

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2003-XXXX
CALIFORNIA WATER CODE SECTION 13267
FOR
WESTERN FARM SERVICE, INC.
MERCED FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
MERCED COUNTY

This monitoring and reporting program (MRP) incorporates requirements for monitoring the progress of the remediation pilot study and groundwater. This MRP is issued by the Executive Officer of the California Regional Water Quality Control Board, Central Valley Region (Regional Board) pursuant to California Water Code Section 13267. Western Farm Service, Inc. (Discharger) is required to comply with this MRP. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. Groundwater sampling and reporting outlined in MRP No. R5-2002-0812 is still required as specified.

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

REMEDICATION PILOT STUDY MONITORING

Monitoring of the HRC® pilot study will consist of groundwater samples collected from MW-4D, MW-5D, MW-11D, MW-7D, and the domestic well at 5510 East Highway 140, owned by Mr. John Hernandez. Split samples will also be obtained quarterly from this domestic well for four consecutive quarters through the third quarter 2003, and one set of samples shall be sent to a California certified laboratory of Mr. John Hernandez' choice for the listed analyses. Two consecutive split sampling events have taken place. Monitoring well samples shall be analyzed for the following constituents. These analyses shall be completed by a State certified laboratory and shall follow standard EPA protocol.

Remediation Pilot Study Monitoring Table

Constituents	Method	Maximum Detection Limit¹	Frequency
Depth to Groundwater	---	0.01 ft	Quarterly
Total Oxidizable Nitrogen	EPA 353.2	1 mg/l	Quarterly
Ammonium	EPA 350.1	0.5 mg/l	Quarterly

Table continued on next page

Remediation Pilot Study Monitoring Table, con't

Constituents	Method	Maximum Detection Limit¹	Frequency
Fumigants (including 1,2,3-trichloropropane)	EPA 504.1	0.02 µg/l	Quarterly
Volatile Organic Compounds (including 1,2-dichloropropane)	EPA 8260B	5 µg/l	Quarterly
Chloride	EPA 300, 325, 9056, or SM 4110	5 mg/l	Quarterly ²
Ferrous Iron (dissolved)	EPA 200, 6020, or SM 3000	0.1 mg/l	Quarterly ²
Manganese (dissolved)	EPA 200, 6020, or SM 3000	0.01 mg/l	Quarterly ²
Sulfide	EPA 376, or SM 4500	0.1 mg/l	Quarterly ²
Sulfate	EPA 300, 375, 9056 or SM 4110 or 4500	1 mg/l	Quarterly ²
Alkalinity	EPA 310, or SM 2320	10 mg/l	Quarterly ²
Carbon dioxide (dissolved)	SM 4500, or ASTM D1945	0.01 mg/l	Quarterly ²
Methane (dissolved)	RSK 175M, or ASTM D1945	0.01 mg/l	Quarterly ²
Total Organic Carbon	EPA 415, 9060, or SM 5310	1 mg/l	Quarterly ²
General Minerals ³	Various	Various	Quarterly ⁴
Metals ⁵	Various	Various	Annually

¹ For nondetectable results

² For samples from wells MW-4D, MW-5D, MW-11D, and MW-7D.

³ General Minerals include: alkalinity, hardness, pH, electrical conductivity, total dissolved solids, calcium, chloride, copper, iron, magnesium, manganese, sodium, sulfate, and zinc.

⁴ General Mineral scan required quarterly in wells MW-7D and the domestic well at 5510 East Highway 140, and annually in the 2nd quarter (April – June) in MW-4D, MW-5D, MW-11D.

⁵ Metals include: antimony, arsenic, beryllium, cadmium, trivalent and hexavalent chromium, cobalt, lead, mercury, molybdenum, nickel, selenium, silver, thallium, and vanadium.

REPORTING

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, sample type (e.g., influent, effluent, groundwater, 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 waste discharge requirements and spatial or temporal trends, as applicable. 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 Groundwater Monitoring Reports shall be prepared under the direct supervision of a Registered Engineer or Geologist and signed by the registered professional.

A. Quarterly Monitoring Reports

Quarterly reports shall be submitted to the Board by the **1st day of the second month following the end of each calendar quarter (i.e., by 1 February, 1 May, 1 August, and 1 November)** until general minerals and metals are less than or equal to background concentrations as described in Provision D.2 of the WDR. The reports may be submitted with the quarterly monitoring reports required by MRP No. R5-2002-0812. At a minimum, the reports shall include:

1. A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the WDR, this MRP, and the Standard Provisions and Reporting Requirements. The narrative shall be supported by field logs for each well documenting depth to groundwater; parameters measured before, during, and after purging; calculation of casing volume; total volume of water purged, etc.;
2. Copies of all laboratory analytical report(s); and
3. Cumulative data tables containing the water quality analytical results and depth to groundwater.
4. Results of any grab groundwater samples obtained during the quarter, and a discussion thereof.

B. Annual Report

An annual report shall be submitted to the Board by **1 November** of each year. This report shall contain an evaluation of the effectiveness and progress of the remediation, and may be submitted with the third quarter monitoring report. The annual report shall contain the following minimum information:

1. Tabular summaries of all data collected during the previous year;
2. Graphical summaries of key indicators of remedial progress;
3. Groundwater contour maps containing all data obtained during the previous year;
4. An evaluation of the performance of the HRC®, an analysis of its effectiveness in destroying the pollutants, and a discussion of the potential for field scale application;

5. A discussion of compliance and the corrective action taken, if any, as well as any planned or proposed actions needed to bring the discharge into full compliance with the waste discharge requirements; and
6. A discussion of any data gaps, potential deficiencies/redundancies in the monitoring system or reporting program and the anticipated date for an effectiveness evaluation of the pilot study.

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: _____
THOMAS R. PINKOS, Executive Officer

(Date)

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2003-0095

WASTE DISCHARGE REQUIREMENTS
FOR
WESTERN FARM SERVICE, INC.
MERCED FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
MERCED COUNTY

The California Regional Water Quality Control Board, Central Valley Region (hereafter Regional Board) finds that:

1. Western Farm Service, Inc. (hereafter Discharger) owns the agricultural chemical distribution facility at 265 Arboleda Drive, Merced, Assessor's Parcel Number 061-030-068, in the southeast quarter of Section 25 of Township 7S, Range 14E, Mount Diablo Baseline and Meridian (hereafter referred to as "Site").
2. On 19 July 2002, the Regional Board adopted Waste Discharge Requirements Order No. R5-2002-0143 (WDRs) for an in situ groundwater remediation pilot study using the proprietary compound Hydrogen Releasing Compound (HRC®) to degrade nitrate and chlorinated solvents under anaerobic conditions.
3. In September 2002, WFS introduced HRC® into the second aquifer, which is between about 73 and 83 feet below ground surface. The pilot study area is beneath a 1,200-square foot area of the adjacent downgradient property owned by Voje, Inc. (hereafter referred to as application area), Assessor's Parcel Number 061-030-092. The general location of the facility is shown on Attachment A, and the location of the pilot study area in relation to the Site is shown on Attachment B. Both Attachments are attached hereto and made part of this Order by reference.
4. Order No. R5-2002-0143 required the Discharger to conduct a downgradient grab groundwater investigation to determine the extent of the remediation zone by 1 June 2003. Monitoring information shows that the remediation is proceeding slower than anticipated. By 5 March 2003, the remediation zone had not advanced beyond the application area. Therefore, these WDRs provide a new schedule for the downgradient delineation, establish baseline concentrations, and add two constituents to the monitoring program.
5. In 1995, WFS conducted a site assessment and found ammonium, chlordane, 1,2-dichloropropane (1,2-DCP), dinoseb, lindane, and nitrate in soil; and ammonium, nitrate and 1,2-DCP in groundwater.

6. Between 1996 and 2001, WFS installed six groundwater monitoring wells in the shallow aquifer, four monitoring wells in the second aquifer, and one monitoring well in the third aquifer. The groundwater surface elevation is about 15-25 feet below ground surface (bgs), and the first aquifer extends to about 35 feet bgs. The second aquifer varies between 10 and 20 feet thick, and is between about 70 and 90 feet bgs. Groundwater flows generally northwesterly in both aquifers.
7. Monitoring results show that constituents of concern in the second aquifer are highest in well MW-5D, about 1,300 feet downgradient (northwest) of the operations area of the Site (which is about 400 feet south of Highway 140). MW-5D contains dibromochloropropane (DBCP) at about 0.2 ug/l, 1,2-DCP at about 800 ug/l, dinoseb at about 20 ug/l, nitrate at about 90 mg/l, and 1,2,3-TCP at about 100 ug/l.
8. On 2 July 2002, the Executive Officer issued Monitoring and Reporting Program (MRP) No. R5-2002-0812 requiring routine groundwater monitoring. This MRP continues in effect and is separate from the MRP required as part of this Order to specifically evaluate the results of this pilot study.
9. The pilot study is intended to demonstrate effective remediation of nitrate, 1,2-DCP, and 1,2,3-TCP in the second aquifer. The pilot study consists of a single injection of Hydrogen Releasing Compound (HRC®), a proprietary polylactate product, into the second aquifer through 32 injection points within the application area. As documented in various conference proceedings, HRC® has been successful in degrading nitrate and chlorinated organic compounds in groundwater in situ. Between 19 and 30 September 2002, the Discharger injected about 6.7 pounds of HRC® per linear foot of aquifer depth, and the aquifer is about 10 feet thick in the application area. Target constituents are in greatest concentration in the application area downgradient of the Site. The application area and injection grid are illustrated on Attachment B.
10. Sustained microbial growth requires carbon, nitrogen, phosphorous and trace minerals. The ratio of carbon to nitrogen in bacterial cell mass is between 5:1 and 4:1 on a molar basis. Microbial growth stimulated by the HRC® may deplete nitrogen in the application area to the extent that it limits further degradation. Phosphorous and trace minerals are required in small amounts and are not expected to be limiting in groundwater systems.
11. If nitrogen species in the groundwater in the application area decline to less than 5 mg/l, Discharge Specification B.1 of this Order allows the Discharger to introduce a limited amount of nitrogen within the application area to maintain biological activity.
12. Byproducts of the HRC® injection could include ammonium, carbon dioxide, reduced forms of sulfate such as hydrogen sulfide, and breakdown products of 1,2-DCP and 1,2,3-TCP, such as 3-chloropropene, propene, chloroethane, methane, or chloride. Of these byproducts, ammonium, hydrogen sulfide, 3-chloropropene, propene, chloroethane, and methane are expected to be intermediate compounds subsequently converted to nitrate, dinitrogen gas, sulfate, and carbon dioxide as the pilot study progresses.

13. The Discharger provided an analysis of a mixture of HRC® and deionized water (1:1 ratio) analyzed for metals and minerals. Most constituents were not detected, and had detection limits below water quality objectives. The following metals were detected at concentrations above water quality objectives, or were not detected and had detection limits that were above water quality objectives: arsenic, cadmium, lead, selenium, sodium, thallium, and vanadium. The Discharger analyzed baseline groundwater samples in the application area and in downgradient well MW-7D for these and other metals, general minerals, and carbon compounds prior to injection and will analyze for these metals and general minerals during the pilot study. Although not required, the Discharger is also monitoring upgradient well MW-3D to ascertain regional background concentrations and seasonal variations.
14. Baseline concentrations are based on the 90% upper confidence limit of the statistical average of baseline monitoring data for metals and general mineral constituents. The statistical procedure is approved by the U.S. EPA for use in analyzing groundwater monitoring data. Baseline sampling for MW-5D occurred between April and September 2002, and for MW-7D between April and December 2002. The tabulated baseline threshold limits for MW-5D and MW-7D, respectively, are presented in Attachments C and D, which are attached hereto and made part of this Order by reference.
15. Groundwater velocity is about one and one-half to four feet per day, and calculations project that a conservative ion such as chloride could reach well MW-7D, about 1,100 feet downgradient of the application area, about one year after the injection event. Nine months after the introduction of HRC®, chloride had not increased in either MW-5D or MW-7D, and no evidence of reducing conditions were observed in MW-5D, about 20 feet downgradient of the application area.
16. Progress of the pilot study is documented by regular sampling of monitoring wells MW-4D, about 700 feet upgradient of the application area, MW-11D within the application area, and downgradient wells MW-5D and MW-7D. Regular sampling of these wells is required by the attached Monitoring and Reporting Program. In addition, grab groundwater samples will be obtained between MW-5D and MW-7D during the course of the pilot study to assess the lateral extent of the treatment zone.
17. The Discharger will monitor the downgradient domestic well at 5510 East Highway 140 (owned by Mr. John Hernandez) quarterly for general minerals, metals, volatile organic compounds, fumigants, nitrate, and ammonium for the duration of the pilot study and one year thereafter. For four consecutive sampling events, the Discharger will obtain split samples and send one of the sample sets to a California certified laboratory of Mr. Hernandez' choice for analyses of the above constituents. The first two quarters of split samples were obtained on 4 December 2002 and 3 March 2003.
18. The Discharger replaced the domestic well at 5510 East Highway 140 in October 2002 with a well deeper than 200 feet, properly destroyed the previous well, and has agreed to

provide bottled drinking water to the household at 5510 East Highway 140 until October 2003.

19. The Discharger submitted the 29 January 2003 *Revised Contingency Plan for In Situ Groundwater Bioremediation Pilot Study* (Contingency Plan) prepared by GeoSyntec Consultants, which Board staff concurred with in a 31 January 2003 letter. The Discharger will implement the Contingency Plan in the event general minerals, metals, total organic carbon, or treatment byproducts exceed the baseline concentration of these constituents in downgradient well MW-7D, or if chloride concentrations exceed 5% above baseline concentrations in MW-5D. When implemented, the Contingency Plan includes expanded investigation to verify and define the extent of an exceedance of baseline constituents, a work plan for remedial actions developed specifically for the nature and extent of the exceedance identified, and could include groundwater extraction.
20. The Discharger provided aquifer test data and boring logs obtained from extensive aquifer characterization work performed at the General Electric Kendall facility (Kendall) about two miles east of the Site. Using hydraulic conductivity and transmissivity values obtained from the Kendall Site, the Discharger provided a model showing that groundwater extracted from wells MW-5D or MW-7D at 50 gallons per minute is expected to contain the HRC application area and plume, if necessary. Comparison of boring logs from the WFS Site with boring logs from the Kendall Site shows that the stratigraphy of the two Sites are closely correlated and transmissivity in the second aquifer is expected to be similar at both Sites.
21. The pilot study will conclude when the concentration of general minerals, metals, and organic carbon within the aquifer beneath the application area are less than or equal to baseline conditions. Based on the previous pilot studies utilizing HRC® to degrade chlorinated organic compounds, the pilot study is estimated to be complete within four years of implementation. The effectiveness of the remediation system may be evaluated before baseline conditions are attained.
22. The closest water supply well is approximately 500 feet cross-gradient from the application area. The Discharger has replaced all of the domestic supply wells that were within 2,000 feet downgradient of the WFS facility (about 1,000 feet downgradient of the application area), less than 200 feet deep, and identified as containing detectable concentrations of 1,2,3-TCP. The new wells extend below 370 feet bgs. WFS is continuing to sample the water quality of those domestic supply wells that did not contain 1,2,3-TCP.
23. The injection to waters of the State is subject to regulation under the California Water Code. This Order authorizes the Discharger to inject HRC® and nitrogen into groundwater subject to specific discharge requirements.
24. The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fourth Edition*, (hereafter Basin Plan) designates beneficial uses, establishes water quality

objectives, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Board. Pursuant to Section 13263(a) of the California Water Code, waste discharge requirements must implement the Basin Plan.

25. Surface water drainage is to the San Joaquin River. The beneficial uses of the San Joaquin River are municipal and domestic supply; agricultural supply; process and service industrial supply; water contact recreation; noncontact water recreation; warm and cold freshwater habitat, migration, spawning, and wildlife habitat.
26. The beneficial uses of underlying groundwater are domestic, municipal, agricultural, and industrial service and process water supply.
27. Surrounding land uses are agricultural, agricultural-residential, and industrial.
28. State Water Resources Control Board (SWRCB) Resolution No. 68-16 (hereafter Resolution 68-16 or the “Antidegradation Policy”) requires the Board in regulating the discharges to maintain high quality waters of the state until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in plans and policies (e.g., quality that exceeds water quality objectives). Temporal degradation of groundwater by the HRC® injection may occur. Such degradation is consistent with Resolution 68-16 since (1) the purpose is to accelerate and enhance remediation of unacceptable concentrations of several waste constituents and such remediation will benefit the people of the state; (2) the discharge facilitates a pilot project to evaluate the effectiveness of cleanup technology in accord with State Water Resources Control Board Resolution 92-49 and is limited in scope and duration; (3) best practicable treatment, including adequate monitoring and contingency plans to assure protection of water quality are required; and (4) the injection will not cause water quality objectives to be exceeded beyond the duration of the project.
29. Section 13267(b) of California Water Code provides that:

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 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 the waters of the state within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports 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.

The technical reports required by this Order and the attached Monitoring and Reporting Program No. R5-2003-0095 are necessary to assure compliance with these waste discharge requirements.

30. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells, as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 74-81* (December 1981). These standards, and any more stringent standards adopted by the State or County pursuant to California Water Code Section 13801, apply to all monitoring wells.
31. Issuance of this Order is an action to assure the restoration of the environment and is, therefore, exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000, et seq.), in accordance with Section 15308 and 15330, Title 14, California Code of Regulations (CCR).
32. This discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste*, as set forth in Title 27, CCR, Section 20005, et seq., (hereafter Title 27). The exemption pursuant to Section 20090(b), is based on the following:
 - a. The Board is issuing waste discharge requirements,
 - b. The discharge complies with the Basin Plan, and
 - c. The wastewater does not need to be managed according to Title 22 CCR, Division 4.5, and Chapter 11, as a hazardous waste.
33. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.
34. All the above and the supplemental information in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge. The Discharger and interested persons were notified of intent to prescribe waste discharge requirements for this discharge.
35. In a public meeting, all comments pertaining to the discharge were heard and considered.

IT IS HEREBY ORDERED that Waste Discharge Requirements Order No. R5-2002-0143 is hereby rescinded, and that pursuant to Sections 13263 and 13267 of the California Water Code, Western Farm Service, Inc., its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted

hereunder, shall comply with the following while conducting the above-described pilot project:

[Note: Other prohibitions, conditions, definitions, and some methods of determining compliance are contained in the attached "Standard Provisions and Reporting Requirements for Waste Discharge Requirements" dated 1 March 1991, incorporated herein.]

A. Discharge Prohibitions

1. The injection of other than HRC® and nitrogen is prohibited.
2. Discharge of waste classified as 'hazardous' under Section 2521 of Title 23, CCR, or as 'designated' under Section 13173 of California Water Code is prohibited.
3. Discharge of HRC® or nitrogen at a location or in a manner different from that described in Finding Nos. 3 and 11 is prohibited.

B. Discharge Specifications

1. If the sum of the concentration of dissolved inorganic nitrogen species (nitrate, nitrite, and ammonium) expressed as nitrogen declines to less than 5 mg/l within the application area, as measured in wells MW-5D or MW-11D, the Discharger may add nitrogen to the application area as follows: addition of nitrogen to groundwater shall not exceed a molar concentration of 25% of the molar concentration of total organic carbon measured in the aquifer in the application area.
2. This Order allows discharge of HRC® into the application area and of nitrogen under the conditions defined in Discharge Specification B.1. No other products shall be discharged.
3. No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of the Groundwater Limitations.

C. Groundwater Limitations

1. During the pilot study, the Discharger shall not cause more than a five percent increase above the baseline concentration of chloride as defined in Finding 14 within the application area. Compliance shall be measured in a single sampling event, subject to confirmation. Based on baseline groundwater samples obtained

from monitoring well MW-5D in the application area between April and September 2002, chloride concentration must not exceed 97 mg/l in the application area as represented by monitoring well MW-5D.

2. At downgradient well MW-7D, the Discharger shall not cause an increase in any groundwater constituent above the baseline concentration as defined in Finding 14 and shown in Attachment D.
3. When the pilot study is concluded, groundwater quality in the application area shall at least meet baseline concentrations in MW-5D as defined in Finding 14 and shown in Attachment C.
4. The Discharger shall not cause the groundwater to contain taste and odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

D. Provisions

1. Metal analyses shall include antimony, arsenic, beryllium, cadmium, trivalent and hexavalent chromium, cobalt, lead, mercury, molybdenum, nickel, selenium, silver, thallium, and vanadium. General mineral analyses shall include alkalinity, hardness, pH, electrical conductivity, total dissolved solids, ammonium, calcium, chloride, copper, iron, magnesium, manganese, nitrate, nitrite, sodium, sulfate, sulfide, and zinc.
2. If nitrogen needs to be added to groundwater as described in Finding 11 and allowed in Discharge Specification B.1, the Discharger shall submit a written request to Board staff for approval, including analytical data supporting the request, calculations justifying quantities proposed to be introduced, manner of introduction, and form of nitrogen proposed. Nitrogen addition shall not occur until Board staff approves the request in writing. A summary report of the nitrogen addition shall be included in the subsequent quarterly monitoring report required by the attached MRP No. R5-2003-0095.
3. During the pilot study, the Discharger shall identify the downgradient and sidegradient extent of the remediation zone by obtaining grab groundwater samples generally between wells MW-5D and MW-7D. The first and subsequent sets shall be scheduled as follows:
 - a. Between three and six months after any of the following concentrations are observed in MW-5D:

- (1) The concentration of methane exceeds 2 mg/l; or
 - (2) The concentration of nitrate declines to below the detection limit; or
 - (3) The concentration of carbon measured as total organic carbon exceeds 20 mg/l.
 - b. Subsequent grab groundwater sample sets shall be scheduled annually thereafter.
4. All of the following reports shall be submitted pursuant to Section 13267 of the California Water Code. All technical reports required herein that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code sections 6735, 7835, and 7835.1. To demonstrate compliance with sections 415 and 3065 of Title 16, CCR, all technical reports must contain a statement of the qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.
- a. Within 1 month of receiving the analytical results of the grab groundwater samples required in Provision D.3.a., but no later than **1 November 2004**, the Discharger shall submit a report documenting the results. This report may be submitted with the corresponding quarterly or annual report as required in the attached MRP No. R5-2003-0095.
 - b. Prior to **1 October 2005**, the Discharger shall submit an effectiveness evaluation report that discusses the feasibility of the remedial technology to treat the constituents of concern, makes recommendations for applying the technology to full scale treatment at this Site, discusses the results of grab groundwater sampling, and provides an estimate of when the application area is expected to return to baseline concentrations of general minerals, metals, and total organic carbon.. This effectiveness evaluation report may be submitted with the annual progress report required in the attached MRP No. R5-2003-0095. If the pilot study has not progressed enough to provide an effectiveness evaluation, then the annual progress report shall include recommendations and a proposed schedule to implement recommendations.
5. If a groundwater sample from well MW-5D contains chloride in concentrations exceeding five percent above baseline concentrations as shown in Attachment C, or if a sample from MW-7D contains general mineral, metal, or total organic carbon concentrations exceeding the baseline concentrations as shown in Attachment D, the Discharger shall obtain a confirmation sample within **7 days** of receiving the results and shall notify the Regional Board.

6. **Within 30 days** of confirming that threshold concentrations have been exceeded, the Discharger shall submit a work plan to implement the Contingency Plan described in Finding 19.
7. The Discharger shall implement the work plan within **30 days** of Board staff approval. Within **2 months** of implementation, the Discharger shall provide a status summary report.
8. The pilot study shall be concluded when the concentration of general minerals, metals, and total organic carbon attains baseline conditions in MW-5D as defined in Finding 14 and shown in Attachment C. If baseline concentrations are not achieved within five years of beginning the pilot study, the Discharger shall submit a work plan to implement the Contingency Plan referenced in Finding 19 or shall demonstrate why the Contingency Plan does not need to be activated.
9. The Discharger shall comply with the attached MRP No. R5-2003-0095, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.
10. The Discharger shall comply with the “Standard Provisions and Reporting Requirements for Waste Discharge Requirements,” dated 1 March 1991, which are attached hereto and are a part of this Order by reference. This attachment and its individual paragraphs are commonly referenced as “Standard Provision(s).”
11. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court order requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.
12. A copy of this Order shall be kept at the discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.
13. The Regional Board will review this Order periodically and will revise requirements when necessary.

I, THOMAS R. PINKOS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 6 June 2003.

THOMAS R. PINKOS, Executive Officer

Attachments

INFORMATION SHEET

ORDER NO. R5-2003-XXXX
WESTERN FARM SERVICE, INC., MERCED FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
MERCED COUNTY

Groundwater in the second aquifer (about 73 to 83 feet below ground surface) contains nitrate at about 90 mg/l, 1,2-dichloropropane at about 800 ug/l, and 1,2,3-trichloropropane at about 100 ug/l, all above their respective water quality limits. This pilot study evaluates the potential of a proprietary polylactate compound, Hydrogen Releasing Compound (HRC®) to create anaerobic conditions in the groundwater in the application area. Under anaerobic conditions, nitrate and the chlorinated organic compounds are to be degraded by indigenous microorganisms.

The remedial process depends upon stimulating growth of a consortium of indigenous microbes by providing a carbon substrate in the form of HRC®. Microbial metabolism obtains energy by oxidizing a compound and reducing another compound. Different amounts of energy can be obtained from different compounds. The first compounds to be utilized as electron acceptors are those that provide the most energy, conferring a competitive advantage to these organisms. Aerobic microbes will consume carbon first using oxygen until it is depleted, as oxygen provides the most energy. After oxygen depletion, a succession of anaerobic microbes become dominant, oxidizing carbon and reducing the specific compounds upon which their metabolism depends. In general, nitrate is the next compound in sequence to be reduced, then iron, sulfate, and chlorinated organic compounds.

The waste products of anaerobic metabolism (the reduced compounds), such as propionic acid, propene, carbon dioxide, methane, hydrogen sulfide, reduced iron, and ammonium, in addition to chlorinated organic compounds, in turn become electron sources for other microbes, and the previously oxidized compounds become electron receptors. This is the basis of geochemical cycling of nutrients. When the carbon provided by the HRC® is exhausted, the system slowly returns to the initial conditions. Some gaseous products, such as nitrogen gas, methane, and carbon dioxide, may migrate into the soil column, and are subject to microbial degradation within the soil column. Some of the transformations are not reversible, such as removal of chlorine molecules from the chlorinated organic compounds, or degradation of compounds containing more than two carbon molecules.

The HRC® was injected in September 2002 in compliance with Waste Discharge Requirements (WDRs) No. R5-2002-0143. Provision D.5.a. required the Discharger to delineate the extent of the remediation zone between MW-5D, about 20 feet downgradient of the injection area, and MW-7D, about 1,100 feet downgradient before 1 June 2003. As of 5 March 2003, nine months after the HRC® injection, the remediation zone had not yet advanced to MW-5D. Since the remediation zone is progressing slower than anticipated, the timetable for downgradient delineation must be changed to reflect the observed reaction rates. This WDR reflects this change.

WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2003-XXXX
WESTERN FARM SERVICE, INC., MERCED FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY, MERCED COUNTY

Monitoring from a monitoring well within the injection area (MW-11D) shows that anaerobic conditions are beginning to develop within the injection area, and that the first indicators of the remediation zone advancing to MW-5D may be within the next six months. Based on the quarterly monitoring history of this pilot study and an ongoing pilot study at a different site, methane will be one of the first constituents to be detected indicating that the remediation zone is arriving at MW-5D. Therefore, a new provision requires the Discharger to conduct the downgradient investigation between three and six months after methane concentrations exceed 2 mg/l in MW-5D, but not later than 1 October 2004, which is two years after the injection.

Other changes made to the WDR include updating the WDR to remove provisions that the Discharger has satisfactorily complied with, to incorporate baseline water quality data, and to add iron and manganese to the MRP.