

**STATE OF CALIFORNIA  
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**STAFF REPORT FOR REGULAR MEETING OF DECEMBER 1-2, 2005**

Prepared on November 2, 2005

**ITEM NUMBER:** 24

**SUBJECT:** **Madonna Plaza Shopping Center, San Luis Obispo County; Waiver of Waste Discharge Requirements for Chemical Oxidation Injection of Potassium Permanganate, [KMnO<sub>4</sub>]**

**SUMMARY:**

Project Area: 0.20 acres  
Treatment Method: Chemical Oxidation with Potassium Permanganate (KMnO<sub>4</sub>)  
Volume of Discharge: 45,000 gallons KMnO<sub>4</sub>  
Groundwater Contaminant: Tetrachloroethylene (PCE)  
Responsible Parties: MRP Institutional Associates and Mr. Charles Pasquini, Jr.  
Existing Orders: Monitoring and Reporting Program Order No. R3-2005-0028

**DISCUSSION**

From 1969 to 1988, Sparkle Dry Cleaners and three others operated dry cleaning businesses in Building F, Suite 1010 at the Madonna Plaza Shopping Center, located at 227 Madonna Road in San Luis Obispo (see Location map, Attachment 1). Since at least 1969, Mr. Charles Pasquini, Jr., has owned the property in fee. In 1989, MRP Institutional Associates acquired the ground lease. Prior to the retail center demolition and subsequent renovation in 2002, the responsible parties performed a site investigation and discovered that the dry cleaning solvent tetrachloroethylene (PCE) had been discharged to soil and groundwater from past business operations.

In 2001, the City of San Luis Obispo Fire Department and Water Board required the responsible parties to further investigate PCE in soil and groundwater at the subject property. During the 2002 investigation, 36 direct push borings, 11 hand auger borings, and 11 groundwater monitoring wells were installed. One deep soil boring (DB-1) was drilled near the PCE source area to determine if the PCE release from the property co-mingled with the South San Luis Obispo (SLO) PCE groundwater plume. The

South SLO PCE plume, discovered by the Water Board during its mid-1980's Well Investigation Program, is thought to originate at one or more dry cleaning facilities located near the intersections of Archer and Carmel Streets with Higuera Street, in downtown San Luis Obispo. The South SLO PCE plume, with concentrations up to 250 milligrams per liter (ppb), encompasses an area approximately two miles long and one mile wide along the length of the San Luis Obispo Creek valley (Attachment 2). The responsible parties collected soil samples from DB-1 and analyzed samples at 27 feet below ground surface (bgs), 32 feet bgs, 46 bgs, and 52 feet bgs. Saturated soil sample data suggests a separation of PCE impacts between the shallow (27 feet bgs) and deeper (52 ft bgs) zones.

In 2002, approximately 4,500 cubic yards of soil were excavated from beneath the former dry cleaner building. From 2002 to 2005, the responsible parties have conducted quarterly groundwater sampling. In 2005, the Executive Officer reduced the groundwater sampling frequency from quarterly to semiannually.

During the February 2005 groundwater sampling event, the depth to groundwater at the property was approximately ten to thirteen feet bgs, which corresponds with a groundwater elevation of about 131 to 123 feet above mean sea level. The groundwater flow direction is estimated to be from the north to the south at 0.0008 feet per foot. On February 23, 2005, PCE was detected in MW-2R at 24.2 ppb, as shown on Attachment 4. Historically, the highest concentration of PCE was detected in well MW-2R at 56 ppb during the August 27, 2003 groundwater sampling event. For comparison, the Water Board's Water Quality Control Plan (Basin Plan) objective for PCE is 5 ppb in groundwater. Other PCE breakdown products have not been detected at the property.

On July 18, 2005, Water Board staff received the "Work Plan for Groundwater Treatment" (Work Plan) prepared by QORE Property Sciences (QORE). Permanganate reagent will be applied via a number of injection wells to target residual PCE in vadose and saturated soils and in groundwater. The Work Plan proposes a grid of injection points to deliver 45,000 gallons of potassium permanganate to the vadose and saturated zone in the treatment areas. In the former excavation area (Area 1), QORE will inject 3,000 gallons of potassium permanganate between 15 and 25 feet bgs, in a 15-foot square grid pattern (30 points) as shown on Attachment 5. In Area 2, the area where PCE concentrations in soil are estimated to be above 100 ppb, QORE will inject 30,000 gallons of potassium permanganate from the surface to 25 feet bgs via 170 points installed on a 12-foot square grid pattern as shown on Attachment 6. In Area 3, the remaining area with PCE groundwater impacts, QORE will inject 12,000 gallons of potassium permanganate from ten to 25 feet bgs via 90 injection points installed on a rectangular grid as shown on Attachment 7.

After the injection or infiltration begins, chlorinated solvents will be mineralized into manganese dioxide and other soluble ion salts (potassium, sodium, chloride) and carbon dioxide by means of oxidation chemical reactions. The oxidation destroys the organic double bonds of the chlorinated ethene compounds, reducing them ultimately to oxygen and carbon dioxide.

Implementation of the Work Plan will expedite soil and groundwater cleanup at the property.

Although the chemical oxidation reactions are swift, the treatment typically requires a few months due to advection and dissolution transport and desorption. For these reasons, the sodium permanganate treatment is expected to mineralize most of the soil and groundwater contamination within six months. In the event that the chemical oxidation reaction stalls and the chlorinated solvents do not completely break down, the Dischargers may reapply and monitor the injection of potassium permanganate in the treatment area with Executive Officer pre-approval.

Because the injection of sodium permanganate into the vadose zone and groundwater table is considered a "discharge", regulation by the Water Board is necessary. Water Board staff recommend a waiver of waste discharge requirements because the proposed project is in the public interest, and the project, when conducted in conformance with the proposed conditions of this waiver, will not pose a significant threat to water quality. The proposed Conditional Waiver of Waste Discharge Requirements, Order No. R3-2005-00140 is included as Attachment 8.

Water Board staff has developed a monitoring and reporting program to evaluate the effectiveness of the injection, chlorinated solvent breakdown, and subsequent impact of the manganese dioxide and soluble salt injection. Initially, the potassium permanganate concentrations will be high and the solution is expected to be above the drinking water standards for manganese and chlorine (50 ppb and 4,000 ppb, respectively). However, during the chemical oxidation process, the chlorinated solvents, manganese, chlorine and sodium will break down rapidly in the shallow aquifer over the treatment area and local groundwater quality will improve and no longer be degraded by chlorinated solvents. The nearest active irrigation well is located approximately 4,200 feet north of the subject property. Two city of San Luis Obispo municipal wells are located 5,000-feet south-southwest of the property. The proposed injection is not expected to impact private or city drinking water supplies.

Water Board staff prepared Monitoring and Reporting Program (MRP) No. R3-2005-00141 (Attachment 8). MRP R3-2005-00141 will replace existing Monitoring and Reporting Program No. 2005-R3-0058, which required semiannual

groundwater monitoring. After the potassium permanganate injection is complete, all groundwater monitoring wells will be monitored monthly for the presence of potassium permanganate, its breakdown products (sodium, potassium, manganese oxide, chlorine) and other general chemistry parameters (such as pH, temperature, oxygen reduction potential (ORP), etc.). Because potassium permanganate is a purple in color, the colorimetric technique is expected to be an effective field monitoring method. In addition, MRP No. R3-2005-00141 requires ongoing quarterly groundwater monitoring for chlorinated volatile organic compounds, metals, and general mineral analysis.

Three and six months following treatment, QORE will evaluate the effectiveness of the potassium permanganate injection and include this information as part of its quarterly groundwater monitoring report for the property.

In addition, a health and safety plan will be required to be submitted to the City of San Luis Obispo Fire Department and San Luis Obispo County Environmental Health prior to work plan implementation to ensure human health protection. In addition, Water Board staff will require the discharger to install two deeper screened (greater than 25 feet bgs) groundwater monitoring wells to monitor the effects of the discharge on the intermediate groundwater zone. In addition, prior to implementing the Work Plan, the discharger is required to obtain groundwater monitoring/injection well permits through the County of San Luis Obispo and any other local agency permits.

### COMPLIANCE HISTORY

Over the 4-year period of Water Board staff regulatory oversight, the responsible parties have complied with all Water Board directives issued to date.

### PUBLIC NOTICE

Prior to implementing this corrective action (Work Plan) at the Property, Water Board staff prepared the attached public hearing notice (Attachment 9).

### RECOMMENDATION

Adopt Order No. R3-2005-00140 as proposed.

### ATTACHMENTS

1. Site Location Map
2. South SLO PCE groundwater plume
3. Analytes Detected in Groundwater (2/23/05)
4. Proposed Injection Map – Area 1
5. Proposed Injection Map – Area 2
6. Proposed Injection Map – Area 3
7. Proposed Order No. R3-2005-00140
8. Proposed Monitoring & Reporting Program R3-2005-00141
9. Public Notice (without Attachments)

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