CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

REVISED MONITORING AND REPORTING PROGRAM NO. R5-2010-0126

FOR
THE BOEING COMPANY
SIGMA COMPLEX IN-SITU GROUNDWATER BIOREMEDIATION PROJECT
INACTIVE RANCHO CORDOVA TEST SITE
SACRAMENTO COUNTY

This Monitoring and Reporting Program (MRP) describes requirements for monitoring a groundwater extraction and treatment system. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. Regional Board staff shall approve specific sample station locations prior to implementation of sampling activities.

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 Attachment B there are 14 monitor wells, 1 extraction well, and 1 injection well associated with this site. The groundwater monitoring program for these wells and any wells installed subsequent to the issuance of this MRP, shall follow the schedule below. Monitor 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 also shall be provided in quarterly monitoring reports. Sample collection and analysis shall follow standard EPA protocol.

The monitor wells, extraction wells and/or injection 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[1]

| Well[1] Number | Quarterly[2] | Semi-Annually[3] | Annually[4] | Monitoring Objective |
|---|---|---|---|---|
| IW-1 | Injection well not sampled on a routine basis; water level obtained by SCADA. | | | |
| EW-1 | Field parameters Suites A, D | Suite B, C | | System Evaluation[5] |
| ISB-1A | Field parameters Suites A, D | Suite B, C | | System Evaluation[5] |
| ISB-2A | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| SMW-1 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |

| Well[1] Number | Quarterly[2] | Semi-Annually[3] | Annually[4] | Monitoring Objective |
|---|---|---|---|---|
| SMW-2 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| SMW-3 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| SMW-4 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| SMW-6 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| SMW-7 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| TEX-1 | Field parameters Suite A | | Suite B, C | System Evaluation[5] |
| 1341 | Field parameters Suites A | Suite B, C | | Compliance[6] |
| SMW-5 | Field parameters Suite A | Suite B, C | | Compliance[6] |
| 1319 | Water level | | Field parameters Suites A,B,C | Upgradient |
| STSW-09A | Water level | | Field parameters Suites A,B,C | Upgradient |
| New Wells | Field parameters Suite A | Suite B, C | | Various |
| STSW-41 | Not Sampled – Replaced by SMW-7 | | | |

1 Well numbers are shown on Attachment B.
2 Wells shall be sampled quarterly.
3 Wells shall be sampled semi-annually during the second and fourth quarters following project startup.
4 Wells shall be sampled annually commencing with the first quarter of the project startup.
5 Wells sampled to evaluate in-situ bioremediation progress inside the treatment zone.
6 Wells sampled to evaluate potential migration of pollutants outside of treatment zone.

## Table 2: ANALYTICAL METHODS

| Constituent | Method[1] | Maximum Practical Quantitation Limit (µg/L)[2] |
|---|---|---|
| **Suite A** | | |
| Perchlorate | EPA 314.1 | 4.0 |
| **Suite B** | | |
| Total Dissolved Solids | EPA 160.1 | 10,000 |
| Total Organic Carbon | EPA 415 | 300 |
| Chloride | EPA 6500 | 300 |
| Sulfate | EPA 6500 | 200 |
| Sulfide | Hach Method 8131 | 30 |

| Constituent | Method[1] | Maximum Practical Quantitation Limit (µg/L)[2] |
|---|---|---|
| **Suite C** | | |
| Iron (Total and Diss.) | EPA 200.7 | 100 |
| Manganese (Total and Diss.) | EPA 200.7 | 25 |
| Arsenic (Total and Diss.) | EPA 200.7, 200.8 | Various |
| **Suite D** | | |
| Electron Donor (VFAs) | | |

[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, and reported as an estimated value.

## Field Sampling

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. Water levels will be collected from all wells in the monitor well network on a quarterly basis. 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 | Grab |
| Oxidation-Reduction Potential | Millvolts | Grab |
| Electrical Conductivity | µhmos | 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:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;
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.

## Treatment System Monitoring

The treatment system used to treat the extracted groundwater prior to infiltration in the source area shall be as specified in Table 4. The analysis shall be by the analytical methods listed in Table 2.

**Table 4: TREATMENT SYSTEM MONITORING**

| Constituent | Monthly | Quarterly | Location |
|---|---|---|---|
| Volatile Organic Compounds | First Three Months | After first three months | Influent and Effluent |
| Perchlorate | First Three Months | After first three months | Influent and Effluent |
| pH | First Three Months | After first three months | Influent and Effluent |
| Sulfate | First Three Months | After first three months | Influent and Effluent |
| Flow | Average Gallons per minute | | Effluent |
| Electron Donor | Gallons per month | | Influent |

## Discharge Monitoring

The Discharger shall monitor the average daily discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 5. The dates of amendment additions shall be recorded and reported.

**Table 5: DISCHARGE MONITORING REQUIREMENTS**

| Parameters | Units | Type of Sample |
|---|---|---|
| Injected Volume | gallons per day | Meter |
| Extracted Volume | gallons per day | Meter |
| Volume Infiltrated | gallons per day | Meter |
| Electron Donor Added | kilograms per day | Grab |
| Chlorine Dioxide Added | kilograms per day | Grab |

## Electron Donor Analysis

Prior to use, the electron donor shall be analyzed for the constituents listed in Table 5. The analysis should be done on the pure donor and on a mixture of the donor and deionized water at the estimated concentration that would be injected during the pilot project.

**Table 4: ELECTRON DONOR ANALYTLICAL REQUIREMENTS**

| Constituent | Method[1] | Maximum Practical Quantitation Limit (µg/L)[2] |
|---|---|---|
| Volatile Organic Compounds | EPA 8020 or 8260B | 0.5 |
| General Minerals | | |
| Metals, Total and Dissolved[3] | EPA 200.7, 200.8 | Various |
| Semi-Volatile Organic Compounds | EPA Method 8270 | 5.0 |

| Constituent | Method[1] | Maximum Practical Quantitation Limit (µg/L)[2] |
|---|---|---|
| Total Dissolved Solids | EPA 160.1 | 10,000 |
| pH | Meter | NA |
| Electrical Conductivity | Meter | NA |

[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, and reported as an estimated value.

[3] Metals include arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium and silica.

## Establishment of Background Concentration Values

The Discharger shall develop background values for concentrations of dissolved iron, dissolved manganese, total dissolved solids and electrical conductivity in groundwater following the procedures found in CCR Section 20415(e)(10). The Discharger shall submit a proposal to develop the background concentrations by **no later than 30 days prior to commencement of operation**.

## 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 illustrate clearly the compliance with this Order. In addition, the Discharger shall notify the Regional Board within 48 hours of any unscheduled shutdown of any soil vapor and/or groundwater extraction system. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Regional Board.

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.

The Discharger shall submit semi-annual electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The semi-annual reports shall be submitted electronically over the internet to the Geotracker database system by **1 February and 1 August** until such time as the Executive Officer determines that the reports are no longer necessary.

Semi-annual reports shall be submitted to the Regional Board by the **by 1 February and 1 August each calendar year**. Each semi-annual report 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, 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 containing the water quality analytical results and depth to groundwater;

(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; and

(k) A log of GAC replacement, if applicable, along with transportation date(s) and destination of disposal.

An Annual Report shall be submitted to the Regional Board by **1 February** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation, and may be substituted for the second semi-annual monitoring report. The Annual Report 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.

A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger 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 the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by: Original signed by:
_____
PAMELA C. CREEDON Executive Officer

_____24 March 2011_____
(Date)

2/1/11:AMM