Janice M. Goebel
September 9, 2003

California Regional Water Quality Control Board
North Coast Region

ORDER NO. R1-2003-086

WASTE DISCHARGE REQUIREMENTS

FOR

PILOT STUDY FOR VOLATILE ORGANIC COMPOUND BIOREMEDIATION

WILLITS ENVIRONMENTAL REMEDIATION TRUST
Former Remco Hydraulics Facility
934 South Main Street
Willits, California

Mendocino County

The California Regional Water Quality Control Board, North Coast Region (hereinafter the Regional Water Board), finds that:

1. The Willits Environmental Remediation Trust (WERT) (hereinafter the discharger) submitted a report of waste discharge on March 7, 2003, June 18, 2003, August 22, 2003, August 28, 2003, and September 3, 2003, proposing to conduct a pilot study for the in-situ bioremediation of groundwater contaminated with chlorinated volatile organic compounds (VOCs). The discharger proposes to conduct a study by injecting food grade substances consisting of sugars, yeast and vegetable oil to enhance the biodegradation of VOCs.

2. The former Remco Hydraulics Facility (hereinafter the site) is located at 934 South Main Street in Willits, California, and was a machine shop and chrome plating facility (Figure 1). The facility began operations as a machine shop in 1945, and in 1963 the first chrome-plating tank was constructed. The facility ceased operations in 1995. Soil and groundwater at the site are contaminated with chromium, VOCs, and other wastes.

3. On December 29, 1995, the City of Willits served both a Notice of Violation and a Notice of Endangerment to Remco Hydraulics and the previous owners of the site. Subsequently, on December 10, 1996, the City of Willits filed its Second Amended Complaint against those same parties for, among other things, the abatement of imminent and substantial endangerment pursuant to the provisions of the federal Resource Conservation and Recovery Act (RCRA), injunctive relief and abatement pursuant to RCRA, nuisance per se pursuant to the City of Willits Municipal Code, abatement of a public nuisance pursuant to California Civil Code Section 731 and recovery of nuisance abatement costs, and negligence.

The outcome was a Final Consent Decree, Final Order and Final Judgment; Order Establishing The Willits Environmental Remediation Trust; And Order Of Reference to Special Master (Consent Decree) as entered by the Federal District Court for the Northern District of California between the City of Willits, the owners, and previous owners of the site (Case No. C96-0283 FMS). The Consent Decree established the Willits Environmental Remediation Trust on August 22, 1997 to investigate and remediate the site. Through operation of the Consent Decree, the discharger acquired ownership of the site.

4. The site, approximating seven acres, is bordered on the east by South Main Street (Highway 101), on the south by railroad lines, with residential homes and Baechtel Grove School to the south of the railroad line, on the west by horse corrals, residential homes and commercial structures, and on the north by residential homes.

5. The site is located on the western margin of the north-northwest trending Little Lake Valley. The Little Lake Valley consists of a thick sequence of fine-textured lake sediments (silts and clays) interlaced with sand and gravel. The site is situated on a sequence of stratified unconsolidated sediments consisting primarily of sands, silts, and clays of alluvial origin.

6. The direction of groundwater flow at the site is predominately to the east-northeast, while in the lower aquifers a more north-northeasterly trend exists. There are three groundwater bearing zones at the site where permeable lenses of sands and gravels have been identified. The A-zone exists from the water table to a depth of approximately 15 to 25 feet below ground surface (BGS), the B-zone from 20 to 40 feet bgs, and the C-zone which begins at 35 to 60 feet bgs. The A-zone is largely unconfined. However, the B- and C-zones are largely confined.

7. Groundwater at the site is contaminated with several compounds: hexavalent chromium; volatile organic compounds; total petroleum hydrocarbons as gasoline, diesel and motor oil; and semivolatile organic compounds. Groundwater in the area of the pilot study is predominantly contaminated with VOCs: tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene, 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (1,1-DCA), and 1,1-dichloroethene (1,1-DCE). These volatile organic compounds are also referred to as ethenes and ethanes. The concentrations of VOCs exceed the water quality objectives for these chemicals, and impair the beneficial uses of groundwater. Other constituents that exist in groundwater in the pilot study area at levels greater than water quality objectives include 1,4-dioxane and petroleum hydrocarbons.

8. The discharger proposes to conduct a pilot study to enhance the bioremediation of VOCs in a small area of the site west of Building 1979. Enhanced in-situ bioremediation involves altering natural geochemical conditions to promote intrinsic processes that degrade volatile organic compounds in soil and groundwater. The treatment mechanism for both the molasses (with a yeast extract) and vegetable oil emulsion (hereinafter referred to as food grade substances) is to provide a food source for the existing microorganisms in the aquifer. Naturally occurring soil microorganisms have the ability to breakdown chlorinated ethenes and ethanes by replacing chlorine atoms with hydrogen atoms. This process is called reductive dechlorination.

9. An earlier pilot study was conducted in 2000 to convert hexavalent chromium to trivalent chromium using two reducing processes: calcium polysulfide and molasses. The results of the pilot study show decreases in hexavalent chromium concentrations in the calcium polysulfide and molasses pilot study area. In addition, decreasing concentrations of volatile organic compounds in the molasses study area were observed.

10. The proposed pilot study consists of injecting molasses with a yeast extract on one side of the pilot study area, and a vegetable oil emulsion on the other half of the pilot study area.

    The molasses injection fluid will consist of a 20 percent solution of molasses with one percent yeast extract and will be used for the more permeable areas of the pilot study. Sodium bromide (NaBr) will be added as a non-toxic tracer to one injection point. An injection fluid of 50 percent molasses with 10 percent common table salt (NaCl) for use as a tracer will be injected into the finer grained material (clays and silts). The monitoring tracers will be used to evaluate the migration of groundwater on the molasses side of the pilot study.

    The vegetable oil emulsion is a soy based oil and water mixture comprised of 70 percent soy oil, 20 percent water and 5 percent emulsifying agent. No tracers are proposed to be added to the vegetable oil emulsion.

    More than one injection may be necessary to provide a sufficient food source to complete the dechlorination process. The area of the pilot study is approximately 100 feet by 150 feet. Approximately 35 injection points to shallow groundwater are proposed. The location of the pilot study is shown on Figure 2.

11. Groundwater monitoring of the pilot study area will be accomplished by sampling groundwater monitoring wells in the A-zone in three areas: the coarse grid monitoring well network; the fine grid monitoring well network, and the pilot study buffer area (contingency area). The coarse grid monitoring well network will consist of eight shallow groundwater monitoring well clusters, two of which will be located upgradient of the study area. Each monitoring well cluster will have one or two small diameter wells that are screened at different depths. The fine grid monitoring well network will consist of eight monitoring well clusters. The

contingency area will consist of three contingency groundwater monitoring well clusters. The contingency area is located downgradient of the pilot study and near the property line, and serves to monitor for any potential migration before the monitored constituents reach the property boundary. The groundwater monitoring well locations and the course grid well network, fine grid network, and contingency areas are depicted in Figure 3.

12. The discharger has indicated that the pilot study may temporarily mobilize iron, manganese, arsenic, and/or antimony. The pilot study may also create a temporary increase in the concentration of vinyl chloride in the injection area. If an upward trend in the concentrations of metals or vinyl chloride occurs in the contingency wells, a contingency plan to add an oxygen source to groundwater will be implemented. The contingency plan consists of injecting a dilute solution of hydrogen peroxide downgradient of the pilot study area to prevent migration of metals and vinyl chloride beyond the contingency area.

13. The discharger proposes to perform an interim remedial action designed to reduce hexavalent chromium to trivalent chromium at another location at the site. The chromium interim remedial action will be conducted under a separate order, Waste Discharge Requirements Order No. R1-2003-085.

14. The proposed pilot study is consistent with the antidegradation provisions of State Water Resources Control Board Resolution No. 68-16.

15. The Regional Water Board's Water Quality Control Plan for the North Coast Region includes water quality objectives and receiving water limitations.

16. Surface water in the Little Lake Valley flows to the Eel River The beneficial uses of the Eel River and its tributaries include:

    a. municipal and domestic supply
    b. agricultural supply
    c. industrial service supply
    d. groundwater recharge
    e. navigation
    f. hydropower generation
    g. water contact recreation
    h. noncontact water recreation
    i. commercial and sport fishing
    j. warm freshwater habitat
    k. cold freshwater habitat
    l. wildlife habitat
    m. preservation of areas of special biological significance
    n. preservation of rare and endangered species
    o. migration of aquatic organisms
    p. spawning reproduction, and/or early development

17. Beneficial uses of groundwater include: municipal, domestic, industrial process and service supply, and agricultural water supply as identified in the Water Quality Control Plan for the North Coast Region.

18. Drinking water for the Remco facility and nearby residents is provided by the City of Willits municipal water system. The City of Willits water supply is located south of town, and is tested regularly to assure compliance with State of California drinking water standards. Individual water supply wells exist in the City limits and are used predominantly for irrigation.

19. The permitted discharge is a minor cleanup action costing less than $1 million taken to prevent, minimize, stabilize, mitigate, or eliminate the release of hazardous waste or substance and is therefore exempt from the California Environmental Quality Act (Public Resources Code Section 21000 et seq.) pursuant to Title 14 of the California Code of Regulations, section 15330.

20. The Regional Water Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit written comments and recommendations.

21. The Regional Water Board, at a public meeting, heard and considered all comments pertaining to the discharge.

THEREFORE, IT IS HEREBY ORDERED that the discharger, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. DISCHARGE PROHIBITIONS

1. The discharge of any waste not specifically regulated by this Order is prohibited.

2. Creation of pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC) is prohibited. [Health and Safety Code, Section 5411]

3. The discharge of treatment additives to land, surface waters or to groundwater in areas other than that proposed for the pilot study is prohibited. The pilot study area is identified on Figure 2.

4. The migration of any metal mobilized by the pilot study or vinyl chloride or other byproducts produced as part of the dechlorination process is prohibited beyond the boundaries of the property owned or controlled by the discharger.

5. The discharge of treatment additives to property not owned or controlled by the discharger is prohibited.

B. DISCHARGE SPECIFICATIONS

1. The proposed injection of food grade substances shall not impart taste, odor, or color to, or otherwise degrade the beneficial uses of areal groundwater, except for temporary taste and odor changes in the immediate vicinity of the study area as shown on Figure 2.

2. The injection of food grade substances shall not impart taste, odor, or color to or otherwise degrade the beneficial uses of areal groundwater beyond the boundaries of the property owned or controlled by the discharger.

3. The methods for injection and reinjection of food grade substances in the proposed areas shall be conducted as described in the Report of Waste Discharge dated March 12, 2003, June 18, 2003, August 22, 2003, August 28, 2003, and September 3, 2003. 30-day notification to the public and all involved agencies shall be provided when reinjections are planned.

4. The injection of food grade carbohydrates shall not produce airborne hydrogen sulfide concentrations which exceed 0.03 parts per million by volume (ppmv) for protection of public health beyond the boundaries of the property owned or controlled by the discharger.

5. The injection of food grade substances shall not produce detectable levels of airborne vinyl chloride at the boundaries of the property owned or controlled by the discharger.

C. PROVISIONS

1. A copy of this Order shall be maintained at the discharge facility and be available at all times to operating personnel.

2. Severability

   Provisions of these waste discharge requirements are severable. If any provision of these requirements is found invalid, the remainder of these requirements shall not be affected.

3. Operation and Maintenance

   The discharger must maintain in good working order and operate as efficiently as possible any facility or control system installed by the discharger to achieve compliance with the waste discharge requirements.

4. Change in Discharge

The discharger must promptly report to the Regional Water Board any material change in the character, location, or volume of the discharge.

5. Change in Ownership

In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharger must notify the succeeding owner or operator in advance of the transfer of ownership or control, of the following items by letter, a copy of which must be forwarded to the Regional Water Board:

a. existence of this Order, and
b. the status of the dischargers' annual fee account.

6. Vested Rights

This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the discharger from his liability under federal, state, or local laws, nor create a vested right for the discharger to continue the waste discharge.

7. Monitoring

The discharger must comply with the Contingency Planning and Notification Requirements Order No. 74-151 and the Monitoring and Reporting Program No. R1-2003-086 any modifications to these documents as specified by the Executive Officer. Such documents are attached to this Order and incorporated herein. Chemical, bacteriological, and bioassay analyses must be conducted at a laboratory certified for such analysis by the State Department of Health Services.

8. Inspections

The discharger shall permit authorized staff of the Regional Water Board:

a. entry upon premises in which an effluent source is located or in which any required records are kept;
b. access to copy any records required to be kept under terms and conditions of this Order;
c. inspection of monitoring equipment or records; and
d. sampling of any discharge.

9. Noncompliance

In the event the discharger is unable to comply with any of the conditions of this Order due to:

a. breakdown of waste treatment equipment;
b. accidents caused by human error or negligence; or
c. other causes such as acts of nature;

The discharger must notify the Executive Officer by telephone as soon as he or his agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring.

10. Revision of Requirements

This Regional Water Board requires the discharger to file a report of waste discharge at least 120 days before making any material change or proposed change in the character, location or volume of the discharge.

11. Expiration

These waste discharge requirements expire 36 months after issuance and no further recision action is necessary.

Certification

I, Catherine E. Kuhlman, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, North Coast Region, on September 24, 2003.

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Catherine E. Kuhlmal
Executive Officer

(VOCPiolotWDR1)

Janice M. Goebel
September 9, 2003

California Regional Water Quality Control Board
North Coast Region

MONITORING AND REPORTING PROGRAM NO. R1-2003-086

FOR

PILOT STUDY FOR VOLATILE ORGANIC COMPOUND BIOREMEDIATION

WILLITS ENVIRONMENTAL REMEDIATION TRUST
Former Remco Hydraulics Facility
934 South Main Street
Willits, California

Mendocino County

MONITORING

Pre-Injection Groundwater Monitoring

1. The 8 coarse grid, 12 fine grid, and 3 contingency area groundwater monitoring wells shall be sampled prior to the injection of the food grade substances for the constituents listed in the Table 1 below.

2. The depth to groundwater shall be determined to at least 0.01 foot increments in all the coarse grid, fine grid, and contingency groundwater monitoring wells prior to injection.

Post-Injection Groundwater Monitoring

3. The depth to groundwater shall be determined to at least 0.01 foot increments in all the coarse grid, fine grid, and contingency groundwater monitoring wells weekly during the injection, every two weeks until the horizontal and vertical gradients have been established, and monthly for three months, and quarterly thereafter.

4. The groundwater-monitoring wells shall be sampled every two weeks until horizontal and vertical groundwater gradients have been established. Upon approval by the Executive Officer, groundwater monitoring may be reduced to monthly sampling for three months for the constituents listed in Table 1 below. After three monthly sampling events, the monitoring wells shall be sampled quarterly for the duration of the pilot study for the following constituents in Table 1 below. The coarse grid, fine grid, and contingency monitoring wells are depicted on Figure 3.

The eight coarse grid monitoring well clusters are identified as: MLW-5 and MLW-5-2; MLW-3-1 and MLW-3-2; MLW-6-1 and MLW-6-2; MLW-7-1 and MLW-7-2; MLW-4-1 and MLW-4-2; MLW-8-1 and MLW-8-2; MLW-10U; and MLW-11-U.

The 12 fine grid monitoring wells are identified as: FG1-1, FG1-2, FG1-3, FG1-4, FG1-5, FG1-6, FG2-1, FG2-2, FG2-3, FG2-4, FG2-5, and FG2-6.

The contingency monitoring well clusters are identified as: MLW-1-1 and MLW-1-2; MLW-2-1; MLW-9-1, MLW-9-2, and MLW-9-3.

5. Contingency Monitoring Wells MLW-1-1, MLW-1-2, MLW-2-1, MLW-9-1, MLW-9-2, and MLW-903 shall be sampled weekly for four weeks. The frequency of weekly sampling may be reduced upon concurrence by the Executive Officer based on the submitted analytical data from the weekly sampling.

   The groundwater monitoring wells shall be sampled for the following constituents and the methods provided below:

TABLE 1

Constituent	EPA Analytical Method
VOCs	Method 8260
Chlorinated Ethenes	Method 8260
Total Petroleum Hydrocarbons	Method 8015 Modified
1,4-Dioxane	Method 8270C low level
Dissolved Hydrocarbon Gases	RSK-175
Dissolved Iron, Manganese, Arsenic and Antimony	Method 6010B
Bromide and Chloride	Method 300.0
Alkalinity	Method 310.1
Nitrogen, Nitrate	Method 300.0
Sulfate	Method 300.0
Dissolved Sulfides	Method 9030
Total Organic Carbon	Method 415.1
Chemical Oxygen Demand	Method 410.4
Dissolved Organic Carbon	Method 415.1
Redox Potential, pH, Dissolved Oxygen, Temperature, Electrical Conductivity	Field Measurements

Baseline sampling for Diethylene Glycol and Oxalic Acid shall be sampled as part of the baseline sampling program, and again in six months in the following wells: MLW1-1, MLW-1-2, MLW-2-1, MLW-3-1, MLW-3-2, MLW-4-1, MLW-5-2, MLW-9-1, MLW-9-2, and MLW-9-3.

6. Contingency Plan

The injection of food grade substances into the subsurface may mobilize iron, manganese, arsenic, and/or antimony. The injection of molasses may also create a temporary increase in the concentration of VOCs in the area of the injection. If these effects remain confined to the injection area, no contingency actions will be taken. However, if any of these effects are observed downgradient of the injection area, the following contingency plan will be implemented:

If groundwater monitoring results indicate an increasing trend of VOCs and metals, a trend analysis using a Mann-Kendall Test will be conducted. If an upward trend is detected at a 90 percent confidence level, and the Maximum Contaminant Level is exceeded for the constituent with the apparent upward trend, the well in which the upward trend was detected will be resampled within three days of receipt of sample results from the laboratory. The resample will be analyzed with a 48 hour turnaround time. If the results of resampling corroborate the upward trend, an effect will be considered verified and contingent action will be triggered.

An in-situ oxygenated zone will be created by injecting a dilute hydrogen peroxide solution approximately 5-feet upgradient and 5 feet downgradient of the contingency wells. Migration of any chemical constituent with the upward trend beyond the contingency well grid will be prevented by creating oxidizing conditions and thereby reversing the chemical reaction. The injection of dilute hydrogen peroxide shall be conducted within 14 days of a verified upward trend.

7. Mobile Air Monitoring Program

Air monitoring shall be conducted in accordance with the following air monitoring program. Air monitoring will include mobile air monitoring stations using a hand held a photoionization detector (PID), and Colortubes® at the locations shown on Figure 4. The PID is capable of detecting volatile organic compounds at 0.5 ppm. Colortubes® are capable of detecting vinyl chloride at 0.1 ppm.

Mobile air monitoring will proceed along the perimeter of the Remco property and within the project area. The frequency of monitoring will occur as follows:

DURATION OF MONITORING	FREQUENCY
1. Background monitoring shall be conducted prior to the startup of the injection process	Daily for three days to establish background concentrations. Background sampling shall be in the morning, around mid day, and at the end of the day.
2. During injection	In the morning prior to startup of the injection, around mid day, and at the end of the work day.
2. Daily for one week after the completion of the injection process	Once per day
3. Once per week for 3 weeks after completion of No. 3 above	Once per day

If volatile organic compounds are 1 ppm (or greater) and there is no contribution from the background air monitoring station, air monitoring will continue until the levels either go down, or are consistent for a five minute period. If air monitoring levels of 1 ppm or greater are sustained for a five minute period, the injections will cease until such time as the source of the elevated levels can be identified and corrective measures are taken to address the exceedance.

REPORTING

8. The results of the post injection monitoring, weekly, every two weeks, monthly sampling, and quarterly sampling shall be submitted 30 days following the quarterly sampling event. The monitoring report shall summarize all monitoring data collected for the in-situ treatment, and include signed laboratory reports.

9. Weekly sampling results and weekly depth to groundwater measurements of the Contingency Monitoring Wells shall be submitted within 8 days of sample collection.

10. Twenty-four hour notification shall be provided when sampling of monitoring well(s) is planned to evaluate an upward trend in the concentrations of metals, hydrogen sulfide, and/or vinyl chloride.

11. Air monitoring results from each required sampling day shall be posted no later than 9:00 a.m. the following day, in a place for public review. The posting location will be on a bulletin board in the parking lot of the Remco facility and at a location at the back entrance to the facility on Franklin Avenue. The air monitoring data for the previous day shall also be faxed by 9:00 a.m. the following day to the Regional Water Board at (707) 523-0135, the Mendocino County Air Pollution Control District Office at (707) 463-5707, and the California Department of Health Services, Environmental Health Investigations Branch at (510) 622-4505.

Ordered by _____
Catherine E. Kuhlman
Executive Officer

September 24, 2003

(VOCPilotM&R)