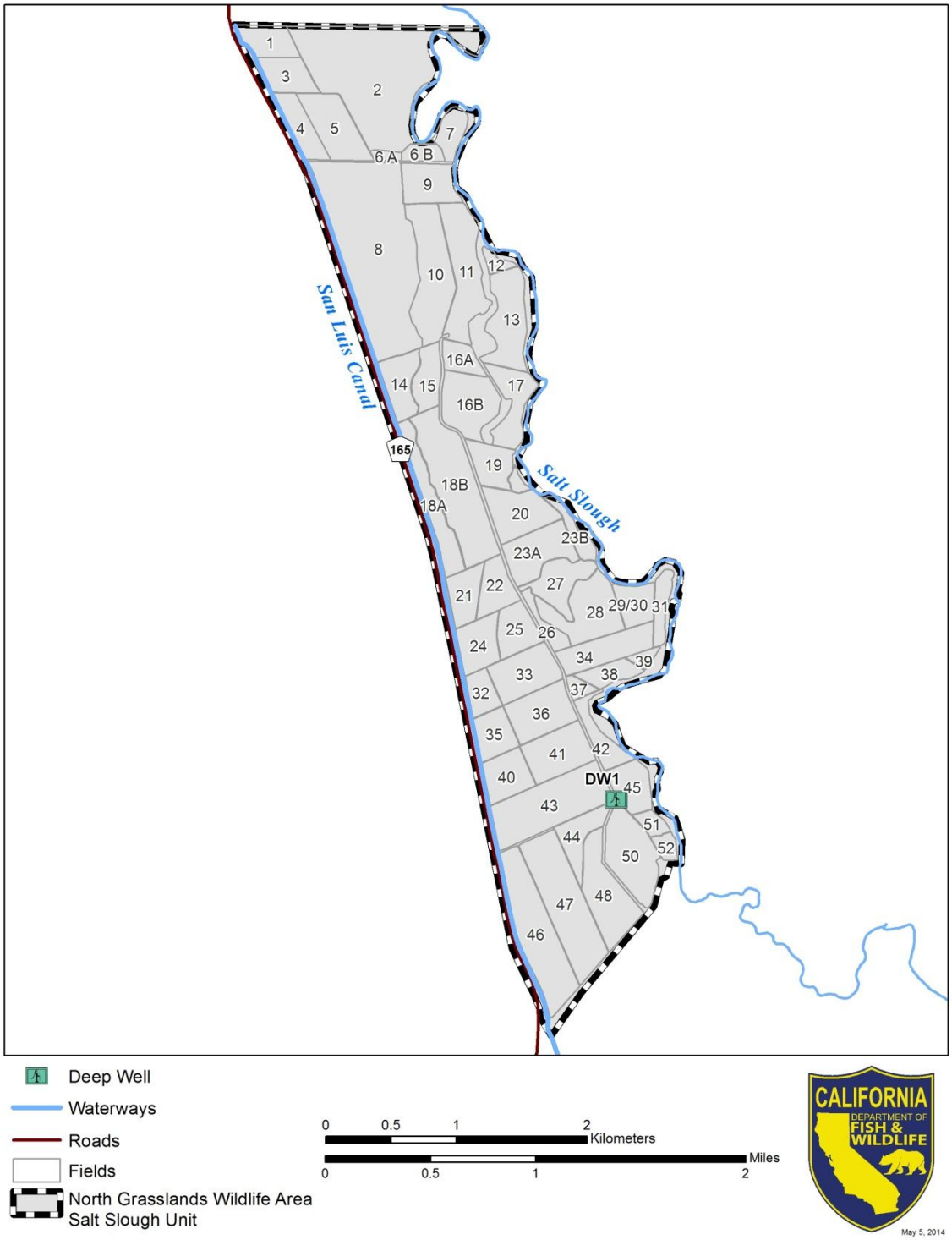
Site Location Map - Los Banos WA



Site Location Map – China Island Unit



Site Location Map – Gadwall Unit



Site Location Map – Salt Slough Unit

Health and Safety

The WAs administer a hunt program during the fall and winter months. "Hunt Days" are scheduled September 1-15 for dove season. The opening day for waterfowl season generally falls on the 3rd Saturday of October. From the 1st day of waterfowl season through February of the following year, "hunt days" are scheduled for Wednesday, Saturday and Sunday. Because of this, sampling will not commence during these times due to safety concerns.

See Table 13

Sample Transport

Samples will be placed in coolers and stored on blue ice during transport to the QA lab. The QA lead is responsible for delivery of samples to applicable laboratories. Organics and other short holds will be shipped from the field.

Paperwork

Required paperwork can be found at the following link:
J:\157\EnviroMonitoring\Special Investigation\ refuge water –level 4\ Los Banos L4 \Forms

Bottle List

See Table 10

Appendix B: Reference Citations

Benninger, Laura M., and Carissa N. Anderson, eds. *Standard Operating Procedures for Environmental Monitoring*, Rep. Vol. 1. Sacramento: United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring Branch, 2012. Print.

Eldredge, Julie, ed. *Standard Operating Procedures for Quality Assurance*. Rep. Sacramento: United States Bureau of Reclamation, Mid Pacific Region, Environmental Monitoring Branch, 2012. Print.

Eldredge, Julie, ed. *Standard Operation Procedures for Data Management*. Rep. Sacramento: United States Bureau of Reclamation, Mid Pacific Region, Quality Assurance and Data Management Branch, 2014. Print.

Appendix C: Acronyms

A	Amount of Spike Added
AD	Autosampler Duplicate
AR	Autosampler Regular
B	Blank
BS	Blank Spike
BSD	Blank Spike Duplicate
BSR	Blank Spike Regular
CDFW	California Department of Fish and Wildlife
COC	Chain of Custody
CVPIA	Central Valley Project Improvement Act
D	Duplicate
DI	Deionized
DMT	Data Management Team
DO	Dissolved Oxygen
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Specific Conductance
EMD	Environmental Monitoring Database
EMHM	Environmental Monitoring and Hazmat Branch
EMT	Environmental Monitoring Team
EPA	Environmental Protection Agency
F	Reference
FB	Field Blank
FD	Reference Duplicate
FR	Reference Regular
GRCD	Grassland Resource Conservation District
ID	Identification
IT	Information Technology
JHA	Job Hazard Analysis
LBWA	Los Banos Wildlife Area

LBR	Los Banos Refuge
MDL	Method Detection Limit
MPV	Most Probable Value
MPN	Most Probable Number
mV	millivolts
N	Total number of results
NIST	National Institute of Standards and Technology
PE	Performance Evaluation
PR	Percent Recovery
PIF	Program Initiation Form
QA	Quality Assurance
QADM	Quality Assurance and Data Management Branch
QAT	Quality Assurance Team
QAPP	Quality Assurance Project Plan
QC	Quality Control
R	Regular
RB	Rinse Blank
Reclamation	United States Bureau of Reclamation
RL	Reporting Limit
RPD	Relative Percent Difference
S	Spike
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
T	Triplicate
TB	Travel Blank
TDS	Total Dissolved Solids
V	Number of valid results
WA	Wildlife Area
YSI	Yellow Springs Instrument

Tables

Table 1 QAPP Distribution List

Name	Affiliation	Contact Information	
		Phone	E-mail
Russell Clayton	Reclamation	916-978-5238	rgclayton@usbr.gov
Stuart Angerer	Reclamation	530 978-5046(office)	sangerer@usbr.gov
Laura Benninger	Reclamation	916-978-5286	lbenninger@usbr.gov
Ali Beals	Reclamation	916-978-5282	abeals@usbr.gov
Sonya Nechanicky	USBR, MP-410	916 978-5559	snechanicky@usbr.gov

Table 2 Program Roles and Responsibilities

Program Role and Responsibility	Participant	Affiliation	Contact Information	
			Phone	E-mail
Program Administration				
Program Manager	Sonya Nechanicky	USBR, MP-410	916-978-5559	snechanicky@usbr.gov
Program Lead	Stuart Angerer	USBR, MP-157	916-978-5046	sangerer@usbr.gov
Environmental Monitoring				
Project design	Stuart Angerer	USBR, MP-157	916-978-5046	sangerer@usbr.gov
QAPP review and revision	Laura Benninger	USBR, MP-157	916-978-5278	lbenninger@usbr.gov
Sample collection and measurements	EMT Staff	USBR, MP-157	not applicable	not applicable
Field equipment maintenance and operation				
Sample transport to analytical laboratories				
Write data assessment report	Laura Benninger	USBR, MP-157	916-978-5286	lbenninger@usbr.gov
Quality Assurance				
QAPP review and revision	Russell Clayton	Reclamation	916-978-5238	rgclayton@usbr.gov
Laboratory coordination				
QA incorporation				
Sample transport to analytical laboratories				
Review and validation of analytical data				
Write QA summary report				
Laboratory Analysis				
Sample analysis	See Table 3	See Table 3	See Table 3	See Table 3
Data Management				
QAPP review and revision	Ali Beals	Reclamation	916-978-5282	abeals@usbr.gov
Data entry	Ali Beals	Reclamation	916-978-5282	abeals@usbr.gov
Data entry secondary review	Rosa Heredia	Reclamation	916-978-5284	rheredia@usbr.gov
	Eva Grey	Reclamation	916-978-5283	egrey@usbr.gov
File and store hard copy data	Rosa Heredia	Reclamation	916-978-5284	rheredia@usbr.gov
	Eva Grey	Reclamation	916-978-5283	egrey@usbr.gov

Table 3 Analytical Laboratories

Laboratory	Analyte(s)	Laboratory Contact	Contact Information	
			Phone	E-mail
CalTest	boron, total dissolved solids (TDS)	Mike Hamilton	(707) 258-4000	Mike_Hamilton@caltestlabs.com
South Dakota Agricultural Laboratory	selenium	Regina Wixon	(605) 692 - 7325	regina.wixon@sdaglabs.com

Table 4 Anticipated Timeline for Major Project Tasks

Task Name	Task Description	Approximate Time Frame	Start Date	End Date
Project Development Meeting(s)	Identify program goals and sub-goals based upon input from program managers. Develop a sampling plan to meet program goals. Identify contaminants of concern and data quality objectives (DQOs). Identify responsible parties. Verify budget allocations.	30 days	N/A (on going program)	N/A (on going program)
Identify and Retain Contract Analytical Labs	Based on DQOs, identify and retain analytical laboratories that will meet data quality requirements.	7 - 60 days (depending on contracting)	N/A	N/A
Preliminary QAPP Development	Develop QAPP based upon input from program managers	5 days	N/A	N/A
QAPP Finalization	Finalize QAPP based upon input from program managers, technical advisors, and internal review	14 days	N/A	N/A
Water Collection	Collect water samples; submit samples to QA team for QA incorporation.	monthly for 6 months then quarterly	monthly for 6 months then quarterly	
QA Incorporation	Incorporate QA samples as necessary (including spikes, references, duplicates, and blanks)	1 - 2 days (depending on the scope of the project)	within one week of sample collection	
Laboratory Analyses	Analyze samples for target analytes identified in this QAPP	3-9 wks (depending on reanalysis)	1-2 wks from sample collection	3-9 wks from sample collection
Data Validation	Validate data; review the results of the QA/QC samples, holding times, and outliers (if being assessed)	1 - 3 days (depending on reanalysis)	1-2 weeks from receipt of data	
Data Entry/Verification	Enter QA-approved data into the USBR database; verify accuracy of data entries by secondary review.	5 days	1-2 weeks from receipt of validated data	
QA Summary Report (water quality data only)	Summarize QA findings and qualifications. Release summary report to interested parties.	3 - 7 days	at 6 months	
WQ Data Summary and Assessment	Compare analyte concentrations to applicable water quality standards. Discuss.	7 - 30 days	at six months annual	

Table 5 Quality Threshold and Reporting Limits – Laboratory Analysis

Analyte	Water Quality Goal (µg/L)	Minimum Desired RL (µg/L)	Method RL[1] (µg/L)
Boron	monitor	140	100
TDS (mg/L)	< 200 increase over background	0.05	10000
Selenium	not to exceed 2 ug/L in San Luis Canal/not to exceed 5 ug/L at the wellhead	N/A	0.4

[1] RLs are subject to change due to dilutions or Method Detection Limit (MDL) studies

Table 6 Field Measurement Error

Physical Measurement	Units	Instrument Error[1]
Specific Conductance	µS/cm	± 0.5% of reading or 1 µS/cm, whichever is greater
pH	units	± 0.2
Temperature	°C	± 0.15 °C

[1] YSI 6-Series Multi-parameter Water Quality Sonde User Manual, April 2009.

[2] Model 2100P Portable Turbidimeter Instrument and Procedure Manual 46500-88, April 2008, Edition 9.

Table 7 External QA Acceptance Criteria

Water Matrix

Result or Spike Concentration/Reference Certified Value	Precision	Accuracy	Contamination
≥ 5 x RL	≤ 20% RPD	80%-120% Recovery or within Manufacturer's Performance Testing Limits	≤ 2 x RL or ≤ 10% of the lowest production sample result
< 5 x RL	± 1 x RL	± 1 x RL or within Manufacturer's Performance Testing Limits	

Table 8 Project Deliverables

Deliverable	Party Responsible for Delivery	Recipient(s)	Due Date
Draft PIF	N/A (on going program)	N/A (on going program)	N/A (on going program)
Final PIF	N/A (on going program)	N/A (on going program)	N/A (on going program)
Budget	Stuart Angerer Chris Garduno Rosa Heredia	Sonya Nechanicky	6/1/2014
Revised QAPP/SAP	Stuart Angerer Chris Garduno Rosa Heredia	See Table 1	5/1/2014
Annual QA Summary Report	Chris Garduno	Stuart Angerer Laura Benninger	To be determined following discussion with USBR program manager
WQ and Sonde data assessments	Stuart Angerer Chris Garduno Rosa Heredia	Sonya Nechanicky	To be determined following discussion with USBR program manager

Table 9 Site Locations

Site Name	Site Description			Latitude (N) deg/min/sec	Longitude (W) deg/min/sec
	Water Source(s)	Well Depth	Screen Interval		
Surface Water					
Boundary Drain		N/A	N/A	37°06'48.449"N	120°48'12.848"W
Low Lift 13	From Ruth Lake	N/A	N/A	37°07'18.609"N	120°49'01.349"W
San Luis Canal	upstream of LBWA deep well #1	N/A	N/A		
San Luis Canal	downstream of LBWA deep well #1 and upstream of Low Lift 13	N/A	N/A		
San Luis Canal	downstream of LBWA Low Lift 13	N/A	N/A		
San Luis Canal	upstream of Gadwall deep well #1	N/A	N/A		
San Luis Canal	downstream of Gadwall deep well #1	N/A	N/A		
Ground Water					
Deep Well #1 LBWA	Irrigation Well	572	?	37°06'05.119"N	120°49'14.232"W
Deep Well #2 LBWA	Irrigation Well	480	?	37°06'50.419"N	120°46'53.981"W
Deep Well #1 Salt Slough	Irrigation Well	510	?	37°09'48.602"N	120°49'05.198"W
Deep Well #1 China Island	Irrigation Well	?	?	37°19'09.024"N	120°59'02.990"W
Deep Well #4 China Island	Irrigation Well	260	?	37°18'28.614"N	120°59'17.058"W
Deep Well #1 Gadwall	Irrigation Well	275	?	37°02'46.980"N	120°48'38.586"W

Table 10 Containers, Preservation, Holding Time Requirements, QA Incorporation, and Analytical Methods

Matrix/ Media	Analyte[1]	Container		Preser-vation[2]	Holding Time		QA Types[3]	Analytical Method[4]	Laboratory	Total Number of Samples
		Type	Size (ml)		Extraction	Analysis				
Water	Selenium	HDPE	125	HNO_3	N/A	6 months	R,S,B,D	SM 3500 C	SD Ag Lab	12
Water	TDS	HDPE	1000	none	N/A	7 days	R,F,B,D	SM 2540 C	Caltest	12
Water	Boron	HDPE	250	HNO_3	N/A	6 months	R,S,B,D	EPA 200.7		12

[1] Analytical parameters include laboratory analysis.

[2] In addition to chemical preservation, all samples will be kept on ice or under refrigeration to keep the sample temperature between 2 - 6 degrees Celsius.

[3] QA Types: AD = Autosampler Duplicate, AR = Autosampler Regular, B = Blank, BS = Blank Spike, BSD = Blank Spike Duplicate, BSR = Blank Spike Regular, D = Duplicate, F = Reference, FB = Field Blank, FD = Reference Duplicate, FR = Reference Regular, R = Regular, RB = Rinse Blank, S = Matrix Spike, T = Triplicate, TB = Travel Blank.

[4] A comparable method with an acceptable reporting limit may be used in place of the method identified.

Table 11 QA Incorporation Rates

Quality Indicator	QA Sample Type[1]	Incorporation Rate
Accuracy	spike or reference	1 for every 10 project samples. If <10 project samples are collected, then 1.
Precision	duplicate	1 for every 10 project samples. If <10 project samples are collected, then 1.
Contamination	blank	1 for every 20 project samples. If <20 project samples are collected, then 1.

[1] Spikes or references are analyte specific. See Table 10.

Table 12 Field Equipment List

Item	Quantity	Vendor	Location
Water Collection			
4 wheel drive vehicle if it has been raining	1	N/A	112 Storage Facility
log book (green)	1	N/A	Cottage Way
field sheet(s)	prn	N/A	Cottage Way
calibration sheet(s) if did not pre-cal at 112	1	N/A	Cottage Way
sample labels	prn	N/A	Cottage Way
sample bottles as specified in Table 10 or 15	prn	N/A	112 Storage Facility
ball point indelible ink pen	2 or more	N/A	Cottage Way
cell phone	1	N/A	N/A
water quality Sonde	1	N/A	112 Storage Facility
calibration solutions	1	N/A	112 Storage Facility
650 data logger	1	N/A	112 Storage Facility
sample churn splitter	1 or more	N/A	112 Storage Facility
gimbeled sampling extension pole	1	N/A	112 Storage Facility
nalgene gloves	1 box	N/A	112 Storage Facility
kimwipes	1 box	N/A	112 Storage Facility
personal items as needed (e.g. sun glasses, sun screen, bug repel, allergy meds, lunch, water, rain gear,)	rpn	N/A	N/A

Table 13 Safety Information

Contact Information for Local Hospital(s)		
Address	**Directions From GLWA**	**Phone**
Los Banos Memorial Hospital	From highway 33 / 152 in Los Banos drive north on W I st	209-826-0591
Applicable Job Hazard Assessments (JHAs)		
JHA Name	**JHA file location**	
EMT Field Hazards.doc	J:\SAFETY\Docs to Read\Job Hazard Analysis	
LabcleaningJHA-2.doc	J:\SAFETY\Docs to Read\Job Hazard Analysis	
QAincorporationJHA-2.doc	J:\SAFETY\Docs to Read\Job Hazard Analysis	
Sample ShipmentJHA-2.doc	J:\SAFETY\Docs to Read\Job Hazard Analysis	

Table 14 Approved Laboratory List for this Project

Caltest Analytical Laboratory	**Address**	1885 N. Kelly Rd. Napa, CA 94558
	Contact	Eli Greenwald, Patrick Ingram (Lab Director)
	P/F	(707) 258-4000/(707) 226-1001
	Email	Eli_Greenwald@caltestlabs.com; Patrick_Ingram@caltestlabs.com info@caltestlabs.com
	Methods	*Approved for inorganic and microbiological parameters*

South Dakota Agricultural Laboratories	**Address**	Brookings Biospace, 1006 32nd Avenue, Suites 103,105, Brookings, SD 57006-4728
	Contact	Regina Wixon, Jessie Davis, Steven Hauger (sample custodian)
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	Methods	*Approved for selenium analysis*