California Regional Water Quality Control Board

Los Angeles Region

Recipient of the 2001 *Environmental Leadership Award* from Keep California Beautiful

Alan C. Lloyd, Ph.D
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Arnold Schwarzenegger
Governor

July 18, 2005

Mr. Jack Oman
Atlantic Richmond Company
6 Centerpointe Drive
La Palma, CA 90623

Mr. John Frary
Unocal Corporation
276 Tank Farm Road
San Luis Obispo, CA 93401

Dear Messrs. Oman and Frary:

GENERAL WASTE DISCHARGE REQUIREMENTS FOR INJECTION OF OZONE, HYDROGEN PEROXIDE, AND OXYGEN IN GROUNDWATER AT PETROLEUM HYDROCARBON FUEL AND/OR VOLATILE ORGANIC COMPOUND IMPACTED SITES – COMMINGLED PLUME SITE #00024, FORMER UNOCAL STATION NO. 5865 LOCATED AT 4410 IMPERIAL HIGHWAY IN HAWTHORNE AND ARCO STATION NO. 0087 LOCATED AT 11402 HAWTHORNE BOULEVARD IN HAWTHORNE, CALIFORNIA (FILE NO. I-09887 AND I-12039, CI NO. 8926, SERIES NO. 022, ORDER NO. R4-2005-0030)

We have completed our review of your application for coverage under General Waste Discharge Requirements to Inject ozone, hydrogen peroxide, and oxygen at the subject sites (the commingled plume sites) to accelerate the oxidation and enhance aerobic biodegradation of petroleum hydrocarbons in the saturated zone.

The commingled plume sites (the Dischargers) are a former Unocal service station No. 5865 located at 4410 Imperial Highway in Hawthorne and Arco service station No. 0087 located at 11402 Hawthorne Boulevard in Hawthorne, California (Figure 1). Arco Station No. 0087 is an operating retail fueling facility that maintains two 10,000-gallon, one 12,000-gallon double-wall fiberglass gasoline underground storage tanks (USTs), and six product dispensers. Former Unocal station No. 5865 is an inactive station that was closed in 1993. The station formerly maintained two 9,950-gallon USTs, one 280-gallon waste oil UST, and four fuel dispenser islands. A dual-phase extraction (DPE) remediation system located inside the former station building is connected to several extraction wells via aboveground piping (Figure 2).

FORMER UNOCAL STATION NO.5865

The initial Unocal site investigation, performed in August 1992, consisted of drilling and sampling 11 soil borings (B-1 to B-11) and 3 ground water monitoring wells (MW-1 to MW-3; Figure 2). Analytical results revealed that fuel hydrocarbon constituents had impacted both soil and ground water. Additional subsurface investigation was performed in March 1994 to further

evaluate the lateral extent of impacted soil and ground water beneath the site. Five additional ground water monitoring wells (MW-4 through MW-8; Figure 2) were drilled and sampled. Dissolved-phase total petroleum hydrocarbons were detected in ground water samples collected from all of the newly installed wells.

During the removal of the fuel storage and delivery system in June 1994, more than 300 tons of hydrocarbon-impacted soil were excavated and removed from the site. Analytical results of soil samples indicated that petroleum hydrocarbons were detected below the former gasoline USTs and product dispensers. After the USTs were removed, horizontal vapor extraction wells H-1 and H-2 were installed in a 2-foot deep trench dug along the bottom of the former tank cavity. H-1 and H-2 are approximately 11 feet below ground surface (bgs) of the western and southern edges of the UST excavation (Figure 2).

In February 1995, a thermal/catalytic oxidation vapor extraction system (VES) was installed and a 90-day vapor extraction pilot test was performed. During the test, approximately 1,700 pounds of hydrocarbons were recovered. The radius of influence for each of the vapor extraction wells was estimated to be over 100 feet. Based on the results of the 90-day test, long-term soil vapor extraction was initiated on March 7, 1996.

An aquifer pumping test was conducted in February 1996. Additional subsurface investigation in April 1996 included drilling borings SW-1**,** SW-2, and EB-1. Groundwater analytical results indicated that dissolved-phase hydrocarbons were present in the groundwater samples collected from both wells. Long-term air injection using wells SW-1, MW-2, and MW-6 was performed in conjunction with vapor extraction from April 1997 to April 1998. In April 1998, this Regional Board concluded that no further soil cleanup was required. The operation of the soil VES was terminated in June 1998.

Because of the extent and magnitude of ground water impact, a 24-hour DPE test using a mobile unit was conducted in June 1998. Subsequently, a ground water treatment system was installed (GWTS). DPE started on January 26, 2000 and operated until June 6, 2000. The groundwater recovery system was turned off on May 22, 2000, but the VES continued to operate until June 6, 2000. Approximately 500,000 gallons of groundwater were recovered, treated, and discharged to the sanitary sewer under a temporary permit issued by the Los Angeles County Sanitation District during the operational period. The results indicate that the rate of hydrocarbon recovery was significantly increased by DPE.

Due to the large volume of extracted ground water with high concentrations of TBA and MTBE and the lack of an efficient ground water treatment alternative, the DPE system was shut down during the fourth quarter of 2002 pending evaluation of alternative ground water treatment and/or remedial technologies that will ensure compliance with the new discharge requirements. During the time the DPE operated (from May to November 2002), approximately 1,500 pounds of hydrocarbon and almost 195,000 gallons of ground water were recovered.

ARCO STATION No.0087

A preliminary site assessment was performed in November 1989 at ARCO station prior to the installation of new USTs in the northwest corner of the site. The assessment included drilling

and sampling of three soil borings (B1 through B3) near the USTs and one boring (B4) in the vicinity of the proposed location of the new USTs. Only two soil samples were collected from each boring for laboratory testing. The highest concentration of TPH-g was detected in the 25-foot soil sample collected from boring B4 at a concentration of 1,800 mg/kg.

In February 1990, four gasoline USTs and one waste oil UST were excavated and removed. Soil samples were collected from the bottom of the UST excavations. Seven soil samples were collected from the bottom of the gasoline UST excavation at approximately 15 feet bgs. Analytical results indicate that soil below the USTs contained TPH-g and benzene at concentrations of up to 8,000 mg/kg and 77 mg/kg, respectively.

To further delineate the petroleum hydrocarbons detected during the UST replacement activities, an additional investigation was performed in July 1990 during which four borings were drilled (B-5 through B-8) and completed as groundwater monitoring wells (MW-1 through MW-4; Figure 2). Static groundwater levels in the newly installed wells averaged about 45 feet bgs. Groundwater analytical data revealed that groundwater from all four wells had been impacted by fuel hydrocarbons. The highest concentrations of dissolved-phase TPH-g (14,000 µg/L) and benzene (860 µg/L) were detected in well MW-4.

In March and April 1991, further investigation was performed to evaluate the extent of impacted soil and groundwater beneath the site. The assessment included drilling and sampling 10 soil borings (B-9 through B-18). Borings B-9 through B-l2 were completed as groundwater monitoring wells MW-5 through MW-8, and borings B-15 through B-18 were completed as vapor extraction wells VZ-1 through VZ-4. The highest contaminant concentrations (6,300 mg/kg TPH-g) were detected in boring B-16, which was drilled within the former UST cavity. Groundwater level measurements in March 1991 revealed the presence of approximately 2 inches of liquid-phase hydrocarbons (LPH) in well MW-4.

Additional site assessment activities performed in November 1992 included drilling and sampling one soil boring (B-19) to a depth of 50 feet. An off-site investigation was performed in March 1995 and included drilling three groundwater monitoring wells (MW-9 through MW-11). A VES was installed and began operating at the ARCO site in March 1998.

In June 2002, the VES was shut down. Available information indicates that the system had operated a total of 14,372 hours and extracted approximately 6,683 pounds of hydrocarbons.

In July 2003, additional off-site assessment was conducted. The assessment concluded that off-site vadose zone soils have not been impacted and that low concentrations of residual contaminants were detected in soil samples collected at or just below the water table. Ground water analytical data revealed that low concentrations of the dissolved-phase hydrocarbon plume extend east to southeast beyond Acacia Avenue.

During September and October 2003, the VES was restarted on the ARCO site to determine if vapor-phase concentrations had rebounded. The one-month long test revealed that vapor-phase hydrocarbons did not rebound.

COMMINGLED PLUME SITE NO.00024

The sites are located within the Los Angeles Basin. Water-bearing zones in the basin are separated by relatively impermeable silt and clay. The most significant aquiclude of the region is the Bellflower aquiclude, which underlies the sites to an approximate depth of 120 feet. Beneath the sites, the semi-perched aquifer is present within the upper part of the aquiclude at an approximate depth of 40 feet bgs. The Gage aquifer is reportedly about 100 feet thick and occurs at a depth of about 120 feet bgs. Semi-perched groundwater beneath the sites occurs at depths ranging from approximately 37.91 to 42.87 feet bgs. The groundwater gradient is towards the east/southeast.

On March 22, 2004, the Dischargers submitted to this Regional Board "Corrective Action Plan" (CAP) proposing to inject ozone, hydrogen peroxide, and oxygen into the subsurface (the in-situ chemical oxidation process, ISCO). The CAP was approved by this Regional Board in a letter dated August 23, 2004.

On June 20, 2005, England Geosystem, the Dischargers' consultant, submitted a ROWD to conduct cleanup of petroleum hydrocarbons in soil and groundwater at the sites. England Geosystem proposed to use the ISCO to accomplish treatment of soil and groundwater.

The ISCO delivers ozone/oxygen/air and hydrogen peroxide into the subsurface via nested injection points for separate delivery of each reactant into ground water (Figure 2). The ISCO results in the rapid degradation of dissolved contaminants, including BTEX, MTBE, and TBA. The reactants (ozone and hydrogen peroxide) are injected directly into the groundwater along with oxygen and air via nested steel injection points in controlled ratios and locations, as follows:

Compressed air is sent to a pressure swing adsorption unit that produces a 90 to 95 percent oxygen stream which is compressed and sent to the ozone generator. The ozone generator produces a stream containing 4.5 percent of ozone in oxygen, and this stream then flows to the injection line. Compressed air taken from the air compressor is used to "pulse" or chase the ozone out into the formation, along with the hydrogen peroxide solution, which is introduced through a separate injection line.

Regional Board staff have determined that the proposed discharge meets the conditions specified in Order No. R4-2005-0030, "*Revised General Waste Discharge Requirements for Groundwater Remediation at Petroleum Hydrocarbon Fuel and/or Volatile Organic Compound Impacted Sites*," adopted by this Regional Board on January 24, 2002 and revised on April 19, 2005.

Enclosed are your Waste Discharge Requirements, consisting of Regional Board Order No. R4-2005-0030 and Monitoring and Reporting Program No. CI-8926 and Standard Provisions.

The Monitoring and Reporting Program requires you to implement the monitoring program on the effective date of this enrollment (July 15, 2005) under Regional Board Order No. R4-2005-0030. All monitoring reports shall be sent to the Regional Board, ATTN: Information Technology Unit.

When submitting monitoring or technical reports to the Regional Board per these requirements, please include a reference to Compliance File No. CI-8926, which will assure that the reports are directed to the appropriate file and staff. Do not combine other reports with your monitoring reports. Submit each type of report as a separate document.

We are sending a copy of Order No. R4-2005-0030 only to the applicant. A copy of the Order will be furnished to anyone who requests it.

If you have any questions, please contact Mr. Rodney Nelson at (213) 620-6119. Questions regarding the underground storage tank issues should be forwarded to Arman Toumari at (213) 576-6758.

Sincerely,

Jonathan S. Bishop
Executive Officer

Enclosures: 1. Board Order No. R4-2005-0030
2. Monitoring and Reporting Program No. CI-8926

cc: Fabio M. Minervini, England Geosystems