

**STATE OF CALIFORNIA  
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
LOS ANGELES REGION**

**ORDER NO. R4-2004-0075  
WASTE DISCHARGE REQUIREMENTS  
FOR  
CONOCOPHILLIPS COMPANY  
(76 STATION NO. 3472)  
(OZONE INJECTION FOR GROUNDWATER CLEANUP)  
(FILE NO. 900200098)**

The California Regional Water Quality Control Board, Los Angeles Region, (Regional Board) finds that:

**PURPOSE OF ORDER**

1. The ConocoPhillips Company (hereinafter Discharger) owns and operates a gasoline service station commonly known as 76 Station No. 3472 (Station) located at 3501 West 3<sup>rd</sup> Street, Los Angeles, California. The Station is located at the intersection of West 3<sup>rd</sup> Street and Vermont Avenue (Figure 1) at 118°17'30" latitude and 34°04'09" longitude. The Station has been in operation since 1980. The surrounding land uses are a mixture of commercial and residential.
2. On November 23, 2003, the Discharger filed a Report of Waste Discharge for injecting gaseous ozone into the shallow aquifer to remediate the contaminated groundwater at the site.

**FACILITY DESCRIPTION**

3. The Station formerly maintained two 12,000-gallon gasoline underground storage tanks (USTs) with associated dispensers and product. During a leak detection investigation in November 1991, four soil borings (B-1 through B-4) were explored and converted to vadose zone wells (VW1 through VW4). Petroleum hydrocarbons were detected in soil samples collected in the vicinity of the fuel tank excavation and product dispensers. Groundwater samples collected from vadose wells VW1 through VW4 contained dissolved-phase total petroleum hydrocarbons as gasoline (TPHg) at concentrations ranging from 28,000 to 55,000 micrograms per liter ( $\bar{i}$  g/L).
4. In July 1992, nine borings were drilled to depth ranging from 20 to 40 feet below ground surface (bgs). Three of the borings were completed as groundwater monitoring wells (GW-1, GW-2, and GW-3). Laboratory results of the investigation confirmed the presence of elevated levels of fuel hydrocarbons in soil samples collected at a depth of 15 feet beneath the fuel tank excavation and southern dispenser island. Groundwater samples collected from wells GW-1 through GW-3 detected dissolved-phase TPHg at concentrations ranging from 1,800 to 11,000  $\bar{i}$  g/L.

March 8, 2004

5. In September 1997, three additional groundwater monitoring wells (GW-4, GW-5, and GW-6) were installed. Dissolved-phase TPHg, benzene, and methyl tertiary butyl ether (MTBE) were detected in well GW-4 at concentrations of 23,000  $\mu$ g/L, 2,200  $\mu$ g/L, and 15,000  $\mu$ g/L, respectively. Free product was observed in well GW-5.
6. In March 1999, the USTs and dispensers were upgraded. Soil samples collected during the upgrade activities contained TPHg at concentrations ranging from 2.3 milligrams per kilogram (mg/Kg) to 9,610 mg/Kg. Samples collected beneath the dispenser and piping contained benzene and MTBE at maximum concentrations of 99 mg/Kg and 426 mg/Kg, respectively. During the upgrade activities approximately 274 tons of contaminated soil were removed.
7. In November 2000, three additional groundwater-monitoring wells (GW-7, GW-8, and GW-9) were installed to assess the dissolved phase contamination up-gradient and down-gradient of the site. No dissolved-phase hydrocarbons were detected in up-gradient monitoring well (GW-9). However, down-gradient monitoring wells (GW-7 and GW-8) contained detectable dissolved-phase concentrations of TPHg (870 and 300  $\mu$ g/L, respectively) and MTBE (8.3  $\mu$ g/L and 210  $\mu$ g/L). Well GW-7 also contained benzene at a concentration of 30  $\mu$ g/L.
8. In February and March 2002, an off-site groundwater investigation was performed. The investigation was to determine the off-site extent of the plume. During the investigation four additional groundwater wells were installed (GW-10 through GW-13). The investigation indicated that the dissolved-phase hydrocarbon has been detected to the northwest and to the south of the site. Also, during this investigation it was noted Well GW-11 contained several inches of naturally occurring crude oil. Crude oil has been observed in the area in manholes and utility junction boxes.
9. Quarterly groundwater monitoring and sampling activities started in April 1994 at the site and continues to the present. The third quarter 2003 monitoring report indicated elevated TPHg, benzene, toluene, ethylbenzene, total xylenes (BTEX), MTBE, and tertiary butyl alcohol (TBA) concentrations in groundwater monitoring wells GW-1 through GW-8. The maximum TPHg, MTBE, and TBA concentrations of 43,000  $\mu$ g/L (TPHg), 28,000  $\mu$ g/L (MTBE), and 48,000  $\mu$ g/L (TBA), respectively, were detected in groundwater monitoring well GW-2. The maximum benzene concentration of 980  $\mu$ g/L was detected in groundwater monitoring well GW-3.

#### **SITE HYDROGEOLOGY**

10. The site is located in the City of Los Angeles in the northern part of the Central Basin within the Los Angeles Forebay Area. Static water levels were measured in groundwater monitoring wells at depths ranging from 12.15 feet to 26.16 feet below casing elevation on April 2, 2002. Groundwater beneath the area flows to the south at an approximate gradient of 0.06 ft/ft.

### **FEASIBILITY TESTING ACTIVITIES**

11. In March 2002, vapor extraction pilot tests were performed on wells VW-3, GW-2, and GW-3. In April 2002, aquifer-pumping tests were also performed. The test results were to assess the potential remedial alternatives for the site and develop a remedial action plan (RAP). The Discharger submitted to the Regional Board a RAP dated June 28, 2002 and a RAP addendum dated February 13, 2003. In the addendum the Discharger proposed to use C-sparge™ technology for remediation of dissolved-phase fuel constituents in groundwater beneath the site. Ten C-sparge™ injection wells were proposed to remediate hydrocarbon-impacted groundwater at the site. The RAP addendum was approved by the Regional Board in a letter dated June 11, 2003.

### **REMEDICATION DESCRIPTION**

12. The Discharger proposes to install and operate a C-Sparge™ system to remediate the dissolved-phase plume beneath the site. The C-Sparge™ technology combines low-flow [3 to 5 cubic feet per minute (cfm)] air sparging with ozonation to oxidize petroleum hydrocarbons into benign byproducts, carbon dioxide and water. Ozone is generated onsite using a control panel with a built-in compressor and ozone generator. Using perforated sparge points, microbubbles [10 to 50 micrometer (µm)] of encapsulated ozone are introduced below the water table, where the oxidation reactions take place. Up to ten C-Sparge points will be installed onsite within and along the southern property line, where highest concentrations of dissolved-phase benzene and MTBE are detected, and down gradient from the USTs and dispenser islands (Figure 3). The C-Sparge™ wells will be installed so that the bottom of the 30-inch long sparge tips are set at depths of approximately 20 feet. During sparging, no groundwater or vapors will be extracted. Sparging will be performed on a cycled basis.
13. The Discharger states that ozone will lose its stability within a few hours to a few days and therefore will not migrate significantly downgradient. In addition, ozone will chemically react with hydrocarbons in the immediate vicinity of each injection point to form intermediate by-products of various smaller chain hydrocarbons and oxygenates. The following table shows the laboratory-isolated breakdown by-products that could be produced during the ozone oxidation process with the hydrocarbons:

Constituent	Breakdown Products
TPH	acetate, butyrate, formate, propionate
BTEX	Carboxylic acids
MTBE	TBA (tertiary butyl alcohol), TBF (tertiary butyl formate), formate, oxygen, hydrogen peroxide
ETBE	TBA, TBF, acetate, oxygen, hydrogen peroxide
TBA	Formaldehyde, acetate, carbon dioxide, water

Finally, the residual oxygen from the reaction encourages bioremediation, which consumes the listed by-products and converts them to carbon dioxide and water.

14. Prior to initiating the C-Sparge™ technology, the following baseline samples will be collected from monitoring wells GW-1, GW2, GW-3, GW-4, GW6, and GW-9: depth to groundwater, TPHg, BTEX, MTBE, TBA, tertiary amyl methyl ether (TAME), di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), ethanol, dissolved oxygen, and dissolved ferrous iron. These samples will also be collected bi-weekly during the first month of system operation. Data collected during the testing period will be used to evaluate the C-Sparge™ effectiveness at this site.

#### **APPLICABLE LAWS, PLANS, POLICIES AND REGULATIONS**

15. On June 13, 1994, the Regional Board adopted a revised *Water Quality Control Plan for Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) which was amended on January 27, 1997 by Regional Board Resolution No. 97-02. The Basin Plan (i) designates beneficial uses for surface waters and groundwater, (ii) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the State anti-degradation policy (*Statement of Policy with Respect to Maintaining High Quality Waters in California*, State Water Resources Control Board (State Board) Resolution No. 68-16, October 28, 1968), and (iii) describes implementation programs to protect all waters in the Region. In addition, the Basin Plan incorporates by reference applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. The Regional Board prepared the 1994 update of the Basin Plan to be consistent with previously adopted State and Regional Board plans and policies. This Order implements the plans, policies and provisions of the Regional Board's Basin Plan.
16. The Basin Plan designated beneficial uses and water quality objectives for groundwater within the Central Basin are as follows:  
  
Existing: municipal and domestic supply; industrial service supply; industrial process supply, and agricultural supply.
17. The requirements contained in this Order are based on the *Basin Plan*, and, as they are met, will be in conformance with the goals of the aforementioned water quality control plans and will protect and maintain existing beneficial uses of the groundwater.
18. The permitted discharge is consistent with the anti-degradation provisions of State Board Resolution No. 68-16. The discharge may result in some localized temporary exceedance of background concentrations of dissolved oxygen, dissolved ferrous iron, total dissolved solids, sulfate, chloride, and boron. However, any parameter change resulting from the discharge:
  - a. will be consistent with maximum benefit to the people of the State,
  - b. will not unreasonably affect present and anticipated beneficial uses of such waters, and

- c. will not result in water quality less than that prescribed in the Water Quality Control Plan for groundwater within the Central Basin of the Los Angeles Coastal Plain.
19. This Regional Board has assumed lead-agency role for this project under the California Environmental Quality Act (CEQA) (Public Resources Code section 21000 et seq.) and has conducted an Initial Study in accordance with section 15063 of the "State CEQA Guidelines" at California Code of Regulations, title 14, section 15000 et seq. Based upon the Initial Study, Regional Board staff prepared a Mitigated Negative Declaration that the project, as mitigated, will not have a significant adverse effect on the environment. The Regional Board is adopting the Mitigated Negative Declaration concurrently with its adoption of this Order.
20. The Regional Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for this discharge and has provided them with an opportunity to submit their written views and recommendations. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge and to the tentative requirements.

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

**A. Discharge Specifications**

1. The discharge (injection) of ozone into the groundwater shall be performed only in accordance with the C-Sparge™ system operations described in the February 13, 2003 Addendum to Remedial Action Plan and Corrective Action Recommendation.
2. The Discharger shall provide hydraulic controls, if required by the Regional Board Executive (Executive Officer), that provide full and complete containment of any released materials or by-products of chemical processes, for the duration of the C-Sparge™ system operations.
3. During C-Sparge™ system operations, the discharge volume of ozone shall be approximately five grams per hour of ozone at a flow rate of 3 to 5 cubic foot per minute (cfm). In the event that additional ozone discharge is needed, written approval by the Executive Officer shall be obtained before such discharge is carried out.

**B. Discharge Prohibitions**

1. The Discharger shall not allow the by-products of the chemical reduction process to migrate beyond the plume.
2. The Discharger shall not cause the groundwater outside of the remediation area to exceed the background concentrations of total dissolved solids,

sulfate, chloride, and boron established prior to the start of the C-Sparge™ system operations.

3. The discharge of ozone or any by-products into any surface water or surface water drainage course is prohibited.
4. The Discharger shall not cause the groundwater to contain taste, color, or odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses outside the treatment area.
5. The Discharger shall not cause the groundwater to contain concentrations of chemical constituents, including ozone and its by-products, in amounts that may adversely affect municipal, domestic, industrial or agricultural uses.

### **C. Provisions**

1. This Order includes the attached Monitoring and Reporting Program No. CI-8715 which is incorporated herein by reference. If there is any conflict between provisions stated in the Monitoring and Reporting Program No. CI-8715 and the Standard Provisions, those provisions stated in the Monitoring and Reporting Program prevail.
2. A copy of this Order shall be maintained at an on-site office and be available at all times to operating personnel.
3. In the event of any change in name, ownership, or control of this facility, the Discharger shall notify this Regional Board in writing and shall notify any succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to this Regional Board.
4. The Discharger shall file with the Regional Board technical reports on self-monitoring work performed according to the detailed specifications contained in Monitoring and Reporting Program No. CI-8715 as directed by the Regional Board Executive Officer (Executive Officer). The results of any monitoring done more frequently than required at the location and/or times specified in the Monitoring and Reporting Program shall also be reported to the Regional Board.
5. In accordance with section 13260(c) of the California Water Code, the Discharger shall file a report of any material change or proposed change in the character, location, or volume of the discharge.
6. Discharge of wastes to any point other than specifically described in this Order is prohibited and constitutes a violation thereof.
7. This Order includes the attached *Standard Provisions Applicable to Waste Discharge Requirements*, which are incorporated herein by reference. If there is any conflict between provisions stated herein and the *Standard Provisions Applicable to Waste Discharge Requirements*, the provisions stated herein will prevail.

8. The Discharger shall notify Regional Board staff by telephone within 24 hours, followed by written notification within one week, in the event it is unable to comply with any of the conditions of this Order due to:
  - a) Breakdown of equipment,
  - b) Accident caused by human error or negligence, or other causes such as acts of nature, and
  - c) Site construction or development operations.
9. The Regional Board considers the property operator to have continuing responsibility for correcting any problem that may arise in the future as a result of this discharge.
10. The Discharger shall submit quarterly Summary Reports detailing the results of the C-Sparge<sup>TM</sup> system operations. The report should include an evaluation of the effectiveness of using ozone to remediate petroleum hydrocarbons impacted groundwater at the site, the impact of any by-products on the receiving groundwater quality, and any other effects the in-situ treatment may have caused.
11. All work must be performed by or under the direction of a California registered civil engineer, registered geologist, or certified engineering geologist, as provided in sections 6762, 7850, and 7842, respectively, of the California Business and Professional Code. A statement is required in all technical submittals that the registered professional in direct responsible charge actually supervised or personally conducted all the work associated with the project.
12. The application of ozone to groundwater may result in unintended adverse impacts to groundwater quality. Any potential adverse water quality impacts that may result shall be localized or short-term duration, and shall not impact any existing or prospective uses of groundwater. Groundwater quality shall be monitored before addition of ozone, during treatment, and after treatment is completed to verify no long-term adverse impact to water quality.
13. The Discharger shall cleanup and abate the effects of injecting ozone, including extraction of any by-products which adversely affect beneficial uses, and shall provide an alternate water supply source for municipal, domestic or other water supply wells that become contaminated in exceedance of water quality objectives as a result of using ozone.
14. These requirements do not exempt the Discharger from compliance with any other laws, regulations, or ordinances, which may be applicable. They leave unaffected any further restraints on the site that may be contained in other statues of and/or required by other agencies.
15. This Order does not relieve the Discharger from responsibility to obtain other necessary local, state, and federal permits to construct facilities necessary for compliance with this Order; nor does this Order prevent imposition of

additional standards, requirements, or conditions by any other regulatory agency.

16. The Discharger shall furnish, within a reasonable time, any information the Regional Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order. The Discharger shall also furnish to the Regional Board, upon request, copies of records required to be kept by this Order.
17. After notice and opportunity for a hearing, this Order may be terminated or modified for cause including, but not limited to:
  - a) Violation of any term or condition contained in this Order;
  - b) Obtaining this Order by misrepresentation, or failure to disclose all relevant facts;
  - c) A change in any condition that requires either a temporary or permanent reduction or elimination of authorized discharge.
18. In accordance with California Water Code section 13263(g), these requirements shall not create a vested right to continue to discharge and are subject to rescission or modification. All discharges of waste into the waters of the State are privileges, not rights.
19. The Discharger shall allow the Regional Board, or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:
  - (a) Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;
  - (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;
  - (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and
  - (d) Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order, or as otherwise authorized by the California Water Code, any substances or parameters at any location. [CWC Section 13267]

**D. Expiration Date:**

This Order expires on May 6, 2008.

The Discharger must file a Report of Waste Discharge in accordance with sections 13260 and 13264 of the California Water Code not later than 180 days in advance of such date as application for issuance of new waste discharge requirements.

I, Dennis A. Dickerson, 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, Los Angeles Region, on May 6, 2004.

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Dennis A. Dickerson,  
Executive Officer