CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

FIRST REVISED MONITORING AND REPORTING PROGRAM ORDER NO. R5-2015-0012-011 FOR UNITED STATES AIR FORCE BEALE AIR FORCE BASE IN-SITU GROUNDWATER REMEDIATION AND DISCHARGE OF TREATED GROUNDWATER TO LAND SITE SS023 YUBA COUNTY

This Monitoring and Reporting Program Order (MRP) describes requirements for providing groundwater monitoring of in-situ chemical oxidation (ISCO) at Beale Air Force Base. This MRP is necessary to evaluate and determine whether the in-situ treatment of groundwater pollutants is effective. This MRP is issued pursuant to Water Code Section 13267. The United States Air Force (Discharger) shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer.

Prior to construction of any new groundwater monitoring or injection wells, and prior to destruction of any groundwater monitoring or injection wells, the Discharger shall submit plans and specifications to the Central Valley Water Board staff for review and approval. Once installed, any new groundwater monitoring wells or injection wells added to the monitoring program shall be sampled annually according to Table 2 of this Order.

All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

GROUNDWATER MONITORING

As shown on Figure 1, the monitoring and reporting for Site SS023 consists of 6 injection locations. Two existing monitoring wells, (SWMU23C009MW and 23SWMU1MW) and four new injection wells will be used as injection locations to provide coverage of the target treatment area. The monitoring network for this treatability study will consist of four treatment zone monitoring wells, six transition zone monitoring wells, two compliance monitoring wells and one background well. The injection locations, which will also be monitored, will provide a treatment area covering approximately 2500 square feet. The injection depth will extend from 15 to 50 feet below ground surface. Monitoring wells with free phase petroleum product or visible sheen, if present, shall be monitored, at a minimum, for product thickness and depth to water. Sample collection and analysis shall follow standard USEPA protocol.

In the 2021 Basewide Groundwater Monitoring Program (BGMP) Annual Report, the Discharger requested a revision to the MRP to reduce the groundwater sampling frequency from semiannual to annual at all monitoring wells. The request was made because adverse effects to groundwater quality have not been observed at the compliance monitoring wells following previous ISCO injections. This first revised MRP was prepared in response to the Discharger’s request.

The monitoring wells shall be sampled according to the schedule in Table 1, and the samples analyzed by the methods in Table 2, as follows:

Table 1: Sampling Frequency and Constituent Suite

Well Number[1]	Frequency	Constituent Suite(s)[2]	Monitoring Objective
SWMU23U003AMW	Annual	A,B	Background Well
23U001BMW	Annual	A,B,C	Compliance Monitoring
39C023MW	Annual	A,B,C	Compliance Monitoring
BAT-1MW	Annual	A,B,C	Treatment Zone Monitoring
SWMU23U005AMW	Annual	A,B,C	Transition Zone Monitoring
BAT-5AMW	Annual	A,B,C	Transition Zone Monitoring[3]
SWMU23U006AMW	Annual	A,B,C	Transition Zone Monitoring[4]
SWMU23U007AMW	Annual	A,B,C	Transition Zone Monitoring
SWMU23U004AMW	Annual	A,B,C	Transition Zone Monitoring
SWMU23C008MW	Annual	A,B,C	Transition Zone Monitoring
SWMU34U002MW	Annual	A,B,C	Treatment Zone Monitoring
BAT- 4AMW	Annual	A,B,C	Treatment Zone Monitoring
BAT-4BMW	Annual	A,B,C	Treatment Zone Monitoring
23SWMU1MW	Annual	A,C	Injection well Monitoring
SWMU23C009MW	Annual	A,C	Injection well Monitoring
SWMU23C014IW	Annual	A,C	Injection well Monitoring
SWMU23C015IW	Annual	A,C	Injection well Monitoring
SWMU23C016IW	Annual	A,C	Injection well Monitoring
SWMU23C017IW	Annual	A,C	Injection well Monitoring

[1] Well numbers as shown on Figure 1
[2] Constituent suite components (see Table 2)
[3] Trichloroethene and permanganate concentrations to be monitored at well BAT-5AMW and if the well has not shown an impact from in-situ chemical oxidation injections by the 2015 Annual Basewide Groundwater Monitoring Program event, then the well will be used as an injection well and monitored as such.
[4] Trichloroethene and permanganate concentrations to be monitored at well SWMU23U006AMW and if the well has not shown an impact from in-situ chemical oxidation injections by the 2015 Annual Basewide Groundwater Monitoring Program event, then the well will be used as an injection well and monitored as such.

Table 2: Analytical Methods

Constituent	Method [5]	Maximum Practical Quantitation Limit (µg/L)[6]
Suite A		
VOCs	SW8260B	0.5
Suite B		
total chlorides, dissolved selenium, dissolved sodium, dissolved manganese, dissolved chromium	EPA Method E300 (total chlorides) EPA Method 6010B (dissolved metals)	various
Suite C		
Total Dissolved Solids[7], Permanganate	EPA 160.1 Hach Colorimeter	10,000 1.0 mg/L

FIELD SAMPLING

In addition to the above sampling and analysis, field sampling and analysis shall be conducted each time a monitoring well or extraction well is sampled. The sampling and analysis of field parameters shall be as specified in Table 3.

Table 3: Field Sampling Requirements

Parameters	Units	Type of Sample
Groundwater Elevation	Feet, Mean Sea Level	Measurement
Oxidation-reduction potential	Millivolts	Grab
Electrical Conductivity	uhmos/cm	Grab
Dissolved Oxygen	mg/L	Grab
pH	pH Units (to 0.1 units)	Grab

Field Test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:

a. The operators are trained in proper use and maintenance of the instruments;
b. The instruments are calibrated prior to each monitoring event; and

[5] Or an equivalent USEPA Method that achieves the maximum Practical Quantitation Limit
[6] All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as trace levels
[7] Total Dissolved Solids (TDS) data should be correlated with electrical conductivity data. Conduct TDS analysis on 10 percent of samples to confirm correlation.

c. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency

DISCHARGE MONITORING

The Discharger shall monitor daily the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 4. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the aquifer.

Table 4: Discharge Monitoring Requirements

Parameters	Units	Type of Sample
Injected Volume	gallons per day	Meter
Amendment(s) Added	kilograms per day	Measured

ESTABLISHMENT OF BACKGROUND CONCENTRATION VALUES

The Discharger shall develop background values for concentrations of TDS and dissolved metals (as noted in Table 2). Background values in groundwater should be developed by averaging the respective concentrations reported in background well SWMU23U003AMW. Alternatively, the Discharger shall develop background values for respective concentrations reported in monitoring wells listed in Table 1.

REPORTING

When reporting the data, the Discharger shall arrange the information in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner as to clearly illustrate the compliance with this Order.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional Civil Engineer or Geologist or their subordinate and signed by the registered professional.

The Discharger shall submit annual electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The annual report shall be submitted electronically by **1 October** of the subsequent calendar year until such time as the Executive Officer determines that the reports are no longer necessary.

Annual reports shall include the following minimum information:

(a) A description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and

groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;

(b) Field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc;

(c) Groundwater contour maps for all groundwater zones, if applicable;

(d) Isocontour pollutant concentration maps for all groundwater zones and all major constituents of concern, if applicable;

(e) A table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;

(f) A table showing historical lateral and vertical (if applicable) flow directions and gradients;

(g) Cumulative data tables for all major constituents of concern containing the water quality analytical results and depth to groundwater for all monitoring wells for the past five years, if applicable. Raw laboratory data shall be provided on CD or DVD and included in the report. The Central Valley Water Board may request additional data as necessary;

(h) A copy of the laboratory analytical data report;

(i) If applicable, the status of any ongoing remediation, including cumulative information on the mass of pollutant removed from the subsurface, system operating time, the effectiveness of the remediation system, and any field notes pertaining to the operation and maintenance of the system; and

(j) If applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

Annual Reports shall contain an evaluation of the effectiveness and progress of the investigation and remediation. Annual Reports shall contain the following minimum information:

(a) Both tabular and graphical summaries of all data obtained during the year;

(b) Groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;

(c) A discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;

(d) An analysis of whether the pollutant plume is being captured by an extraction system or is continuing to spread;

(e) A description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;

(f) An identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and

(g) If desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

The results of any monitoring done more frequently than required at the locations specified in the MRP shall also be reported to the Central Valley Water Board. The Discharger shall implement the above monitoring program as of the date of the Order.

Ordered by:

Digitally signed by John J. Baum
Date: 2023.03.16 21:51:05 -07'00'

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JOHN BAUM, Assistant Executive Officer

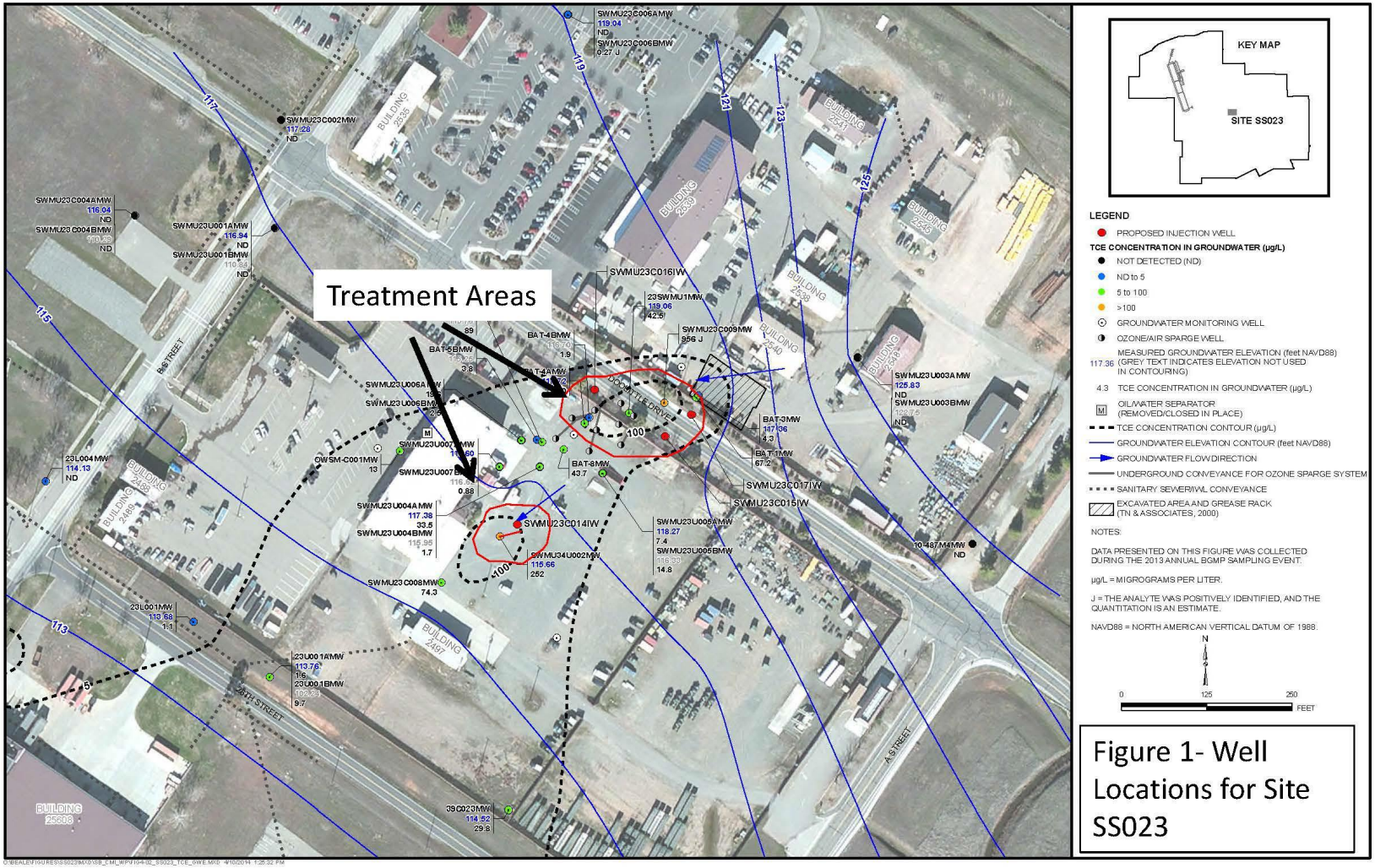

Figure 1- Well Locations for Site SS023