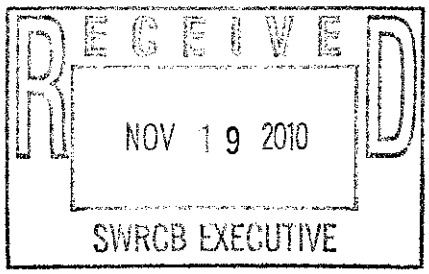
Taber
Since 1954

Taber Consultants
3911 West Capitol Avenue
West Sacramento, CA 95691-2116
(916) 371-1690
(707) 575-1568
Fax (916) 371-7265
www.taberconsultants.com

Public Comment
UST Case Closure – RCH Corp
Deadline: 11/19/10 by 12 noon

November 18, 2010



State Water Resources Control Board
1001 I Street
Sacramento, California 95814

Attention: Jeanine Townsend, Clerk to the Board

Subject: Draft Order WQ 2010-XXXX-UST
Petition of RCH Corporation for Review of Denial of Petroleum Underground Storage Case Closure at 7891 Stockton Boulevard, Sacramento, California

Attached are comments regarding the above referenced case. Please provide these comments to State Water Resources Control Board staff and Board members for consideration of this matter at the upcoming December 14, 2010 Board meeting.

Very truly yours,
TABER CONSULTANTS

Thomas E. Ballard
Senior Geologist
P.G. #7299

Taber
Since 1954

COMMENTS TO DRAFT WQ ORDER 2010-XXXX-UST PETITION OF RCH CORPORATION FOR REVIEW OF DENIAL OF PETROLEUM UNDERGROUND STORAGE TANK CASE CLOSURE AT 7891 STOCKTON BOULEVARD, SACRAMENTO, CALIFORNIA

The comments that follow are provided by Taber Consultants to address specific points in the technical analysis and conclusions developed by the State Water Resources Control Board in the above referenced case.

Taber Consultants agrees with the SWRCB conclusion that the dissolved phase plume is stable and has not migrated off-site in spite of the release having occurred over 20 years ago. A natural attenuation assessment has been conducted at the site and the results have been discussed in Taber Consultants' *Site Conceptual Model* dated July 2, 2010. Groundwater water samples were collected from four wells in various parts of the plume and analyzed for carbon dioxide, carbonate as calcium carbonate, ethane, ethene, ferrous iron, total iron, manganese, methane, nitrate, total Kjeldahl nitrogen, phosphorus, sulfate and sulfide. In addition, dissolved oxygen, oxygen reduction potential (ORP), temperature and pH were measured in the field. Results indicate a typical petroleum hydrocarbon plume undergoing active natural attenuation, with zonation ranging from strongly reducing conditions indicated by methanogenesis at the center of the plume to oxidizing conditions at the perimeter of the plume. Ongoing natural attenuation has created a stable to decreasing plume as natural attenuation processes at the boundaries of the plume degrade the petroleum hydrocarbons at a rate equal to or greater than the rate at which groundwater movement occurs. The natural attenuation analysis conducted at the site is consistent with the Biodegradation and Natural Attenuation sections in the SWRCB *Draft LUFT Manual* dated October 4, 2010.

Taber Consultants disagrees that the site is not adequately delineated laterally or vertically. A substantial number of soil borings, monitoring wells, remediation wells, UST excavation samples and other shallow soil samples have been collected from the site. Remediation and monitoring wells are screened at a variety of depths and fully define the extent the trapped free product plume at the site. The on-site water supply well located to the north of the petroleum hydrocarbon plume pumps water from deeper water bearing zones, which are not impacted based on recent sampling of this well. The location and orientation of the groundwater plume at the site is consistent with the predominant groundwater gradient, groundwater (Darcy) velocity and natural attenuation processes acting on the petroleum hydrocarbon compounds in groundwater. While the Regional Water Quality Control Board has raised the issue of anisotropic flow conditions at the site, there is no evidence to support this condition.

It appears that the on-site water supply well, which is actually a cable tool-constructed well with 132 feet of casing and open hole to the total depth of 201 feet, is described incorrectly by the SWRCB in their technical analysis. Pumping from this on-site well shows no effect on the groundwater contours at the site, indicating a lack of hydraulic connectivity between deeper and shallower water-bearing zones in the vicinity of this well. Lack of impacts in the on-site water supply well, based on recent sampling by Taber Consultants, indicates a lack of impacts to deeper water-bearing zones at the site. Many of the domestic wells in the area are constructed similarly to and installed by the same driller as the on-site Dhami well. If a pathway and mechanism were present that allowed the migration of petroleum hydrocarbons to deeper water-bearing zones, it seems obvious that a pumping well in the vicinity of the groundwater plume would certainly show evidence of such impacted groundwater. If there are no impacts to

groundwater in the deeper water bearing zones on-site, then the chance of such impacts to off-site wells is unlikely.

Additionally, the Regional Water Quality Control Board puts a great deal of emphasis on vertical gradients as evidence that downward migration of petroleum hydrocarbons is occurring. These conclusions are based strictly on potential head differences between overlying water-bearing zones. This conclusion draws upon only a partial analysis of aquifer interactions and must assume that overlying water bearing zones have a substantial hydrologic connectivity based on the concept of leakage flux as shown below. In actuality, vertical hydraulic conductivities tend to be on the order of one to two orders of magnitude lower than horizontal vertical conductivities. Based on underlying lithologies at the site and their associated hydraulic conductivities, leakage flux between overlying aquifers is likely to be very low. Low rates of leakage flux give ample opportunity for natural attenuation processes to degrade any petroleum hydrocarbons which would move vertically downward with whatever leakage flux is present. Once again, this condition is verified by the lack of impacts to the on-site water supply well.

Leakage flux between overlying aquifers is calculated using the following formula:

$$q_L = \frac{-K}{d}(h_1 - h_2) = c(h_1 - h_2)$$

where

q_L = leakage flux per square unit in [L/T]
K = hydraulic conductivity of aquitard in [L/T]
d = thickness of aquitard in [L]
h_1 = head in aquifer 1 in [L]
h_2 = head in aquifer 2 in [L]
c = resistance factor of aquitard in [T^{-1}]

As can be seen, the head differential between overlying water-bearing zones is only a part of the factors that govern the rate of water movement between these zones.

The requirement to sample all wells within 1000 feet of the site has many unresolved issues. The groundwater modeling used to support closed Elsie Truck Stop to the north of the Dhami Truck Plaza site, shows the potential for 1,2-DCA to impact domestic water wells on Victory Avenue. Should 1,2-DCA be detected in the domestic wells on Victory Avenue, it would be much more likely to be from the Elsie Truck Stop plume, especially considering the predominant direction of groundwater flow in this area, which is to the east-southeast. In addition, calculated Darcy velocities for groundwater movement at the site indicate groundwater migration of approximately 15 feet per year or 300 feet in the 20 years since the release occurred at the site. Petroleum hydrocarbons are projected to move at a much slower rate and eventually stabilize based on retardation and other natural attenuation processes that have been conclusively demonstrated to be occurring at the site. This is indeed consistent with the observed plume location and configuration. Other issues that could result in difficult to interpret or erroneous data from such a domestic well sampling program could result from the age of the wells and potential degradation of the sanitary seal in the wells which could allow household chemicals, motor oil and fuel spills from vehicles, lawn chemicals, solvents and any number of other compounds to impact the well water at the individual residences.

Taber Consultants believes the evidence supports closure of this site as a low-risk groundwater case and that such closure is consistent with Water Board Resolution 92-49. Based on evidence of natural attenuation of the groundwater plume documented in Taber Consultants' *Site Conceptual Model* and in the State Water Resources Control Board technical analysis prepared for this petition, along with empirical evidence based on the location and extent of the groundwater plume approximately 20 years after the release at the site, it is clear that this site does not present a risk to human health, safety or the environment, the plume is stable and/or degrading and the site will meet water quality objectives consistent with the established standards in Resolution 92-49.