



California Regional Water Quality Control Board Central Valley Region

Katherine Hart, Chair



Linda S. Adams
Secretary for
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Arnold
Schwarzenegger
Governor

8 December 2010

Mr. Kent Hawley
9 CES/CEVR
6601 B Street
Beale Air Force Base, CA 95903-1708

**NOTICE OF APPLICABILITY OF GENERAL ORDER NO. R5-2008-0149
UNITED STATES AIR FORCE – BEALE AIR FORCE BASE IN-SITU BIOREACTOR
REMEDICATION OF VOLATILE ORGANIC COMPOUNDS AT SITE 13, YUBA COUNTY**

The United States Air Force – Beale Air Force Base (Discharger) submitted a Notice of Intent, dated 27 September 2010, requesting coverage under General Order No. R5-2008-0149, General Waste Discharge Requirements for In-situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds and/or Petroleum Compounds. Based on information in your submittal, it is our determination that this project meets the required conditions to be approved under General Order No. 2008-0149. All of the requirements contained in the general order are applicable to your project. You are assigned Order No. R5-2008-0149-018.

Project Location:

The project is at Beale Air Force Base in Yuba County,
Township/Range/Section: T 14N R5E S4 Mount Diablo B&M

Project Description:

Operations at the Site 13 Landfill at Beale Air Force Base caused pollution of the soil and groundwater. The primary pollutants of concern are volatile organic compounds (VOCs). The primary VOC detected in soil and groundwater is trichloroethylene (TCE). Site 13, has an operating groundwater and pump and treat system and soil vapor extraction (SVE) system which provides cleanup of TCE pollution in soil and groundwater. In addition, a landfill cover was constructed in 2004. The SVE system and groundwater pump and treat system were optimized in 2005 and 2006 to address VOC contamination in proximity to the proposed in-situ bioreactor. These optimization efforts did not provide the reduction in VOC concentrations anticipated by the Discharger and the concentrations remaining near the VOC source area at Site 13 remain at unacceptable levels.

For this project, the Discharger will excavate soil to a depth of 25 feet below surface and will excavate an area approximately 25 feet deep by 25 feet long by 15 feet wide. The excavation is centered around vapor monitoring point (VMP-1) which detected 261,000 parts per billion by volume (ppbv) TCE during the 2009 rebound sampling event. The Discharger will also be conducting sampling and reporting the results as described in the attached Groundwater Monitoring and Reporting Order. If the Discharger desires to conduct longer-term in-situ

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remediation of the groundwater, a revised Notice of Intent must be submitted and a new Notice of Applicability received prior to proceeding with the additional remediation.

General Information:

1. The project will be operated in accordance with the requirements contained in the General Order and in accordance with the information submitted in the Notice of Intent.
2. Injection of materials other than those specified in the Notice of Intent into the subsurface is prohibited, unless analysis, as specified in the Order No. R5-2008-0149, of the injectant is provided and approval is given by Board staff.
3. Failure to abide by the conditions of the General Order could result in an enforcement action as authorized by provisions of the California Water Code.
4. The Discharger shall comply with the attached Monitoring and Reporting Order No. R5-2008-0149-018, and any revisions thereto as ordered by the Executive Officer.

If you have any questions regarding this matter, please contact Robert Reeves at (916) 464-4651 or by email him at reeves@waterboards.ca.gov.

PAMELA C. CREEDON
Executive Officer

Attachments

Monitoring and Reporting Order R5-2008-0149-018
General Order No. R5-2008-0149

cc: Della Kramer, Regional Water Quality Control Board, Sacramento
Chuck Elliot, CH2MHill, Sacramento
Terry Escarda, DTSC

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING ORDER NO. R5-2008-0149-018
FOR
UNITED STATES AIR FORCE
BEALE AIR FORCE BASE
IN-SITU BIOREACTOR REMEDIATION OF VOLATILE ORGANIC COMPOUNDS AT
SITE 13
YUBA COUNTY

1. This Monitoring and Reporting Order (MRP) describes requirements for providing groundwater monitoring of an enhanced in-situ bioremediation (Bioremediation) system 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. As appropriate, Regional Water Board staff shall approve specific sample station locations prior to implementation of sampling activities.
2. The Discharger proposes to operate a bioremediation system at Environmental Restoration Program (ERP) Site 13 located at Beale Air Force Base. Site 13 is a former landfill which received both domestic and industrial waste from the 1940's until the mid 1950's. A groundwater pump and treat system is currently operating at Site 13 and will continue to operate during the operation of the bioremediation system. The groundwater pump and treat system is operated to contain a volatile organic compound (VOC) plume originating from the Site 13 landfill and includes fifteen groundwater extraction wells and two air strippers. The groundwater flow rate of the groundwater pump and treat system ranged from 350 to 360 gallons per minute (gpm) in 2009.
3. The bioremediation system consists of an in-situ bioreactor and one extraction well. The bioreactor is designed to remediate a VOC hot spot located in the vadose zone and groundwater near the north-central portion of Site 13. Soil vapor data collected in 2010 indicate TCE concentrations range from 1,040 parts per billion by volume (ppbv) to 261,000 ppbv within the proposed footprint of the bioreactor. Groundwater samples collected in July 2010 within the footprint of the the proposed bioreactor indicate that TCE concentrations ranged from 18 to 56 µg/L in shallow groundwater. The bioreactor is an excavated area approximately 25 feet long by 15 feet wide by 25 deep which is backfilled with a 70/30 mixture of composted mulch and gravel. Also included in the 70/30 mixture of mulch and gravel is approximately 500 gallons of food grade oil and 2,100 gallons of molasses. The molasses includes 0.3 percent sulfur to prevent the migration of dissolved metals. Water is added to the bioreactor at a design flow rate of 3 gallons per minute (gpm) from existing groundwater extraction well 13C083MW to allow circulation of contaminated groundwater through the bioreactor. The extracted water is transferred to the top of the bioreactor through a 0.75-inch Schedule 40 PVC pipe buried approximately 3 feet below ground surface (bgs).

The bioreactor also contains a 2- inch diameter monitoring well (13C088MW) to monitor VOC concentrations and geochemical conditions within the bioreactor.

4. Prior to construction of any new groundwater monitoring or extraction wells, and prior to destruction of any groundwater monitoring or extraction 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 added to the monitoring program shall be sampled semi-annually according to Table 2 of this Order.
5. 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

9. As shown on Figure 1, the monitoring and reporting for Site 13 consists of eight treatment zone wells, two compliance monitoring wells and one background well. The treatment zone wells include one extraction well which is part of the Site 13 Bioremediation system. Monitoring wells with free phase petroleum product or visible sheen shall be monitored, at a minimum, for product thickness and depth to water. The volume of extracted groundwater, if applicable, shall also be provided in semi-annual monitoring reports. Sample collection and analysis shall follow standard EPA protocol.
10. The monitoring wells and extraction well 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
13C070VEW	Semi-Annual	A, B, C	Treatment Zone
13C077VEW	Semi-Annual	A, C	Treatment Zone
13C079VEW	Semi-Annual	A, B, C	Treatment Zone
13C083MW	Semi-Annual	A, B, C, D	Treatment Zone
13C085MW	Semi-Annual	A, B, C	Treatment Zone

¹ Well numbers as shown on Figure 1

² Constituent suite components (see Table 2)

Table 1: Sampling Frequency and Constituent Suite (continued)

13C084MW	Semi-Annual	A, B, C, D	Treatment Zone
13C086MW	Semi-Annual	A, C, D	Treatment Zone
13C064IW	Semi-Annual	A, B, C, D	Background
13C051EW	Semi-Annual	A, B, C, D	Compliance
13C088MW	Semi-Annual	A, B, C	Treatment Zone
13L004EW	Semi-Annual	A, B, C, D	Compliance

Table 2: Analytical Methods

Constituent	Method ¹	Maximum Practical Quantitation Limit (µg/L) ²
Suite A		
Volatile Organic Compounds	EPA 8020 or 8260	0.5
Suite B		
Carbon Dioxide, ethane, ethene and methane	EPA Method RSK 176/3810	10
Total Organic Carbon	EPA 415	300
Nitrate	EPA 6500	300
Sulfate	EPA 6500	200
Suite C		
Dissolved Iron	EPA 200.7,200.8	10
Dissolved Manganese	EPA 200.7,200.8	10
Total Dissolved Solids ³	EPA 160.1	10,000
Suite D		
Dissolved Lead	EPA 200.7, 200.8	10

¹ Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit

² All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as trace levels.

³ TDS data should be correlated with electrical conductivity data. Conduct TDS analysis on 10 percent of samples to confirm correlation.

FIELD SAMPLING

11. In addition to the above sampling and analysis, field sampling and analysis shall be conducted each time a monitor 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

12. 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;
 - c. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency

DISCHARGE MONITORING

13. 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

14. The Discharger shall develop background values for concentrations of sulfide, sulfate, carbon dioxide, methane, ethane, ethane, dissolved organic carbon (filtered), Total Dissolved Solids, dissolved metals (manganese, lead, iron) and sodium in groundwater by averaging the respective concentrations reported in background well 13C064IW. Alternatively, the Discharger shall develop

background values for respective concentrations reported in monitoring wells listed in Table 1.

REPORTING

15. 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 illustrate clearly the compliance with this Order. In addition, the Discharger shall notify the Central Valley Water Board within 48 hours of any unscheduled shutdown of groundwater extraction wells associated with the bioreactor.
16. As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional or their subordinate and signed by the registered professional.
17. The Discharger shall submit semi-annual and annual electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The semi-annual report and annual report shall be submitted electronically over the internet to the Geotracker database system by **1 June and 1 December**, respectively, of each calendar year until such time as the Executive Officer determines that the reports are no longer necessary. Hard copies of semi-annual and annual reports shall be submitted to the Central Valley Water Board **by 1 June and 1 December** of each year, respectively, until such time as the Executive Officer determines that the reports are no longer necessary.

Semi-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.
- (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.

- (g) If desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.
18. 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.
19. Any person aggrieved by this action of the Central Valley Water Board may petition the State Water Board to review the action in accordance with CWC section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday (including mandatory furlough days), the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

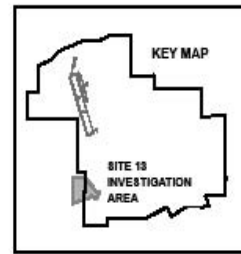
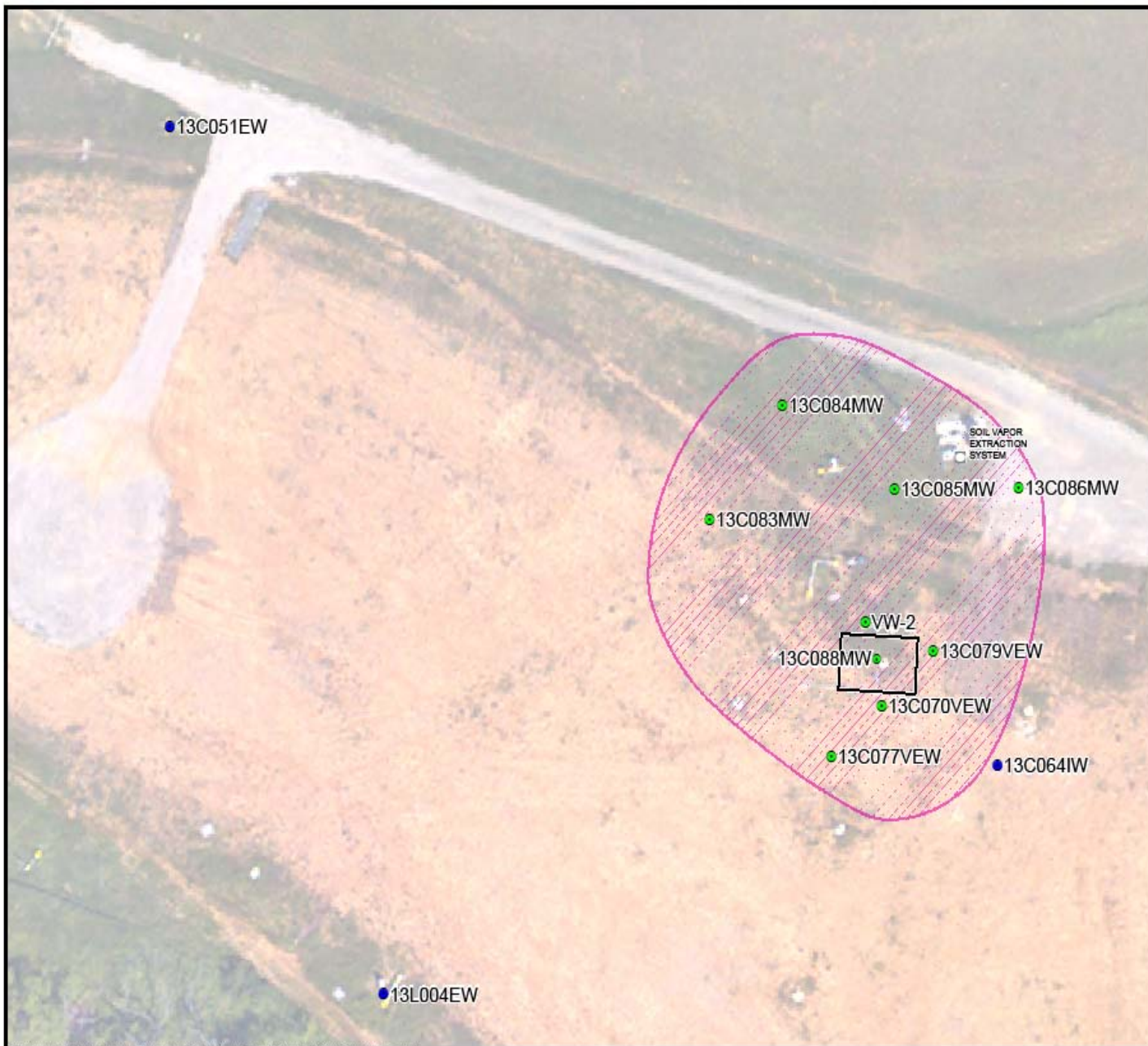
This Order is effective upon the date of signature.

Ordered by:

original signed by
PAMELA C. CREEDON, Executive Officer

8 December 2010
(Date)

12/03/2010:RRR



- LEGEND**
- COMPLIANCE MONITORING WELL
 - TREATMENT ZONE MONITORING WELL
 - SOIL VAPOR EXTRACTION BLOWER
 - ▨ TARGET TREATMENT ZONE
 - ▭ EXTENT OF BIOREACTOR

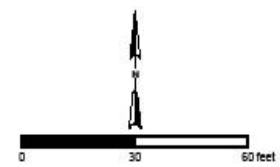


Figure 1
Site 13 In-situ Bioreactor