Jillian Holloway
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September 12, 2014

RECEIVED
By Alameda County Environmental Health at 2:42 pm, Sep 12, 2014

Alameda County Health Care Services Agency
Environmental Health Services
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: **Unocal No. 5484 (351812)**
18950 Lake Chabot Road, Castro Valley, California
ACEH Fuel Leak Case No. RO0000352
GeoTracker Global ID T0600101453

I have reviewed the attached report dated September 12, 2014.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by AECOM, upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13257(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,

Jillian Holloway

Jillian Holloway
Project Manager

Attachment: Focused Site Conceptual Model by AECOM

AECOM
2020 L Street, Suite 400
Sacramento, CA 95811
www.aecom.com

916 414 5800 tel
916 414 5850 fax

September 12, 2014

Keith Nowell
Alameda County Health Care Services Agency
Environmental Health Services
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: **Focused Site Conceptual Model**
Unocal No. 5484 (351812)
18950 Lake Chabot Road, Castro Valley, California
Fuel Leak Case No. RO0000352
Geotracker Global ID # T0600101453

Dear Mr. Nowell,

On behalf of Chevron Environmental Management Company's (EMC's) affiliate, Union Oil Company of California ("Union Oil"), AECOM has prepared this Focused Site Conceptual Model for the Unocal No. 5484 site located at 18950 Lake Chabot Road in Castro Valley, California .

The Focused Site Conceptual Model updates the February 20, 2014 Site Conceptual model in response to the July 25, 2014 email from Alameda County Environmental Health (ACEH) requesting the performance of a Soil, Groundwater, and Soil Gas Investigation.

Remarks/Signatures

The interpretations in the attached documents represent AECOM's professional opinions which are based on currently available information and are arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

If you have any questions regarding this project, please contact James Harms at (916) 361-6412.

Sincerely,

James Harms
Project Manager

Jessica Law, PG No. 8840
Project Geologist
Stamped: 09/12/2014

cc: Jillian Holloway EMC (via electronic copy)
Abdi Fugfugosh and Shukri Noor, property owners (via paper copy)

Attachments
Attachment A Focused Site Conceptual Model

Attachment A

Focused Site Conceptual Model

Attachment A
Focused Site Conceptual Model
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

SCM Element	SCM Sub-Element	Description	Reference	Data Tables/Graphics	Data Gaps	Work to Address Data Gap
		A site conceptual model (SCM) has been developed and was submitted to ACEH on February 20, 2014. This focused SCM updates that SCM with the recent investigations requested by ACEH with the goal of moving the site towards closure.	AECOM, 2014, Site Conceptual Model, Unocal No. 5484 (351812), February 20.		May 30, 2014 email, Technical Comment 1: General Criteria e- It is ACEHs opinion that the site does not meet the LTCP General Criteria e. General Criteria e has not been satisfied until a site is considered closable by ACEH.	9/12/2014 Focused SCM
Sensitive receptors	Surface water and water supply wells	An Alameda County Public Works Agency (ACPW) well search was conducted in July 2014 within a half-mile radius of the site. A Department of Water Resources (DWR) well search was performed in 2006 within a one-mile radius of the site for the sensitive receptor survey (Delta 2006). **Table 1** contains the well search information, the well locations are also shown on **Figure 1.** While the MTBE plume has been delineated to below the ESL by the existing monitoring wells, there is the potential for the plume to pass between downgradient well MW-5 and previously abandoned well MW-4. Therefore, this potential scenario has been considered and the potential maximum plume length for MTBE (which is the site contaminant that typically has the greatest plume lengths) is 1,046 feet according to Low Threat Closure Technical Justification Paper for Groundwater (SWRCB 2012). The nearest surface water or water supply well from the 2006 DWR search and 2014 ACPW search is greater than 1,000 feet beyond the maximum plume boundary (**Figure 1 and Figure 2**). Therefore, further delineation of the plume boundary is not necessary. No additional groundwater monitoring is planned as monitoring has been conducted for nearly 20 years and installing an additional well in the narrow downgradient gap between MW-5 and now abandoned MW-4 is not feasible (**Figure 3**). The closest section of Chabot Creek is over one-mile to the south. There are noted drained or buried sections of Chabot Creek to the east and west of the site within 1,000 feet There is a noted length of greater than 24" culvert or storm drain that is approximately 750 feet downgradient of the site to the southwest, It connects to an engineered channel and then finally to Chabot Creek (2011). The entire length of Chabot Creek that is downgradient of the site is in a culvert. In the unlikely event that groundwater from the site is entering the culvert, the site maximum concentration of benzene and MTBE are below the aquatic receptor San Francisco Bay Region Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels (ESL. The concentration of naphthalene in MW-7 exceeds the aquatic receptor ESL (24 ug/L), however MW-2 and MW-5 are downgradient of the source area (though not directly downgradient of MW-7 at all times) and have always been non-detect for naphthalene.	Delta, 2006. Sensitive Receptor Survey Report, August 22. SWRCB 2012, Technical Justification for Groundwater Media-Specific Criteria, April 24. Creek and Watershed Map of Hayward & San Leandro, 2011	Table 1 - Water Supply Well Search Figure 1 - Receptor Map Figure 2 - Plume Extents Map Figure 3 - Groundwater Elevation Contour Map	May 30, 2014 email, Technical Comment 2: Media Specific Groundwater criteria - Groundwater monitoring well MW-7, located near the southern property boundary, demonstrates the highest contaminant concentrations reported for the existing monitoring well network. Historic analytical data for well MW-7 indicate persistent fluctuations of total petroleum hydrocarbons as gasoline (TPHg) concentrations range from 450 micrograms per liter (ug/L) to 2,800 ug/L, most recently reported at 1,900 ug/L. These concentrations indicate residual source material may reside beneath the station building. Plotting groundwater flow, which has been consistently been to the southwest, through well MW-7 suggests the plume is passing between well MW-5 and previously abandoned well MW-4. ACEH is of the opinion that the contaminant plume has not been defined, there by the Media Specific Groundwater criteria for plume length, distance to the nearest surface water body from the plume boundary and distance to the nearest supply well from the plume boundary are not met. July 21, 21014 Meeting Discussion: ACEH wanted the location of Chabot Creek to be verified. July 25, 2014 ACEH Email: Identification of all sensitive receptors identified within 2,000 feet, including foundation types, wells and surface water bodies	Added results of ACPW well search to Table 1 and to Figures 1 and 2. Researched Chabot Creek location See Figures 2 and 3.
Distribution of Petroleum Hydrocarbons	Soil Vapor	The site is an active gasoline service station and is planned to be for the foreseeable future. The site therefore qualifies for the exemption to the vapor intrusion to indoor air criteria as stipulated in the low threat closure policy. Two soil vapor wells were installed on August 20, 2014 and sampled on August 26, 2014 (AECOM 2014), **Figure 4**. Analytical results for TPHg, BTEX, and MTBE in soil vapor were detected above laboratory reporting limits at the site boundary but at concentrations below the residential screening levels, **Table 2**. Naphthalene was the primary constituent of concern for vapor intrusion based on the concentrations in shallow groundwater, however, naphthalene was not detected in any of the vapor samples. Naphthalene concentrations in groundwater greater than the ESL for groundwater to indoor air criteria of 160 µg/L have not been measured at the site (AECOM 2014). The maximum concentration was 150 µg/L at MW-7 in the sample collected on January 30, 2010. The ESL for groundwater to indoor air criteria is only applicable to sites where the depth to groundwater is 10 feet bgs or deeper therefore a soil vapor investigation to determine the indoor vapor risk to down gradient properties was conducted. Naphthalene was not detected in any of the vapor samples. There was leakage observed in the upgradient vapor sample, SV-1, therefore those results were not considered for this evaluation. However the downgradient sample, SV-2, is valid and is the true indicator for potential off site vapor intrusion risk. For downgradient off site properties, which are primarily residential, the shallow groundwater depth potentially negates the bioattenuation zone. However, the oxygen percentage observed in SV-2 at the edge of the site was 17%, this is well above the 4% level cited in the LTCP scenario 4 which greatly enhances (1000-fold) the subsurfaces ability to attenuate vapors. The soil vapor sample results indicate that there is no vapor intrusion risk to the downgradient residences posed by groundwater migrating from the site (AECOM 2014). Additionally an August 2014 survey of foundation types is summarized in **Table 3** which found that all of the downgradient residences have a crawl space type foundation.	AECOM 2014, Report on Soil, Groundwater, and Soil Gas Investigation, September 12	Figure 4 - Soil Vapor Sample Locations Table 2 -Soil Vapor Analytical Results and Comparison to CHHSLs and ESLs Table 3 - Downgradient Foundation Construction	May 30, 2014 email, Technical Comment 3: Media Specific Vapor Intrusion to Indoor Air - The site is situated in a residential neighborhood. Based on the reported depth to groundwater beneath the site, as shallow as 2.99 feet below the ground surface (bgs). ACEH is of the opinion that the site does meet the bioattenuation zone criteria. It is unclear to ACEH that the waste oil underground storage tank, in the vicinity of MW-7, has been analyzed for the appropriate analysis suite and that MW-7 has most recently been reported to contain 41 µg/L naphthalene, with recent concentrations varying up to 150 µg/L. The San Francisco Bay Region Regional Water Quality Control Board (SFRWQCB) Environmental Screening Levels (ESL) concentration for naphthalene presented in Table E-1 (Groundwater Screening Levels for Evaluation of Potential Vapor Intrusion) is 160 µg/L. Based on our review, it is unclear to ACEH that the Media Specific Vapor Intrusion to Indoor Air criteria has been met.	Investigated downgradient foundation types on 8/26/2014.

Attachment A
Focused Site Conceptual Model
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

SCM Element	SCM Sub-Element	Description	Reference	Data Tables/Graphics	Data Gaps	Work to Address Data Gap
					July 25, 2014 ACEH Email: There is the potential of naphthalene vapor intrusion risk due to shallow groundwater (shallowest reported as less than 3 feet bgs). Due to the uncertainty in depth of the vadose zone, the use of Environmental Screening Levels (ESLs) for groundwater to vapor intrusion are not appropriate (i.e. requires depth to water greater than 10 feet). Therefore, please recover soil gas samples from two on site locations; one near the waste oil tank pit, the suspected source area, and one near the property boundary down gradient of the pit.	Soil Vapor was investigated in August 2014 investigation. No screening level exceedances were found.
	Groundwater	**Chart 1** through **Chart 5** show the statistical trends for various compounds in MW-2 and MW-7. Chart 5 demonstrates that concentrations at MW-7 have been stable over the last nine years, even though historical groundwater trends for naphthalene in MW-7 show variability.. The linear trends for all data MW-7 in **Chart 6** still shows a slight decrease. AECOM analyzed the water level fluctuation and the effect that the shallow bedrock has on those fluctuations. There were no clear cut trends to be found between the well construction (screen intervals) and bedrock interface without conducting a much more involved study. The soil vapor investigation eliminated the concern that may be related to falsely shallow depths to water observed in monitoring wells due to confined conditions within the screened zones. Groundwater was not encountered in either of the soil vapor monitoring wells installed in August 2014. The depth to groundwater at MW-7, near SV-1, was 9.02 feet below the top of casing (bTOC), approximately 9.5 feet bgs. The depth to water in MW-2, near SV-2, was 6.63 feet bTOC, approximately 7 feet bgs. The soil vapor data from SV-2 shows that even with water within 2 feet of the vapor sampling depth there are no significant vapors to pose a risk to indoor air downgradient of the site. During the foundation survey conducted by AECOM it was noted that there is a hillside that rises above the elevation of the site to the southwest. The downgradient potential plume extent was adjusted to account for the hillside's effect on groundwater flow which pushes the direction more to the south as groundwater travels downgradient, **Figure 1** and **Figure 2**.		Charts 1 through 5 - Mann Kendall Statistical Analysis of Groundwater in select wells. Chart 6 - Historical Groundwater Trends for MW-7 Figure 1 - Receptor Map Figure 2 - Plume Extents Map	July 25, 2014 ACEH Email: Expanded trend analysis for naphthalene in groundwater monitoring well MW-7 to include all repeated spikes in concentration over time, ranging to 130 micrograms per liter (µg/L) on March 3, 1994, 120 µg/L on March 1, 1995, and 150 µg/L on January 13, 2010. Please include all historical naphthalene concentration data for the concentration trend graph for groundwater monitoring well MW-7. July 25, 2014 ACEH Email: Evaluation of depth to water in wells and correlation to vadose zone thickness and the effect of shallow bedrock beneath the site on the depth to groundwater. July 25, 2014 ACEH Email: Resume analyzing for diesel in well MW-7 for future groundwater monitoring events	Chart 6. Researched bedrock depth versus screen intervals. Further groundwater monitoring is not necessary if no wells or surface water bodies are beyond the maximum plume extent from the LTCP Justification Paper plus 1,000 feet.
	Soil	The low threat closure policy specifies the analyses required to meet the media specific direct contact and outdoor air exposure criteria which include benzene, ethylbenzene, naphthalene, and PAHs. Naphthalene and PAH analysis had not been performed on soil samples collected from the site prior to August 2014. Concentrations of benzene and ethylbenzene in all samples collected after excavation from 0 to 5 feet are below the residential criteria in Table 1 of the LTCP for direct contact. Soil concentrations form 5 to 10 feet are below the residential criteria in Table 1 of the LTCP except for ethylbenzene in boring B-7 at 10 feet in November 1989 (AECOM 2014a), see **Table 4**. The soil criteria from 5-10 feet screen for outdoor air exposure which is limited by asphalt covering the surface of the site and minimal compared to the vapors created by the site operation as a fueling station. The potential source of PAHs and naphthalene at the site is the former waste oil tank. The tank base samples were collected at 8 feet bgs therefore the presence of PAHs and naphthalene from 0 to 5 feet bgs is unlikely. MW-7 is the closest monitoring well to the former waste oil tank and the shallowest observed groundwater was 6.27 feet. PAHs and naphthalene from 5 to 10 feet are only a concern for utility worker exposure. Any subsurface work in the vicinity of the former waste oil tank would be performed by workers trained to deal with potentially impacted soil due to the site being an active service station. Two shallow soil samples, one directly down gradient of the former waste oil tank, were collected on August 20, 2014. No concentrations of TPHg, BTEX, MTBE, or naphthalene were detected in the soil samples. TPHd and TPHmo were detected below the screening levels. No PAHs were detected in SV-1. PAHs were detected in SV-2, were below the 2012 Low Threat Closure Policy (LTCP) screening levels with a calculated toxicity equivalent of benzo(a)pyrene of 0.008792 mg/kg. The soil sample chemical analytical results are presented in **Table 5** and **Table 6**.	AECOM, 2014a, Case Closure Summary, Unocal No. 5484 (351812), February 20. AECOM 2014b, Report on Soil, Groundwater, and Soil Gas Investigation, September 12.	Table 4 - Soil Sample Concentrations by Depth Table 5 - Soil Chemical Analytical Results Table 6 - Soil Chemical Analytical Results - PAHs	May 30, 2014 email, Technical Comment 4: Media Specific Direct Contact and Outdoor Air Exposure - It is unclear to ACEH that the waste oil underground storage tank has been analyzed for the appropriate analyses suit as limited sampling for chemicals listed in Table 1 of the LTCP at the appropriate depths has been performed. July 25, 2014 ACEH Email: Naphthalene was not an analyte in the analysis suite for the former waste oil tank. Groundwater concentration of Naphthalene has been observed in well MW-7 indicating the former waste oil tank it is the possible source. The site has potential for vapor intrusion issues due to the shallow groundwater levels (shallowest reported as less than 3 feet below grade surface)	Tabulated the concentrations in the 0 to 5-foot bgs and 5 to10-foot bgs zones for chemicals listed in Table 1 of the LTCP. Soil and Soil Vapor were investigated in August 2014 investigation. No screening level exceedances were found.

Tables

Table 1
Water Supply Well Search
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

Well Owner	Date Installed	Total Depth (feet)	Use	Distance from Site (ft)	Direction from site	Source	Comment
Wilbert Martin	3/1977	50	Irrigation	3200	northeast	2006 DWR and 2014 ACPW	
Lorri Timond	not specified	unknown	not specified	4000	southeast	2006 DWR	
Eden Township Hospital	not specified	unknown	not specified	3900	south	2006 DWR	
Foothill Baptist Church	not specified	unknown	not specified	2700	south-southeast	2006 DWR	
C.H. Gossett	6/29/1954	70	Domestic	7,900	east	2014 ACPW	
Rees	8/1964	76	Domestic	6,000	south-southeast	2014 ACPW	
Bill Jensen	8/1/1980	220	Domestic	6,000	south-southeast	2014 ACPW	Deepening of well installed in 1964

Notes:
Well address not included due to privacy concerns.
DWR - Department of Water Resources
ACPW = Alameda County Public Works Department

Table 2
Soil Vapor Analytical Results and Comparison to CHHSLs and ESLs
RO352, Unocal No. 5484 (351812)
18950 Lake Chabot Road
Castro Valley, California

SAMPLE ID	DATE	DEPTH (feet)	TPH-g ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	MTBE ($\mu g/m^3$)	Total Xylenes ($\mu g/m^3$)	Naphthalene ($\mu g/m^3$)
Screening Levels									
Soil Vapor CHHSLs (a)									
future commercial/industrial (AF=0.0005)			*NA*	*280*	*890,000*	*3,600*	*29,000*	*2,100,000*	*310*
future residential (AF=0.001)			*NA*	*85*	*320,000*	*1,100*	*8,600*	*740,000*	*93*
Soil Vapor ESLs (b)									
Commercial/industrial Default AF=0.001			*2,496,600*	*423*	*1,314,000*	*4,906*	*47,169*	*438,000*	*361*
Future commercial/industrial (adjusted; AF=0.0005)(c)			*4,993,200*	*846*	*2,628,000*	*9,811*	*94,338*	*876,000*	*721*
Residential Default AF=0.002			*297,214*	*42*	*156,429*	*487*	*4,679*	*52,143*	*36*
Future residential (adjusted; AF=0.001)(c)			*594,429*	*84*	*312,857*	*973*	*9,359*	*104,286*	*72*
LTCP Soil Gas Criteria - No Bioattentuation Zone									
Residential			*NA*	*85*	*NA*	*1,100*	*NA*	*NA*	*93*
Commercial			*NA*	*280*	*NA*	*3,600*	*NA*	*NA*	*310*
LTCP Soil Gas Criteria - With Bioattentuation Zone									
Residential			*NA*	*85,000*	*NA*	*1,100,000*	*NA*	*NA*	*93,000*
Commercial			*NA*	*280,000*	*NA*	*3,600,000*	*NA*	*NA*	*310,000*
Soil Vapor Results									
SV-1-V-N-5-20140826	8/26/2014	5	**42,000**	**5.9**	**19**	**5.6**	<4.2	24.5	**<24**
SV-1-V-Y-5-20140826	8/26/2014	5	**42,000**	**6.1**	**22**	**6.7**	<4.2	**27.8**	<24
SV-2-V-N-5-20140826	8/26/2014	5	**1,500**	**11**	**130**	**28**	**6.4**	**128**	<25
EB-V-N-20140827	8/27/2014	--	<230	<3.6	<4.2	<4.9	<4.0	<9.8	**<23**

Notes:

bgs = Below ground surface

TPH-GRO = Total Petroleum Hydrocarbons as Gasoline Range Organics

B = Benzene

T = Toluene

E = Ethylbenzene

X = Total xylenes

MTBE = Methyl t-butyl ether.

$\mu g/m^3$ = Micrograms per cubic meter

ND<# = Analyte was not detected at or above indicated laboratory method detection limit

J = Laboratory estimated value

Bold values indicate concentration is above the laboratory method detection limit

ID = Identification

(a) OEHHA Soil Gas Screening Numbers. Updated 9/23/10. Table 2. Values for buildings constructed with engineered fill below sub-slab gravel (i.e., representative of a future scenario and based on soil vapor to indoor air AFs of approximately 0.001 (residential) and 0.0005 (commercial/industrial), consistent with CalEPA (2011) Vapor Intrusion Guidance.

(b) SFRWQCB, 2013 = San Franciso Bay Regional Water Quality Control Board, December 2013 update to Environmental Screening Levels. Summary Table E.

(c) Values adjusted based on CalEPA's (2011) recommended attenuation factors for a future use scenario.

Table 3
Downgradient Foundation Construction
RO352, Unocal No.5484 (351812)
18950 Lake Chabot Road, Castro Valley, CA

	Address	Foundation Type (Observed From Street)
Lake Chabot Road		
	18935 to 18951	Slab on Grade
	18979 to 18981	Crawl Space
	18983	Crawl Space
	19051	Crawl Space
Keith Avenue		
	3278	Crawl Space
	3270	Crawl Space
	3262	Crawl Space
	3252	Crawl Space
	3246	Crawl Space
	3230	Crawl Space
	3222	Crawl Space
	3214	Crawl Space
	3206	Slab garage, first floor living space
	3213	First floor slab
	3215	Slab garage, first floor living space
	3227/3229	1st floor slab
	3237	Crawl Space
	3245	Crawl Space
	3253	Crawl Space
	3261	Crawl Space
	3269	Crawl Space
	3277	Crawl Space
Huber Drive		
	18915	Crawl Space
	18918/18910	Crawl Space
	18909	Crawl Space
Heidi Street		
	18898	First floor slab

Research Notes:
Foundation Type by site walk on 8/26/2014 by AECOM.

Table 4
Soil Sample Concentrations by Depth
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

Sample Location	Date	Sample Area	Sample Depth (fbg)	Benzene (ppm)	Ethyl-benzene (ppm)
0-5 Feet Below Ground Surface					
Applied GeoSystems, 1988, Report of Subsurface Environmental Investigation, April 30.					
S-5-B2 (MW-2)	7/12-13/1988	MW-2	5	0.16	0.66
S-5-B3 (MW-3)	7/12-13/1988	MW-3	5	0.83	3.81
Applied GeoSystems 1990, Report on Soil Excavation, Aeration, and Sampling, March 30.					
S-5.0-B7	11/17-18/1989	Southeast of Waste Oil UST	5	<0.050	<0.050
S-5.0-B8	11/17-18/1989	South of Waste Oil UST	5	--	--
Kaprealian Engineering, Inc. (KEI), Results of Soil and Groundwater Investigation, June 27, 1991					
EB1 (3)	5/7/1991	East Along Sidewalk	3	ND	0.05
MW7 (4.5)*	5/7/1991	MW-7	4.5	ND	ND
Delta Consultants, Inc., 2005, Baseline Assessment Report, March 3, 2005.					
B-1	1/13/2005	South of Waste Oil UST	1.5	<0.005	<0.005
5-10 Feet Below Ground Surface					
Applied GeoSystems, 1988, Report of Subsurface Environmental Investigation, April 30.					
S-5-B2 (MW-2)	7/12-13/1988	MW-2	5	0.16	0.66
S-5-B3 (MW-3)	7/12-13/1988	MW-3	5	0.83	3.81
Applied GeoSystems 1990, Report on Soil Excavation, Aeration, and Sampling, March 30.					
S-8.5-B4 (MW-4)	5/23-24/1989	MW-4	8.5	<0.050	<0.050
S-8.5-B5 (MW-5)	5/23-24/1989	MW-5	8.5	<0.050	<0.050
S-8.5-B6 (MW-6)	5/23-24/1989	MW-6	8	<0.050	<0.050
Applied GeoSystems 1990, Report on Soil Excavation, Aeration, and Sampling, March 30.					
S-6-T2S	6/13/1989	Gasolene UST excavation	6	4.2	39
S-0728-1A	7/28/1989		+	<0.050	<0.050
S-15-PIT	8/1/1989		15	<0.050	<0.050
S-0803-1B	8/3/1989		+	<0.050	<0.050
S-0803-1W	8/3/1989		++	<0.050	<0.050
S-0711-WT1	7/11/1989	Waste Oil UST Excavation	8	<1.0	15
S-0711-WT2	7/11/1989		8	<0.5	2.1
Applied GeoSystems 1990, Report on Soil Excavation, Aeration, and Sampling, March 30.					
S-5.0-B7	11/17-18/1989	Southeast of Waste Oil UST	5	<0.050	<0.050
S-10.0-B7	11/17-18/1989		10	0.062	160
S-5.0-B8	11/17-18/1989	South of Waste Oil UST	5	--	--
S-9.5-B8	11/17-18/1989		9.5	0.34	4.1
S-10.0-B8	11/17-18/1989		10	--	--
S-10.0-B9	11/17-18/1989	South of Gasoline USTs	10	1.1	2
S-10.0-B10	11/17-18/1989	South of B-9	10	0.27	5.6
S-10.0-B11	11/17-18/1989	West of Waste Oil UST	10	0.074	1.2
Kaprealian Engineering, Inc. (KEI), Results of Soil and Groundwater Investigation, June 27, 1991					
EB1 (6.5)	5/7/1991	MW-7	6.5	0.16	0.73
MW7 (4.5)*	5/7/1991		4.5	ND	ND
MW7 (10)*	5/7/1991		10	0.048	0.5
Delta Consultants, Inc., 2005, Baseline Assessment Report, March 3, 2005.					

Table 4
Soil Sample Concentrations by Depth
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

B-2	1/13/2005	Southeast of	6.5	<0.024	0.95
B-2	1/13/2005	Gasoline USTs	7	<0.005	<0.005
Delta Consultants, Inc., 2009, Well Replacement Report, April 2, 2009.					
MW-4A@9	2/18/2009	MW-4A	9	<0.005	<0.005
MW-4B@10	2/18/2009	MW-4B	10	<0.005	<0.005

Abbreviations and Notes:

TOG = Total oil and grease by Method SM 503
TPHd = Total petroleum hydrocarbons as diesel by EPA Method 8015 TPHg = Total petroleum hydrocarbons as gasoline by EPA Method 8015 Benzene, toluene ethylbenzene and total xylenes by EPA Method 8020
MTBE = Methyl tert butyl ether by EPA Method 8020
HVOC = Halogenated Volatile Organic Compounds by EPA Method 8010 fbg = Feet below grade
mg/kg = Milligrams per kilogram
ppm = Parts per million
ND = Not detected at or above laboratory detection limits
<x.xx = Not detected at or above laboratory detection limit indicated
* = TOG and all EPA Method 8010 constinuents were nondetectable.
? = Approximate depth
1234 = Sample point overexcavated
+ = Floor excavation
++ = Sidewall of excavation
shaded = exceeds LTCP Table 1

Table 5
Soil Chemical Analytical Results
RO352, Unocal No. 5484 (351812)
18950 Lake Chabot Road
Castro Valley, California

Sample ID	Date	Benzene	Ethylbenzene	Toluene	Xylenes (Total)	MTBE	TPH-Gasoline (C6-C12)	TPH-Diesel (C6-C12)	TPH-Motor Oil (C6-C12)	Napthalene	PAH[1]
0 to 5 feet bgs											
LTCP Residential		**1.9**	**21**	**--**	**--**	**--**	**--**	**--**	**--**	**9.7**	**0.063**
LTCP Commercial		**8.2**	**89**	**--**	**--**	**--**	**--**	**--**	**--**	**45**	**0.68**
LTCP Utility Worker		**14**	**314**	**--**	**--**	**--**	**--**	**--**	**--**	**219**	**4.5**
Shallow Soil ESL		**0.044**	**3.3**	**2.9**	**2.3**	**0.023**	**100**	**100**	**100**	**1.2**	--
SV-1-S-N-5-20140820	8/20/2014	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<4.0	<2.0	**4.7**	<0.0030	<0.0030
SV-2-S-N-5-20140820	8/20/2014	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<4.0	<2.0	**4.7**	<0.0030	**0.008792**
5 to 10 feet bgs											
LTCP Residential		2.8	32	**--**	**--**	**--**	**--**	**--**	**--**	**9.7**	**NA**
LTCP Commercial		12	134	**--**	**--**	**--**	**--**	**--**	**--**	**45**	**NA**
LTCP Utility Worker		**14**	**314**	**--**	**--**	**--**	**--**	**--**	**--**	**219**	**4.5**
Soil ESL		**0.044**	**3.3**	**2.9**	**2.3**	**0.023**	**100**	**100**	**100**	**1.2**	--
SV-1-S-N-6.5-20140820	8/20/2014	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<4.0	**2.3**	**13**	<0.0030	<0.0030

Notes:

Analyses were conducted by USEPA methods 8260 and 8015B modified.

Non-detected analytes are reported as less than (<) practical quantitation limits.

Bold = Analyte detected above practical quantitation limits

All results are in milligrams per kilogram (mg/kg)

[1]Calculated Toxcity Equivalent of benzo(a)pyrene, see Table 2 for calculation.

ESL - Environmental Screening Levels, California Regional Water Quality Control Board, San Francisco Bay Region, February 2013 update

NA = Not Applicable

ND = Not Detected

MTBE = Methyl t-butyl ether.

-- = none specified

Table 6
Soil Chemical Analytical Results - PAHs
RO352, Unocal No. 5484 (351812)
18950 Lake Chabot Road
Castro Valley, California

Sample ID	SV-1-S-N-5-20140820	SV-1-S-N-6.5-20140820	SV-2-S-N-5-20140820	PEF
Benzo(a)pyrene	<0.0030	**0.0062**	<0.0030	*1*
Benzo(a)anthracene	<0.0030	**0.0072**	<0.0030	*0.1*
Benzo(b)fluoranthene	<0.0030	**0.0081**	<0.0030	*0.1*
Benzo(k)fluoranthene	<0.0030	**0.0033**	<0.0030	*0.1*
Chrysene	<0.0030	**0.0072**	<0.0030	*0.01*
Dibenz(a,h)anthracene	<0.0030	<0.0030	<0.0030	*0.34*
Indeno(1,2,3-cd)pyrene	<0.0030	<0.0030	<0.0030	*0.1*
BaPe	<0.0030	**0.008792**	<0.0030	

Notes:

Analyses were conducted by USEPA methods 82670-SIM

Non-detected analytes are reported as less than (<) practical quantitation limits.

Bold = Analyte detected above practical quantitation limits

All results are in milligrams per kilogram (mg/kg)

BaPe = Toxicity equivalent for benzo(a)pyrene calculated as the sum of the 7 carcinogenic PAHs, factors taken from the 3-15-2012 Technical Justification for Soil Screening Levels for Direct Contact and Outdoor Air Exposure Pathways.

PEF = OEHHA Potency Equivalent Factor for carcinogenic PAHs.

PAHs = Poly-aromatic Hydrocarbons.

Figures

Legend

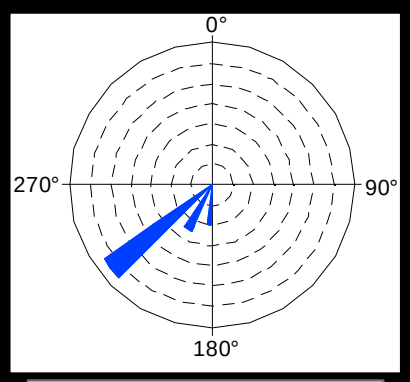
- Abandoned Monitoring Well
- Active Monitoring Well
- Supply Well, 2006 DWR Search
- Supply Well 2014 ACPW Search
- Maximum Plume plus 1,000 foot Buffer
- Maxium MTBE Plume Extent
- Source Area

Sensitive Receptors

- Community Center
- Church
- School

Surface Water

- Creeks, Buried or Drained
- Underground Culverts and Storm Drains



Historical Groundwater Flow Direction 4Q90 to 1Q13

2,000 Feet

Central Chinese Christian Church

The Church of Jesus Christ Latter-Day Saints

1,000 Feet

Almond Reservoir 3,080 Feet

Site Location

Casto Valley Community Center

Chabot Elementary School

Castro Valley Church of the Nazarene

East Bay Chinese Church

Map Source: ESRI Data Resource Center 2013.

AECOM
2020 L Street, Suite 400
Sacramento, CA 958211
916.414.5800

N

0 0.125 0.25 Miles

Figure 1: Receptor Map

Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

Path: P:\ENV\01231-Chevron\76Products_transfer_sites\351812_5484_Castro Valley\7.0 Deliverables\7.2 CADD\GIS\Projects\FSCM\Figure 1_Receptor_Map_351812.mxd

Legend

- Abandoned Monitoring Well
- Active Monitoring Well
- Maximum Plume plus 1,000 foot Buffer
- Maxium MTBE Plume Extent
- Source Area

Sensitive Receptors

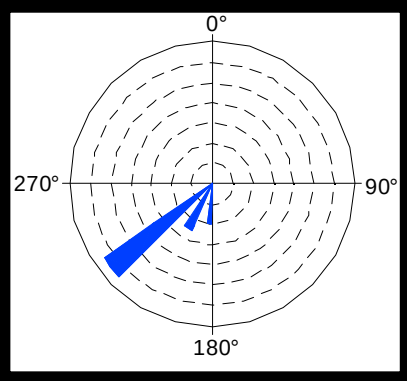
- Community Center
- Church
- School

Surface Water

- Creeks, Buried or Drained
- Underground Culverts and Storm Drains

1,000 Feet

Almond Reservoir 3,080 Feet



Historical Groundwater Flow Direction 4Q90 to 1Q13

Site Location

MW-3
MW-6
MW-1
MW-2
MW-4B
MW-4A
MW-7
MW-4
MW-5

Area of Potential MTBE Plume Migration from LTC Justification Paper and Historical Groundwater Flow Direction

Hillside: Elevation Increases to Above the Site Elevation

1,000 Foot Buffer Beyond Maximum MTBE Plume

2,000 Feet

Map Source: ESRI Data Resource Center 2013.

AECOM
2020 L Street, Suite 400
Sacramento, CA 958211
916.414.5800

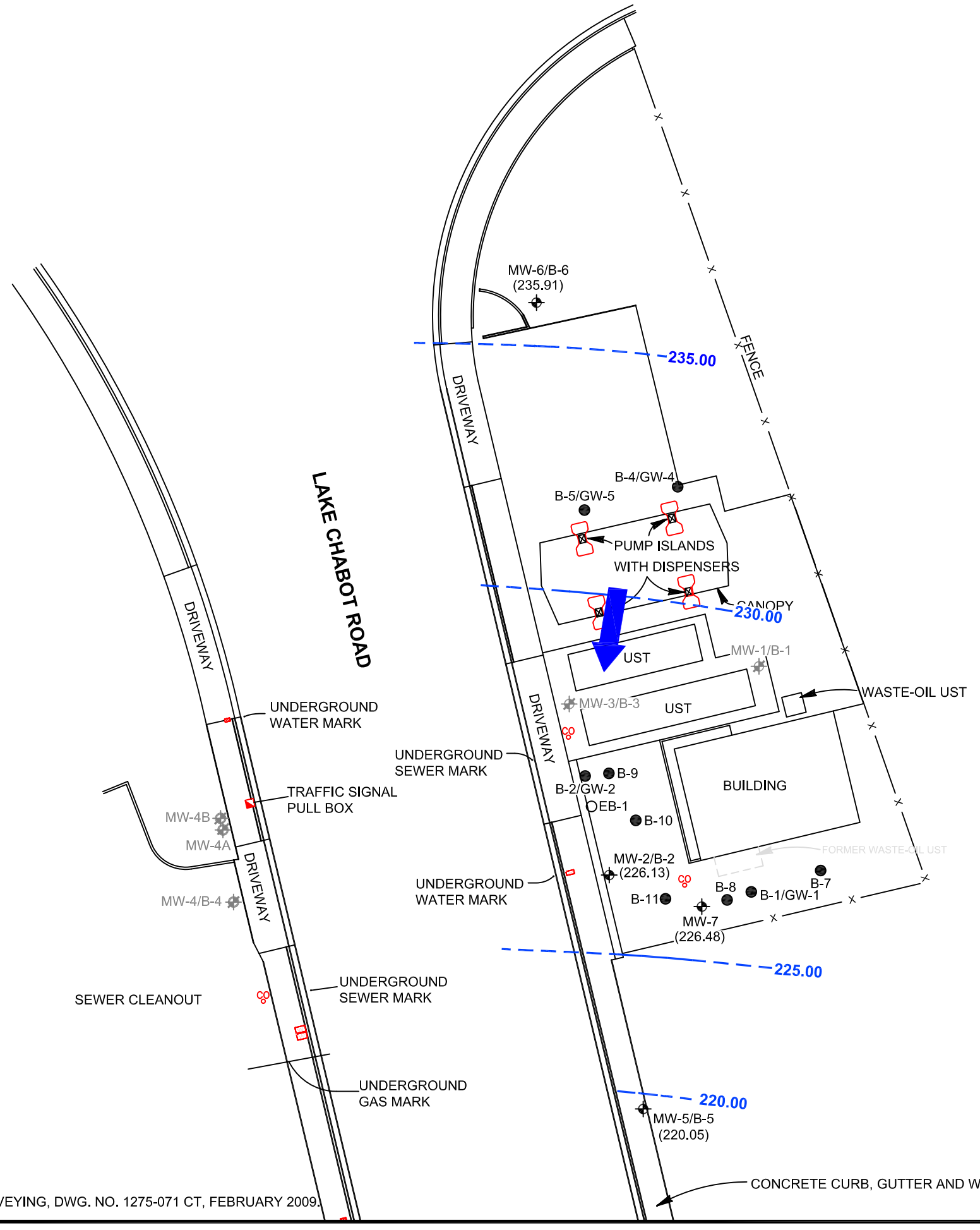
N

0 300 600 Feet

Figure 2: Plume Extent Map

Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

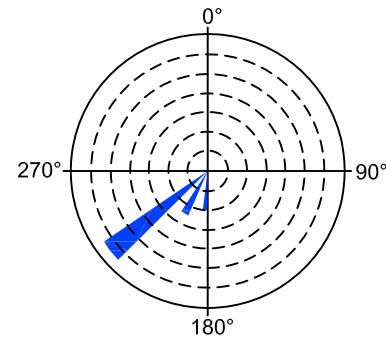
Path: P:\ENV\01231-Chevron\76Products_transfer_sites\351812_5484_Castro Valley\7.0 Deliverables\7.2 CADD\GIS\Projects\FSCM\Figure2_Plume_extents_351812_.mxd



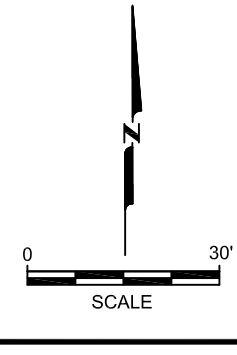
SOURCE: MORROW SURVEYING, DWG. NO. 1275-071 CT, FEBRUARY 2009.

Legend

- Monitoring Well
- Destroyed Monitoring Well
- Soil Boring
- UST — Underground Storage Tank
- (#) — Groundwater Elevation in Feet Above Mean Sea Level
- 230.00 — Groundwater Contour Line in Feet Above Mean Sea Level (Dashed Where Inferred)
- Groundwater Flow Direction
- Hydraulic Gradient = 0.15 Feet per Foot



HISTORICAL GROUNDWATER
FLOW DIRECTION
4Q90 TO 1Q13



REVISIONS			
NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
TQ	TQ	JH	JH

AECOM
AECOM TECHNICAL SERVICES
10461 OLD PLACERVILLE ROAD, SUITE 170
SACRAMENTO, CALIFORNIA 95827
PHONE: (916) 361-6400
FAX: (916) 361-6401
WEB: HTTP://WWW.AECOM.COM

Groundwater Elevation Contour Map

Unocal Service Station #5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

PROJECT NUMBER:	DATE:	SCALE:
60284081	2/12/2013	1" = 30'

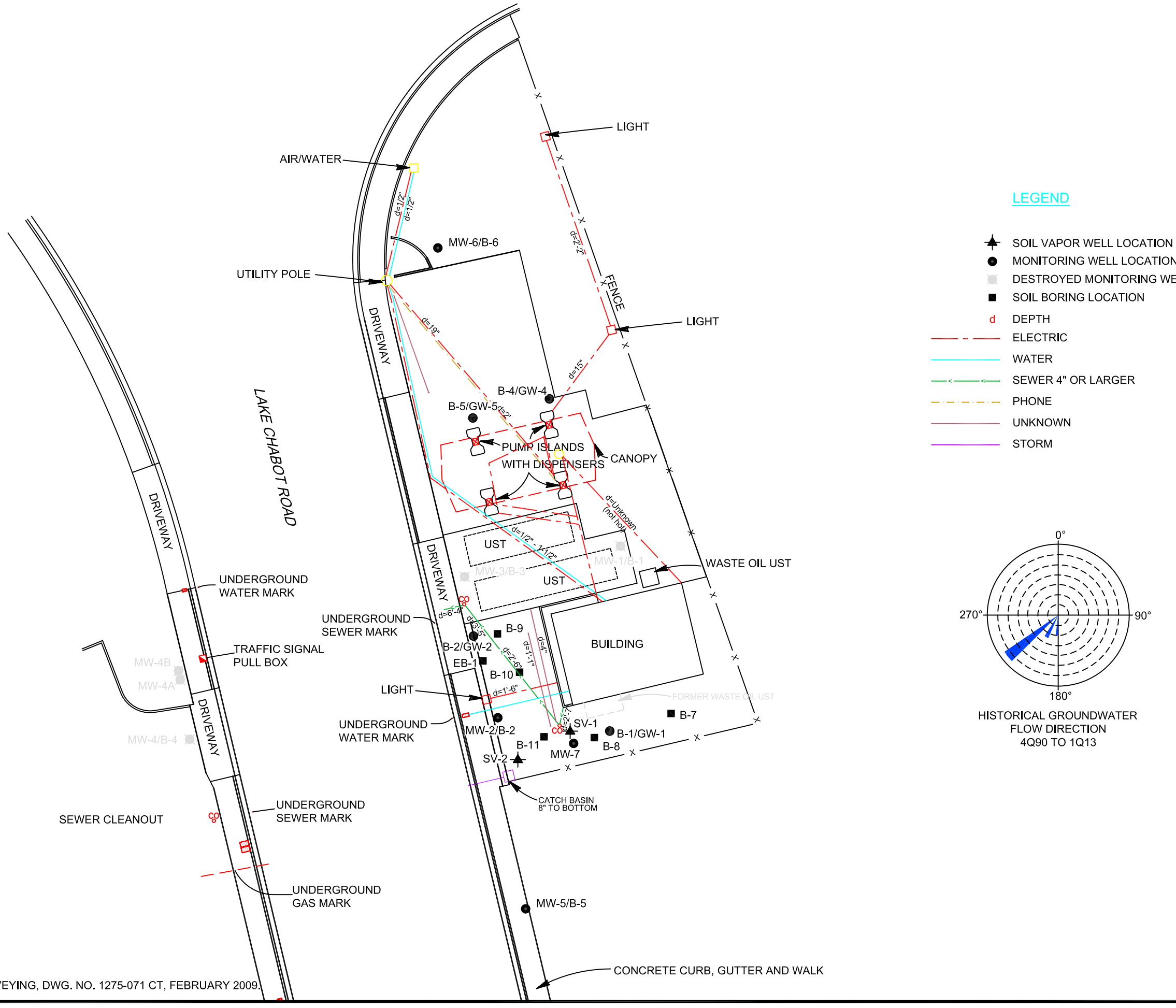
FIGURE NUMBER:

3

SHEET NUMBER:

1 of 1

P:\ENV\01231-Chevron\76Products_transfer_sites\351812_5484_Castro Valley\7.0 Deliverables\7.2_CADD\CSM\Fig 2 - GW Elevation.dwg Jul 21, 2014 - 4:46pm HarmsJ



SOURCE: MORROW SURVEYING, DWG. NO. 1275-071 CT, FEBRUARY 2009.

LEGEND

- SOIL VAPOR WELL LOCATION
- MONITORING WELL LOCATION
- DESTROYED MONITORING WELL LOCATION
- SOIL BORING LOCATION
- d DEPTH
- ELECTRIC
- WATER
- SEWER 4" OR LARGER
- PHONE
- UNKNOWN
- STORM

HISTORICAL GROUNDWATER
FLOW DIRECTION
4Q90 TO 1Q13

N

0 30'

SCALE

REVISIONS			
NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
	JH	JL	JH

AECOM

AECOM TECHNICAL SERVICES
2020 L STREET, SUITE 170
SACRAMENTO, CALIFORNIA 95811
PHONE: (916) 414-5800
FAX: (916) 414-5850
WEB: HTTP://WWW.AECOM.COM

Soil Vapor Sample Locations
Unocal No. 5484 (351812), RO352
18950 Lake Chabot Road
Castro Valley, California

SCALE:	DATE:	PROJECT NUMBER:
1" = 30'	09/08/2014	60267030

FIGURE NUMBER:

4

SHEET NUMBER:

1 of 1

P:\ENV\01231-Chevron\76Products_transfer_sites\351812_5484_Castro Valley\7.0 Deliverables\7.2 CADD\CSM\SCM Update\Figure 4_Site_Plan_Utilities_351812.dwg Sep 09, 2014 - 7:57pm harmsj

Charts

Chart 1: Mann-Kendall Statistical Method Worksheet

Site-- RO 352, Unocal #5484
Compound-- TPHg
Well-- MW-7

Input data from four to ten sampling events in Row 10.

Date:	03/26/04	03/17/05	03/31/06	02/16/07	01/21/08	02/25/09	01/13/10	03/30/11	03/30/12	**03/08/13**	**Events**
Concentration (ug/L):	2800	2700	450	1600	1,300	1,000	1,800	680	1900	1900	10
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	-1	-1	-1	-1	-1	-1	-1	-1	-8
Compared to Event 3	*****	*****	*****	1	1	1	1	1	1	1	7
Compared to Event 4	*****	*****	*****	*****	-1	-1	1	-1	1	1	
Compared to Event 5	*****	*****	*****	*****	*****	-1	1	-1	1	1	1
Compared to Event 6	*****	*****	*****	*****	*****	*****	1	-1	1	1	2
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	1	1	0
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	1	2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	0	

Mann-Kendall Statistic 'S' = -5

Statistical Confidence Level

>90% Confidence

I S I ≥ 15

Result: No Trend

>95% Confidence

I S I ≥ 20

Result: No Trend

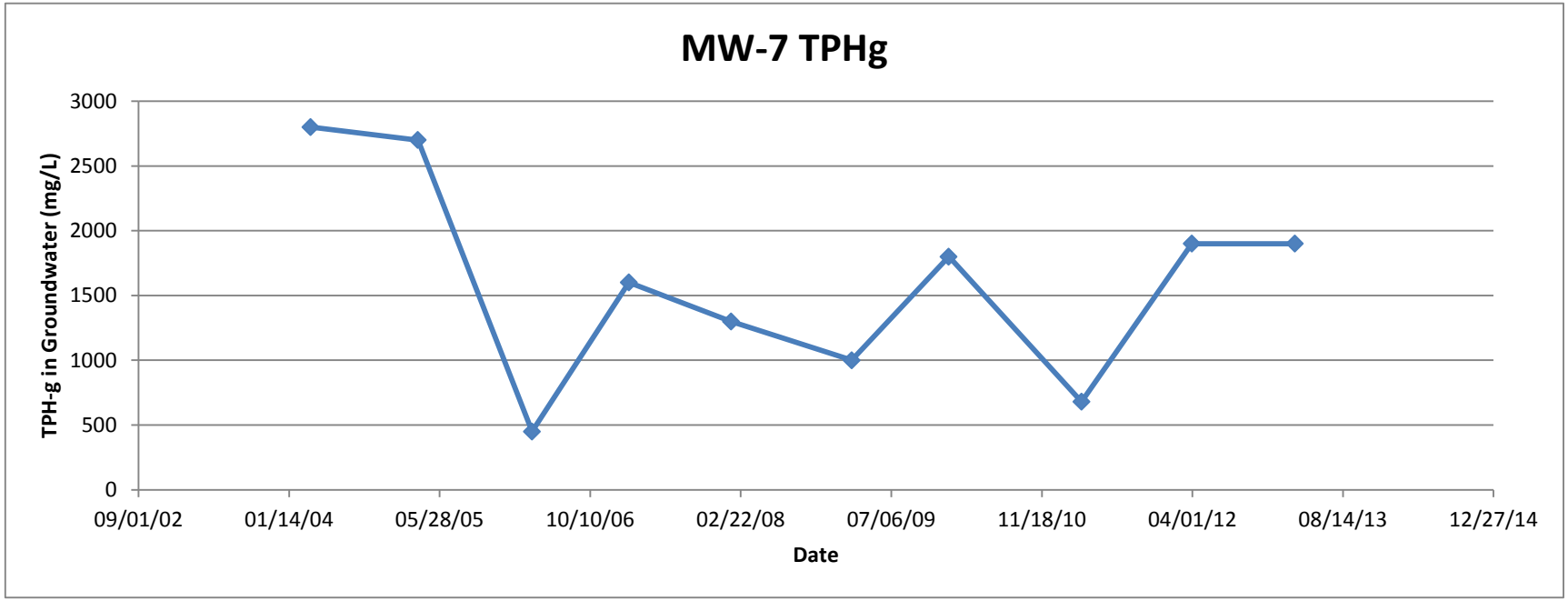

MW-7 TPHg
TPH-g in Groundwater (mg/L)
3000
2500
2000
1500
1000
500
0
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
Date

Chart 2: Mann-Kendall Statistical Method Worksheet

Site-- RO 352, Unocal #5484
Compound-- MTBE 8021
Well-- MW-2

Input data from four to ten sampling events in Row 10.

Date:	12/05/95	02/25/09	01/13/10	03/30/11	03/30/12	03/08/13					**Events**
Concentration (ug/L):	390	220	260	46	17	2.7					6
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1					-5
Compared to Event 2	*****	*****	1	-1	-1	-1					-2
Compared to Event 3	*****	*****	*****	-1	-1	-1					-3
Compared to Event 4	*****	*****	*****	*****	-1	-1					-2
Compared to Event 5	*****	*****	*****	*****	*****	-1					-1
Compared to Event 6	*****	*****	*****	*****	*****	*****					
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****				0
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****			
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -13

Statistical Confidence Level

>90% Confidence		**>95% Confidence**	
I S I ≥	8	**I S I ≥**	10
Result:	Decreasing Trend	**Result:**	Decreasing Trend

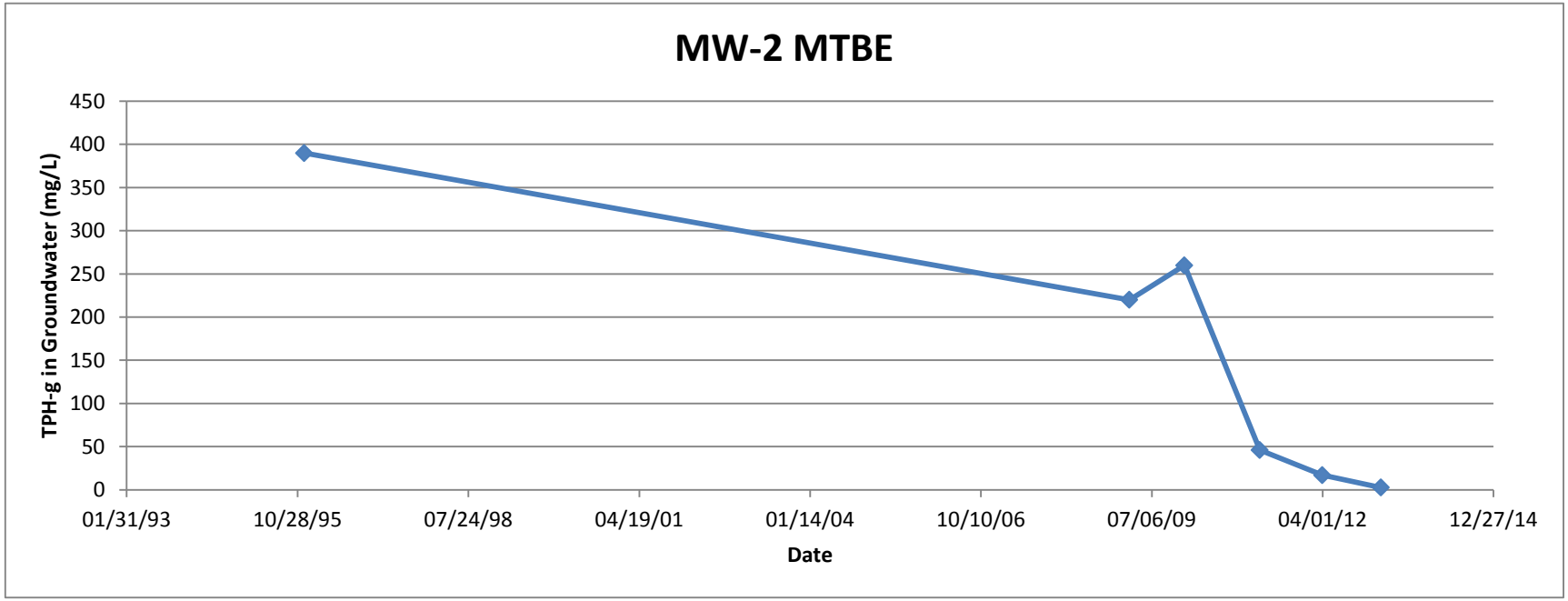

MW-2 MTBE
TPH-g in Groundwater (mg/L)
450
400
350
300
250
200
150
100
50
0
01/31/93
10/28/95
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
Date

Chart 3: Mann-Kendall Statistical Method Worksheet

Site-- RO 352, Unocal #5484
Compound-- MTBE 8021
Well-- MW-7

Input data from four to ten sampling events in Row 10.

Date:	03/26/04	03/17/05	02/16/07	01/21/08	02/25/09	01/13/10	03/30/11	03/30/12	03/08/13		**Events**
Concentration (ug/L):	1200	940	350	250	130	240	44	79	42		9
	--	--	--	--	--	--	--	--	--	--	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1		-8
Compared to Event 2	*****	*****	-1	-1	-1	-1	-1	-1	-1		-7
Compared to Event 3	*****	*****	*****	-1	-1	-1	-1	-1	-1		-6
Compared to Event 4	*****	*****	*****	*****	-1	-1	-1	-1	-1		-5
Compared to Event 5	*****	*****	*****	*****	*****	1	-1	-1	-1		-2
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1		-3
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	1	-1		0
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	-1		-1
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = -32

Statistical Confidence Level

>90% Confidence

I S I ≥ 13

Result: Decreasing Trend

>95% Confidence

I S I ≥ 17

Result: Decreasing Trend

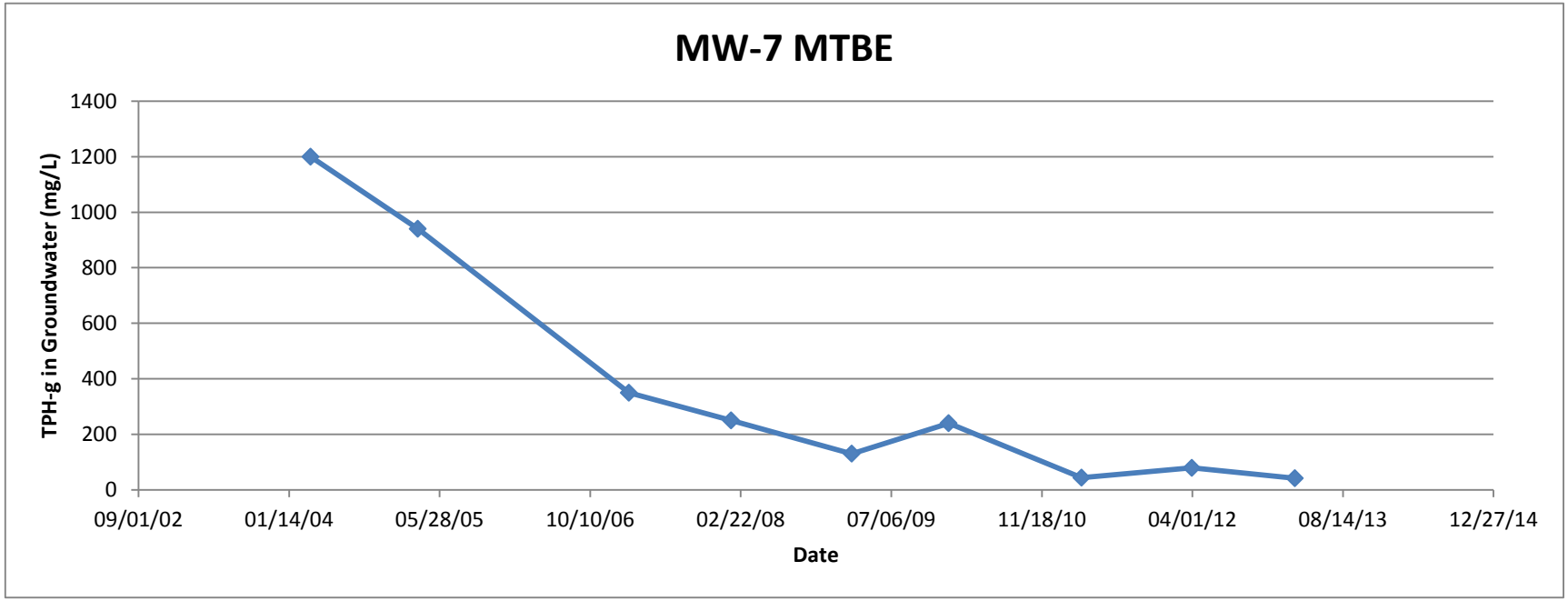

MW-7 MTBE
TPH-g in Groundwater (mg/L)
1400
1200
1000
800
600
400
200
0
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
Date

Chart 4: Mann-Kendall Statistical Method Worksheet

Site-- RO 352, Unocal #5484
Compound-- Benzene
Well-- MW-7

Input data from four to ten sampling events in Row 10.

Date:	03/26/04	03/17/05	03/31/06	02/16/07	01/21/08	02/25/09	01/13/10	03/30/11	03/30/12	03/08/13	**Events**
Concentration (ug/L):	37	5	8.7	11	11	15	10	5	13.0	5.8	10
	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**Sum**
Compared to Event 1	*****	-1	-1	-1	-1	-1	-1	-1	-1	-1	-9
Compared to Event 2	*****	*****	1	1	1	1	1	-1	1	1	6
Compared to Event 3	*****	*****	*****	1	1	1	1	-1	1	-1	3
Compared to Event 4	*****	*****	*****	*****	0	1	-1	-1	1	-1	-1
Compared to Event 5	*****	*****	*****	*****	*****	1	-1	-1	1	-1	-1
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1	-1	-4
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	-1	1	-1	0
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1	1	2
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1	-1

Mann-Kendall Statistic 'S' = -5

Statistical Confidence Level

>90% Confidence

I S I ≥ 15

Result: No Trend

>95% Confidence

I S I ≥ 20

Result: No Trend

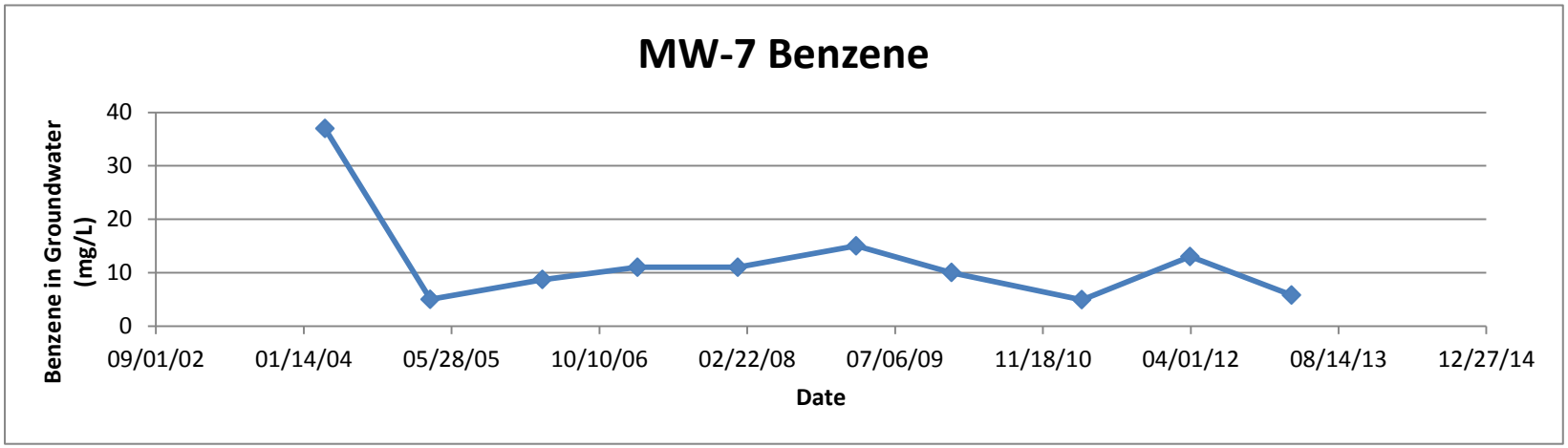

MW-7 Benzene
Benzene in Groundwater (mg/L)
40
30
20
10
0
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
Date

Chart 5: Mann-Kendall Statistical Method Worksheet

Site-- RO 352, Unocal #5484
Compound-- Naphthalene
Well-- MW-7

Input data from four to ten sampling events in Row 10.

Date:	03/26/04	03/31/06	02/16/07	01/21/08	02/25/09	01/13/10	03/30/11	03/30/12	03/08/13		**Events**
Concentration (ug/L):	17	6.2	37	40	27	150	8	32	41		9
	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**Sum**
Compared to Event 1	*****	-1	1	1	1	1	-1	1	1		4
Compared to Event 2	*****	*****	1	1	1	1	1	1	1		7
Compared to Event 3	*****	*****	*****	1	-1	1	-1	-1	1		
Compared to Event 4	*****	*****	*****	*****	-1	1	-1	-1	1		-1
Compared to Event 5	*****	*****	*****	*****	*****	1	-1	1	1		2
Compared to Event 6	*****	*****	*****	*****	*****	*****	-1	-1	-1		-3
Compared to Event 7	*****	*****	*****	*****	*****	*****	*****	1	1		0
Compared to Event 8	*****	*****	*****	*****	*****	*****	*****	*****	1		1
Compared to Event 9	*****	*****	*****	*****	*****	*****	*****	*****	*****		

Mann-Kendall Statistic 'S' = **10**

Statistical Confidence Level

>90% Confidence

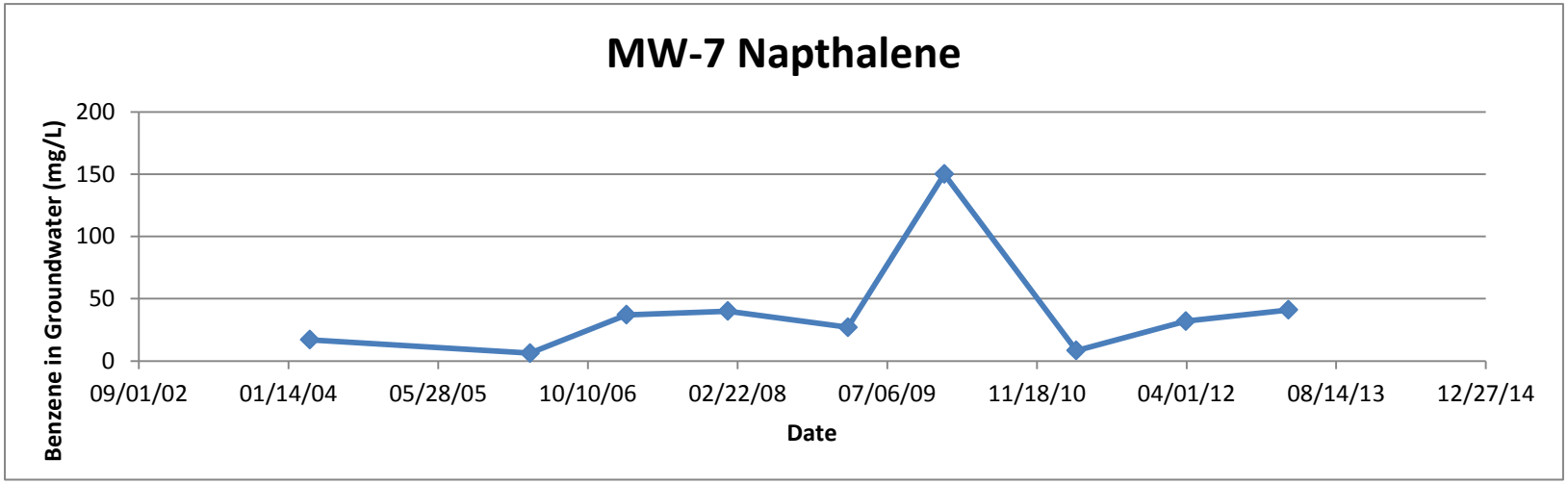
I S I ≥ 13

Result: No Trend

>95% Confidence

I S I ≥ 17

Result: No Trend


MW-7 Napthalene
Benzene in Groundwater (mg/L)
200
150
100
50
0
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
Date

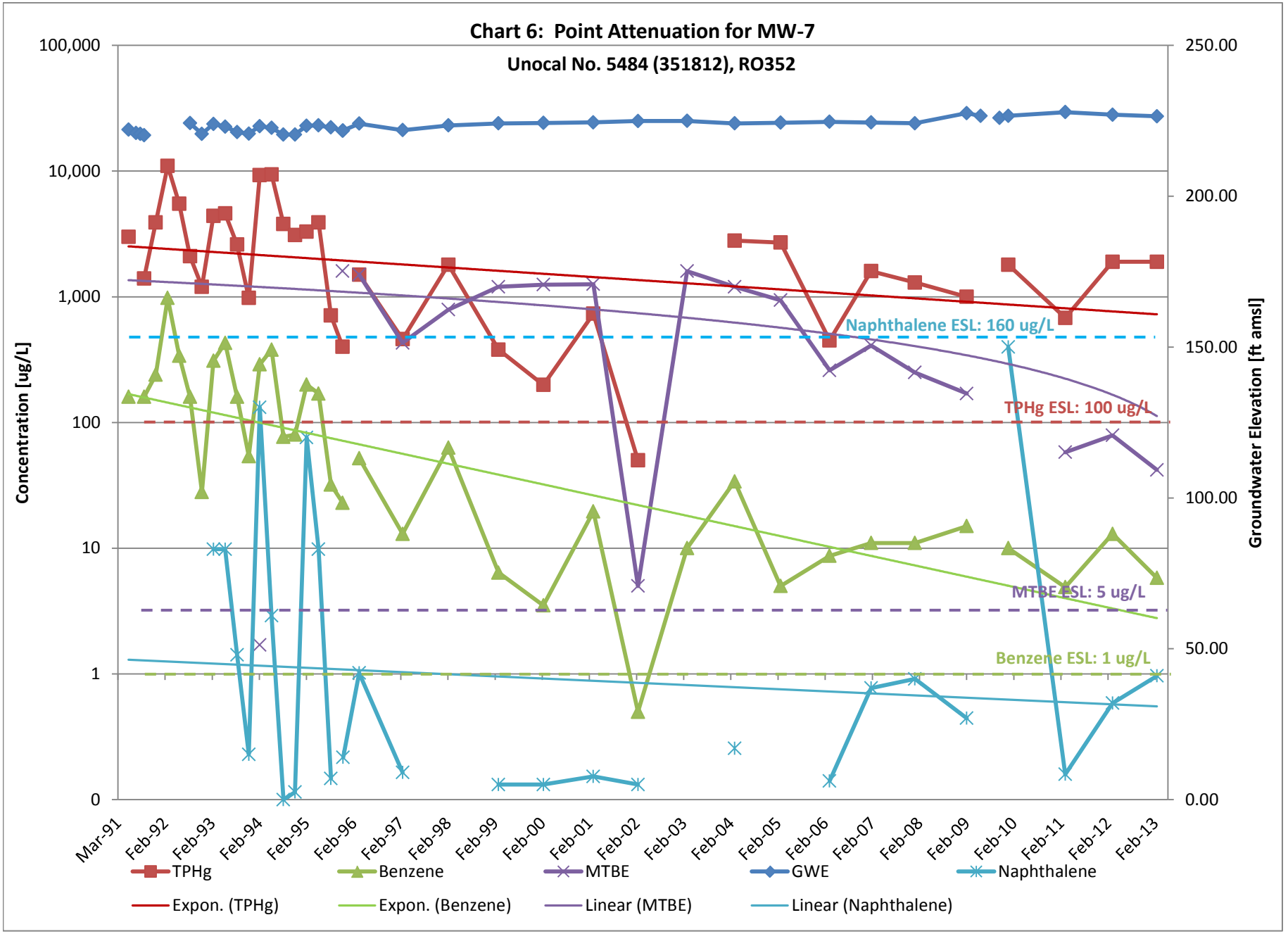


Chart 6: Point Attenuation for MW-7
Unocal No. 5484 (351812), RO352
Concentration [ug/L]
Groundwater Elevation [ft amsl]
100,000
10,000
1,000
100
10
1
0
250.00
200.00
150.00
100.00
50.00
0.00
Naphthalene ESL: 160 ug/L
TPHg ESL: 100 ug/L
MTBE ESL: 5 ug/L
Benzene ESL: 1 ug/L
Mar-91
Feb-92
Feb-93
Feb-94
Feb-95
Feb-96
Feb-97
Feb-98
Feb-99
Feb-00
Feb-01
Feb-02
Feb-03
Feb-04
Feb-05
Feb-06
Feb-07
Feb-08
Feb-09
Feb-10
Feb-11
Feb-12
Feb-13
TPHg
Benzene
MTBE
GWE
Naphthalene
Expon. (TPHg)
Expon. (Benzene)
Linear (MTBE)
Linear (Naphthalene)