

California Regional Water Quality Control Board
North Coast Region

Monitoring and Reporting Program No. R1-2008-0099

Chevron Environmental Management Company

Former Redwood Oil/Chevron Bulk Plant
258 Roseland Avenue
Santa Rosa, California

Sonoma County

MONITORING

This Monitoring and Reporting Program is issued pursuant to California Water Code Section 13267 (b) and requires monitoring of groundwater and submission of technical reports. The objective of monitoring conducted under this program is to monitor and determine the remedial effectiveness of surfactant flushing into DHS-8 and MW-2 and to monitor any unwanted migration of surfactant or petroleum hydrocarbons during activities conducted under Waste Discharge Requirements Order No. R1-2008-0099. This Monitoring and Reporting Program is required in conjunction with existing Monitoring and Reporting Program Order No. R1-2007-0052.

Pre-Surfactant Injection Monitoring

1. The following monitoring activities must be conducted prior to surfactant injection into monitoring wells DHS-8 and MW-2 as follows:
 - a) Groundwater monitoring wells DHS-8, MW-2, MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be checked for the presence of separate phase hydrocarbons (SPH). If present, the thickness shall be measured to at least 0.01-foot increments.
 - b) Prior to purging, the depth to groundwater in monitoring wells DHS-8, MW-2, MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be determined to at least 0.01 foot increments. The depth to water in these wells shall also be determined 24 hours prior to injection activities.
 - c) Groundwater samples from monitoring wells DHS-8, MW-2, MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be measured in the field for pH, temperature, conductivity, dissolved oxygen, and oxidation-reduction potential.
 - d) Groundwater samples from DHS-8, MW-2, MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be collected and analyzed by a state certified laboratory for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, benzene, toluene, ethylbenzene, xylenes, methyl tertiary butyl ether, foaming agents/dissolved non-ionic/CTAS surfactants, nitrate as nitrogen, phosphate, alkalinity, methane, and ferrous iron.

Injection Monitoring

2. During surfactant injection to DHS-8, depth to water measurements shall take place at an hourly frequency in monitoring wells MW-10, MW-14, and MW-16A. Hourly depth to water measurements shall cease one hour after injections to DHS-8 are completed.
3. Samples shall also be collected from MW-10, MW-14, and MW-16A at an hourly frequency during surfactant injections in DHS-8 to check for the presence of surfactant and separate phase hydrocarbons. The presence of surfactant will be determined in the field using a methylene blue indicator test. Hourly sampling of surfactant and separate phase hydrocarbons monitoring shall cease one hour after injections cease.
4. During surfactant injection to MW-2, depth to water measurements shall take place at an hourly frequency in monitoring wells MW-4, MW-5, and MW-9. Hourly depth to water measurements shall cease one hour after injections to MW-2 are completed.
5. Samples shall also be collected from MW-4, MW-5, and MW-9 at an hourly frequency during surfactant injections in MW-2 to check for the presence of surfactant and separate phase hydrocarbons. The presence of surfactant will be determined in the field using a methylene blue indicator test. Hourly sampling for surfactant and free product monitoring shall cease one hour after injections cease.

Extraction Monitoring

6. Extraction shall occur no later than 48 hours following injection activities. Immediately prior to implementation of extraction activities, depth to groundwater shall be taken from observation wells MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A and shall be sampled using a methylene blue indicator test to determine the presence of surfactant. Additionally, groundwater samples from MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be collected and analyzed on a 24 hour turn around time by a state certified laboratory for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, benzene, toluene, ethylbenzene, xylenes, methyl tertiary butyl ether, foaming agents/dissolved non-ionic/CTAS surfactants, nitrate as nitrogen, phosphate, alkalinity, methane, and ferrous iron.
7. During extraction activities in DHS-8, depth to water measurements shall take place at an hourly frequency in monitoring wells MW-10, MW-14, and MW-16A. Hourly depth to water measurements shall cease one hour after extraction activities from DHS-8.
8. During extraction activities in MW-2, depth to water measurements shall take place at an hourly frequency in monitoring wells MW-4, MW-5, and MW-9. Hourly depth to water measurements shall cease one hour after extraction activities from MW-2.

9. Samples shall be collected from DHS-8 and MW-2 after 600 gallons of fluid is extracted from both wells. Samples shall be checked for the presence of surfactant in the field using a methylene blue indicator test.
10. If additional extraction is necessary based upon sample results, field sampling for the presence of surfactant shall continue until levels of surfactant or any of its by-products are restored to pre-injection background levels, or until the Regional Water Board Executive Officer authorizes cessation of fluid extraction.
11. Once the presence of surfactant is no longer detected in extracted groundwater (based on field testing), groundwater samples shall be collected from DHS-8 and MW-2 and analyzed on a 24 hour turn-around time by a state certified laboratory for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, benzene, toluene, ethylbenzene, xylenes, methyl tertiary butyl ether, foaming agents/dissolved non-ionic/CTAS surfactants, nitrate as nitrogen, phosphate, alkalinity, methane, and ferrous iron.
12. In the event additional extraction activities are deemed necessary based on the results of the samples collected in accordance with No. 11 above, monitoring activities, as described in No. 10 and No. 11 above, shall be continued until pre-injection levels of surfactant and its by-products are restored in extraction wells, as confirmed by the testing results performed by a state certified laboratory.
13. In the event surfactants or significant increases in petroleum hydrocarbons are detected in any of the observation wells (MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A), extraction activities shall be implemented as required in the migration contingency plan, and monitoring activities described in No. 10, No. 11, and No. 12, above shall be implemented and repeated until pre-injection background levels of surfactant or petroleum hydrocarbons levels are restored in observation wells, as confirmed by the testing results performed by a state certified laboratory. The presence or absence of petroleum hydrocarbons shall be confirmed by a state certified laboratory analysis of TPH as gasoline and TPH as diesel and the presence or absence of surfactant shall be confirmed with the analysis of foaming agents/dissolved non-ionic/CTAS surfactants, nitrate as nitrogen, phosphate, alkalinity, methane, and ferrous iron.

Post-Remedial Monitoring

14. Following injection/extraction activities, DHS-8, MW-2, MW-4, MW-5, MW-9, MW-10, MW-14, and MW-16A shall be monitored at a weekly frequency for one month and monthly thereafter, or until the Executive Officer deems post remedial monitoring is no longer required.
 - a) Groundwater monitoring wells shall be checked for the presence of separate phase hydrocarbons. If present, the thickness shall be measured to at least 0.01-foot increments.

- b) Prior to purging, the depth to groundwater in monitoring wells shall be determined to at least 0.01-foot increments.
- c) Groundwater samples from monitoring wells shall be measured in the field for pH, temperature, conductivity, dissolved oxygen, and oxygen-reduction potential.
- d) Groundwater samples from shall be collected and analyzed by a state certified laboratory for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, benzene, toluene, ethylbenzene, xylenes, methyl tertiary butyl ether, foaming agents/dissolved non-ionic/CTAS surfactants, nitrate as nitrogen, phosphate, alkalinity, methane, and ferrous iron.

REPORTING

- 15. Analytical results described in No. 1 above shall be available at the start of surfactant injection. Analytical results described in No. 6 and No. 11 shall be submitted to the Executive Officer within 24 hours of availability.
- 16. All pre-injection, injection and extraction monitoring and analytical data collected as described in this monitoring and reporting program shall be submitted collectively in a remedial system summary report as specified in Provision C) 4 of Order No. R1-2008-0099.
- 17. Post-remedial monitoring and sampling data as described in No. 14 above shall be incorporated into routine monitoring reports and submitted as described in Monitoring and Reporting Program Order No. R1-2007-0052.
- 18. All reports, data and depth to groundwater measurements shall also be submitted electronically to the State Water Resources Control Board's Geographic Environmental Information Management System database (GeoTracker) as required by Title 23, Division 3, Chapter 16, Article 12 of the California Code of Regulations (i.e AB2886 electronic reporting requirements).¹

Ordered By _____
Catherine Kuhlman
Executive Officer

October 23, 2008

¹ Information on AB2886 electronic reporting can be obtained on the Internet by following the Electronic Submittal of Information link on the GeoTracker home page at <http://geotracker.waterboards.ca.gov>.