STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

ORDER: WQO 2003 - 0001 -UST

In the Matter of the Petition of

MICHAEL O'DONOGHUE TRUST

For Review of Denial of Petroleum Underground Storage Tank Site
Closure at 6862 Manchester Avenue, Buena Park, California

BY THE BOARD:

The Michael O'Donoghue Trust (petitioner) seeks review of the decision of the Santa Ana Regional Water Quality Control Board (SARWQCB) not to close petitioner's case involving an unauthorized release of petroleum at its site located at 6862 Manchester Boulevard, Buena Park, California. For the reasons set forth below, this Order determines that petitioner's case should be closed and no further action related to the release should be required and the site's nine monitoring wells should be destroyed.[1]

I. STATUTORY AND REGULATORY BACKGROUND

Owners and operators of underground storage tanks (USTs) and other responsible parties can petition the State Water Resources Control Board (SWRCB) for a review of their case if they feel the corrective action plan for their site has been satisfactorily implemented, but closure has not been granted. (Health and Safety Code, § 25299. 39.2, subd. (b)(1).) Aggrieved persons, including UST owners and operators and other responsible parties, may also appeal to the SWRCB for review of certain actions of Regional Water Quality Control Boards (RWQCBs) or failures to act (Wat. Code, § 13320, subd. (a).)

Several statutory and regulatory provisions provide the SWRCB, RWQCBs, and local agencies with broad authority to require responsible parties to clean up a release from a petroleum UST

[1] Because we are reviewing the petition on the merits, we will not act on petitioner's stay request that was received by the SWRCB on November 12, 2002.

(e.g., Health & Saf. Code, § 25299.37; Wat. Code, § 13304, subd. (a)). The SWRCB has promulgated regulations specifying corrective action requirements for petroleum UST cases (Cal. Code Regs., tit. 23, §§ 2720-2728). The regulations define corrective action as "any activity necessary to investigate and analyze the effects of an unauthorized release, propose a cost-effective plan to adequately protect human health, safety and the environment and to restore or protect current and potential beneficial uses of water, and implement and evaluate the effectiveness of the activity (ies)." (Cal. Code Regs., tit. 23, § 2720.) Corrective action consists of one or more of the following phases: (1) preliminary site investigation, (2) soil and water investigation, (3) corrective action plan implementation, and (4) verification monitoring. (Cal. Code Regs., tit. 23, § 2722, subd. (a).)

The preliminary site assessment phase includes initial site investigation, initial abatement actions, initial site characterization and any interim remedial action. (Cal. Code Regs., tit. 23, § 2723, subd. (a).) Corrective action is complete at the conclusion of the preliminary site assessment phase, unless conditions warrant a soil and water investigation. A soil and water investigation is required if any of the following conditions exists: (1) there is evidence that surface water or groundwater has been or may be affected by the unauthorized release; (2) free product is found at the site where the unauthorized release occurred or in the surrounding area; (3) there is evidence that contaminated soils are or may be in contact with surface water or groundwater; or (4) the regulatory agency requests an investigation based on the actual or potential effects of contaminated soil or groundwater on nearby surface water or groundwater resources, or based on the increased risk of fire or explosion. (Cal. Code Regs., tit. 23, § 2724.)

The purpose of a soil and water investigation is “to assess the nature and vertical and lateral extent of the unauthorized release and to determine a cost-effective method of cleanup.” (Cal. Code Regs., tit. 23, § 2725, subd. (a).) Section 13267, subdivision (b) of the Water Code provides that:

> “. . . the regional board may require that any person discharging or proposing to discharge waste . . .that could affect the quality of waters within its region shall furnish . . . those technical and monitoring program reports as the Board may specify. 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.”

SWRCB Resolution No. 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code §13304* also applies to petroleum UST cases. Resolution No. 92-49 directs that water affected by an unauthorized release attain either background water quality or the best water quality that is reasonable if background water quality cannot be restored. (SWRCB Resolution No. 92-49, section III.G.) Any alternative level of water quality less stringent than background must be consistent with the maximum benefit to the people of the state, not unreasonably affect current and anticipated beneficial use of affected water, and not result in water quality less than that prescribed in the water quality control plan for the basin within which the site is located. (*Ibid*.)

Resolution No. 92-49 does not require, however, that the requisite level of water quality be met at the time of site closure. Resolution No. 92-49 specifies compliance with cleanup goals and objectives within a reasonable time frame (*Id*. at section III.A.). Therefore, even if the requisite level of water quality has not yet been attained, a site may be closed if the level will be attained within a reasonable period.

The SARWQCB's Basin Plan (Basin Plan) designates existing and potential beneficial uses of groundwater in the Santa Ana Pressure Area groundwater basin as municipal and domestic supply (MUN), agricultural supply (AGR), and Industrial Process Supply (PROC). (SARWQCB & SWRCB, Water Quality Control Plan, Santa Ana River Basin (1995) at p. 3-28.) The Basin Plan specifies a narrative taste and odor water quality objective as follows: "The groundwaters of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause nuisance or adversely affect beneficial uses." (*Id*. at p. 4-14.) The Basin Plan also contains the following narrative water quality objective for "Toxic Substances:" "All waters of the region shall be maintained free of substances in concentrations which are toxic, or that produce detrimental physiological responses in human, plant, animal or aquatic life." (*Id*. at p. 4-14.)

With regard to the water quality objectives for "Toxic Substances," the State Department of Health Services (DHS) has set maximum contaminant levels (MCLs) for benzene, toluene, ethylbenzene, and xylene (BTEX) in drinking water of 1 ppb, 100 ppb, 680 ppb, and 1,750 ppb, respectively (Cal. Code Regs., tit. 22, § 64444). DHS has set primary and secondary MCLs for methyl-tertiary-butyl-ether (MTBE) at 13 ppb and 5 ppb, respectively. (DHS, Drinking

Water Standards, August 3, 2000.) The threshold odor concentration of three common petroleum constituents, ethylbenzene, toluene, and xylene are 29 ppb, 42 ppb, and 17 ppb, respectively. (U.S. EPA, Federal Register, Volume 54, No. 97, May 1989.) The threshold odor concentration of commercial gasoline (measured as total petroleum hydrocarbon gasoline, or TPH-g) is commonly accepted to be 5 ppb, with 10 ppb giving a strong odor. The threshold odor concentration of commercial diesel (measured as TPH-d) is commonly accepted to be 100 ppb. (SWRCB, Water Quality Criteria (2d ed. 1963) p. 230.)

II. FACTUAL BACKGROUND

A. Site Setting

Petitioner's site is located at 6862 Manchester Boulevard, Buena Park, California, within the Santa Ana Pressure Area of the Orange County Groundwater Basin. The site is a retail car dealership and service center situated in a commercial/residential area and immediately adjacent to Interstate Highway 5 (I-5). The nearest water supply well, which is a municipal supply well, is located about 2,700 feet west of the site, and the nearest surface water feature is the Fullerton Creek channel, a storm water runoff conveyance, tributary to the San Gabriel River, located about 900 feet to the north.

The Santa Ana Pressure Area is defined as that area of the basin where surface water and shallow groundwater are prevented from percolating in large quantities into the main production aquifers by shallow aquitards.[2] The shallow groundwater (at depths of less than 50 feet) is typically of poor quality, occurs in primarily low-permeability clays and silts and intermittent sand lenses, and is of minimal use from a water supply standpoint.[3] The principal groundwater supply aquifers in the pressure area are confined aquifers generally occurring at depths between 300 and 2,000 feet, and are principally recharged by either direct percolation of surface water or vertical groundwater flow from overlying, hydraulically-connected aquifers underlying the cities of Anaheim, Fullerton, and Orange.[4]

B. UST Case History

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[2] *Hydrogeology of the Orange County Groundwater Basin – an Overview.* R. Herndon, Manager, Hydrogeology Department, Orange County Water District, 1992, p. 244.

[3] *Id.* at p. 244.

[4] *Id.* at p. 243.

In June 1998, two 2,000-gallon capacity gasoline USTs and one 1,000-gallon capacity diesel UST were removed from the site. The Orange County Health Care Agency (County) had regulatory oversight of UST removal and the ensuing corrective actions. Observations at the time of the removal activities indicated that petroleum hydrocarbon affected soil was present in the bottom of the UST excavation. Analyses of soil samples collected from the base of the walls of the excavation[5] in June of 1998 showed TPH-g and TPH-d concentrations as high as 5,900 ppm and 23,000 ppm, respectively. Reported concentrations of benzene and MTBE ranged from non-detect to 33 ppm and 0.07 to 12.2 ppm, respectively. In July 1998, approximately 350 cubic yards of affected soil was excavated from the area of the former USTs. The excavation at that time measured about 30 feet by 18 feet by 18 feet deep and it was noted that water was accumulating in the bottom of the excavation from a leaking pipe.[6] The responsible party indicated that the release was a "soil only" case on the Unauthorized Release Report form dated July 1, 1998. The excavation was subsequently filled with pea gravel and an upgraded UST system.

In September 1998, 18 Hydropunch® borings at locations up to 75 feet from the excavation were advanced to depths of 26 to 30 feet below ground surface (bgs) to characterize site hydrogeology and assess the extent of affected soil and groundwater. Groundwater was encountered at about 23 feet bgs in each of the borings (five feet below the depth of the July 1998 excavation). The stratigraphy was characterized as primarily silty fine sand to about 12 feet bgs, clayey fine sand to about 18 feet bgs and then silty fine sand to the total depth explored.

Soil samples from 13 of the 18 borings were generally collected at 10, 15, and 20 feet bgs and analyzed for TPH-g, BTEX and MTBE. Soil samples that were determined to have high concentrations of TPH-g were also analyzed for TPH-d. The soil sample analytical results showed that soil at 15 feet bgs, and within about 10 feet of the extent of the July 1998 over-excavation, had reported concentrations of TPH-g ranging from 45 to 10,000 ppm; concentrations of benzene and MTBE ranged

[5] The precise location in the excavation where the samples were obtained is uncertain. The consultant for the petitioner (Atlas Environmental Engineering, Inc.) reported that they were beneath the UST inverts and also from the corners of the excavation. On a drawing, dated June 29, 1998, prepared by the on-site County caseworker, the sample locations are shown to be at the midpoints of the excavation sidewalls.

[6] July 8, 1998 field activity notes prepared by County caseworker, A. Dietz.

from 0.01 to 2.3 ppm and 0.007 to 0.35 ppm, respectively. The samples analyzed for TPH-d tested non-detect (less than 10 ppm). Two soil samples collected at 20 feet bgs from borings within five feet of the excavation had reported TPH-g concentrations of 1.4 and 3.1 ppm; reported benzene and MTBE concentrations were 0.033 and 0.052 ppm and non-detect and 0.006 ppm, respectively. One soil sample collected at 10 feet bgs from a boring about five feet from the limits of the excavation had a reported TPH-g concentration of 4,500 ppm and benzene and MTBE concentrations of 0.39 ppm and 0.017 ppm, respectively.

Samples of groundwater collected via the Geoprobe® technique from the 18 borings were collected from depths of about 23 to 25 feet bgs and analyzed for TPH-g, BTEX and MTBE. Detectable concentrations of TPH-g ranging from 1,100 ppb to 98,000 ppb were reported for five groundwater samples from borings located within ten feet of the excavation; one sample, from a boring located about 55 feet south of the excavation, had a reported TPH-g concentration of 600 ppb. Detectable concentrations of benzene ranging from 0.3 to 200 ppb were reported for nine of the 18 groundwater samples; MTBE was detected in ten of the samples at reported concentrations ranging from 1.8 to 180 ppb. Toluene and/or xylene was detected in all groundwater samples in concentrations ranging from 0.5 to 22,000 ppb and 0.9 to 27,000 ppb, respectively. The groundwater samples with the highest concentrations of gasoline constituents (TPH-g >1,000 ppb, benzene >10 ppb, and MTBE >10 ppb) were from those borings drilled within ten feet of the UST excavation.

In a workplan submitted to the County dated October 12, 1998, petitioner proposed to construct five groundwater monitoring wells at the site to further characterize soil and groundwater impacts associated with the UST release. The design depth of each well was 30 feet bgs, and the well screens were to extend at least 10 feet above the groundwater level so that the wells could be used for soil vapor extraction. Well installations were initiated on November 6, 1998. During the drilling of the first boring, groundwater was reported to have initially occurred at a depth of 28 feet[7], which was deeper than estimated. Consequently, the completion design depth of each well was changed to 35 feet bgs. The completed wells were screened from 15 to 35 feet bgs.

[7] *Five Groundwater Monitor Wells (MW-1 To MW-5) At The House Of Imports. . .*, ATC Associates Inc., February 9, 1999, at p. 3. However, the log of the boring indicates that groundwater was initially encountered at a depth of 23.6 feet bgs.

Two of the wells, MW-4 and MW–5, were located within a few feet of the limits of the west side of the former excavation. Wells MW-2 and MW–3 were located within 25 to 30 feet south and southwest (the direction groundwater was believed to flow) of the former excavation, and MW-1 was placed through the excavation back fill, about three feet from the site's active fuel dispenser. Upon completion, the depth to water in each well was about 14 feet bgs. The difference in the elevation of groundwater in the wells after completion, compared to the elevation of "initial" or "first water"[8] encountered in the well borings led petitioner's consultant to conclude that the shallow groundwater was confined groundwater.[9] Based on the elevation of the water surface in each well, a southerly groundwater flow gradient was determined.[10]

After well development, groundwater samples were collected from each well and analyzed for TPH-g, BTEX, MTBE and TPH-d. Reported concentrations of TPH-d in the samples from wells MW-1, MW-2 and MW-4 were 66 ppm, 133 ppm, and 147 ppm respectively;[11] TPH-d was non-detect (<0.5 ppm) in the samples from wells MW-3 and MW-5. Reported concentrations of benzene, toluene and xylene in samples from three of the wells were as follows: MW-1: 8,000 ppb, 33,000 ppb, 21,000 ppb; MW-2: 3,600 ppb, 2,700 ppb, 1,700 ppb; and MW-4: 2,400 ppb, 16,000 ppb, and 26,000 ppb. (See **Attachment 1** for a compilation of groundwater analytical results for samples from all monitor wells at the site. See **Attachment 2** for a compilation of groundwater analytical results for samples from all geoprobes at the site.)

Soil samples from depths of 15 to 35 feet were collected while drilling each well boring and analyzed for TPH-g, BTEX, MTBE and TPH-d. Concentrations of TPH-g detected in these samples ranged from non-detect (< 0.050 ppm) to 350 ppm. The two highest concentrations, 160 ppm

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[8] Initial or first groundwater, as used by the field geologist, designates the first observable occurrence of "free water," i.e., water that flows from the interstices of the soil (this is related to a soil's specific yield and hydraulic conductivity) and identifies the location of a water bearing zone.

[9] *Id.* at p. 6.

[10] The water level elevation in MW-1 was not used for the gradient determination because the well was installed in the UST backfill (pea gravel) and thus judged to be unrepresentative.

[11] The solubility of diesel fuel is about 5 ppm. These reported diesel concentrations (and the concentrations of other constituents in excess of their effective solubilities, e.g., toluene, ethylbenzene, and xylene) indicate that the sample results are not representative of dissolved-phase concentrations but of an emulsion consisting of sorbed and/or liquid-phase petroleum hydrocarbons.

and 350 ppm, were from samples collected from MW-1 at a depth of 35 feet and MW-4 at a depth of 25 feet. All 18 of the soil samples tested non-detect (< 5 ppm) for TPH-d.

In May 2000, four more monitoring wells were constructed. Well MW-6 was sited about 40 feet west of the former excavation and wells MW-7, MW-8, and MW–9 were located in an arc, 10 to 20 feet easterly of the former excavation. The wells were constructed with screen intervals extending from 10 to 35 feet bgs. Soil samples from each well boring were collected at five-foot intervals (5 feet to 35 or 40 feet bgs) and tested in the same manner as previously collected soil samples. Reported concentrations of TPH-g ranged from non-detect to 4.2 ppm; TPH-d and MTBE were non-detect (< 10 ppm and < 0.01 to 0.02 ppm, respectively) in all 32 samples tested. The highest concentrations of TPH-g (4.2 ppm) and BTEX (0.17 ppm, 0.15 ppm, 0.06 ppm, and 0.52 ppm respectively) detected were from a sample collected at a depth of 13 feet in well boring MW-9, located about 15 feet east of the former excavation.

During the drilling of the new wells, the initial occurrence of groundwater was reported at about 19 feet bgs in well borings MW-6 and MW-7[12] and about 28 feet bgs in well borings MW-8 and MW-9. After the wells were completed, the water level in each was about 16 to 17 feet bgs. Analyses of groundwater samples collected from the newly constructed wells showed that detectable concentrations of BTEX were present only at the location of well MW-9 (310 ppb, 380 ppb, 84 ppb, and 620 ppb, respectively), about 15 feet easterly of the excavation.

In February 2001, the County concluded that the assessment of the extent of soil and groundwater impacts was adequate and directed the petitioner to submit a Remedial Action Plan to address the residual petroleum hydrocarbons remaining in site soil and groundwater. In April 2001, petitioner submitted a Corrective Action Plan (CAP) that considered four remediation alternatives:

- Pump and Treat,
- Soil Vapor Extraction,
- Enhanced bio remediation (ORC [Oxygen Releasing Compounds]), and
- No-Action (natural attenuation).

[12] Free groundwater was not detected at this depth (14 feet) in any of the 23 borings drilled at the site in 1998.

Included in the CAP was a site conceptual model that considered the site-specific hydrology, geology, geochemistry, spatial and temporal data trends and anomalies, and the fate and transport of petroleum hydrocarbon constituents from the location of the former USTs to possible receptors via completed or potentially completed environmental pathways. The CAP concluded that the natural attenuation alternative was the reasonable and prudent remediation technology to address public health, safety, and environmental concerns at the site.

By letter dated July 2, 2001, more than 60 days after the submittal of the CAP and still lacking a response of concurrence or objection to the proposed remediation alternative, petitioner notified the County that the proposed No-Action plan was being implemented.[13] In a letter dated July 13, 2001, petitioner again requested that the County clarify any specific points of disagreement with the conclusions of the CAP. In a letter dated August 20, 2001, the County stated that the SARWQCB would not likely agree to close the site since the maximum benzene concentration in groundwater was over 20 times the SARWQCB's standard. The County also stated that the SARWQCB has agreed to closure in cases where the maximum benzene concentration exceeded the low-risk criteria used by the SARWQCB, but that in those cases, there must be a clear demonstration of a stable plume, limited zone of petroleum hydrocarbon impacts, reasonable removal of the source zone or core of the residual petroleum hydrocarbons, and confirmation of no significant impact to public safety, human or other biological receptors.

In a letter to the County dated December 13, 2001, the SARWQCB provided its rationale for not concurring with site closure. The letter referred to previous discussions between SARWQCB and County staff where it had been determined that additional groundwater monitoring was needed to verify the effectiveness of the implemented CAP. This letter also stated that during the last four years of monitoring, the concentration levels in MW-1 and MW-4 gradually decreased and later began increasing, and that additional monitoring data are necessary to verify that intrinsic biodegradation is effective at the site.

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[13] California Code of Regulations, Title 23, Division 3, Chapter 16, Section 2726(c) provides that "In the interest of minimizing environmental contamination and promoting prompt cleanup, the responsible party may begin cleanup *[footnote continued next page]*

On January 28, 2002, the County informed petitioner that the case was transferred to the SARWQCB effective January 24, 2002.

In a letter to the SARWQCB dated February 25, 2002, petitioner requested case closure and submitted a "Closure Summary Report." Petitioner claimed the case should be closed because:

1. The bulk of residual, detectable soil impacts – approximately 350 cubic yards – were removed.

2. The extent of residual detectable petroleum is confined to a very small area.

3. MTBE is not a constituent of concern at the site.

4. Detectable concentrations of petroleum hydrocarbons do not pose a threat to human health, safety or the environment.

5. More data are not necessary to determine the conceptual model of the site.

In a letter to petitioner dated May 6, 2002, the SARWQCB responded. Citing Water Code section 13267, the SARWQCB ordered petitioner "…to conduct groundwater monitoring and to provide [the SARWQCB] with monitoring reports to verify that the contaminant plume is undergoing natural attenuation by intrinsic biodegradation." The determination that additional monitoring was necessary was based on the facts that (i) gasoline constituent concentrations are "…significantly higher than the low-risk criteria…" and (ii) "The latest monitoring data show an increase in the constituent concentrations."[14]

On May 28, 2002, petitioner appealed to the SWRCB for case closure. In a letter dated July 17, 2002, the SWRCB UST Program Manager requested the SARWQCB to transmit its record for the site and its response to the petition. The SARWQCB's complete record was sent to the SWRCB UST Program Manager on September 27, 2002.

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of soil and water after the Corrective Action Plan has been submitted and before it has received agency concurrence. Implementation of the Corrective Action Plan may begin sixty (60) calendar days after submittal, unless the responsible party is otherwise directed in writing by the regulatory agency."

[14] Data reported for a groundwater sample obtained from well MW-1 on July 18, 2001, showed BTEX and MTBE at 5,800 ppb, 16,000 ppb, 4,100 ppb, 18,600, ppb and 120 ppb, respectively.

III. CONTENTIONS[15] AND FINDINGS

Contention 1: *Petitioner contends that its UST case should be closed because petitioner has verified the effectiveness of the completed CAP to protect human health, safety, and the environment, based upon substantial evidence in the record and in accordance with applicable statutes, regulations, policies and published SWRCB decisions in similar UST cases.*

Response: As explained below, the facts in the record support the finding that petroleum hydrocarbon constituents at petitioner's site do not pose a threat to human health and safety, or the environment. The evidence indicates that the groundwater beneath petitioner's site is confined and that the petroleum release had only localized and limited impacts. The groundwater monitoring wells installed at the site in response to the UST release most likely caused groundwater impacts to be overstated and resulted in misleading characterization of the magnitude of the release. Proper destruction of the site's nine monitoring wells will remedy this situation. Additional soil and groundwater investigation or remediation is not necessary and residual petroleum hydrocarbon constituents in soil at petitioner's site will not adversely affect, or threaten to affect, beneficial uses of groundwater once the wells are destroyed.

The site does not pose a risk to human health, safety or the environment for the following reasons:

- The primary source of the release was removed in 1998, and remaining, limited residual petroleum hydrocarbons in soil are confined to an area within about ten to 15 feet from the limits of the southern half of the former UST excavation in the depth interval of about 13 to 17 feet bgs.
- There is no evidence to suggest that shallow groundwater at and below a depth of 23 feet in the vicinity of petitioner's site is directly being used presently or that it has any likelihood of being used in the foreseeable future for domestic or municipal supply.
- There are no water supply wells located within 2,700 feet of the site.

[15] The SWRCB finds that the issues that are not addressed in this order are insubstantial and not appropriate for SWRCB review. (See *People v. Barry* (1987) 194 Cal.App.3d 158 [239 Cal.Rptr. 349]; Cal. Code Regs., tit. 23, §§ 2052, subd. (a)(1) and 2814.7, subd. (d)(4).)

- The shallow groundwater is non-potable. At petitioner's site, analyses of groundwater revealed the following ambient constituent concentrations: TDS – 3,000 to 3,500 ppm, nitrate – 180 to 240 ppm, sulfate – 780 to 1,300 ppm, sodium – 430 to 630 ppm.[16]

- Demonstrated intrinsic biodegradation[17] of residual petroleum hydrocarbons in site soil and groundwater will continue to reduce the mass of those residual hydrocarbons (see discussion below).

- Groundwater exhibits confining conditions limiting downward migration of contaminants (see discussion below).

Discussion

Confining Groundwater Conditions

The SARWQCB contends that the shallow groundwater is unconfined. However, as explained below, the weight of the evidence demonstrates that the hydrogeology at the site has resulted in the shallow groundwater being under confining conditions, which causes it to rise above the elevation where it was first encountered. The high concentrations of petroleum hydrocarbon constituents reported for groundwater samples from site wells are most likely due to the manner in which the wells were constructed and the presence of confining conditions. The lower portions of the wells (20 to 25 feet bgs) are screened across water-bearing intervals; the upper portions of the wells are screened across intervals where soil with residual petroleum hydrocarbons is present. The interconnection of these screened intervals, along with the confining conditions, allows groundwater from the lower portions of the wells to rise and flow into the zone of residual petroleum hydrocarbons in soil. Consequently, when the wells are purged and sampled, contaminants from the zone of residual petroleum hydrocarbon soil impacts are incorporated in the groundwater samples, resulting in analyses that are unrepresentative of a dissolved-phase plume. Evidence of confining conditions includes (1) initial groundwater encountered at or below 23 feet bgs which then rose to 14 feet bgs after completion of the first five

[16] The MCLs for TDS, nitrate, and sulfate, are 500 ppm, 45 ppm, and 250 ppm, respectively; the SARWQCB Basin Plan WQOs are 500 ppm, 3 ppm, and 100 ppm, respectively. The Basin Plan WQO for sodium is 45 ppm.

[17] Lines of evidence that demonstrate biodegradation of residual petroleum hydrocarbons in site soil and groundwater are: (1) constituent concentrations are decreasing both spatially and temporally and (2) the spatial array ("footprint") of geochemical indicators of the biological reactions indicative of active microbial metabolism are present.

wells, (2) temporal and spatial constituent concentration trends in groundwater samples, and (3) site stratigraphy.

A confining layer is a geologic unit having low hydraulic conductivity. Such units are characteristic of clays, silts, sandy silts and clayey sands which typically exhibit a hydraulic conductivity of less than 10^{-5} cm/sec. Groundwater moves through confining layers although the rate is very slow relative to flow in more permeable aquifers. Although the boring logs do not show the presence of a distinct confining layer, they do indicate that the shallow groundwater is at greater than atmospheric pressure (confining conditions). Review of the logs indicates that the stratigraphic column exhibits a "fining upward" gradation: coarse sand with silt at about 30 feet bgs grades to silty fine sand, then grades to clayey fine sand at about 18 feet bgs. This gradation, from coarser sediments at the bottom of the wells to finer-grained sediments closer to the surface, likely represents a decrease in hydraulic conductivity of about two to three orders of magnitude and would account for the confining conditions. The groundwater in the lower portions of the wells (> about 25 feet bgs) is able to flow readily into the well boring and is discernable as free water. At depths less than about 23 feet bgs, due to the decreased intrinsic permeability of the soil, free water is not discernable. Some localized areas of more permeable soils likely exist at depths shallower than 23 feet bgs, but these soils are isolated from the deeper groundwater, except where long-screened monitor wells provide a conduit.

When drilling a soil boring for hydrogeologic site assessment, the field geologist notes the depth that water is initially encountered. This observation identifies the presence of the first water bearing zone encountered in the boring. If the subsequent water level in the well rises above the "first" water, it is an indicator of confining groundwater conditions. In this particular case, that rise was about nine to 14 feet. The first water bearing zone at the site was encountered at or below 23 feet bgs in the 18 Geoprobe® borings drilled in September 1998, the five monitoring wells installed in November 1998, and two of the four monitor wells constructed in May 2000. Under confining conditions, groundwater can rise into a previously unsaturated zone and can affect the depth at which first water will be detected in subsequently drilled borings. The shallower groundwater (at about 19 feet bgs) encountered in the other two May 2000 borings (MW-6 and MW-7) is likely a consequence of groundwater flowing into that zone via the previously constructed wells. Alternatively, this shallower water-bearing zone may indicate the presence of unconfined ("perched") groundwater in the area of

these two wells. However, analyses of groundwater samples from these wells show no apparent impacts from the release.

The record indicates that groundwater did not rise in the tank excavation to a level of 14 feet bgs. If water table conditions existed at 14 feet bgs, the tank pit would have become filled with 4 feet of standing water, which would have been obvious to the casual observer. In addition, groundwater was not noted at 14 feet in monitor well MW-1 when it was installed, almost four months after the excavation was backfilled. MW-1 was installed through a conductor casing in the tank backfill, and water would have been present at 14 feet when it was installed. In contrast, the boring log for MW-1 states that no soil sample could be recovered at 15 feet bgs because pea gravel collapsed into the boring from the tank backfill and that the lithology from 15 to 20 feet bgs was logged from drill cuttings. If water had been standing in the tank pit for almost four months, those soils would have appeared muddy and clearly saturated and yet the boring log makes no note of this.

The geologist in charge of the well installations and report preparation made the following observations and concluded:

- "Shallow groundwater was encountered initially in a silty fine sand stratum at a depth of approximately 23 to 28 feet bgs."
- "The shallow groundwater is confined. The hydraulic head was at a depth of approximately 14 feet bgs on 6 November 1998." (The day after the wells were installed.)[18]

Localized Groundwater Impacts

The Geoprobe® groundwater sample data collected in September 1998 suggest some degree of communication between affected soil and shallow groundwater at a depth of about 23 to 26 feet in the immediate area of residual petroleum hydrocarbon soil impacts. Outside the immediate area of residual petroleum hydrocarbon impacted soil, Geoprobe® groundwater sample data generally show very low concentrations (ND to about 3 ppb) of benzene, toluene, and xylene. GP-18 is the exception, with its concentrations being somewhat higher. Based on their distribution, these suggest background water quality not inconsistent with the site setting (i.e., automotive service and adjacent I-5 freeway). If these concentrations are indeed from the UST release, the uniform distribution would indicate that the

[18] ATC Associates, February 9, 1999, page 7.

groundwater gradient is very flat and that diffusion of contaminants may predominate over advective groundwater flow. The low levels would imply that biodegradation is robust. The relative depletion of benzene and ethylbenzene imply that the degradation is aerobic in contrast to the anaerobic degradation profile seen in the groundwater beneath the source area. Based on material contained in the record, it appears that no trip blanks were submitted to the laboratory along with the Geoprobe samples, so neither sample contamination in transit nor lab error can be ruled out as a possible explanation.

Plume Migration

The recent increase in benzene, ethylbenzene, and MTBE in well MW-4 does not appear to be evidence of sudden plume migration after four years of groundwater monitoring, but rather reflects sampling variability from a well screened into a zone containing residual petroleum hydrocarbons. The recent increase in concentrations of benzene, ethylbenzene, and MTBE in this well should be viewed in the context of the well's design and the concentration trends of other petroleum constituents in the well. The concentrations of TPH-g, TPH-d, toluene, and xylene in well MW-4 are at their lowest historic levels and are consistent with a stable plume undergoing anaerobic biodegradation. Furthermore, the tank pit now contains gravel and groundwater with residual petroleum hydrocarbons; any plume migrating from this source in an unconfined aquifer would be at least as wide as the tank pit and would be likely to be detected in groundwater samples from wells MW-3, MW-5, and MW-6, which are in the same direction from the tank pit as MW-4. The weight of the evidence shows that the temporal fluctuations exemplified by well MW-4 are not indicative of petroleum plume migration to adjacent wells, but are rather an indication that the monitoring well design is not appropriate for the hydrogeologic and contaminant conditions at the site.

Currently, the effects on groundwater from the UST release are only evident in groundwater samples from wells MW-1 and MW-4. Initial groundwater samples from the other site wells gave the appearance of wider groundwater impacts, although these impacts rapidly diminished. This rapid depletion of petroleum constituents in groundwater samples from the perimeter wells is likely due to the groundwater rising into contact with a small, relatively isolated mass of petroleum constituents in soil, which quickly biodegraded in the presence of nutrients in that groundwater. These trends, and the persistence of high constituent concentrations in wells MW-1 and MW-4, indicate that significant

groundwater impacts are only apparent where monitoring wells are located in the limited area of residual petroleum hydrocarbon impacted soil.

Biodegradation

Temporal concentration trends and the geochemistry of groundwater samples from site wells demonstrate biodegradation of petroleum hydrocarbons in site soil and groundwater. For example, the initial BTEX, TPH-g and TPH-d concentrations in groundwater sampled from well MW-2 (November 1998) were 2,400, 2,700, 750, 1,700, 15,000, and 133,000 ppb, respectively. Concentrations of these constituents decreased to non-detect in about 24 months. Similar rapid decrease of constituent concentrations (e.g., MW-4 TPH-g, toluene and xylene concentrations: 120,000 to 6,000 ppb, 16,000 to 20 ppb, and 26,000 to 30 ppb, respectively) demonstrate very active biodegradation. Comparison of the concentrations of electron acceptors (e.g., sulfate and nitrate) and the byproducts of biodegradation (e.g., carbon dioxide) in groundwater samples from wells inside and outside the immediate area of affected soil show evidence of the biological reactions occurring in active microbial metabolism. The geochemistry of the groundwater and the decay rates of specific petroleum constituents indicate that anaerobic biodegradation by indigenous sulfate and nitrate reducing microorganisms is occurring. The lack of detectable petroleum constituents in groundwater samples from the perimeter wells and the high ambient concentrations of electron acceptors indicates that intrinsic anaerobic biodegradation is sufficient to contain dissolved-phase petroleum hydrocarbons that may emanate from the area of residual petroleum hydrocarbon impacted soil to the perimeter area.

Groundwater samples from wells MW-1 and MW-4 have historically exhibited and currently exhibit high concentrations of petroleum hydrocarbon constituents. Data from these wells also exhibit a large degree of temporal variation, e.g., sometimes greater than a 100 percent increase or decrease in constituent concentrations from one sampling round to the next. The evidence indicates that these spikes in concentrations, either up or down, are a consequence of the monitor well's overly long screen extending into the zone of residual petroleum hydrocarbon soil impacts and the inherent variability in groundwater sampling. For example, the most recent concentration of benzene reported for the groundwater sample from MW-4 (Aug 2002) was 3,800 ppb, a 150% increase over the concentration (1,500 ppb) for the May 2002 groundwater sample. For the same time frame, benzene concentrations reported for the samples from MW-1 decreased by a factor greater than three (3,900 ppb to 1,200

ppb). Similar swings in constituent concentrations have occurred in the past and will continue in the future as long as the groundwater sampled from these wells remains in intimate contact with residual petroleum hydrocarbons present in shallow soil via the overly-long well screens.

Cleanup Levels

To effectively remove the residual petroleum constituents at petitioner's site in the short term would require further active remediation at a significant cost. The low intrinsic permeability of the soils would limit the effectiveness of vapor extraction and also limit the ability to introduce chemical oxidizing agents. Excavation of the affected soils at 15 to 20 feet bgs would require the removal of the existing UST system and possibly a portion of a building. Even if this remediation were to occur, there would be little benefit to current or anticipated beneficial uses of the limited volume of groundwater that is currently not meeting water quality objectives for the constituents of concern. Because of the minimal benefit of attaining further reductions in concentrations of petroleum constituents at this site and the fact that the use of the groundwater is not affected or threatened, attaining background water quality at petitioner's site is not feasible.

While it is impossible to determine the precise level of water quality that will be attained given the residual petroleum constituents that remain at the site, in light of all the factors discussed above, a level of water quality will be attained that is consistent with the maximum benefit to the people of the state.[19]

The final step in determining whether cleanup to a level of water quality less stringent than background is appropriate for this site requires a determination that the alternative level of water quality will not result in water quality less than that prescribed in the Basin Plan. Pursuant to Resolution No. 92-49, a site may be closed if the Basin Plan requirements will be met within a reasonable period.

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[19] In approving an alternative level of water quality less stringent than background, the SWRCB has also considered the factors contained in California Code of Regulations, title 23, section 2550.4, subdivision (d). As discussed earlier, the adverse effect on shallow groundwater will be minimal and localized, and there will be no adverse effect on the groundwater contained in deeper aquifers, given the physical and chemical characteristics of petroleum constituents; the hydrogeological characteristics of the site and surrounding land; and the quantity of the groundwater and direction of the groundwater flow. In addition, the potential for adverse effects on beneficial uses of groundwater is low, in light of the proximity of groundwater supply wells; the current and potential future uses of groundwater in the area; the existing quality of groundwater; the potential for health risks caused by human exposure; the potential damage to wildlife, crops, vegetation, and physical structures; and the persistence and permanence of potential effects.

After the nine monitoring wells are properly destroyed, it could take several decades for the petroleum constituents to meet water quality objectives. That period of time is, however, reasonable because: (1) the shallow groundwater is of poor quality (elevated concentrations of TDS, nitrate, sulfate and sodium) and is an unlikely source of drinking water in the foreseeable future, (2) there are no water supply wells located within 2,700 feet of the site and the nearest surface water feature, the Fullerton Creek storm water conveyance channel, is located about 900 feet to the north, and (3) standard well construction practices for water supply wells mandate a surface sanitary seal to preclude shallow groundwater from entering the well.

Discussion Summary

After the nine monitoring wells are properly destroyed, it is expected that any residual dissolved petroleum introduced through installation and sampling of the wells should rapidly attenuate to below water quality objectives (WQOs) due to the active biodegradation occurring at the site. The site would then be returned to a pre-1998 condition with the uppermost portion of the shallow groundwater in contact with low concentrations of petroleum hydrocarbons that are likely migrating slowly from the overlying confining unit. The relatively stagnant groundwater with its very high concentrations of nitrate and sulfate and anaerobic degraders will counter any apparent plume migration. Residual petroleum hydrocarbons in the shallow soil will persist for a considerably longer period of time. However, because these soils containing residual petroleum hydrocarbons would be effectively isolated from the groundwater due to the tight soils at the site, it will not unreasonably affect existing or anticipated beneficial uses. Any water percolating from the surface, contacting the residual petroleum hydrocarbons in soil or migrating through the tight soil to the groundwater may become contaminated, but this would be expected to rapidly degrade as well.

Contention 2: *Petitioner contends that failing to close the UST case has unnecessarily delayed the proper destruction of inappropriately long-screened monitoring wells that were located within the lateral and vertical limits of residual soil impact. Petitioner contends that the construction and location of these wells (MW-1 and MW-4) have allowed confined groundwater to rise under pressure into direct contact with residual petroleum adsorbed to previously-unsaturated soils above the water-bearing zone and has resulted in reported concentrations that are erroneous and misleading and continue to pose an unreasonable threat to*

the surrounding environment. Petitioner contends that the County specified the number of monitoring points, the location of monitoring wells and manner in which the monitoring wells were to be constructed, and that these specific County directives violated California Water Code, section 13360.

The SARWQCB contends that the monitor wells are properly designed and constructed.

Response: As discussed in Contention 1, a preponderance of evidence in the record indicates that shallow site groundwater is groundwater under confining conditions. Corroboration or denial of the SARWQCB's conceptual model of unconfined groundwater and proper well construction would necessitate the destruction of the existing monitor wells and their replacement with nested wells (i.e., clusters of two or three wells designed to monitor groundwater at different discrete depth intervals).

Guidance and standards[20] for assessment well construction specify that a well's annular space be effectively sealed to prevent it from becoming a preferential pathway for the movement of poor quality water, pollutants, and contaminants or a conduit for contaminate transport across hydraulically separated geologic units. The design of the site's nine monitoring wells, with screen lengths of 20 to 25 feet across separate hydrogeologic units, allows shallow groundwater, under confining conditions, to rise in the wells and flow into the zone of hydrocarbon impacted soil. As a consequence of their location and design, the monitoring wells will continue to provide a conduit for the spread of petroleum hydrocarbon constituents until they are destroyed.

With exceptions not relevant here, Water Code section 13360 prohibits the SWRCB, RWQCBs and courts from issuing orders pursuant to Division 1 of the Water Code that specify the design, location, type of construction or particular manner in which compliance may be had with a requirement, order or decree. Section 13360 does not apply to local agencies. And while Chapters 6.7 and 6.75 provide local agencies with authority to oversee corrective action at leaking UST sites, there is no similar restriction that prohibits local agencies from specifying the manner or method of complying with cleanup orders. As indicated earlier, the County participates in the Local Oversight Program and,

[20] *Guideline for Hydrogeologic Characterization of Hazardous Substance Release Sites*, Cal/EPA, July 1995; *Bulletin 74-90, Water Well Standards*, Department of Water Resources, June 1991.

as such, operates under a contract with the SWRCB. The contract between the SWRCB and the County does not specifically prohibit the County from directing the method or manner of compliance with cleanup orders. Rather, the contract contains generic language that requires the County to comply with all applicable state laws, rules, regulations and local ordinances. Since Water Code section 13360 does not apply to the County, this contract provision would not bar the County from dictating the manner of compliance. Thus, even if we determined that the County specified the design and location of the monitor wells, petitioner's contention, that the County violated Water Code section 13360, has no merit.

Contention 3: *Petitioner claims that the SARWQCB inappropriately based its decision to deny closure on the fact that the concentration levels at petitioner's site exceeded low-risk concentration levels for BTEX that the SARWQCB had established. Specifically, petitioner contends that the SARWQCB's reliance on the guidance document violates Government Code section 11340.5, which prohibits a state agency from using a guideline, criterion, or standard unless the criterion or standard has been formally adopted as a regulation.*

Response: In light of our technical analysis of petitioner's UST case and our conclusion that the UST case should be closed, it is not necessary to determine if the SARWQCB's use of the low-risk criteria was inappropriate.

IV. SUMMARY AND CONCLUSIONS

After an independent review of the record and consideration of the issues raised by the petitioner, and for the reasons previously discussed, we conclude the following:

1. Petitioner's site is a "low risk" site for the following reasons:

A. No water supply wells are located within 2,700 feet of the site and the nearest surface water feature, the Fullerton Creek storm water conveyance channel, is located about 900 feet to the north.

B. The shallow groundwater is of poor quality containing elevated concentrations of TDS, nitrate, and sulfate above MCLs and Basin Plan Water Quality Objectives. Concentrations of sodium in that groundwater also exceeds Basin Plan Water Quality Objectives.

C. The bulk of soil containing residual petroleum hydrocarbons was removed in 1998.

D. Residual petroleum hydrocarbons in soil are confined to a small, limited area.

E. MTBE is not a constituent of concern.

F. The apparent plume and constituent concentrations are stable and decreasing.

G. Demonstrated intrinsic biodegradation will continue to reduce the remaining, limited mass of petroleum hydrocarbons in soil and groundwater.

2. Improperly constructed monitoring wells and confining groundwater conditions have allowed groundwater in the lower portions of the wells to rise and come into direct contact with the limited volume of shallower soil containing detectable concentrations of residual petroleum constituents. This has exacerbated groundwater impacts.

3. Intrinsic permeabilities of shallow soils at the site are low enough to create confining pressure to groundwater that occurs below about 23 feet bgs. The low intrinsic permeability of these soils also retards the vertical and horizontal migration of residual petroleum constituents in soil and dissolved in groundwater.

4. Plan Water Quality Objectives for petroleum hydrocarbons currently detected in site groundwater will likely be achieved within several decades after the monitor wells are properly destroyed. This is a reasonable period because there are no nearby water supply wells; it is unlikely that the shallow groundwater will be used as a source of drinking water due to its poor quality; and standard well construction practices for water supply wells mandate a surface sanitary seal to preclude shallow groundwater from entering the well should one be installed to access deeper groundwater.

5. The level of site cleanup, which included removal of the USTs and approximately 350 cubic yards of affected soil in 1998, and groundwater monitoring, is consistent with the maximum benefit to the people of the State.

6. The site's nine monitoring wells must be properly destroyed to restore the natural barrier separating residual petroleum hydrocarbons present in shallow soil from underlying groundwater, which is under confining conditions.

7. Once the monitoring wells are properly destroyed, no further corrective action is necessary.

8. The above conclusions are based on the site-specific information relative to this particular case.

V. ORDER

IT IS HEREBY ORDERED THAT, following the proper destruction of the site's nine monitoring wells, petitioner's UST case be closed, and no further action related to the release be required. Once the monitoring wells are properly destroyed, the Chief of the Division of Water Quality is directed to issue petitioner a uniform closure letter consistent with Health and Safety Code, section 25299.37, subdivision (h).

CERTIFICATION

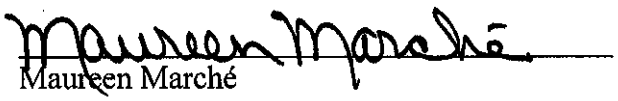
The undersigned, Clerk to the Board, does hereby certify that the foregoing is a full, true, and correct copy of an order duly and regularly adopted at a meeting of the State Water Resources Control Board held on February 19, 2003.

AYE: Arthur G. Baggett, Jr.
Peter S. Silva
Richard Katz
Gary M. Carlton

NO: None

ABSENT: None

ABSTAIN: None



Maureen Marché
Clerk to the Board