State Water Resources Control Board

Division of Water Quality
1001 I Street, Sacramento, California 95814 ♦ (916) 341-5851
Mailing Address: P.O. Box 2231, Sacramento, California 95812
FAX (916) 341-5808 ♦ Internet Address : http://www.waterboards.ca.gov

Linda S. Adams
Acting Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

UST Case Closure Summary
Former Phil's Market
Amber Stone (Petitioner)
10221 Old Redwood Highway, Windsor (Site)

Summary:
The release from the subject Site was discovered during the removal of underground storage tanks (USTs) in 1989. The Sonoma County Department of Health Services, Environmental Health Division (Sonoma County) staff denied the Petitioner's request for closure because concentrations of total petroleum hydrocarbons as gasoline (TPHg), tert butyl alcohol (TBA), and 1,2 dichloroethane (1,2 DCA) remain above the North Coast Water Board's Basin Plan Water Quality Objectives (WQOs) and contend that additional Site characterization and remediation are needed.

Residual petroleum hydrocarbons including 1,2 DCA are limited to shallow soil and groundwater in the immediate vicinity of the Site. Petroleum hydrocarbon concentrations including 1,2 DCA in groundwater have generally decreased over time confirming the remaining residual petroleum mass is limited. The processes of dispersion, dilution, and degradation will continue, allowing the plume to naturally attenuate.

Land use is commercial bordered by residential and the Site is currently undeveloped. Most businesses and residents in the area are provided water and sewer service from the local utility district. Although nearby commercial properties rely on a public water supply, a private supply well is cross gradient of the Site and a public supply well (Mobile Home Park) is approximately 400 feet northwest of the Site. Based on facts in the record and the hydrologic and geologic conditions at the Site, the limited residual petroleum hydrocarbons, including 1,2 DCA, that remain in soil and groundwater do not represent a significant threat to public health, safety and the environment. For these reasons, case closure is appropriate.

Background:
This UST Case Closure Summary has been prepared in support of a petition to the State Water Resources Control Board (State Water Board) for closure of the UST case at 10221 Old Redwood Highway, Windsor. All record owners of fee title for this Site as well as adjacent property owners and other interested parties have been notified of the recommendation for closure and were given the opportunity to provide comments.

Petitioner's Site is a former gasoline station located at 10221 Old Redwood Highway, Windsor, in central Sonoma County. Land use is commercial bordered by residential and the Site is currently undeveloped. Businesses and residents in the area are provided water and sewer service from the local utility district.

Sonoma County Staff denied Petitioner's request for UST case closure asserting that closure is inappropriate because further Site characterization and active remediation are needed to mitigate the threat to currently used water supply wells. Petitioner contends that Site conditions do not threaten public health and safety and that the burden of additional corrective actions out weighs the need for those actions.

Case Information

Site Name: Former Phil's Market	Address: 10221 Old Redwood Hwy., Windsor, 95492
Global ID: T0609700233	Petition Date: January 20, 2009
USTCUF Claim No: 1631	USTCUF Expenditures: $415,000

Agency Information

Agency Name: County of Sonoma Environmental Health Division	Address: 475 Aviation Blvd. #200 Santa Rosa, 95403-2097
Agency Case No: 00002232	Number of Years Case Has Been Open: 22 years

Release Information:

- USTs: Two locations, southern (250-gallon and 500-gallon) and northern (6,000-gallon and 8,000-gallon); all four USTs removed in 1989
- Source of Release: UST system
- Discovery Date: October 1989
- Affected Media: Soil and shallow groundwater
- Free Product: None reported
- Corrective Actions
    - January 1989 – removal of four USTs
        - soil excavation
    - August 2001– soil and groundwater assessment
        - soil excavation ~260 cubic yards
    - May 2004 – soil and groundwater assessment
        - soil excavation ~250 cubic yards
    - June 2005– soil and groundwater assessment
    - October 2006 – soil and groundwater assessment
    - December 2006 – private supply well destruction
    - February - March 2008 – soil and groundwater assessment
    - 2001-2011 – groundwater monitoring

Site Description/Conditions:

- Groundwater Basin: Santa Rosa Valley
- Beneficial Uses: MUN, AGR, IND, PRO
- Land Use: Commercial
- Distance to Nearest Supply Wells: Private well 250 feet south (cross gradient); Public well 400 feet northwest (cross gradient) (Mobile Home Park)
- Minimum Groundwater Depth: ~26 feet
- Flow Direction: Westerly
- Geology: Alluvial deposits consisting of poorly sorted coarse sand and gravel, and moderately sorted fine sand, silt, and clay

- Hydrology: Unconfined or slightly confined to approximately 58 feet below ground surface (bgs), the total depth explored; Recharge method is infiltration of rainfall and irrigation water within the vicinity of the Site and discharge is subsurface outflow and evapotranspiration.
- Estimate of Remaining Mass: Small – low levels of gasoline constituents likely remain in the soil east of the southern fuel island excavation near utility lines
- Estimated Time to Meet WQOs for all constituents: decades to hundreds of years

Site History:
In 1989, four USTs were removed from two locations, southern (250-gallon and 500-gallon) and northern (6,000-gallon and 8,000-gallon). Analytical results from soil samples indicated an impact by fuel hydrocarbons. Over the course of several corrective actions, 12 monitoring wells and 26 soil borings have been drilled and sampled. Contaminated soils have been excavated from the Site on several occasions removing approximately 510 cubic yards of impacted soil.

Contaminant Concentrations:
Over the course of corrective actions at the Site, concentrations of 1,2 DCA have been reported for samples from wells MW-4, MW-5, MW-5A, MW-6, MW-7 and MW-7D. Well MW-5 was destroyed during an over-excavation corrective action event in 2004. Concentrations of 1,2 DCA have decreased over time in wells MW-5A and MW-7, stabilized between ND[1] <0.5 ppb to 3.5 ppb in wells MW-6, and MW-7D, and have increased from ND<0.5 ppb in 2007 to 9.9 ppb in 2011 in well MW-4. Concentrations of 1,2 DCA in groundwater have generally decreased over time confirming the remaining residual petroleum mass is limited. The processes of dispersion, dilution, and degradation will continue.

Minor concentrations of TPHg and benzene, toluene, ethyl-benzene, and xylenes have fluctuated in well MW-6 and anticipated to continue with a similar pattern into the near future.

Table 1: March 7, 2011 Groundwater Assessment Sampling

Sample	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylenes (ppb)	MTBE (ppb)	TBA (ppb)	1,2 DCA (ppb)
MW-4	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	9.9
MW-5A	<50	<0.5	<0.5	<0.5	<0.5	<0.5	4.8	6.1
MW-6	190	<0.5	1.1	<0.5	<0.5	<0.5	15	2.3
MW-7	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	5.1
MW-7D	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	1.6
MW-8	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5
MW-10	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5
DW-10139	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5
DW-10281	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5
WQOs	5	1	42	29	17	5	12	0.5

Discussion:
Source has Been Removed: The primary source of the release was removed during UST system removal activities that occurred in 1989, and residual petroleum hydrocarbons in soil were removed to the extent practical. The presence of underground utilities and property boundaries restrict further excavation. Approximately 510 cubic yards were removed during excavation and over-excavation activities. The data show that the low levels of gasoline constituents likely remain in the soil east of the southern fuel island excavation near utility lines.

[1] Not detected above laboratory reporting limits.

UST Release is Old: Historically 1,2 DCA was added to leaded gasoline to prevent buildup of lead oxide deposits within internal combustion engines. A gradual reduction of lead and 1,2 DCA began in the early 1970's and were completely eliminated by 1996. The detection of 1,2 DCA in shallow groundwater confirms that the petroleum release is old.[2]

Data Show that the Onsite Plume is Very Slowly Migrating:

1) Soil contamination has not traveled far from the UST release: Over the course of several corrective actions, 12 monitoring wells and 26 soil borings have been drilled and sampled. Samples confirm that soil contamination (including 1,2 DCA) has remained within 30 feet of the former UST system.

2) Groundwater contamination has not traveled far from the UST release: Concentrations of 1,2 DCA reported as ND during previous sampling events began to be reported in well MW-4 on May 1, 2008. Well MW-4 is approximately 30 feet down gradient from the former USTs and it took more than 20 years for concentrations of 1,2 DCA to migrate this relatively short distance. Using this model, the 1,2 DCA plume will remain and attenuate within the property boundary for many decades.

3) Downward migration of 1,2 DCA is likely minimal: The data show that well MW-7 is screened from 20 to 47 bgs and well MW-7D is screened from 53 to 58 feet bgs. A comparison between the 1,2 DCA concentrations in wells MW-7 to MW-7D drop from an average concentrations of 18.7 ppb in well MW-7 to an average concentration of 2.2 ppb in well MW-7D. An order of magnitude drop in groundwater concentrations occurs by a separation of approximately 6 feet of fine grained sediments. The nearby offsite well logs describe similar fine grained units that vary in thickness and in quantity with depth. Using the empirical data that fine grained sediments restrict downward migration of the 1,2 DCA along with an understanding of the local geology and hydrogeology, a model can be formulated that the deeper waters typically used for drinking are protected from the 1,2 DCA plume.

4) A failed dual-phase extraction pilot study confirms a low groundwater flow rate: A Dual-Phase Pilot Test and Feasibility Study was submitted in 2005 indicating that, due primarily to the low permeability of the soil beneath the Site, the technology was not cost effective.

Current and Anticipated Beneficial Uses: A private supply well is located approximately 340 feet south (cross gradient) of the Site. The well was sampled from 2002 to 2006 and reported ND for all petroleum hydrocarbons, oxygenates, and 1,2 DCA. A public supply well (Mobile Home Park) is approximately 400 feet northwest (cross gradient) of the Site and according to Department of Public Health (DPH) well data, screened between 76 to 96, 116 to 156, and 176 to 216 feet bgs. The well was sampled from 1987 to 2008 and reported ND for all petroleum hydrocarbons, oxygenates, and 1,2 DCA (except for an anomalous hit of toluene in 2008).

[2] USEPA, EPA History, EPA Takes Final Step in Phase-Out of Leaded Gasoline, http://www.epa.gov/history/topics/lead/02.htm

The probability of 1,2 DCA affected groundwater to travel the pathway to the nearest wells is very low because the natural attenuation processes of adsorption, dilution, and dispersion of dissolved 1,2 DCA would likely lower 1,2 DCA concentrations to below WQOs before affected groundwater would intercept the nearest wells.

Objections to Case Closure and Response:
1. The solvent 1,2 DCA groundwater plume has been shown to be undefined in an area of high groundwater use. The most distant downgradient well MW-4 is showing persistent and increasing concentrations that exceed the water quality objective for 1,2 DCA.

Response: Increasing 1,2 DCA concentrations in well MW-4 are the result of a slowly migrating plume of impacted groundwater. The data show that the dissolved 1,2 DCA plume is limited to shallow groundwater that is not currently used as a drinking water source or for any other designated beneficial use and not likely to be used as a drinking water source or any other designated beneficial use in the foreseeable future. The probability of 1,2 DCA affected groundwater to travel the pathway to the nearest wells is very low because the natural attenuation processes of adsorption, dilution, and dispersion of dissolved 1,2 DCA would likely lower 1,2 DCA concentrations to below WQOs before affected groundwater would intercept the nearest wells.

2. Groundwater contamination is also shown to be persistent in the only deep zone monitoring well MW-7D.

Response: The shallow 1,2 DCA groundwater plume including the affected groundwater sampled from well MW-7D is not currently used as a drinking water source or any other beneficial use and not likely to be used as a drinking water source or for any other designated beneficial use in the foreseeable future. As explained in paragraph 3 of the “Discussion” section, the data show that the deeper waters typically used for water supply are protected from the 1,2 DCA plume.

3. Further Site characterization and active remediation are needed to mitigate the threat to currently used water supply wells.

Response: Additional Site characterization and active remediation at this Site are unnecessary because:

1. The corrective actions taken to date - approximately 510 cubic yards were removed during excavation and over-excavation activities.
2. A Dual-Phase Pilot Test and Feasibility Study was submitted in 2005 indicating that, due primarily to the low permeability of the soil beneath the Site, the technology was not cost effective.
3. The 1,2 DCA plume is slowly moving and will meet water quality objectives by the time the impacted groundwater could impact an offsite well.
4. Nearby supply wells have no detections of 1,2 DCA.
5. Local geology and hydrogeology restrict the downward migration of contaminants, which will prevent impacts to deeper water zones that may be used for water supply.

4. Soil remediation has been done but a Feasibility Study and Corrective Action Plan to address groundwater contamination have not been completed for the Site.

Response: A Dual-Phase Pilot Test and Feasibility Study was submitted in 2005 indicating that, due primarily to the low permeability of the soil beneath the Site, the technology was not cost effective.

Closure:

Will corrective action performed ensure the protection of human health, safety and the environment? Yes

Is corrective action and UST case closure are consistent with State Water Board Resolution 92-49? Yes
Is achieving background water quality feasible? No
The data show that low levels of gasoline constituents likely remain in the soil east of the southern fuel island excavation near utility lines and that the presence of underground utilities and property boundaries restrict further excavation. To remove all traces of residual petroleum constituents at the Site would require significant effort and cost. If complete removal of detectable traces of petroleum constituents becomes the standard for UST corrective actions, however, 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 precedent that would be set by requiring additional excavation at this Site and the fact that beneficial uses are not threatened, attaining background water quality at this Site is not feasible.

If achieving background water quality is not feasible:

Is the alternative cleanup level consistent with the maximum benefit to the people of the State? Yes.
It is impossible to determine the precise level of water quality that will be attained given the limited residual petroleum hydrocarbons that remain at the Site, but in light of all the factors discussed above, and the fact that the residual petroleum constituents will not unreasonably affect present and anticipated beneficial uses of groundwater beyond the immediate vicinity of the Site of the UST excavation, a level of water quality will be attained that is consistent with the maximum benefit to the people of the state and between the background level and the applicable water quality objective.

Will the alternative cleanup level unreasonably affect present and anticipated beneficial uses of water? No.
Impacted groundwater is not used as a source of drinking water or for any other beneficial use currently and it is highly unlikely that the impacted groundwater will be used as a source of drinking water or for any other beneficial use in the foreseeable future.

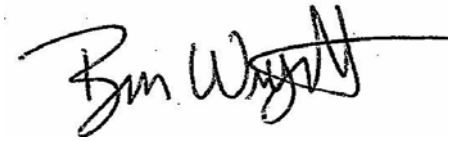
Will the alternative level of water quality exceed water quality prescribed in applicable Basin Plan? No.
The final step in determining whether cleanup to a level of water quality less stringent than background is appropriate for this Site requires a determination that the alternative level of water quality will not result in water quality less than that prescribed in the relevant basin plan. Pursuant to State Water Board Resolution 92-49, a Site may be closed if the basin plan requirements will be met within a reasonable time frame.

Have factors contained in Title 23 of the California Code of Regulations, Section 2550.4 been considered? Yes.
In approving an alternative level of water quality less stringent than background, the State Water Board 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 the 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 direction of groundwater flow, the patterns of precipitation in the region, and the proximity of residual petroleum to surface waters.

Has the requisite level of water quality been met? No
If no, the approximate time period in which the requisite level of water quality will be met:
The approximate time period in which the requisite level of water quality will be met for all constituents of concern is decades to hundreds of years. This is a reasonable period in which to meet the requisite level of water quality because the affected groundwater is not currently being used as a source of drinking water and it is highly unlikely that the affected groundwater will be used as a source of drinking water in the future. The data show that the deeper waters typically used for water supply are protected from the 1,2 DCA plume. Other designated beneficial uses of water are not adversely impacted and it is highly unlikely that they will be. The record indicates that the source was removed in 1989; a small 1,2 DCA plume was created from an old release that is slowly moving and attenuating; and all constituents, including 1,2 DCA, have not impacted existing wells and will likely meet objectives by the time the impacted groundwater moves offsite to one of the existing wells.

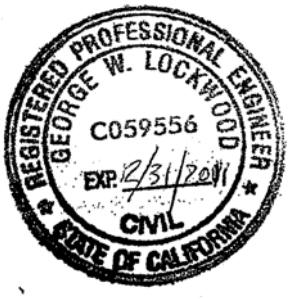
Summary and Conclusions:
Although shallow groundwater affected by the release from the former USTs exceeds the North Coast Water Board's Basin Plan WQO for TPHg, TBA and 1,2 DCA in a localized area, the WQOs will be achieved in a reasonable period of time. Shallow affected groundwater is not currently being used as a source of drinking water or for any other designated beneficial use and it is highly unlikely that the affected groundwater will be used as a source of drinking water or for some other beneficial use in the foreseeable future. Closure is appropriate.

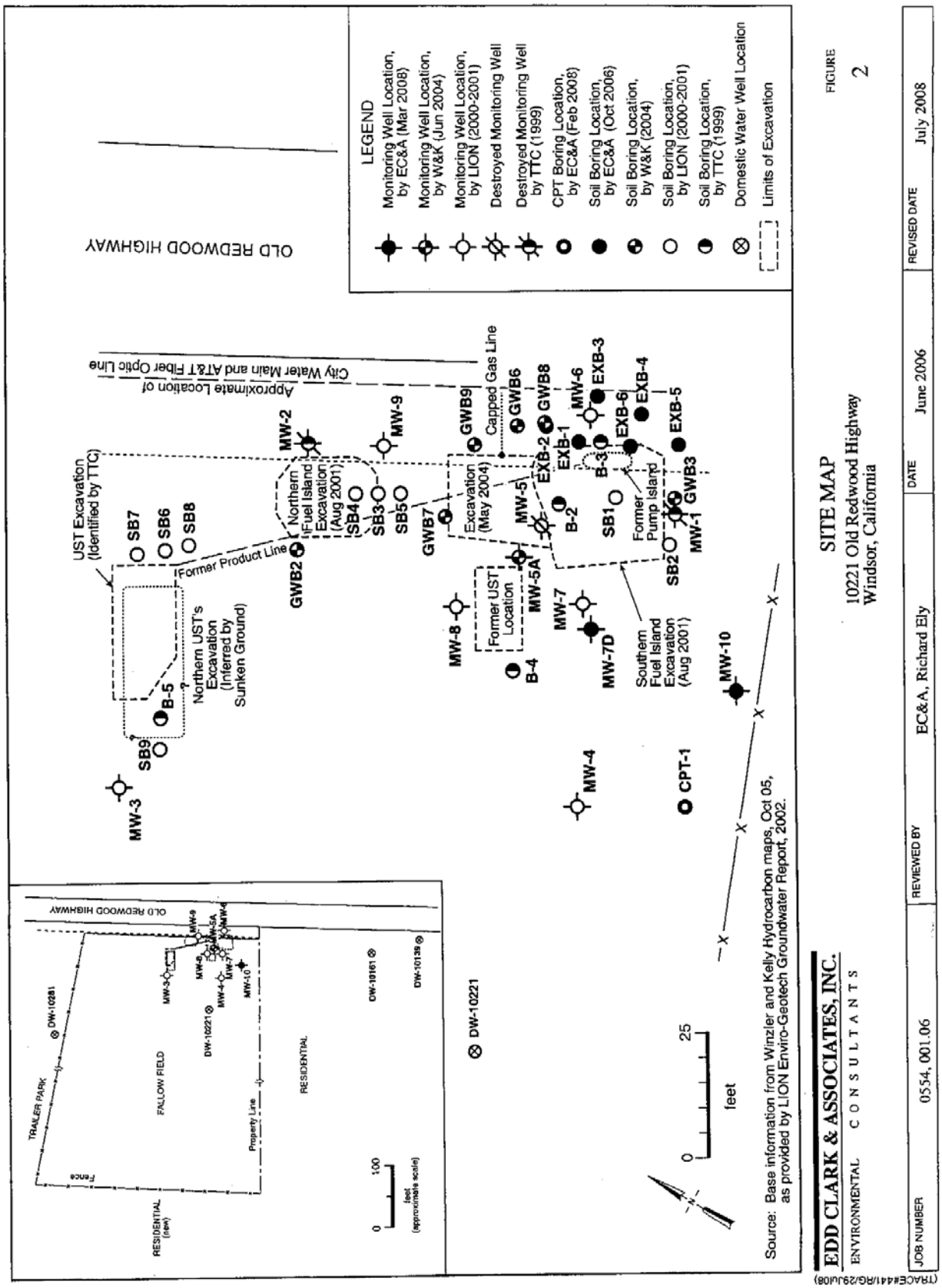


Prepared By: _____ June 6, 2011
Ben Wright Date
Engineering Geologist

Reviewed By: _____ June 6, 2011

George Lockwood, PE#59556 Date
Senior Water Resource Control Engineer




OLD REDWOOD HIGHWAY
LEGEND
Monitoring Well Location, by EC&A (Mar 2008)
Monitoring Well Location, by W&K (Jun 2004)
Monitoring Well Location, by LION (2000-2001)
Destroyed Monitoring Well
Destroyed Monitoring Well by TTC (1999)
CPT Boring Location, by EC&A (Feb 2008)
Soil Boring Location, by EC&A (Oct 2006)
Soil Boring Location, by W&K (2004)
Soil Boring Location, by LION (2000-2001)
Soil Boring Location, by TTC (1999)
Domestic Water Well Location
Limits of Excavation
Approximate Location of City Water Main and AT&T Fiber Optic Line
Capped Gas Line
UST Excavation (Identified by TTC)
Former Product Line
Northern UST's Excavation (Inferred by Sunken Ground)
Northern Fuel Island Excavation (Aug 2001)
Excavation (May 2004)
Former UST Location
Former Pump Island
Southern Fuel Island Excavation (Aug 2001)
MW-2
MW-3
MW-4
MW-5
MW-5A
MW-6
MW-7
MW-7D
MW-8
MW-9
MW-10
SB1
SB2
SB3
SB4
SB5
SB6
SB7
SB8
SB9
B-2
B-3
B-4
B-5
GWB1
GWB2
GWB3
GWB6
GWB7
GWB8
GWB9
EXB-1
EXB-2
EXB-3
EXB-4
EXB-5
EXB-6
CPT-1
DW-10221
DW-10161
DW-10139
DW-10281
TRAILER PARK
FALLOW FIELD
RESIDENTIAL
RESIDENTIAL (new)
Property Line
Fence
feet (approximate scale)
feet
Source: Base information from Winzler and Kelly Hydrocarbon maps, Oct 05, as provided by LION Enviro-Geotech Groundwater Report, 2002.
SITE MAP
10221 Old Redwood Highway
Windsor, California
FIGURE
2
EDD CLARK & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS
JOB NUMBER 0554.001.06
REVIEWED BY EC&A, Richard Ely
DATE June 2006
REVISED DATE July 2008
(TRACE#441/RG/29JUL08)