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STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

ORDER: WQ 99 - 10 - UST

In the Matter of the Petition of
UNOCAL CORPORATION
for Review of Denial of
Petroleum Underground Storage Tank Site Closure
at
1665 Pacific Avenue, Stockton, California

BY THE BOARD:

UNOCAL Corporation (Petitioner) seeks review of the decision of the San Joaquin County Public Environmental Health Division (County) not to close Petitioner's case involving an unauthorized release of petroleum at its site located at 1665 Pacific Avenue, Stockton, California. For the reasons set forth below, this order determines that Petitioner should monitor its site for one year before the State Water Resources Control Board (SWRCB) will consider closure. The order also directs that the County not require any additional work other than monitoring during this one-year period.

I. STATUTORY, REGULATORY, AND FACTUAL BACKGROUND

Tank owners and operators who are eligible for reimbursement from the Underground Storage Tank (UST) Cleanup Fund can petition the Fund Manager 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 Saf. Code, § 25299.39.2, subd. (b)).¹

The site is part of the SWRCB Underground Storage Tank Local Oversight Program. Responsible parties such as Petitioner may seek review of local agency decisions made under this program. (Health and Saf. Code § 25297.1, subd. (d)).

¹ To the extent that the SWRCB may lack authority to review this petition pursuant to Health and Saf. Code § 25299.39.2, subd. (b) because the petitioner did not submit a corrective action plan for the site, the petition is being reviewed pursuant to Health and Saf. Code § 25297.1, subd. (d) and SWRCB Resolution No. 88-23.

Several statutory and regulatory provisions provide the SWRCB, Regional Water Quality Control Boards (RWQCBs), and local agencies with broad authority to require responsible parties to clean up a release from a petroleum UST (e.g., Health & Saf. Code, § 25299.37; Wat. Code, § 13304, subd. (a)). The County has been designated as an agency to participate in the Local Oversight Program for the abatement of, and oversight of the abatement of, unauthorized releases of hazardous substances from USTs (Health & Saf. Code, § 25297.1). The SWRCB has promulgated regulations specifying corrective action requirements for petroleum UST cases (Cal. Code of 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 of Regs., tit. 23, § 2725, subd. (a)).

SWRCB Resolution No. 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 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 which is reasonable if background water quality cannot be restored (SWRCB Resolution No. 92-49, 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 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 (hereafter Basin Plan). (*Ibid.*)

Resolution No. 92-49 does not require, however, that the requisite level of water quality be met at the time of site closure. 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 (SWRCB Resolution No. 92-49, III.A).

The Central Valley RWQCB's Basin Plan designates existing and potential beneficial uses of groundwater in the San Joaquin Valley groundwater basin as municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), and industrial process supply (PRO) (Central Valley RWQCB & SWRCB, Water Quality Control Plan, Central Valley Region (1994) at p.II-3). The Basin Plan specifies a narrative taste and odor water quality objective as follows: "Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses." (Id. at p. III-10). The Basin Plan also contains the following narrative water quality objective for organic chemicals: "...ground waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of maximum contaminant levels (MCLs) specified in...Title 22 of the California Code of Regulations..." (Id. at III-9).

With regard to the water quality objectives for organic chemicals, the State Department of Health Services (DHS) has set 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 of Regs., tit. 22, § 64444). Although DHS has not yet set an MCL for methyl-tertiary-butyl-ether (MTBE), DHS has set an interim action level of 35 ppb (DHS Memorandum from Joseph P. Brown, Ph.D., Acting Chief, Water Toxicology Unit to Alexis M. Milea, P.E., Acting Supervisor, Standards and Technology Unit, Office of Drinking Water (February 19, 1991) at p. 2). DHS has adopted a 5 ppb MTBE concentration as a secondary drinking water standard for taste and odor. The threshold odor concentration of commercial gasoline (measured as total petroleum hydrocarbon gasoline, or TPH-g) in water is commonly accepted to be 5 ppb, with 10 ppb giving a strong odor.

The following is a brief historical summary of Petitioner's site at 1665 Pacific Avenue in the City of Stockton. The site is located in a commercial/residential area of the city and was an operating service station from about 1947 to 1988; gasoline was dispensed from two 10,000 gallon capacity USTs. Since demolition of the station and removal of the USTs in 1988, the site has remained vacant.

The site is underlain by flood plain sediments (clay, silt and sand) of the Pliestocene Victor Formation. In the vicinity of the site, groundwater in the more permeable strata of the Victor Formation is generally of inferior quality (concentrations of nitrate greater than 45,000 ppb, chloride greater than 300,000 ppb, and TDS greater than 1,000,000 ppb) and is not viewed by local water purveyors as a source of drinking water. Underlying the Victor Formation are the alluvial sediments (clay, silt, sand, and gravel) of the Plio-Pliestocene Laguna Formation. Groundwater in the Laguna Formation is used extensively throughout the area for municipal, industrial, and agricultural supply. There are no active municipal water supply wells within 2,500 feet of the site. There is an emergency backup well 800 feet to the northeast of the site which is screened between 200-400 feet and which has a 96-foot seal. This well, owned by the California Water Service (CWS), was taken out of service in 1991 because of a sanding problem. The CWS has indicated that it has no intention of using this well for municipal supply purposes and intends to use it only in the event of a local disaster or fire. An additional CWS well is located 2,200 feet north of the site and has a 72-foot seal. This well is listed as a backup well. The nearest surface water, a canal that extends easterly from the Port of Stockton, is about 2,000 feet to the west. Shallow groundwater at the site flows in a general easterly direction with a gradient of about 0.002.

In January 1988, analyses of soil samples from five soil borings drilled to depths of 20 to 30 feet indicated that a release had occurred at the site. In February 1988, three groundwater monitor wells were installed to assess site groundwater conditions. The initial groundwater samples from the three wells revealed an absence of gasoline constituents in groundwater near the location of the two gasoline USTs, high concentrations (99,000 ppb TPH-g and 5,700 ppb benzene) in the vicinity of the easterly pump island, and low concentrations (170 ppb TPH-g and 1 ppb benzene) in the vicinity of the waste oil UST. Data gained from the well installations also indicated that the groundwater was confined and that it flowed in an easterly direction.

In March 1988, the two 10,000-gallon capacity gasoline USTs, the waste oil UST, and the dispensers and associated piping were removed from the site. Visual inspection of the

bottom and side-walls of the gasoline UST excavation revealed that soil was affected by a release prompting Petitioner to over-excavate an estimated 850 cubic yards of soil to a final depth of 28 to 30 feet.² Soil samples collected from the bottom and sidewall of the excavation indicated TPH-g and benzene concentrations ranged from 3 to 18 ppm and less than 0.05 to 1.7 ppm, respectively.

In August 1989, two additional groundwater monitor wells were constructed off-site approximately 100 feet east and northeasterly of the former pump island where high constituent concentrations had previously been detected in groundwater. Analyses of groundwater samples from these wells revealed low concentrations of TPH-g (150 and 240 ppb), xylene (1.4 and 1.9 ppb), and ethylbenzene (less than 0.5 and 8.1 ppb); benzene and toluene were not detected.

In February 1992, three vapor extraction wells and two more groundwater monitor wells were installed. Two of the vapor extraction wells were located where the easterly pump island had been while the third well was positioned at the former location of the site's second, westerly pump island. One of the new groundwater monitor wells was constructed about 300 feet down-gradient of the site while the other was positioned on-site and up-gradient, about 60 feet southwest of the pair of vapor extraction wells. Analyses of soil samples collected during the drilling of these wells indicated an absence of gasoline constituents in the vicinity of the westerly pump island and at the locations of the two newly installed groundwater monitor wells. However, in the vicinity of the easterly pump island, TPH-g and benzene were detected at concentrations as high as 7,300 ppm and 3.4 ppm, respectively, at a depth of 26 feet; the data indicated that concentrations diminished to 120 ppm and 0.083 ppm, respectively, at a depth of 51 feet.

In July 1994, two more groundwater monitor wells were installed southeast and southwest of the site to complete definition of the plume. Water quality data from the array of nine groundwater monitor wells showed that the dissolved phase benzene plume, centered at the location of the easterly pump island, extended down-gradient about 120 feet, no more than 50 to 60 feet off-site.

In January 1996, recovery of residual petroleum hydrocarbons in the vadose zone was initiated using Soil Vapor Extraction (SVE) technology. The SVE system was operational

² The volume of soil excavated is a point of contention. Petitioner indicates in its Site Closure Summary report that an estimated 1,100 cubic yards of soil were excavated while the County contends that only 350 cubic yards are documented to have been excavated. However, in a March 12, 1991 letter to Petitioner, the County states that, "...approximately 1300-1400 cubic yards of contaminated soil..." were excavated. Based on the reported dimensions of the excavation, we have estimated 850 cubic yards.

through November 1996 and recovered an estimated 400 gallons of TPH-g, including about two gallons of benzene.

Beginning in May 1996, MTBE was analyzed in quarterly groundwater samples from site monitor wells. To date, analyses (EPA Method 8260) have detected low concentration of MTBE, generally 2 to 10 ppb, in groundwater samples collected during the winter of 1998/1999 from up-gradient, cross-gradient, and down-gradient monitor wells. These occurrences of MTBE are consistent with United States Geological Survey findings that atmospheric "washout" can result in concentrations of MTBE in excess of 20 ppb in shallow groundwater.

By letter to Petitioner dated January 9, 1997, County staff concluded that "...the assessment of the lateral extent of groundwater contamination is complete, the assessment of soil contamination is complete, and the plume appears to be stable." The County recommended that a feasibility study and corrective action plan (CAP) be submitted, quarterly groundwater monitoring continue, and data in support of the presence of natural attenuation be collected.

By letter to the County dated February 7, 1997, Petitioner summarized the extent of remedial activities undertaken at the site and the findings of its investigative efforts. Petitioner then concluded that the site was suitable for closure as a low-risk groundwater case and that further site assessment or corrective action was not necessary.

By letter to Petitioner dated March 3, 1997, County staff concluded that the plume of dissolved phase petroleum hydrocarbons was about 130 feet long and 60 feet wide, that the average benzene concentration within the limits of the plume was 32 ppb, and that the plume was stable and declining. However, the County also concluded that site closure at that time was not appropriate without additional information that demonstrated that natural attenuation was occurring and an explanation that natural attenuation would restore the beneficial use of groundwater.

By letter to the UST Cleanup Fund Manager dated June 13, 1997, Petitioner requested that its case be reviewed for closure. Petitioner contended that petroleum hydrocarbon sources (USTs and piping) had been removed from the site, impacted soil had been excavated, SVE had removed additional residual petroleum hydrocarbons in soil, free product had never been observed, MTBE had never been detected in groundwater, the nearest public water supply well is approximately 800 feet from the site, and the County had determined that assessment of the extent of affected soil and groundwater was complete.

By letter to the UST Cleanup Fund dated January 16, 1998, County staff expressed concern regarding Petitioner's failure to define the extent of affected soil and groundwater and to document the volume of affected soil excavated at the site.

In March 1998, responding to the County's request for information demonstrating that natural attenuation was occurring at the site, Petitioner analyzed groundwater samples from site wells for selected inorganic constituents which are indicative of microbial metabolism of petroleum hydrocarbons. These analyses, in addition to showing that very active biodegradation was occurring within the dissolved phase hydrocarbon plume, also showed that in shallow groundwater, background concentrations of nitrate (about 70 ppm) and Total Dissolved Solids (1,000 to 1,200 ppm) exceeded State MCLs (45 ppm and 500 ppm respectively).

In January 1999, responding to the County's demand that further delineation of affected soil and groundwater was required, Petitioner collected soil samples to a depth of 90 feet and installed two more monitor wells in the vicinity of the release. Analyses of the soil samples showed that soil affected with TPH-g and BTEX was present in the depth interval of 40 to 60 feet, that only trace concentrations (less than 0.02 ppm) of toluene and xylene were present at 70 feet, and that all gasoline constituents were not detectable in the samples from the 80 and 90 foot depths. Concentrations of MTBE were not detectable in any of the samples collected.

The two new wells were constructed to monitor groundwater at the depth intervals of 50 to 60 feet and 85 to 90 feet. These wells, in conjunction with other monitor wells, provided a means of assessing the vertical hydraulic gradient and the vertical extent of the dissolved phase hydrocarbon plume at the site. The initial sampling of groundwater from the two new wells indicated that groundwater at 50 to 60 feet and 85 to 90 below grade had benzene concentrations of 14,000 ppb and 210 ppb³, respectively. The hydraulic gradient between the two zones monitored was about 0.02 upward.

On May 4, 1999 the County issued a directive requiring Petitioner to submit a workplan to define the lateral and vertical extent of offsite, down-gradient soil and groundwater contamination, and to install wells onsite for feasibility studies of viable remedial alternatives. On June 3, 1999, Petitioner filed a petition pursuant to Health and Safety Code §25297.1 seeking review of the May 4, 1999 directive and the County's failure to close the site. Petitioner also

³ Concentrations of dissolved phase petroleum hydrocarbons detected in groundwater from this deeper zone are an artifact of the well installation process, i.e., contamination introduced at the time the well was being drilled and constructed. Subsequent sampling, in March and May 1999, have demonstrated a steady decline in the concentrations of all gasoline constituents. i.e., 150 ppb benzene in March, 43 ppb in May.

asked the SWRCB to issue a stay of the May 4th directive pending SWRCB action on Petitioner's request for closure. However, since this order considers the petitions on their merits the issuance of a stay order is now moot. Because both petitions raise similar issues, we have consolidated them and will deal with both in this order.

By letter dated July 22, 1999, the Chief of the Division of Clean Water Programs, State Water Resources Control Board, informed the County that sufficient data were available to conclude that further assessment of site conditions was not warranted and that he would recommend closure if the results of four additional quarters of sampling remained consistent with the historic data. In responding to the letter, the County expressed disagreement with the Division Chief's conclusions and contended that declining concentrations of dissolved phase hydrocarbons in site groundwater was a consequence of natural attenuation via dispersion and dilution and that the occurrence of biologic degradation was not supported by available data. The County also contended that down-gradient monitor wells do not monitor the depth interval where the highest concentrations of dissolved phase hydrocarbons were detected at the site, hence the need for continued investigative activities.

II. CONTENTIONS AND FINDINGS

Contention: Petitioner contends its case should be closed because soil and groundwater assessment is complete and corrective actions conducted have diminished the presence of residual petroleum hydrocarbon constituents to a point where they pose a "low risk" to public health and safety, the environment, and to current or probable future beneficial uses of water.

The County concedes that natural attenuation is occurring at the site but it argues that biologic degradation is not a factor in the observed decline of petroleum hydrocarbon constituents in groundwater and contends that down-gradient monitor wells do not extend to the depth interval where the highest documented concentrations of dissolved phase hydrocarbons have been detected at the site.

Findings: Petitioner's contention has merit. As explained below, the facts in the record support the finding that additional soil and groundwater investigation or additional remediation is not necessary, and that residual petroleum hydrocarbon constituents at Petitioner's site do not pose a threat to human health and safety, or the environment, and do not adversely affect, or

threaten to affect, current or anticipated future beneficial uses of water. In addition, the level of site cleanup is consistent with the maximum benefit to the people of the state and will meet the applicable objectives in the Central Valley RWQCB Basin Plan within a reasonable time frame.

The County's contentions are not supported by the facts in the record. As explained below, the facts show that both aerobic and anaerobic biologic degradation of residual petroleum hydrocarbon constituents is occurring at the site. The facts further show that all down-gradient monitor wells extend to and below the depth interval where the highest documented concentrations of dissolved phase hydrocarbons have been detected at the site.

The primary sources of the release (the USTs, dispenser, and associated piping) have been removed as well as a substantial volume of affected soil from the immediate vicinity of the former USTs. Free product has never been observed in any site monitor wells and SVE has removed a substantial mass of residual petroleum hydrocarbons in the vicinity of the former pump island.

With regard to affected groundwater and its potential to adversely impact current or anticipated future beneficial uses, substantial evidence in the record indicates that concentrations of dissolved phase hydrocarbons are decreasing, the plume is stable, MTBE is not present as a consequence of the release, and attenuation and biologic degradation of residual petroleum hydrocarbons in site soil and groundwater is occurring. Further, available data indicate that the affected groundwater monitored by site wells, in addition to being of inferior quality, is not hydraulically connected to the deeper groundwater aquifers that are used locally for municipal, industrial or agricultural supply.

The highest documented concentrations of petroleum hydrocarbons detected in site groundwater are in samples from monitor well MW-2 (this well is completed to a depth of 50 feet at the location of the former pump island where the release occurred). Concentrations of TPH-g and benzene typically ranged from 100,000 to 200,000 ppb and 6,000 to 25,000 ppb, respectively, from 1988 through 1994; concentrations of these constituents have declined to about 80,000 and 2,400 ppb, respectively, as demonstrated by the monitoring results of the past year. Reported concentrations of TPH-g and benzene in groundwater samples from the monitor well MW-4 (immediately down-gradient of MW-2 and completed to a depth of 54 feet) have ranged from 69 to 460 ppb and "non-detect" to 2.0 ppb, respectively⁴ (32 sampling events over nine years). Other down-gradient wells, MW-5 (completed to a depth of 55 feet) and

⁴ One sample, collected in August 1992, had a reported TPH-g concentration of 3,000 ppb.

MW-7 (completed to a depth of 60 feet), have infrequently detected low concentrations of benzene (0.85 to 2.2 ppb), toluene (0.74 to 4 ppb), ethylbenzene (0.63 ppb), and xylene (0.52 to 4.8 ppb) since 1994 (during 7 of 42 sampling events). Concentrations of TPH-g and benzene in groundwater samples from wells peripheral to the former pump island have declined from relatively high concentrations (3,300 to 110,000 ppb and 160 to 330 ppb respectively) reported through 1995, to very low concentrations ("non-detect" for TPH-g and 1 ppb to "non-detect" for benzene) since 1997 (the past nine quarterly monitoring events). Similarly, concentrations of toluene, ethylbenzene, and xylene in groundwater samples from well MW-2 have historically ranged from 25,000 to 82,000 ppb, 2,700 to 9,900 ppb, and 14,000 to 37,000 ppb, respectively. However, concentrations of these constituents are less than MCLs (generally "non detect" to less than 10 ppb) in groundwater from all other site monitor wells. Thus the data clearly show the plume is stable, concentrations of residual petroleum hydrocarbons in groundwater are decreasing, and that residual concentrations in excess of Basin Plan objectives are limited to less than 60 feet off-site with respect to toluene, ethylbenzene, and xylene, about 70 feet with respect to benzene, and an estimated 150 feet with regard to TPH-g.

The introduction of petroleum hydrocarbons into the subsurface causes rapid changes in the prevailing groundwater geochemistry due to microbially mediated reactions between the hydrocarbons and naturally occurring inorganic compounds. Aerobic respiration, denitrification, Fe (III) reduction, sulfate reduction, and methanogenesis are largely responsible for these changes, and each leaves behind a unique biogeochemical signature. Analyses of the groundwater samples collected from site wells in March 1998 show that concentrations of reduced iron (ferrous) are greater, and nitrate and sulfate concentrations are significantly less, in samples from wells within the plume when compared to samples from "background" wells. For example, groundwater samples from up-gradient and cross-gradient wells have ferrous iron concentrations of less than 0.1 ppm while groundwater samples within the plume have reported concentrations ranging from 0.5 to 3.4 ppm. Up-gradient concentrations of nitrate and sulfate are about 70 ppm and 170 ppm respectively while concentrations of these constituents at the core of the plume are "non detect" and in down-gradient groundwater nitrate concentrations are "non detect" while sulfate concentrations are only 10 to 20 ppm. Thus, the data demonstrate that the dissolved phase hydrocarbon plume in site groundwater is undergoing biodegradation via iron, sulfate and nitrate reduction (i.e., anaerobic biodegradation).

Measurements of dissolved oxygen in groundwater samples collected from site wells in February 1999 provide the basis to conclude that aerobic biodegradation is also acting to attenuate the petroleum hydrocarbons present in site soil and groundwater. Concentrations of dissolved oxygen in groundwater from wells MW-1, MW-2, MW-3, and MW-6 (the four shallow wells that have historically defined the core of the site's groundwater plume) were less than 0.5 ppm. Concentrations of dissolved oxygen in groundwater from up-gradient, cross-gradient, and down-gradient monitor wells ranged from 2.24 to 5.49 ppm. Thus the low dissolved oxygen concentration associated with the location of the release relative to the higher concentrations at distance further demonstrates the on-going biodegradation and attenuation of the hydrocarbon plume.

In considering possible impacts to current and future beneficial uses of groundwater, three factors are relevant: 1) according to Department of Water Resources (DWR) Bulletin 146 (1967) and Petitioner's March 1998 sample analyses, shallow groundwater in the vicinity of the site is of "inferior quality," 2) the groundwaters monitored by site wells are not in direct hydraulic communication with deeper groundwater aquifers or local supply wells, and 3) as discussed above, the plume is stable and concentrations are decreasing as a consequence of natural attenuation. The presence of poor quality water (which generally contains elevated concentrations of nitrate, chloride, and TDS) in the Victor Formation is a consequence of the easterly intrusion of poor quality water underlying the Delta and the Stockton Deep Water Ship Channel over the past 50 years or so. An analysis of water level elevation data for site wells also shows an absence of the seasonal fluctuations one would expect if the groundwater monitored was in direct hydraulic communication with local production wells. Hence, the localized volume of affected water is not currently being used and, due to its inferior quality, is not likely to be used in the future. Furthermore, historic groundwater monitoring data, in addition to showing plume stability and decreasing constituent concentrations, shows that the poor quality of the shallow groundwater enhances the on-going bioremediation, consequently reducing the residual petroleum hydrocarbon mass in the subsurface. Because constituent concentrations will continue to decline as the mass of residual petroleum hydrocarbons decrease over time, continued monitoring of site groundwater would serve no useful purpose.

The only way to ensure complete removal of lingering, residual, detectable concentrations of petroleum constituents in site groundwater would be to excavate an additional several thousand cubic yards of affected soil to depths in excess of 50 feet. This would entail a

substantial disruption of streets, businesses, sewers and other utilities while producing little or no benefit to current or anticipated beneficial uses of the minimal area of groundwater not meeting Basin Plan objectives.

Furthermore, if complete removal of detectable traces of petroleum constituents becomes the standard for UST corrective actions, the statewide technical and economic implications will be enormous. For example, disposal of soils from comparable areas of excavation throughout the state would greatly impact already limited landfill space. In light of the minimal if any benefit to be gained, the evidence of continuing attenuation of residual petroleum concentrations, and the precedent that would be set by requiring additional excavation at this site, attaining background water quality in this limited area 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.⁵

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 relevant Basin Plan. Pursuant to SWRCB Resolution No. 92-49, a site may be closed if the Basin Plan requirements will be met within a reasonable time frame.

In this particular case, as discussed above, TPH-g and BTEX in the shallow groundwater in immediate contact with the limited residual petroleum hydrocarbon constituents adsorbed to soils will likely remain above, and thus violate, the Basin Plan's objectives in a localized volume of surrounding groundwater for a significant period of time. This time period could be anywhere from a few decades for BTEX to degrade below MCLs to hundreds of years for that limited

⁵ 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.

Finally, a level of water quality less stringent than background is unlikely to have any impact on surface water quality, in light of the volume and physical and chemical characteristics of petroleum constituents; the hydrogeological characteristics of the site and surrounding land; the quantity and quality of groundwater and the direction of groundwater flow; the patterns of precipitation in the region, and the proximity of residual petroleum to surface waters.

volume of groundwater in immediate contact with longer chain, immobile residual petroleum constituents adsorbed to soils to meet the commonly accepted 5 ppb taste and odor threshold.

Nonetheless, during this time these residual concentrations in excess of Basin Plan objectives will not pose a threat to current or future beneficial uses. It is highly unlikely that petroleum hydrocarbon constituents detected in localized areas in the immediate area of the release will migrate substantially beyond current limited spatial extent. Though the longer chain hydrocarbons comprising weathered TPH-g biodegrade more slowly than certain petroleum constituents, such as benzene, they are also more recalcitrant (i.e., less volatile, less soluble and highly absorbent) and much less mobile. It is also highly unlikely that this particular very limited pocket of shallow groundwater will be used directly as a source of drinking water. Thus, the significant period of time that it will take for water quality in this limited area to meet all Basin Plan objectives is a reasonable time frame. Closure of the site, given the facts in this particular case, is appropriate. Nevertheless, both the County and CVRWQCB do not agree that residual diminishing concentrations of petroleum hydrocarbons remaining at the site do not threaten the beneficial use of underlying groundwater. It would therefore be appropriate to monitor site groundwater for dissolved phase BTEX, TPH-g, and oxygen four additional quarters to validate more convincingly the above findings that are based on the currently available information.

III. SUMMARY AND CONCLUSION

1. There is no evidence of MTBE in groundwater as a consequence of the release at this site. Corrective actions including soil vapor extraction and removal of an estimated 850 cubic yards of contaminated soil have removed a significant mass of residual petroleum hydrocarbons at Petitioner's site.

2. The plume of dissolved phase hydrocarbons is stable, concentrations of constituents are declining, and naturally occurring biodegradation of residual petroleum hydrocarbons adsorbed to soil and present in groundwater is occurring.

3. Ten years after the release was stopped, groundwater meets Basin Plan objectives with respect to BTEX constituents within about 70 feet of the site; with respect to TPH-g, groundwater meets Basin Plan objectives within 150 feet of the site.

4. Petitioner's site is located in a commercial/residential area. No water supply wells are located within 800 feet and the nearest surface water is about 2,000 feet from the site.

5. There are no active municipal water supply wells within 2,500 feet of the site.

6. Additional soil and water remediation at Petitioner's site is not necessary.

7. The level of site cleanup is consistent with the maximum benefit to the people of the state.

8. Given the adverse technical and economic implications statewide if further corrective action other than monitoring was required, and the minimal benefits, if any, that would be gained by further corrective action, it is not feasible to attain background water quality at Petitioner's site.

9. Detectable concentrations of BTEX in shallow groundwater in contact with the limited residual petroleum hydrocarbons adsorbed to soil particles may remain above MCLs and thus violate the Basin Plan objectives in a very localized, small volume of surrounding groundwater for decades.

10. Detectable concentrations of TPH-g in shallow groundwater in contact with the limited residual petroleum hydrocarbons adsorbed to soil particles will likely remain above 5 ppb (the commonly accepted odor threshold for drinking water) and thus violate the Basin Plan's narrative odor objective in a very localized, small volume of surrounding groundwater for anywhere from decades to hundreds of years.

11. The determination as to what constitutes a reasonable period to attain water quality objectives must be based on evaluation of all relevant factors, including but not limited to the extent and gravity of any threat to public health and the environment during the period required to meet Basin Plan objectives. Although the time required to attain objectives in this case is lengthy, it is a reasonable period considering the facts of this particular case, including that there are no known drinking water wells within 800 feet of the site and that affected water is of inferior quality and will likely be excluded from any well which may be constructed in the future. It is highly unlikely that petroleum constituents detected in the immediate area of the discharge will migrate substantially beyond the current limited spatial extent, and it is highly unlikely that this particular very limited pocket of shallow groundwater will be used directly as a source of drinking water in the foreseeable future.

12. Both the County and the Regional Board do not agree that residual diminishing concentrations of petroleum hydrocarbons remaining at the site do not threaten the beneficial use

of underlying groundwater. Therefore, it would be appropriate to monitor site groundwater for dissolved phase BTEX, TPH-g, and oxygen for four additional quarters to validate more convincingly staff's site conceptual model.

13. Therefore, no further corrective action other than monitoring is needed at this site.

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

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IV. ORDER

IT IS THEREFORE ORDERED THAT:

1. Petitioner's request for closure is denied at this time.
2. No further action be required until the groundwater monitoring as described in this order is completed.
3. If the results of the additional four quarters of monitoring remain consistent with the historic data and further validate staff's site conceptual model, this matter is to be scheduled for consideration for closure by the SWRCB at its November 2000 workshop and meeting.

CERTIFICATION

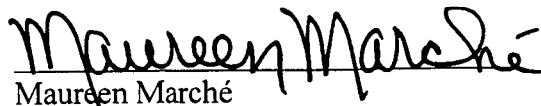
The undersigned, Administrative Assistant to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on November 18, 1999.

AYE: James M. Stubchaer
John W. Brown
Arthur G. Baggett, Jr.

NO: None

ABSENT: Mary Jane Forster

ABSTAIN: None


Maureen Marché
Administrative Assistant to the Board