CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD

REVISED MONITORING AND REPORTING PROGRAM R5-2020-0801Rev1
FOR
AQUIFER STORAGE AND RECOVER PROJECTS
THAT INJECT DRINKING WATER INTO GROUNDWATER
CITY OF DAVIS, AQUIFER STORAGE AND RECOVERY PILOT TEST AT WELL 27
YOLO COUNTY

This Monitoring and Reporting Program (MRP) allows determination of the potential for groundwater degradation and incorporates requirements for monitoring of injected water and groundwater for the Aquifer Storage and Recovery (ASR) pilot test at Well 11 and Well 27 in the City of Davis. This MRP is issued pursuant to Water Code Section 13267. The Permittee shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. As appropriate, California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) staff shall approve specific sample station locations prior to implementation of sampling activities.

Section 13267 of the California Water Code states, in part:

> *"In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports."*

Section 13268 of the California Water Code states, in part:

> *"(a) Any person failing or refusing to furnish technical or monitoring program reports as required by subdivision (b) of Section 13267, or failing or refusing to furnish a statement of compliance as required by subdivision (b) of Section 13399.2, or falsifying and information provided therein, is guilty of a misdemeanor and may be liable civilly in accordance with subdivision (b).*
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> *(b)(1) Civil liability may be administratively imposed by a regional board in accordance with Article 2.5 (commencing with section 13323) of Chapter 5 for a violation of subdivision (a) in an amount which shall not exceed one thousand dollars ($1,000) for each day in which the violation occurs."*

All samples should be representative of the volume and nature of the monitored medium. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

Field test instruments (such as those used to monitor pH) may be used provided that:

1. The operator is trained in the proper use of the instrument;
2. The instruments are field calibrated prior to each use;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in the "Reporting" section of this MRP.

INJECTION WELL MONITORING

The Permittee proposes to utilize existing Well 11 and Well 27 as injection wells for the ASR pilot test. Each injection well shall be monitored when water is being injected into the aquifer. Monitoring of the injection well shall include, at a minimum, the parameters shown in **Table 1** below. Well operational status shall be reported for each well associated with the ASR pilot test. Injection activity shall be recorded on a daily basis.

Table 1. Injection Well Monitoring

Parameter	Units	Type of Sample	Sampling Frequency
Well Operational Status	N/A	Recorded	Daily
Daily Average Injection Rate	gpm	Meter	Continuous
Injected Water, cumulative total for year to date	ac-ft/yr	Meter	Continuous
Extracted Water, cumulative total for year to date	ac-ft/yr	Meter	Continuous

INJECTED WATER MONITORING

Injected water is limited to potable water that the Permittee receives from the Woodland-Davis Clean Water Agency (WDCWA), which is produced through WDCWA's State Water Resources Control Board (State Water Board) Division of Drinking Water (DDW) domestic water supply permit. Section 116470 of the California Health and Safety Code requires:

1. An Annual Water Quality Report (AWQR). The AWQR characterizes the injected water.

2. Public water systems that serve more than 10,000 service connections and that detect one or more contaminants in drinking water that exceed the applicable public health goal, are required to prepare a report that addresses the contaminant issue.

Both of the reports shall be submitted as part of the Technical Addendum to be submitted at the completion of the pilot test.

Additionally, potable water used as injected water shall be monitored during periods when injection is occurring. Unless otherwise indicated, **Table 2** specifies the sampling frequency, representing the total number of samples to be collected during each ASR pilot test cycle (i.e., one sample in Cycle 1, one sample in Cycle 2, and three samples in Cycle 3). At a minimum, one sample shall be collected on the first day of injection for each cycle. Monitoring of the injected water shall include, at a minimum, the constituents shown in below.

Table 2. Injected Water Monitoring

Constituent	Unit	Type of Sample	Sampling Frequency
pH	pH units	Grab	1, 1, 3
Arsenic (see note 1 below)	mg/L	Grab	1, 1, 3
Iron (see note 1 below)	mg/L	Grab	1, 1, 3
Manganese (see note 1 below)	mg/L	Grab	1, 1, 3
Nitrate (as Nitrogen)	mg/L	Grab	1, 1, 3
Total Dissolved Solids	mg/L	Grab	1, 1, 3
Boron	mg/L	Grab	1, 1, 3

Table 2 Notes:

1. Sample to be analyzed for dissolved and total concentrations. Dissolved samples to be filtered by the lab.

EXTRACTION WELL MONITORING

Monitoring of the extraction well shall include at a minimum the parameters/constituents shown in **Table 3** and meet the following requirements below.

1. All Well Activity shall be reported for all wells associated with the ASR pilot test.

2. Injection/extraction activity shall be recorded on a daily basis.

3. Average pump rate is measured in gallons per day (gpd) or alternative units.

4. Extracted Water/Year represents the total of water extracted from a well for the duration of the pilot test.

5. Unless otherwise indicated, **Table 3** specifies the sampling frequency, indicating the total number of samples to be collected during each ASR pilot test cycle (i.e., three samples in Cycle 1, five samples in Cycle 2, and ten samples in Cycle 3). See **Table 5** *Water Quality Constituents to be Analyzed* located at the end of this MRP for additional constituents to be analyzed.

Table 3. Extraction Well Monitoring

Parameter/Constituent	**Units**	**Type of Sample**	**Sampling Frequency**
Well Activity	N/A	Recorded	Daily
Average Pumping Rate	gpd	Meter	Continuous
Extracted Water/Year	ac•ft/yr	Meter	Continuous
Electrical Conductivity	µmhos/cm	Grab	3, 5, and 10 (see requirement 5 above)
pH	pH units	Grab	3, 5, and 10 (see requirement 5 above)
Arsenic (see note 1 below)	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Iron (see note 1 below)	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Manganese (see note 1 below)	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Nitrate (as Nitrogen)	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Total Dissolved Solids	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Boron	mg/L	Grab	3, 5, and 10 (see requirement 5 above)
Hexavalent Chromium	mg/L	Grab	3, 9, 14
See Table 5 *Water Quality Constituents to be Analyzed* at the end of this MRP		Grab	3, 5, and 10 (see requirement 5 above)

Table 3 Notes:

1. Sample to be analyzed for dissolved and total concentrations. Dissolved samples to be filtered by the lab.

GROUNDWATER AQUIFER MONITORING

The Permittee proposes to monitor groundwater quality at the target aquifer zone using existing inactive municipal Well 7 and nested observation well OW-27. Prior to sampling, groundwater elevations shall be measured, and the wells shall be purged until temperature, pH, and electrical conductivity have stabilized. All groundwater samples shall be collected using approved EPA methods. Samples shall be filtered using a 0.45-micron filter. Depth to groundwater shall be measured to the nearest 0.01 feet.

Groundwater monitoring shall include, at a minimum, the constituents shown in **Table 4** below. Unless otherwise indicated, the sampling frequency reflects the total number of samples to be collected across all phases of each cycle during the ASR pilot test (i.e., three samples in Cycle 1, nine samples in Cycle 2, and fourteen samples in Cycle 3). See **Table 5** *Water Quality Constituents to be Analyzed* at the end of this MRP for additional constituents to be analyzed.

Table 4. Groundwater Aquifer Monitoring

Constituent	Units	Type of Sample	Sampling Frequency
Electrical Conductivity	µmhos/cm	Grab	3, 9, 14
pH	pH units	Grab	3, 9, 14
Arsenic (see note 1 below)	mg/L	Grab	3, 9, 14
Iron (see note 1 below)	mg/L	Grab	3, 9, 14
Manganese (see note 1 below)	mg/L	Grab	3, 9, 14
Nitrogen (as Nitrate)	mg/L	Grab	3, 9, 14
Total Dissolved Solids	mg/L	Grab	3, 9, 14
Boron	mg/L	Grab	3, 9, 14
Hexavalent Chromium	mg/L	Grab	3, 9, 14
See Table 5 *Water Quality Constituents to be Analyzed* at the end of this MRP.		Grab	3, 9, 14

Table 4 Notes:

1. Sample to be analyzed for dissolved and total concentrations. Dissolved samples to be filtered by the lab.

REPORTING

All regulatory documents, submissions, materials, data, monitoring reports, and correspondence shall be converted to a searchable Portable Document Format (PDF) and submitted electronically. Documents that are less than 50 MB should be emailed to:

CentralValleySacramento@waterboards.ca.gov

Documents that are 50 MB or larger should be transferred to a CD, DVD, or flash drive and mailed to the following address:

Central Valley Regional Water Quality Control Board
ECM Mailroom
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

To ensure that your submittals are routed to the appropriate staff, the following information block should be included in any correspondence used to transmit documents to this office:

Facility Name:	City of Davis ASR Pilot Test at Well 27, Yolo County
Program:	Non-15 Compliance
Order:	WQO 2012-0010-DWQ-0006Rev1
CIWQS Place ID:	CW-871533

In reporting monitoring data, the Permittee shall arrange the data in tabular form so that the date, sample type (e.g., source water, injection well, extraction well, etc.), and reported analytical result for each sample are readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with the *General Waste Discharge Requirements for Aquifer Storage and Recovery Projects That Inject Drinking Water into Groundwater*, Water Quality Order 2012-0010-DWQ (General Order), Notice of Applicability (NOA), and Basin Plan. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall be reported in the Technical Addendum.

As required by the California Business and Professions Code sections 6735, 7835, and 7835.1, all groundwater monitoring reports shall be prepared under the supervision of a registered professional engineer or geologist and signed by the registered professional.

A. Technical Addendum

No later than **90 days** following the completion of the pilot test, the Discharger shall submit a Technical Addendum which include the following:

1. A discussion of the status (dates of injection, extraction, and idle time) for all extraction/injection wells associated with the ASR pilot test. Include a discussion on the disposal of extracted/recovered water.

2. The annual water quality report and public health goal report published during the calendar year (if required by DDW).

3. Tabular and graphical summaries of all monitoring data collected during the pilot test (reporting limits for non-detectable results).

4. A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the injection, extraction, and groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the General Order, the NOA, this MRP, and the Standard Provisions and Reporting Requirements (SPRRs).

   (https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/std_provisions/wdr-mar1991.pdf)

   The narrative shall be supported by field logs for each monitoring well documenting depth to groundwater; parameters measured before, during, and after purging; method of purging; calculation of casing volume; and total volume of water purged (if applicable, see notes on passive sampling in the Receiving Water section).

5. Calculation of change in groundwater elevations for each water-bearing interval monitored during the pilot testing activities. Monitoring data to be evaluated will be collected prior to injection, during injection, and during and after extraction activities.

6. A narrative discussion of the analytical results for all groundwater locations monitored including spatial and temporal trends, with reference to summary data tables, graphs, and appended analytical reports (as applicable).

7. A comparison of baseline groundwater monitoring data with the injected water data to evaluate water quality during the storage and extraction periods of the test.

8. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells and any other sampling stations, and groundwater elevation contours referenced to mean sea level datum.

9. Copies of laboratory analytical report(s) for groundwater monitoring.

10. A calibration log verifying calibration of all handheld monitoring instruments and devices used to comply with the prescribed monitoring program.

11. Projected ASR project activity for the next calendar year.

12. A discussion of compliance and corrective actions taken, as well as any planned or proposed actions needed to bring the discharge into full compliance with the General Order and/or the NOA.

A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of violations found during the reporting period, and actions taken or planned for correcting noted violations. If the Permittee has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain a statement by the Permittee, or the Permittee's authorized agent, under penalty of perjury, that to the best of the signer's knowledge the report is true, accurate and complete.

The Permittee shall implement the above monitoring program on the first day following issuance of the NOA.

This Order is issued under the authority delegated to the Executive Officer by the Central Valley Water Board pursuant to Resolution R5-2018-0057 and is effective upon signature.

Ordered by:

for PATRICK PULUPA, Executive Officer

12/17/2025

Date

Table 5 - *Water Quality Constituents to be Analyzed*.

Analyte	Analytical Method	DDW Detection Limit for Reporting[a]	Units	Sample Container and Preservative[b]	Hold Time[c]
General Mineral / Physical					
Alkalinity - Total	SM 2320 B	--	mg/L	1 - 1000 mL Poly w/ no pres [d]	14 d
Alkalinity - Bicarbonate	SM 2320 B	--	mg/L		
Alkalinity - Carbonate	SM 2320 B	--	mg/L		
Alkalinity - Hydroxide as $CaCO_3$	SM 2320 B	--	mg/L		
Hardness as $CaCO_3$	SM 2340 B	--	mg/L	1 - 500 mL Poly w/ HNO_3 [e]	180 d
Apparent Color	SM 2120 B	--	--	1 - 500 mL Amber w/ no pres [h]	48 h
Electrical Conductance (EC)[f]	SM 2510 B	--	µS/cm	1 - 1000 mL Poly w/ no pres [d]	28 d
pH[d]	SM 4500-H+B	--	pH units	1 - 1000 mL Poly w/ no pres [d]	ASAP
Calcium[g]	EPA 200.7	--	mg/L	1 - 125 mL Poly w/ HNO_3	180 d
Chloride	EPA 300.0	--	mg/L	1 - 1000 mL Poly w/ no pres [d]	28 d
Chromium, Hexavalent[g]	EPA 218.7	0.1	µg/L	1-250mL Poly w/ $NH_4OH/(NH_4)_2SO_4$	28 d
Magnesium[g]	EPA 200.7	--	mg/L	1 - 125 mL Poly w/ HNO_3	180 d
Sodium[g]	EPA 200.7	--	mg/L	1 - 125 mL Poly w/ HNO_3	180 d
Sulfate as SO_4	EPA 300.0	--	mg/L	1 - 1000 mL Poly w/ no pres [d]	28 d
Threshold Odor Number (TON)	EPA 140.1	--	T.O.N.	1 - 500 mL Amber w/ no pres [h]	24 h
Total Dissolved Solids (TDS)[f]	SM 2540 C	--	mg/L	1 - 1000 mL Poly w/ no pres [d]	7 d
Dissolved Organic Carbon	SM 5310B	--	mg/L	2 - 40mL VOAs	7 d
Total Organic Carbon	SM 5310B	--	mg/L	2 - 40mL VOAs w/ HCL	28 d
Orthophosphate	EPA 300.0	--	mg/L	1 - 1000 mL Poly w/ no pres [d]	48 h
Total Phosphorous	SM4500PE	--	mg/L	1 - 250 mL Poly w/ H_2SO_4	28 d
Silica[g]	EPA 6010B	--	mg/L	1 - 125 mL Poly w/ HNO_3	28 d
Turbidity	EPA 180.1	--	NTU	1 - 500 mL Amber w/ no pres [h]	48 h
Other Inorganic Chemicals					
Fluoride	EPA 300.0	0.1	mg/L	1 - 1000 mL Poly w/ no pres [d]	28 d
Nitrite as N	EPA 300.0	0.4	mg/L		48 h
Nitrate as N[f]	EPA 300.0	0.4	mg/L		48 h
Nitrate as NO_3	EPA 300.0	2	mg/L		48 h
Metals [g]					
Aluminum	EPA 200.8	50	µg/L	1 - 500 mL Poly w/ HNO_3 [e]	180 d
Antimony	EPA 200.8	6	µg/L		180 d
Arsenic[f]	EPA 200.8	2	µg/L		180 d
Barium	EPA 200.8	100	µg/L		180 d
Beryllium	EPA 200.8	1	µg/L		180 d
Boron	EPA 200.8	--	µg/L		180 d
Cadmium	EPA 200.8	1	µg/L		180 d
Chromium	EPA 200.8	10	µg/L		180 d
Copper	EPA 200.8	50	µg/L		180 d
Iron[f]	EPA 200.7	--	µg/L		180 d
Lead	EPA 200.8	5	µg/L		180 d
Manganese[f]	EPA 200.8	--	µg/L		180 d
Silver	EPA 200.8	--	µg/L		180 d
Mercury	EPA 200.8	1	µg/L		180 d
Nickel	EPA 200.8	10	µg/L		180 d
Potassium	EPA 200.7	--	mg/L		180 d
Selenium	EPA 200.8	5	µg/L		180 d
Thallium	EPA 200.8	1	µg/L		180 d
Zinc	EPA 200.8	--	µg/L		180 d
Uranium	EPA 200.8	1	µg/L	2 - 125 mL Poly (one for total w/ HNO_3, one for dissolved w/no pres)	180 d
Disinfection Byproducts					
Total Trihalomethanes	EPA 524.2	--	µg/L	3 - 40mL VOA w/ $Na_2S_2O_3$	14 d
Bromodichloromethane	EPA 524.2	1	µg/L		14 d
Bromoform	EPA 524.2	1	µg/L		14 d
Chloroform	EPA 524.2	1	µg/L		14 d
Dibromochloromethane	EPA 524.2	1	µg/L		14 d
Haloacetic Acids	EPA 552.2	--	µg/L	3 - 40mL VOA w/ NH_4Cl	14 d
Monochloroacetic Acid	EPA 552.2	2	µg/L		14 d
Dichloroacetic Acid	EPA 552.2	1	µg/L		14 d
Trichloroacetic Acid	EPA 552.2	1	µg/L		14 d
Monobromoacetic Acid	EPA 552.2	1	µg/L		14 d
Dibromoacetic Acid	EPA 552.2	1	µg/L		14 d

[a] Detection limits for reporting are from DDW document "MCLs, DLRs, and PHGs, for Regulated Drinking Water Contaminants" (SWRCB, 2024).
[b] Sample containers and preservations were acquired from either California Laboratory Services (CLS).
[c] Sample hold times were acquired from California Laboratory Services (CLS).
[d] Alkalinity, EC, pH, chloride, sulfate, TDS, orthophosphate, fluoride, nitrate as N, nitrite as N, an nitrate as NO_3 can be combined in the same bottle.
[e] Hardness, total and dissolved metals can be combined in the same bottle.
[f] Required by Monitoring and Reporting Program – Order WQ 2012-0010 General Waste Discharge Requirements for Aquifer Storage and Recovery Projects that Inject Drinking Water into Groundwater. Electrical conductivity measurements are only required for groundwater monitoring.
[g] Sample to be run for dissolved and total concentrations. Dissolved samples to be filtered by the laboratory.
[h] Color, odor, and turbidity can be combined in the same bottle.