Attachment 8. Quality Assurance

This Quality Assurance Attachment 8 (Attachment 8) presents functions, procedures, and specific quality assurance (QA) and quality control (QC) activities that will be used for each task of this proposed project. Attachment 8 provides procedures for planning, implementation, and assessment in the collection of information and production of project deliverables to ensure data and deliverables are useful for the purposes for which they are intended. The procedures described herein are designed to ensure that precise, accurate, representative, comparable, and complete (PARCC) data are collected throughout the data collection program and so that project deliverables (reports, groundwater models, etc..) receive the appropriate review by qualified individuals.

Personnel Qualifications

The key personnel roles and qualifications for the team that will carry out this project are:

- Project Manager – The Project Manager (PM) is responsible for overall project planning and execution including: establishing project objectives, scope, budget, schedule, preparing final submittals, and coordinating with the team. The PM will have managed similar projects prior to this assignment and will be responsible for the implementation of quality procedures and will, as necessary, perform audits, surveillance, and document reviews. The PM will initiate corrective actions, and be responsible to review laboratory data. The Project Manager has the authority to stop work if quality procedures are not followed.
- Technical Advisory Committee (TAC) – A Technical Advisory Committee (TAC) will be established to include a wide range of participants (e.g. a representative from DWR) from key stakeholders. The TAC members will have background in area or regional groundwater issues and will provide strategic insight to the project and, in the case of DWR, provide ongoing oversight regarding compliance with the Prop 84 grant guidelines. The TAC will participate through regularly held meetings and review of key project documents.
- Project California Certified Hydrogeologist (CHG) – groundwater activities, data collection and reporting will be conducted under the supervision of a CHG. The project CHG will have over 10 years of professional experience and will oversee work plan development, data collection, well drilling and installation activities, groundwater sampling and analysis, data review and reporting.
- California Project Engineer (PE) - Engineering activities will be conducted under the direction of a California professional civil engineer. The California PE will have over 10 years of professional experience and will oversee production of design documents and calculations and will sign and stamp engineering drawings and engineering reports.
- California Certified Geophysicist – will be responsible for review and approval of geophysical work products and surveys.
- Field Staff – Field personnel that participate in field work and sampling will have reviewed the site-specific plans and will be trained prior to the first sampling event in sample collection procedures (including QA/QC, grab sampling techniques, completing laboratory chain-of-custody forms, and the proper handling of samples), and field analysis (including instrument calibration, data recording procedures, and interpretation of collected data).

Procedural Assurances

All project documents and deliverables will be produced in accordance with an efficient process that includes: assigning a lead author responsible for deliverable content and meeting schedule, producing draft and final versions of each deliverable, technical review of draft versions by the appropriate technical lead, and conducting final work product review by the project manager.

- Reports and Documents: each document will be signed by the appropriate technical leader: engineering documents will be signed by the responsible PE, groundwater documents will be signed by the responsible CHG. Key deliverables will also be reviewed by the TAC.
- Calculations: calculations that are made as part of this investigation will be reviewed by the appropriate technical leader. For example, groundwater gradients and contours will be reviewed and approved by the project CHG. Engineering calculations will be reviewed by the PE.
- Field Records: all field records, including: field data sheets documenting results of field tests and QC samples; field forms documenting equipment maintenance and calibration; and, sample collection and handling documentation (copies of chain-of-custody forms, shipping receipts, etc.) will be reviewed by the senior technical lead and archived in project files.
- Laboratory Data: Analytical labs will maintain sample receipt and storage documentation, instrument calibration logs, raw data and QC sample records. The records will be reviewed by the Data Management Coordinator for usability. Field data sheets, field QC results, chain-of-custody forms, and lab reports from each sampling event will be maintained by the Project Manager or technical leader.
- Public outreach materials: materials for public meetings will be generated by the technical team and reviewed by the appropriate technical leader and the PM prior to release to the public.
- Proposition 84 Guidelines – A DWR representative will participate in the TAC and oversee the project to ensure Proposition 84 requirements are met through the life of the project.

Field Sampling

Advance planning for field sampling events will be conducted to ensure that the necessary arrangements are in place and that equipment is ready. The following will be considered when planning sampling events for this project:

- Sample Handling and Custody Procedures – Field personnel will make arrangements with the appropriate laboratory for proper sample containers and custody forms;
- Equipment – Field personnel will ensure that sampling equipment has been properly assembled, decontaminated, calibrated, and is functioning properly prior to use as part of the pre-field check process. Each piece of equipment will be checked for calibration data and recalibrated as necessary;
- Field Forms – Field personnel will need to ensure that necessary field forms, such as field logs, soil and groundwater sampling forms, and boring logs are assembled prior to the sampling event;
- Investigation-Derived Waste - Field personnel will plan for the generation of investigation-derived waste (IDW) and arrange to have appropriate containers for IDW;
- Paperwork and Permits – Prior to the sampling event, field personnel will ensure that other applicable paperwork is in order, such as permits and site access agreements;
- Checklist - A checklist of equipment to be assembled and used for each sampling event. If problems occur during sampling, the Project Manager will be notified. The source of the problem will be identified and the appropriate corrective action taken; and

- Field QC - Field-collected QC samples will primarily consist of field duplicates and blanks, Field duplicates will be collected at the same time and in the same manner as the primary samples and will be used to assess precision. Trip blanks are used to determine whether sample cross-contamination has occurred during sample transportation, delivery, and storage and consist of pre-filled bottles of laboratory certified water. Field duplicates and trip blanks will be collected and analyzed at a rate of at least ten percent (10%).

Lab Analysis QAQC and data review

All laboratory analytical testing will follow standard analytical methods for the appropriate analyte and laboratory analyses will be conducted by California-certified analytical laboratories. Table 1 provides a list of likely analytical methods for this project. Laboratory personnel will be certified and trained as required by the laboratory's quality assurance manuals.

Table 1 – Analytical Methods

Analytical Parameter	Test Method
Volatile Organic Compounds (VOCS)	EPA 8260 or 524.2
Anions (nitrate, chloride, carbonate, bicarbonate,)	EPA 300.0
Nitrate as Nitrogen	EPA 300.0
Alkalinity	EPA 310
Metals (arsenic, iron, manganese) and Cations (sodium, potassium, calcium, magnesium)	EPA 6010B
Total Dissolved Solids	EPA 160.1
PH, temperature, oxidation-reduction potential, specific conductivity, dissolved oxygen, and turbidity	Field instrument

Laboratories used for this project will be requested to supply analyte and method specific quality control acceptance criteria before field work has started. The laboratories will qualify any data that are not within their control limits in their data report. Laboratories shall report detection limits based on current statistical detection limit studies and reporting limits based on the low standards in their calibration curves. Laboratories will be expected to meet the following criteria for precision and accuracy: QC limits for precision are 20% RPD for metals, inorganic parameters, Total Petroleum Hydrocarbons (TPH) and Volatile Organic Compounds (VOCs). Precision limits are 30% RPD for Semi-volatile Organic Compounds (SVOCs); and 40% RPD for all other compounds. The QC limits for accuracy are between 75% and 125% for metals, TPH, and VOCs; and, for all other compounds shall be between 50% and 150%.

Analytical laboratories will provide reports in electronic format. The information contained within and the format of the hard-copy data report package will include, at a minimum, the sample identification, sampling date/time, test method, extraction date/time, analysis date/time, analytical results, QA sample results, instrument and equipment calibration summary information, and a description of the corrective action taken to resolve data quality issues. Requirements for electronic database deliverables (EDD) will be provided to selected analytical laboratories.

Laboratory data will be entered into an electronic database. The database will be compliant with CASGM requirements. Prior to entry into the database, all laboratory data will be subjected to a data verification process to evaluate the completeness, correctness, conformance, and compliance of a specific data set against the method, procedural, or contractual requirements. Data verification will ensure that decisions are supported by data of a type and quality needed and expected for their intended use. The following elements will be evaluated during verification.

- Accuracy. Accuracy describes how close an analytical measurement is to its true value. Accuracy is typically measured by analyzing a sample of known concentration (prepared using analytical-grade standards) and comparing the analytical result with the known concentration.
- Precision. Precision describes how well repeated measurements agree. Precision will be measured using both field and laboratory duplicates in addition to duplicate laboratory control spikes.
- Representativeness. The representativeness of the data is mainly dependent on the sampling locations (spatial), sampling frequency (temporal), sample collection procedures, and analytical constituents and methods. The sampling approach will be designed to be representative reflect the environment or conditions being measured.
- Completeness. Completeness measures the amount of valid data needed to be obtained from a planned measurement system. The goal for the percent completeness of samples for each site will be 90% for each method and sample matrix.
- Comparability. Data comparability is the confidence with which one data set can be compared to another data set. For this project, the use of approved analytical methods and certified laboratories will provide the appropriate level of comparability.

Health and Safety

To protect workers during the project, a site-specific Field work Safety Plan (FWSP) will be prepared. The FWSP will describe the safe use of equipment, evaluation of hazards, safe site investigation procedures, personal protective equipment, emergency procedures, and training required to conduct the project work activities.

Activities conducted at the Site will be in compliance with applicable Occupational Safety and Health Administration (OSHA) regulations, particularly those in Title 29 of the Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 29 CFR 1926), and other applicable federal, state, and local laws, regulations, and statutes. A copy of the FWSP will be kept on site during scheduled field activities

Standardized Methodologies

Technical activities undertaken for this project will use standardized methodologies that accepted to meet or exceed industry standards. These methodologies include standard operating procedures (SOPs), ASTM methods, California state standards, and local standards and regulations.

- Utility clearance – all invasive subsurface activities for this project will include utility clearance to ensure drilling and excavation locations are safe. Utility location will include contacting Underground Service alert, and conducting boring clearance and utility locations surveys on the site prior to beginning work.
- Well installation and development – Monitoring wells will be installed to comply with the California Water Well Standards as defined in Bulletin 74-81 and updated in Bulletin 74-90, and in accordance with Section 13801 of the California Water Code. Well installation will also comply with local regulations for well construction. Well development will be conducted in accordance with ASTM Standard D5521 – Development of Groundwater Wells in Granular

Aquifers. To ensure the well will perform for its intended use. Development will consist of a series of bailing, pumping, and surging to remove residual fine grained material and ensure proper filter pack. Upon completion of the installation, monitoring well descriptions will be filed with DWR/CASGM in accordance with DWR requirements.

- Aquifer testing – Based on specific conditions of the project groundwater bearing units, an appropriate method will be selected for aquifer testing based on ASTM D4043 – selection of Aquifer Test Method in Determining Hydraulic Properties by Well Techniques. Once an appropriate methodology has been selected, an aquifer test work plan will be developed that documents specific procedures, and quality control activities.
- Soil classification/soil description – Soils encountered during sampling events and well drilling will be classified in accordance with the Unified Soil Classification System (ASTM D2487). USCS descriptions will be included on well and soil boring logs.
- Soil Sampling - There are a variety of acceptable methods for collection of soil samples (ASTM D4700, ASTM D4547, ASTM D6169, etc…), and selection of an appropriate method will depend on site conditions. Methods commonly used to collect soil samples include drilling soil borings, digging test pits, sampling via hand auger, and digging with a shovel or trowel. Soil samples will be collected from designated locations as specified in the site specific work plan. Soil sampling quality control will include collection of duplicate samples, and for certain analytical methods, the use of composite samples.
- Field data measurements (ORP, water level, pH, temperature, EC, DO) - Field measurements will be collected using portable meters and/or field test kits that follow EPA-approved methods. Field instruments will be calibrated daily, and measurements taken using the procedures recommended by the manufacturer of the meter or test kit. Field instruments will be calibrated according to the schedule recommended by the manufacturer. Calibrations that are performed by personnel in the field may also be recorded on the field data sheets to indicate which samples were analyzed pre- and post-calibration for the specific sampling event. If calibration is not successful or other issues pertaining to calibration arise, the equipment manufacturer will be contacted to determine the appropriate corrective action; the problem and corrective action will be documented in the maintenance/calibration logbook. Results of field measurements will be recorded on field data sheets.
- Water sample collection (monitoring wells) – ASTM D5903 samples from monitoring wells will be collected using disposable or decontaminated equipment to prevent cross contamination.
- Sample Handling and Custody (Field) - Field personnel will make arrangements with the appropriate laboratory for proper sample containers, preservatives, and sampling request forms. Sample custody must be traceable from the time of sample collection until results are reported. Each sample will be recorded on a field data sheet and a chain-of-custody form must be completed after sample collection and prior to sample shipment or release. The chain-of-custody form, sample labels, and field documentation will be cross-checked to verify sample identification, type of analyses, number and type of containers and preservatives. The samples will be transported or commercially shipped to the analytical lab in insulated containers within the appropriate holding time and will be accompanied by a chain-of-custody form.
- Sample Handling and Custody (Laboratory) – Once received at the Laboratory, samples will be logged in and verified with the chain-of-custody form with discrepancies noted during login on the chain-of-custody. The Laboratory will then initiate internal laboratory custody procedure by verify sample preservation (e.g. temperature) and notifying the Project Manager if problems or discrepancies are identified.

- Surface Geophysical surveys – Electrical Resistivity surveys will be used as an investigative tool to assist in locating well sites. Electrical resistivity is the physical property of a material that resists the flow of electrical current. The electrical resistivity of earth materials is directly affected by moisture content and permeability. The electrical resistivity of the subsurface is measured using a galvanic resistivity method. This consists of transmitting electrical current into the earth through a pair of grounded metal electrodes, and measuring the resulting potential drop across the second pair of grounded metal electrodes. There are a variety of electrode arrangements (arrays) that can be used. The dipole-dipole electrode configuration is typically used because it provides information on both the depth and lateral extent of subsurface electrical properties. A common feature of all electrical methods is that the models derived from the electric profiling are not unique. That is, depending on the subsurface geo-electric structure, there may be many models that will produce essentially the same apparent resistivities. This is known as the principal of equivalence. To overcome this limitation, computer software programs include routines for evaluating the equivalence of a given model relative to the observed resistivity values, resulting in a model that provides the closest fit to the observed data.
- Borehole geophysical logging – down hole logging by geophysical methods may be necessary to assess the stratigraphy, integrity of the borehole, or the diameter of the borehole prior to well installation. Planning for geophysical logging will be completed in accordance with ASTM D5753 to assess and select the appropriate method. Geophysical logging will be conducted in accordance to individual method requirements such as ASTM D6167 (Caliper log), ASTM D6274 (Gamma log), ASTM D6727 (Neutron logging).

Quality Requirements for Materials Selection

Materials to be selected for this project will consist primarily of sampling materials and supplies and well construction materials. Prior to any sampling or well construction activity the field leader will conduct an inspection of materials and supplies to make sure they are appropriate for the task. Sampling materials inspections will include review of field test equipment condition; confirm calibration standards are within date, inspect sample containers and preservatives for applicability to the desired methods. During well construction, the field staff will inspect and verify that materials to be used in well construction meet the requirements and specifications of the well design. Specific items that will be reviewed include cement and bentonite type and quantities, filter pack sand specifications and quantities, well casing material specifications and condition, well screen size and condition. Any material that does not meet design requirements will be rejected.

Modeling QAQC and Calibration

Groundwater modeling is not anticipated for this study.

Auditing of Field Activities

At least one field audit will be conducted during the life of the project. The field audit will be used to reveal any weaknesses in field practices and procedures. The field audit will evaluate if the field personnel are following the procedures and will be performed by senior team members. During the field audit, the assessor will conduct personnel interviews and direct observations. Specific items that will be verified include: examination of field documents; Documentation of field personnel training; Verify that the proper laboratory containers and proper preservatives are being used and that laboratory sample containers are properly labeled and stored; and verify that field equipment in use is functioning properly. During the audit, deficiencies will be discussed with field personnel and corrections will be made as soon as reasonably possible.