

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL VALLEY REGION

ORDER NO. R5-2004-0081

WASTE DISCHARGE REQUIREMENTS  
FOR  
CITY OF MERCED  
MERCED MUNICIPAL AIRPORT  
ENHANCED BIOREMEDIATION PROJECT  
MERCED COUNTY

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

1. The City of Merced (hereafter Discharger) submitted a Report of Waste Discharge on 6 June 2003 and supplemental information on 25 September 2003 and 25 February 2004 for an enhanced bioremediation project at the Merced Municipal Airport.
2. The Discharger owns the Municipal Airport, 20 Macready Drive in Merced, Assessor's Parcel Numbers 059-42-056 and 059-42-064 at Township 7 South, Range 13 East, Section 35, MDB&M, as shown on Attachment A, which is attached hereto and made part of this Order by reference. The general location of the project (hereafter Site) is near the intersection of West Avenue and Riggs Avenue in Merced, as shown on Attachment B, which is attached hereto and made part of this Order by reference.
3. The groundwater pollution originated in two areas, as shown on Attachment B. Area A is on the old taxiway and was used as an engine "warm-up" area for crop dusters prior to takeoff. Pollution in Area A is limited to pesticides in shallow soils. Area B includes a pesticide mixing and washdown area and an old City of Merced Fire Department training area. The Fire Training Area was used from the 1950s to approximately 1981. Flammable substances, which were placed in above ground tanks, concrete burn pads, a concrete foundation and a concrete burn pit, were ignited and extinguished during training exercises. Soil and groundwater in Area B are polluted with petroleum hydrocarbons, pesticides and volatile organic compounds (VOCs) from the washdown and fire training areas.
4. The Discharger has performed several investigations to delineate the extent of the pollution and has completed a human health risk assessment. To prevent exposure to identified receptors, in February 2003 the Discharger completed an asphalt-concrete cap over the pesticide- contaminated soil in Areas A and B and will record a land use covenant to limit the future use of both areas.
5. Shallow groundwater is about 10 feet below ground surface (bgs) and contains petroleum hydrocarbons and VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2 dichloroethene (cis-1,2 DCE). Three water bearing zones are identified at the Site and are monitored by 16 groundwater monitoring wells as required by Monitoring and Reporting Program (MRP) No. R5-2002-0832. The City conducted a water supply well survey in

April 2003 and found that the nearest active water supply well is about 800 feet cross gradient to the Site.

6. Most of the mass of VOC pollution is in the A zone aquifer, which begins about 10 feet bgs and varies from about 15 to 30 feet in thickness across the Site. Monitoring results from 3 September 2003 show that constituents of concern in the A zone aquifer are highest in monitoring well MW-10, which contains up to 89 micrograms per liter ( $\mu\text{g/l}$ ) of PCE, 21  $\mu\text{g/l}$  of TCE, and up to 52  $\mu\text{g/l}$  of cis-1,2 (DCE).
7. The Discharger proposes enhanced bioremediation of polluted groundwater using the proprietary polylactate compound Hydrogen Releasing Compound (HRC<sup>®</sup>) to degrade VOCs and petroleum hydrocarbons under anaerobic conditions. The Discharger proposes to inject HRC<sup>®</sup> through 120 injection points into the A zone aquifer. The injection points are arranged in four barriers across the plume, with each barrier consisting of two rows of injection points spaced 10 feet apart and staggered to provide overlapping radii of influence, as shown on Attachment B. The depth of the injection points will vary depending on the lithology at the injection point. Prior to injecting HRC, the Discharger will advance two to three pilot borings along each injection barrier to evaluate the lithology at each barrier. The Discharger will inject between four and nine pounds of HRC<sup>®</sup> per linear foot of vertical depth in the aquifer, depending on the aquifer lithology at the injection point. The HRC<sup>®</sup> is estimated to radiate out about five feet. Injection spacing and HRC<sup>®</sup> dosing for full coverage of the plume was determined by analysis of site conditions by Regenesys, the manufacturer of HRC<sup>®</sup>. The treatment area is expected to extend about 220 feet downgradient of the most downgradient barrier.
8. The Discharger will install two new monitoring wells in the A zone aquifer as additional monitoring points to evaluate the HRC<sup>®</sup> injection. MW-20 will be installed about 75 feet downgradient (northwest) of monitoring well MW-10, and MW-21 will be installed about 280 feet downgradient of MW-17 and 300 feet downgradient of the most downgradient injection barrier. The depth of the screen intervals will be determined after installation of the pilot borings as discussed in Finding No. 7. The Discharger will collect baseline groundwater samples a minimum of two weeks prior to the injection of HRC<sup>®</sup> and will conduct routine monitoring of the new wells and existing monitoring wells MW-9, MW-10, MW-11, MW-13, MW-15 and MW-17 for volatile organic compounds, total organic carbon (TOC), lactic acid, metals, and general chemistry parameters, as required in the attached MRP No. R5-2004-0081. The estimated groundwater flow velocity is 110 feet per year.
9. The Discharger shall determine baseline concentrations in MW-21 using quarterly monitoring data collected within the first year after the date of the HRC injection and using EPA and Regional Board staff approved statistical methods to define the 95% upper confidence limit. Baseline concentrations are defined as those values contained within the 95% confidence interval.

10. Bench-scale testing was not performed because the most common mechanism of degradation of chlorinated compounds is reductive dechlorination where the chlorinated compounds serve as electron acceptors and carbon is the main electron donor. Injecting HRC<sup>®</sup> will stimulate growth of indigenous microorganisms by providing a carbon substrate, thereby accelerating the reductive dechlorination process. The Discharger has determined that HRC<sup>®</sup> injections will reduce pollutant concentrations because monitoring data have shown that reductive dechlorination is occurring under anaerobic conditions and VOCs are breaking down.
11. Byproducts from the injection of HRC<sup>®</sup> may include carbon dioxide, reduced forms of sulfate such as hydrogen sulfide, and breakdown products of PCE and TCE, such as 1,1-dichloroethylene, 1,1-dichloroethane, 1,2-dichloroethane, vinyl chloride, and chloroethane. Further degradation of chloroethane could create ethylene, ethane, chloromethane, methane and chloride ion. With the exception of chloride ion, the breakdown products of tetrachloroethene and trichloroethene are expected to be intermediate compounds. The Discharger will monitor for these byproducts, along with the constituents listed in Finding No. 8, in accordance with the attached MRP NO. R5-2004-0081. Groundwater monitoring of amendments, breakdown products, and byproducts will continue throughout the treatment period. The treatment period will continue until concentrations return to baseline levels.
12. In the event that PCE, TCE, cis-1,2 DCE, any of their breakdown products, methane or TOC exceeds 20% above baseline concentrations, as described in Finding No. 9, in monitoring well MW-21 during the treatment period, the Discharger will implement the 14 May 2004 Contingency Plan. The Contingency Plan includes an initial Hydropunch<sup>®</sup> investigation to verify and evaluate the extent of the exceedance and based on the investigation results, a work plan for remedial actions developed specifically for the nature and extent of the exceedance identified. These remedial actions could include installing a pump and treat system. The Discharger provided a capture zone analysis that shows that pumping from the existing and proposed monitoring wells would achieve capture of the groundwater within the plume area. The Discharger also agrees to install additional extraction wells screened in the A zone aquifer if needed to achieve capture of the plume. The Discharger may also submit a Report of Waste Discharge to re-inject the treated water if initial results show that groundwater extraction may be a long-term corrective measure.
13. The injection of chemicals into waters of the State is subject to regulation under the California Water Code. This Order authorizes the Discharger to inject HRC<sup>®</sup> into groundwater subject to specific discharge requirements.
14. 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 Water Resources Control Board (State Board). Pursuant to Section 13263(a) of the California Water Code, waste discharge requirements must implement the Basin Plan.

15. Surface water drainage is into the San Joaquin River via the Merced and Zentner laterals, Owens Creek and Bear Creek. The beneficial uses of the San Joaquin River between Sack Dam and the mouth of the Merced River are municipal and domestic supply; agricultural irrigation and stock watering supply; industrial process supply; water contact recreation; noncontact water recreation; warm freshwater habitat; migration of warm and cold freshwater species; spawning, reproduction and/or early development of warm and cold freshwater species; and wildlife habitat.
16. The designated beneficial uses of underlying groundwater are municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.
17. Surrounding land uses are commercial and industrial.
18. State Board Resolution No. 68-16 (hereafter Resolution 68-16 or the “Antidegradation Policy”) requires the Regional Board in regulating 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 present and potential 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 at this site due to the HRC<sup>®</sup> injection may occur. The temporary degradation allowed by this Order is consistent with Resolution 68-16 since (1) the purpose is to accelerate and enhance remediation of groundwater pollution by several waste constituents and such remediation will benefit the people of the state; (2) the degradation is limited in scope and duration; (3) best practicable treatment and control, including adequate monitoring and contingency plans to assure protection of water quality, are required; and (4) the discharge will not cause water quality objectives to be exceeded beyond the treatment zone or the duration of the project as described in Findings 7 and 11.
19. 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 MRP No. R5-2004-0081 are necessary to assure compliance with these waste discharge requirements. The Discharger owns the facility that discharged the waste subject to this Order.

20. 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.

21. 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).
22. 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). Section 20090(d) allows exemption for a project to clean up a condition of pollution that resulted from an unauthorized release of waste based on the following:
  - a. The cleanup and abatement action is under the direction of a public agency;
  - b. Wastes removed from the immediate place of release will be discharged according to the Title 27 regulations; and
  - c. The remedial actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.
23. 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.
24. All the above and the supplemental data and information and details in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge.
25. The Discharger and interested agencies and persons were notified of intent to prescribe waste discharge requirements for this discharge and provided with an opportunity for a public hearing and an opportunity to submit written views and recommendations.
26. In a public meeting, all comments pertaining to the discharger were heard and considered.

**IT IS HEREBY ORDERED** that pursuant to Sections 13263 and 13267 of the California Water Code, the City of Merced, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following while conducting the above-described pilot study:

*[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. Discharge of wastes to surface waters or surface water drainage courses is prohibited.
2. The injection of other than HRC<sup>®</sup> into groundwater is prohibited.
3. Discharge of waste classified as 'hazardous' under Section 2521 of Title 23, CCR, or as 'designated' under Section 13173 of the California Water Code is prohibited.
4. Discharge of HRC<sup>®</sup> at locations or in a manner different from that described in Finding No. 7 is prohibited.

**B. Discharge Specifications**

1. 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.
2. Discharge of HRC<sup>®</sup> shall be limited to the project scope as described in Finding No. 7.

**C. Groundwater Limitations**

1. During the treatment period, the Discharger shall not cause an increase of methane, TOC, or pollutant breakdown products above baseline concentrations in monitoring well MW-21.
2. When the treatment period is completed, the concentrations of constituents in groundwater from all amendments, byproducts and pollutant breakdown products shall not exceed baseline levels.

**D. Provisions**

1. The Discharger shall notify Board staff a minimum of one week prior to the injection of HRC<sup>®</sup>.
2. The Discharger shall comply with the attached MRP No. R5-2004-0081, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.
3. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements," dated 1 March 1991, which are attached hereto and by reference a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."
4. The Discharger shall determine baseline concentrations in MW-21 using quarterly monitoring data collected within the first year after the date of the HRC injection.

Discharger shall define the 95% upper confidence limit using statistical methods appropriate for site conditions and approved by the EPA and Regional Board staff.

5. 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. The Discharger shall submit a Stratigraphic Definition Report within **21 days** after installation of the injection barrier pilot borings that includes pilot boring logs and cross sections of each barrier, and proposes the depth of the injection points along each barrier and the depth of the screen interval in MW-20 and MW-21 for approval by Regional Board staff.
  - b. The Discharger shall submit an Implementation Report due no later than **60 days** after injection of HRC<sup>®</sup> that shall include a description of field activities, well installations, quantities and locations of HRC<sup>®</sup> injections, discussion of baseline concentrations, a proposed statistical method to calculate baseline concentrations in MW-21, and results of the first month of monitoring.
  - c. The Discharger shall submit an Evaluation Report no later than **14 months** after the injection of HRC<sup>®</sup>, that shall include a summary of analytical results, a discussion of the proposed baseline concentrations in MW-21, the statistical method used, and an evaluation of the effectiveness of the HRC<sup>®</sup> injections.
6. In the event that PCE, TCE, cis-1,2 DCE, any of their breakdown products, methane or TOC exceeds 20% above the baseline concentration in monitoring well MW-21 during the treatment period, the Discharger shall immediately notify Regional Board staff of the exceedance(s) and obtain a confirmation sample within **7 days** of receiving the results. Within **48 hours** of receiving the confirmation sample results, the Discharger shall notify Regional Board staff of the results followed by written notification within **7 days**.
7. **Within 30 days** of confirming an exceedance as described in Provision D.6, the Discharger shall implement the contingency plan as described in Finding 12 and within **60 days** after beginning the Hydropunch<sup>®</sup> field work submit the Hydropunch<sup>®</sup> investigation results report and a Work Plan for Remedial Actions.
  - a. **Within 30 days** of Regional Board staff concurrence with the Work Plan for Remedial Actions, the Discharger shall implement the Remedial Actions.

- b. **Within 90 days** of the start of implementation of the Remedial Actions the Discharger shall submit a Remedial Actions Implementation Report.
8. 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.
9. The Discharger shall maintain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer.
10. The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control that are installed or used by the Discharger to achieve compliance with this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are to be installed by the Discharger only when necessary to achieve compliance with the conditions of this Order.
11. The Discharger shall report any non-compliance, and/or accidental spill or release of liquid or material verbally to the Regional Board within 24 hours of the spill or release, and follow-up the verbal notification with written documentation of the spill or release within 14 calendar days of the incident.
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. As described in the Standard Provisions, the Discharger shall report promptly to the Regional Board any material change or proposed change in the character, location, or volume of the discharge.
14. While this Order is in effect, and prior to any change in ownership of the Site or management of this operation, the Discharger shall transmit a copy of this Order to the succeeding Owner/Operator, and forward a copy of the transmittal letter and proof of transmittal to the Regional Board
15. The Regional Board will review this Order periodically and will revise requirements when necessary.



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CITY OF MERCED  
MERCED MUNICIPAL AIRPORT  
ENHANCED BIOREMEDIATION PROJECT  
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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 4 June 2004.

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THOMAS R. PINKOS, Executive Officer

Attachments

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2004-0081  
FOR  
CITY OF MERCED  
MERCED MUNICIPAL AIRPORT  
ENHANCED BIOREMEDIATION PROJECT  
MERCED COUNTY

This Monitoring and Reporting Program (MRP) incorporates requirements for monitoring the progress of the enhanced bioremediation project. This MRP is issued pursuant to California Water Code Section 13267. The City of Merced (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. R5-2002-0832 is still required.

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 sample shall be recorded on the sample chain of custody form.

**ENHANCED BIOREMEDIATION MONITORING**

As shown on Attachment B, there are 16 monitoring wells and two proposed monitoring wells. Monitoring of the enhanced bioremediation project will consist of groundwater samples collected from MW-9, MW-10, MW-11, MW-13, MW-15, MW-17 and the newly installed monitoring wells MW-20 and MW-21. These analyses shall be completed by a State certified laboratory and shall follow standard EPA protocol. Monitoring well samples shall be analyzed for the following constituents and parameters according to the schedule below.

Constituents	EPA Method	Maximum Quantitation	
		Limit <sup>1</sup>	Frequency
Depth to Groundwater	---	0.01 ft	Monthly <sup>2</sup>
Volatile Organic Compounds <sup>4</sup>	8021B or 8260B	0.5 µg/l	Quarterly <sup>3</sup>
Ammonium <sup>4</sup>	EPA 350.1	0.5 mg/l	Quarterly <sup>3</sup>
Sulfide <sup>4</sup>	EPA 376.2 or SM4500	1 mg/l	Quarterly <sup>3</sup>
Sulfate <sup>4</sup>	EPA 300, 375, 9056 or SM 4110 or 4500	1 mg/l	Quarterly <sup>3</sup>
Ferrous Iron <sup>4</sup>	EPA 200, 6020, or SM 3500-FED	0.1 mg/l	Quarterly <sup>3</sup>
Total Iron (dissolved) <sup>4</sup>	EPA 200, 6020, or SM 3500	0.1 mg/l	Quarterly <sup>3</sup>
Manganese (total) <sup>4</sup>	EPA 200, 6020, or SM 3000	0.01 mg/l	Quarterly <sup>3</sup>
Manganese (dissolved) <sup>4</sup>	EPA 200, 6020, or SM 3000	0.01 mg/l	Quarterly <sup>3</sup>
Carbon dioxide (dissolved) <sup>4</sup>	SM 4500 or ASTM D1945	5 mg/l	Quarterly <sup>3</sup>
Methane, ethane, ethene (dissolved) <sup>4</sup>	RSK 175M or ASTM D1945	0.01 mg/l	Quarterly <sup>3</sup>
Total Organic Carbon (TOC) <sup>4</sup>	415 or SM 5310	1 mg/l	Quarterly <sup>3</sup>

Constituents	EPA Method	Maximum Quantitation	
		Limit <sup>1</sup>	Frequency
Lactic acid <sup>4</sup>	IC-001 or HPLC	1.0 mg/l	Quarterly <sup>3</sup>
General Minerals <sup>4,5</sup>	Various	Various	Quarterly <sup>3</sup>
Metals <sup>4,6</sup>	Various	Various	Quarterly <sup>3</sup>
Field Parameters <sup>4,7</sup>	--	--	Quarterly <sup>3</sup>

<sup>1</sup> For nondetectable results

<sup>2</sup> Depth to Groundwater shall be measured in MW-8, MW-9, MW-10, MW-11, MW-13, MW-15, MW-16, MW-17, MW-18, MW-19, MW-20 and MW-21.

<sup>3</sup> Monitoring of MW-20 shall begin after there is evidence of HRC<sup>®</sup> in MW-10. An increase of 50 percent over baseline of the following constituents shall be considered evidence of HRC<sup>®</sup> in MW-20: Carbon dioxide, methane, total alkalinity, bicarbonate, or TOC. A decrease of 50 percent below baseline shall be considered evidence of HRC<sup>®</sup>: Nitrate or sulfate.

<sup>4</sup> Baseline samples shall be collected a minimum of two weeks prior to injection.

<sup>5</sup> General Minerals include alkalinity, total dissolved solids, calcium, chloride, magnesium, sodium, sulfate, and nitrate.

<sup>6</sup> Metals include antimony, arsenic, beryllium, cadmium, total chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. Discharger also shall analyze for hexavalent chromium during baseline sampling. If total chromium is detected in any well, the Discharger shall analyze for hexavalent chromium during the month following that detection.

<sup>7</sup> Field Parameters are Oxidation-reduction potential, dissolved oxygen, pH, temperature, and conductivity.

Field testing instruments (such as those used to test oxidation-reduction potential 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 field 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 provided with the appropriate monitoring report.

## REPORTING

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, sample type, 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 MRP 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.

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)**. These reports may be combined with the quarterly monitoring reports required by MRP No. R5-2002-0832. At a minimum, the reports shall include:

1. Results of groundwater monitoring.
2. 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 or lack thereof with the waste discharge requirements, 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.;
3. Calculation of groundwater elevations and discussion of seasonal trends, if any;
4. 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;
5. A narrative discussion of the analytical results for all groundwater locations monitored, including spatial and temporal trends, with reference to summary data tables, graphs, and appended analytical reports (as applicable);
6. A comparison of the monitoring data to the groundwater limitations and an explanation of any violation of those requirements;
7. Summary data tables of historical and current water table elevations and analytical results;
8. A scaled map showing relevant structures and features of the facility, the injection grid, the locations of monitoring wells and any other sampling stations, and groundwater elevation contours referenced to mean sea level datum; and
9. Copies of all laboratory analytical report(s) for groundwater monitoring not previously transmitted.

### **C. Annual Report**

An annual report shall be submitted to the Board by **1 August** of each year, commencing in **2005**. This report shall contain an evaluation of the effectiveness and progress of the remediation, and may be submitted with the corresponding quarterly monitoring report. The annual report shall contain the following minimum information:

1. Tabular summaries of all data collected during the previous year, including groundwater gradient directions;
2. A graphical representation of concentrations of tetrachloroethene, trichloroethene, and cis-1,2 dichloroethene in monitoring wells MW-9, MW-10, MW-11, MW-13, MW-17, MW-20 and MW-21 over the period of record;

3. A graphical representation of concentrations of total alkalinity, total organic carbon, carbon dioxide, methane, bicarbonate, nitrate and sulfate in monitoring wells MW-9, MW-10, MW-11, MW-13, MW-15, MW-17, MW-20 and MW-21;
4. An evaluation of the performance of the HRC<sup>TM</sup> and an analysis of its effectiveness in destroying the pollutants;
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;
6. A discussion of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and
7. 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 as of the date of the Order.

Ordered by: \_\_\_\_\_  
THOMAS R. PINKOS, Executive Officer

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(Date)

GJD

## INFORMATION SHEET

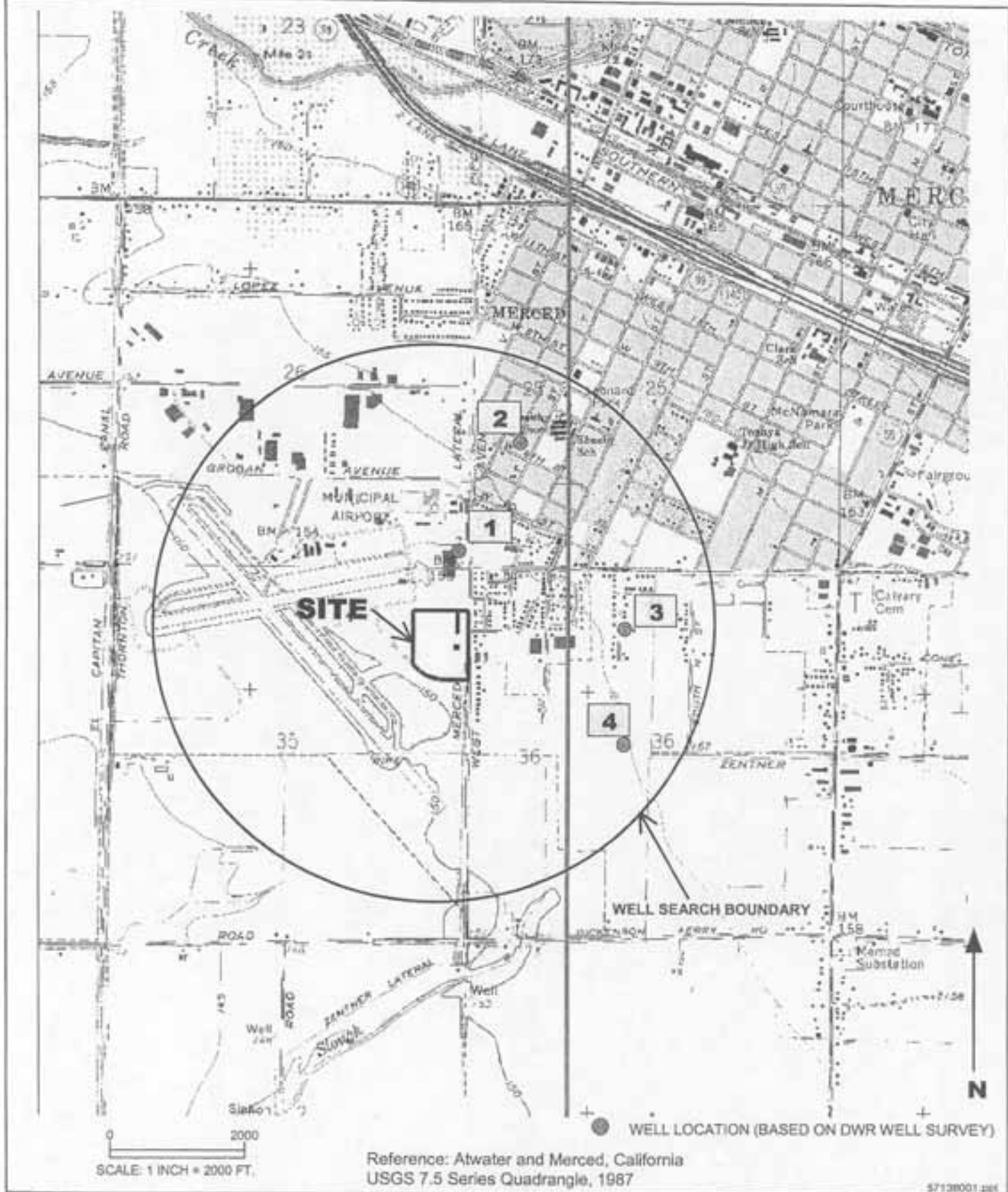
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ENHANCED BIOREMEDIATION PROJECT  
MERCED COUNTY

The City of Merced (City) owns and operates the Merced Municipal Airport. From 1947 to 1978, crop dusting operators used a portion of the airport as a staging and storage area. From the 1950s to about 1981, the City of Merced Fire Department used an adjoining area for fire training exercises during which flammable substances were ignited and extinguished. Groundwater is polluted with petroleum hydrocarbons and volatile organic compounds (VOCs) from these activities. The soil is contaminated with pesticides, which are primarily adsorbed onto near-surface soils. In late 2002, the City placed an asphalt cap over these soils and will record a land use covenant to limit their future use. VOCs persist in the shallow A zone aquifer (about 10 feet below ground surface), which contains 89 micrograms per liter ( $\mu\text{g/l}$ ) of tetrachloroethene, 21  $\mu\text{g/l}$  of trichloroethene, 52  $\mu\text{g/l}$  of cis-1,2 dichloroethene, and 33  $\mu\text{g/l}$  of trans-1,2 dichloroethene. All of these compounds are above their respective water quality limits.

This project utilizes Hydrogen Releasing Compound (HRC<sup>®</sup>) to create anaerobic conditions in the groundwater in the application area. Under anaerobic conditions, nitrate and the chlorinated organic compounds are 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<sup>®</sup>. In general, as the microbes consume the carbon, they reduce electron acceptors in a sequence starting with nitrate and then progressing to iron, sulfate, and chlorinated organic compounds. When the carbon provided by the HRC<sup>®</sup> 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.

The HRC<sup>®</sup> will be injected into the water table aquifer using Hydropunch<sup>®</sup> borings. The injection points will be arranged in four barriers about 100 feet apart, oriented across the plume at right angles to the direction of groundwater flow. Each barrier will consist of two rows of injection points spaced about 10 feet apart to provide overlapping radii of influence. HRC<sup>®</sup> is expected to last from one to two years in the groundwater, depending on the biological demand of the microbes. Groundwater velocity is estimated to be about 110 feet/year, so the treatment zone should extend from about 110 feet to 220 feet downgradient of the most downgradient injection barrier. The barriers are located upgradient from existing monitoring wells that will be used to monitor the treatment zone. In addition, the Discharger will install two additional monitoring wells. One well will be installed about midway between two of the barriers to provide a monitoring point

to confirm the downgradient rate of migration of the reaction products. The other well will be located about 300 feet downgradient of the most downgradient barrier. Because of the length of time required for downgradient migration of the groundwater, no reaction products are expected to reach this well. This well will be utilized as a trigger well that will require the City to activate a Contingency Plan if treatment zone products are detected in it. The Contingency Plan consists of conducting a Hydropunch® survey to delineate the extent of the reaction products and a subsequent work plan for mitigation measures to capture them, which could include pumping and treating groundwater.



**Site Location Map**  
Groundwater Monitoring  
City of Merced Airport  
Merced, California

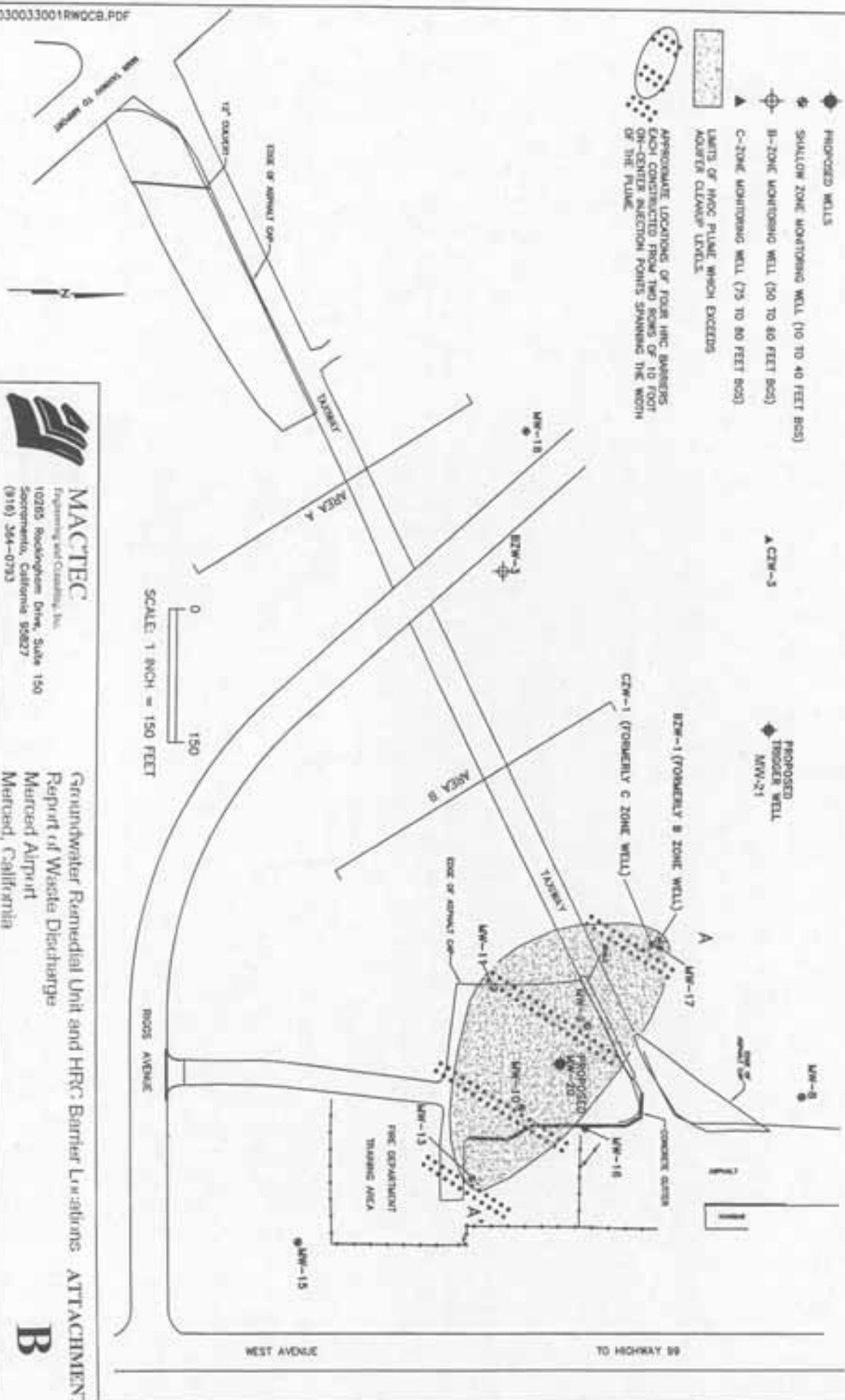
**ATTACHMENT**

**A**

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YVG	57138		1/03	



- LEGEND**
- ◆ PROPOSED WELLS
  - ◆ SHALLOW ZONE MONITORING WELL (10 TO 40 FEET BGS)
  - ◆ B-ZONE MONITORING WELL (50 TO 60 FEET BGS)
  - ◆ C-ZONE MONITORING WELL (75 TO 80 FEET BGS)
  - ▲ LIMITS OF HRC PLUME WHICH EXCEEDS MOISTURE CLUMP LEVELS
- APPROXIMATE LOCATIONS OF FOUR HRC BARRIERS EACH CONSTRUCTED FROM TWO SEAS OF 10 FOOT ON-CENTER INJECTION POINTS SPANNING THE WIDTH OF THE PLUME



**MACTEC**  
 Engineering and Consulting, Inc.  
 10265 Rockingham Drive, Suite 150  
 Sacramento, California 95827  
 (916) 364-0793

Groundwater Remedial Unit and HRC Barrier Locations ATTACHMENT  
 Report of Waste Discharge  
 Merced Airport  
 Merced, California

DRAWN	FILE NAME	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YVG	4452030033RWQCB	4452030033		2/04	

**B**