

Appendix 3-B Monitoring Protocols for Data Collection

Monitoring Protocols

This appendix provides the monitoring protocols for data collection used in the monitoring networks described in Chapter 3.

Groundwater Levels

Groundwater level data collection may be conducted remotely via telemetry equipment or with an in-person field crew. The following section provides a brief summary of monitoring protocols for groundwater level collection. Establishment of these protocols will ensure that data collected for groundwater quality are accurate, representative, reproducible, and contain all required information. All groundwater level data collection in support of this GSP is required to follow these established protocols for consistency throughout the Basin and over time. These monitoring protocols will be updated as necessary and will be re-evaluated every five years.

All groundwater elevation measurements are referenced to a consistent elevation datum, known as the Reference Point (RP). For monitoring wells, the RP consists of a mark on the top of the well casing. For most production wells, the RP is the top of the well's concrete pedestal. The elevation of the (RP) of each well is surveyed to the National Geodetic Vertical Datum of 1929 (NGVD 29). The elevation of the RP is accurate to at least 0.5 ft (15.2 cm), and most well RPs are accurate to 0.1 ft (3 cm) or less.

Groundwater level measurements are taken to the nearest 0.01 ft (0.3 cm) relative to the RP using procedures appropriate for the measuring device. Equipment is operated and maintained in accordance with manufacturer's instructions, and all measurements are in consistent units of feet, tenths of feet, and hundredths of feet.

Groundwater elevation is calculated using the following equation:

$$\text{GWE} = \text{RPE} - \text{DTW}$$

where:

GWE = groundwater elevation

RPE = reference point elevation

DTW = depth to water

In cases where the official RPE is a concrete pedestal but the hand soundings are referenced off the top of a sounding tube, the measured DTW is adjusted by subtracting the sounding tube offset from the top of the pedestal.

All groundwater level measurements must include a record of the date, well identifier, time (in 24-hour military format), RPE, DTW, GWE, and comments regarding factors

which may influence the recorded measurement, such as nearby production wells pumping, weather, flooding, or well condition.

Manual Groundwater Level Measurement

Groundwater level data collected by an in-person field crew will follow the following general protocols.

- Prior to sample collection, all sampling equipment and the sampling port must be cleaned.
- Manual groundwater level measurements are made with electronic sounders or steel tape. Electronic sounders consist of a long, graduated wire equipped with a weighted electric sensor. When the sensor is lowered into water, a circuit is completed and an audible beep is produced, at which point the sampler will record the depth to water. Some production wells may have lubricating oil floating on the top of the water column, in which case electric sounders will be ineffective. In this circumstance, steel tape may be used. Steel tape instruments consist of simple graduated lines where the end of the line is chalked to indicate depth to water without interference from floating oil.
- All equipment is used following manufacturer specifications for procedure and maintenance.
- Measurements must be taken in wells that have not been subject to recent pumping. At least two hours of recovery must be allowed before a hand sounding is taken.
- For each well, multiple measurements are collected to ensure the well has reached equilibrium such that no significant changes in groundwater level are observed.
- Equipment is sanitized between well locations to prevent contamination and maintain the accuracy of concurrent groundwater quality sampling.

Data Logger Groundwater Level Measurement

Telemetry equipment and data loggers can be installed at individual wells to record continuous water level data, which is then remotely collected via satellite to a central database and accessed on the Water Level Portal in a web browser.

Installation and use of data loggers must abide by the following protocols:

- Prior to installation the sampler uses an electronic sounder or steel tape to measure and calculate the current groundwater level in order to properly install and calibrate the transducer. This is done following the protocols listed above.

- All data logger installations follow manufacturer specifications for installation, calibration, data logging intervals, battery life, and anticipated life expectancy.
- Data loggers are set to record only measured groundwater level to conserve data capacity; groundwater elevation is calculated after data are downloaded.
- In any log or recorded datasheet, the well ID, transducer ID, transducer range, transducer accuracy, and cable serial number are recorded.
- The sampler notes whether the pressure transducer uses a vented or non-vented cable for barometric compensation. If non-vented units are used, data are properly corrected for natural barometric pressure changes.
- All data logger cables are secured to the well head with a well dock or other reliable method. This cable is marked at the elevation of the reference point to allow estimates of future cable slippage.
- Data logger data are periodically checked against hand-measured groundwater levels to monitor electronic drift, highlight cable movement, and ensure the data logger is operating correctly. This check occurs at least annually, typically during routine site visits.

For wells not connected to a supervisory control and data acquisition (SCADA) system, transducer data are downloaded as necessary to ensure no data are overwritten or lost. Data are entered into the data management system as soon as possible after download. After the transducer data are successfully downloaded and stored, the data are deleted or overwritten to ensure adequate data logger memory.

Sample collection will follow the USGS (USGS 2015) and (Rice et al., 2012), as applicable, in addition to the general sampling protocols listed below.

The following section provides a brief summary of monitoring protocols for sample collection and testing for groundwater quality. Establishment of these protocols will ensure that data collected for groundwater quality are accurate, representative, reproducible, and contain all required information. All sample collection and testing for water quality in support of this GSP are required to follow the established protocols for consistency throughout the Basin and over time. All testing of groundwater quality samples will be conducted by laboratories with certification under the California Environmental Laboratory Accreditation Program (ELAP). These monitoring protocols will be updated as necessary and will be re-evaluated every five years.

Wells used for sampling are required to have a distinct identifier, which must be located on the well housing or casing. This identifier will also be included on the sample label to ensure traceability.

Event Preparation:

- Before the sampling event, coordination with any laboratory that will be used for sample analysis is required. Coordination must include scheduling laboratory time for sample testing, and a review of the applicable sample holding times and preservation requirements that must be conducted before the sampling event.
- Sample labels must include the sample ID, well ID, sample date and time, personnel responsible for sample collection, any preservative in the sample container, the analyte to be analyzed, and the analytical method to be used. Sample containers may be labelled prior to, or during, the sampling event.

Sample Collection and Analysis:

- Sample collection must occur at, or close to, the wellhead for wells with dedicated pumps and may not be collected after any treatment, from tanks, or after the water has travelled through long pipes. Prior to sample collection, the sample collector should clean all sampling equipment and the sampling port must be cleaned. The sample equipment must also be cleaned with any change at each new sample location or well.
- Sample collection in wells with low-flow or passive sampling equipment must follow protocol (Puls and Barcelona, 1996) and USGS Fact Sheet 088-00 (USGS, 2000), respectively. Prior to sample collection in wells without low-flow or passive

EPA Ground Water Issue

Standard

methods for the examination of water and wastewater.

Use of Passive Diffusion Samplers for Monitoring Volatile Organic Compounds in Groundwater

National Field Manual for the Collection of Water Quality Data. U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9

General Information and Guidelines: U.S. Geological Survey Techniques of Water-Resources Investigations