ECM group

February 12, 2009

Bob Legallet
Telegraph Business Properties
1401 Griffith Street
San Francisco, CA 94124

Re:

Workplan for Subsurface Investigation
Telegraph Business Park
5427 Telegraph Avenue
Oakland, California
ECM Project 07-181-10

Dear Mr. Legallet:

ECM Group has prepared this workplan to perform subsurface investigative work at the above referenced site (Figures 1 and 2, Appendix A). The October 27, 2008 guidance letter from Alameda County directed the following:

1.) Redevelop and sample the existing site monitoring wells;

2.) Prepare a work plan to assess current conditions downgradient of the site;

3.) Prepare a work plan to assess the vertical extent of soil contamination at the site;

4.) Prepare a work plan to collect in-situ soil vapor samples beneath the site building to evaluate potential vapor pathways.

5.) In the workplan, include an evaluation of the potential vapor migration pathway in the area adjacent to boring B-15 and the nearby apartment building.

Site wells (MW-1 through MW-3) were redeveloped on November 18, 2008. Existing well vaults were replaced on November 24, 2008. Well coordinates were re-surveyed in accordance with California Electronic Submittal of Information (ESI) guidelines by Barry Kolstad, PLS 5677, on November 23 and December 7 , 2008. Wells were sampled on December 4, 2008. A well monitoring report, dated January 29, 2009, has been submitted under separate cover.

Monitoring well locations and groundwater elevation contours from the December 4, 2008 sampling event are shown on Figure 2, Appendix A. Well construction details and groundwater elevation measurements are tabulated in Table 1, Appendix B. Historical laboratory analytical results, as well as results from the December 4, 2008 sampling event, are tabulated in Tables 2 and 3, Appendix B.

ECM proposes to install two offsite groundwater monitoring wells to assess current conditions downgradient of the site; to install one soil boring to assess the vertical extent of soil contamination in the source area; and to collect two sub-slab soil vapor samples in the site building to evaluate potential vapor pathways. The locations of the proposed monitoring wells, boring, and sub-slab soil vapor sampling points are shown on Figure 3 (Appendix A).

BACKGROUND

Site History

The following site history was taken from the 1997 Sierra Environmental Services (SES) Risk Screening Analysis.[1]

The site was formerly a large-scale dry-cleaning establishment. The on-site underground storage tanks (USTs) were used by previous occupants to store Stoddard solvent, Stoddard solvent waste, and gasoline.

Seventeen USTs were removed from the site in May 1992. Petroleum hydrocarbons as gasoline, Stoddard solvent, and BTEX compounds were detected in soil sidewall samples collected from the UST excavations.

In several investigations between 1993 and 1996, 30 soil borings and 3 monitoring wells were installed at the site. Boring and well locations are shown on Figure 3, Appendix A. Well construction details and groundwater elevation measurements are tabulated in Table 1, Appendix B. Historical laboratory analytical results for groundwater samples from wells and borings are tabulated in Tables 2 and 3, Appendix B. Analytical laboratory results for soil are tabulated in Table 4, Appendix B.

A well survey was conducted by SES in January 1997 at the Department of Water Resources in Sacramento for all wells located within 1,500 ft of the business park. The survey indicated that no drinking water wells were present within the study area. The well survey was confirmed by inspecting all properties within the search radius for the possible presence of wells. One irrigation well was located at Children's Hospital, approximately 1,500 ft south of the site. Other monitoring, industrial, and cathodic protection wells were noted in the study area.

Risk Screening Analysis

In 1996/1997, an investigation into the potential public health risks due to subsurface conditions

[1] SES, 1997, Risk Screening Analysis, Telegraph Business Park, 5427 Telegraph Avenue, Oakland CA, March 6, 1997, 24 pages and 3 appendices.

at the site was conducted. The risk screening analysis evaluated potential exposure pathways for constituents of concern at the site. Three potential exposure pathways were identified as potentially 'complete': 1.) Direct exposure to contaminated groundwater which might be used as a drinking water source; 2.) Inhalation of contaminated soil vapor that has migrated into indoor air in buildings; and 3.) Direct contact with contaminated soil during future excavation.

Potential exposure pathway 1.) was considered incomplete because the well survey indicated that no drinking water wells were present in the area. Potential exposure pathway 3.) was not considered in the risk analysis because institutional controls can easily be put into place during any potential future excavation to effectively eliminate the exposure pathway.

In order to evaluate potential exposure from indoor air (exposure pathway 2.), two 8-hour indoor air samples were collected in the on-site commercial building. Analytical results are shown in Table 5, Appendix A. Benzene was detected in each of the air samples at 2.1 ppb, or 6.71 $\mu g/m^3$. The Regional Water Quality Control Board (RWQCB) commercial/industrial land use indoor air ESL for benzene is 0.14 $\mu g/m^3$.

EVALUATION OF POTENTIAL VAPOR MIGRATION PATHWAY IN B-15 AREA

The apartment building located adjacent to B-15 (downgradient of the site to the south) is constructed with a parking garage occupying the entire ground level. The apartment building located approximately 120 ft east of B-15 is constructed in the same manner. Potential for migration of impacted soil vapor to indoor air in these apartment buildings is therefore incomplete.

Another residential building is located approximately 150 ft southwest of B-15 on 54th Street. The two proposed monitoring wells on 54th Street will provide data regarding impacts to soil and groundwater in the area. If data from the proposed wells indicates there may be a potential for vapor migration to this building, soil vapor sampling points in the area will be proposed.

SUBSURFACE INVESTIGATION

ECM proposes to install two offsite groundwater monitoring wells to assess current conditions downgradient of the site; to install one soil boring to assess the vertical extent of soil contamination in the source area; and to collect two sub-slab soil vapor samples in the site building. The locations of the proposed monitoring wells, boring, and sub-slab soil vapor sampling points are shown on Figure 3 (Appendix A).

Scope of Work

The following outlines the scope of work and procedures to be used for this investigation:

1.) Prepare a site-specific safety plan for this investigation.

2.) Install 2 monitoring wells and one soil boring in the approximate locations shown on Figure 3, Appendix A. Collect soil samples from the wells and boring.

3.) Analyze selected soil samples for Total Petroleum Hydrocarbons as Gasoline [TPH(G)], Stoddard solvent, benzene, toluene, ethylbenzene, and xylenes (BTEX), oxygenates including MTBE, and for the lead scavengers EDB and EDC.

4.) Develop the newly-installed monitoring wells. Survey the vertical and lateral coordinates of the newly-installed monitoring wells in compliance with ESI program specifications.

5.) Sample the newly-installed monitoring wells in accordance with the monitoring program for the site. Analyze the samples for TPH(G), Stoddard solvent, BTEX, oxygenates, and the lead scavengers EDB and EDC.

6.) Collect sub-slab vapor samples at the locations shown on Figure 3, Appendix A. Analyze the vapor samples for TPH(G), Stoddard Solvent, BTEX, and oxygenates by EPA Methods TO-15 and TO-3.

7.) Report the results, including recommendations for additional work if appropriate. Submit all site data and reports electronically in accordance with the ESI program.

Each of these tasks is described below.

Task 1 - Site Safety Plan

Using available site history information, ECM will prepare a site-specific safety plan. The site safety plan (SSP) will identify potential site hazards and specify procedures to protect site workers. The SSP will be on-site during field operations.

Task 2 - Well/Boring Installation

Locations of the proposed wells and boring are shown on Figure 3, Appendix A. Prior to drilling, utilities will be located by USA and a private underground utility detection company. Drilling permits will be obtained from Alameda County. An encroachment permit for the proposed wells will be obtained from the city of Oakland. The wells and boring will be installed by a California licensed drilling contractor.

Depth to groundwater at the site varies between approximately 5 and 12 ft bgs. Wells will be installed to approximately 20 ft bgs and screened between approximately 5 and 20 ft

bgs. In order to assess the vertical extent of soil contamination, the boring will be continued until there is no visual or other evidence of significant soil contamination, or until refusal.

The boring/wells will be logged in accordance with ECM Standard Operating Procedure - Logging Method (Appendix C) under the supervision of a California Registered Engineer. Soil samples will be collected at intervals of no greater than 5 ft, at the soil-groundwater interface, and in areas where soil is observed to be contaminated, in accordance with ECM Standard Operating Procedure - Soil Sampling (Appendix C). The soil samples will be field screened with an OVM in accordance with ECM Standard Operating Procedure - OVM Readings (Appendix C). The boring will be installed using either hollow stem or hydraulic push methods, in accordance with ECM Standard Operating Procedure - Boring Construction (Appendix C). Wells will be constructed in accordance with ECM Standard Operating Procedure - Monitoring Well Design and Construction (Appendix C).

All drilling equipment will be steam-cleaned prior to use, and all sampling equipment will be washed between samples using EPA-approved detergent (Liquinox) and rinsed with potable water. Temporary borings will be grouted to surface with a cement grout containing 3% to 5% bentonite.

Task 3 - Soil and Groundwater Analyses

Selected soil and groundwater samples will be analyzed for TPH(G), Stoddard solvent, BTEX, oxygenates, and the lead scavengers EDB and EDC.

Task 4 - Develop and Survey the Newly Installed Monitoring Wells

The newly installed monitoring wells will be developed in accordance with ECM Standard Operating Procedures - Well Development (Appendix C). The wells will be developed no sooner than 48 hours following well construction, in order to allow the cement grout to set.

The vertical and lateral coordinates of the newly-installed monitoring wells will be surveyed by a licensed land surveyor, using established USGS datums in compliance with ESI Program specifications.

Task 5 - Sample the Newly Installed Monitoring Wells

The newly-installed monitoring wells will be sampled in accordance with ECM Standard Operating Procedures - Monitoring Well Sampling (Appendix C) in accordance with the

monitoring program for the site. The samples will be analyzed for TPH(G), Stoddard solvent, BTEX, oxygenates, and the lead scavengers EDB and EDC.

Task 6 - Sub-Slab Vapor Sampling

Sub-slab vapor samples will be collected at the locations shown on Figure 3, Appendix A in accordance with ECM Standard Operating Procedures - Sub-Slab Vapor Sampling (Appendix C). The vapor samples will be analyzed for TPH(G), Stoddard Solvent, BTEX, and oxygenates by EPA Methods TO-15 and TO-3.

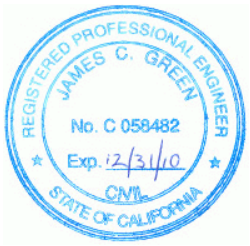
Task 7 - Report the Results

A report presenting the results of this investigation will be completed within 60 days of completion of field work. The report will include recommendations for additional work, if appropriate. In addition to hard copy submission, ECM will upload the report and site data to the ESI system.

Thank you for the opportunity to provide environmental consulting services for your project. Please call if you have questions or require additional information.

Sincerely,
ECM Group

Rachel Guptel
Staff Scientist



Jim Green
Professional Engineer #C58482

Attachments: Appendix A - Figures
Appendix B - Table
Appendix C - Standard Operating Procedures

cc: Barbara J. Jakub, P.G., Alameda County Environmental Health Services
Leroy Griffin, Oakland Fire Department

APPENDIX A
FIGURES

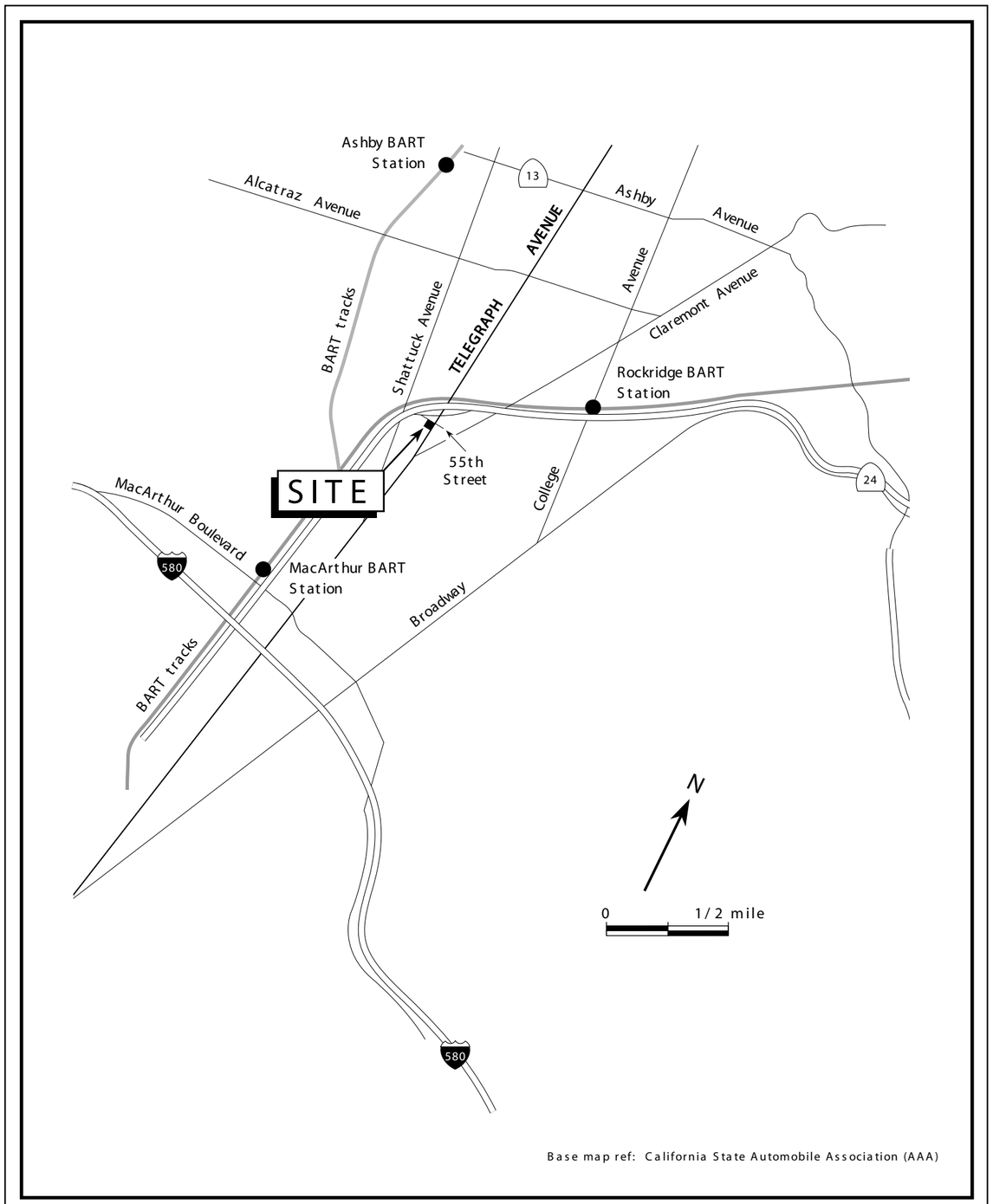


Figure 1. Site Location Map – Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

07-181-04 [Site loc] 1/19/09

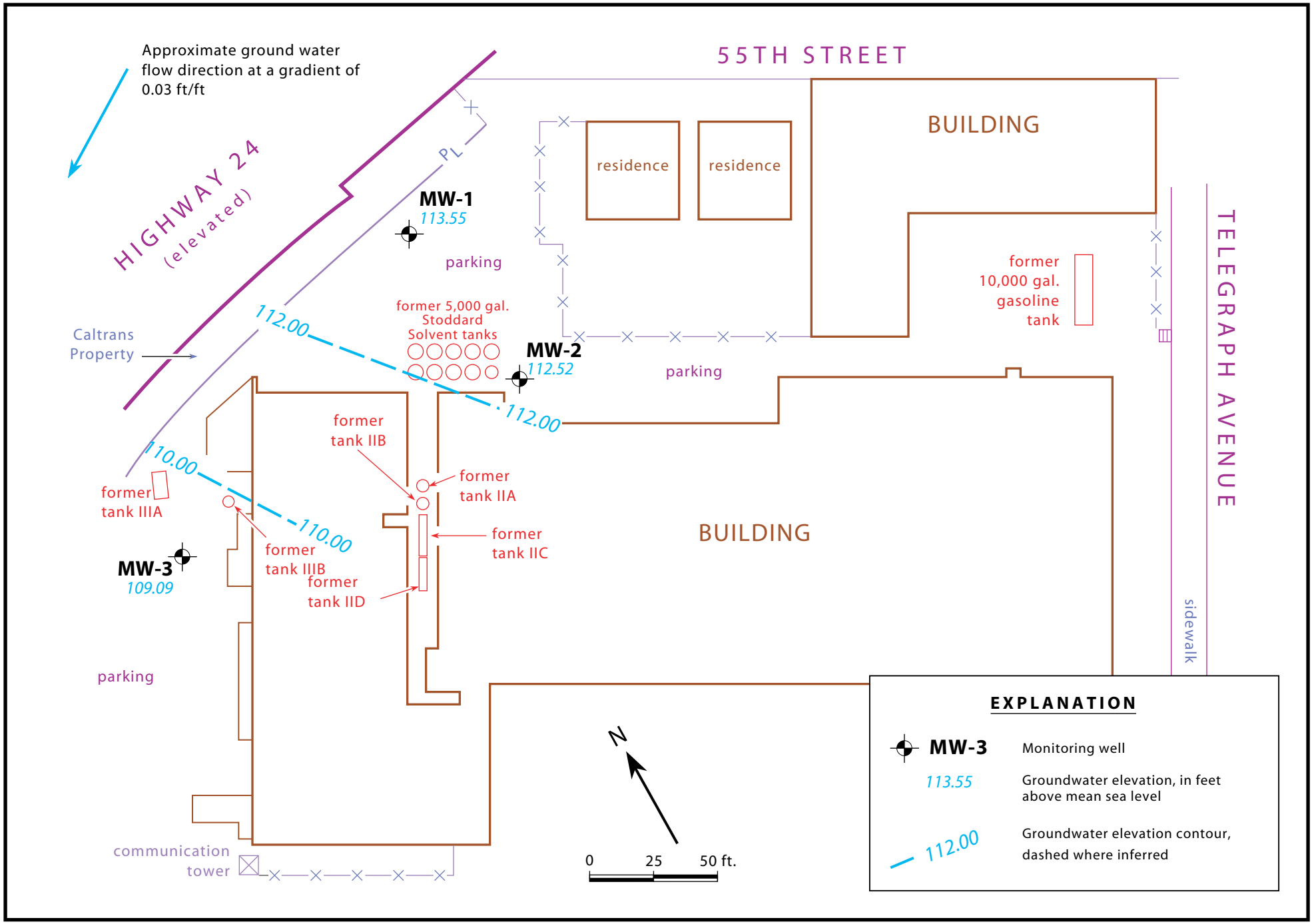
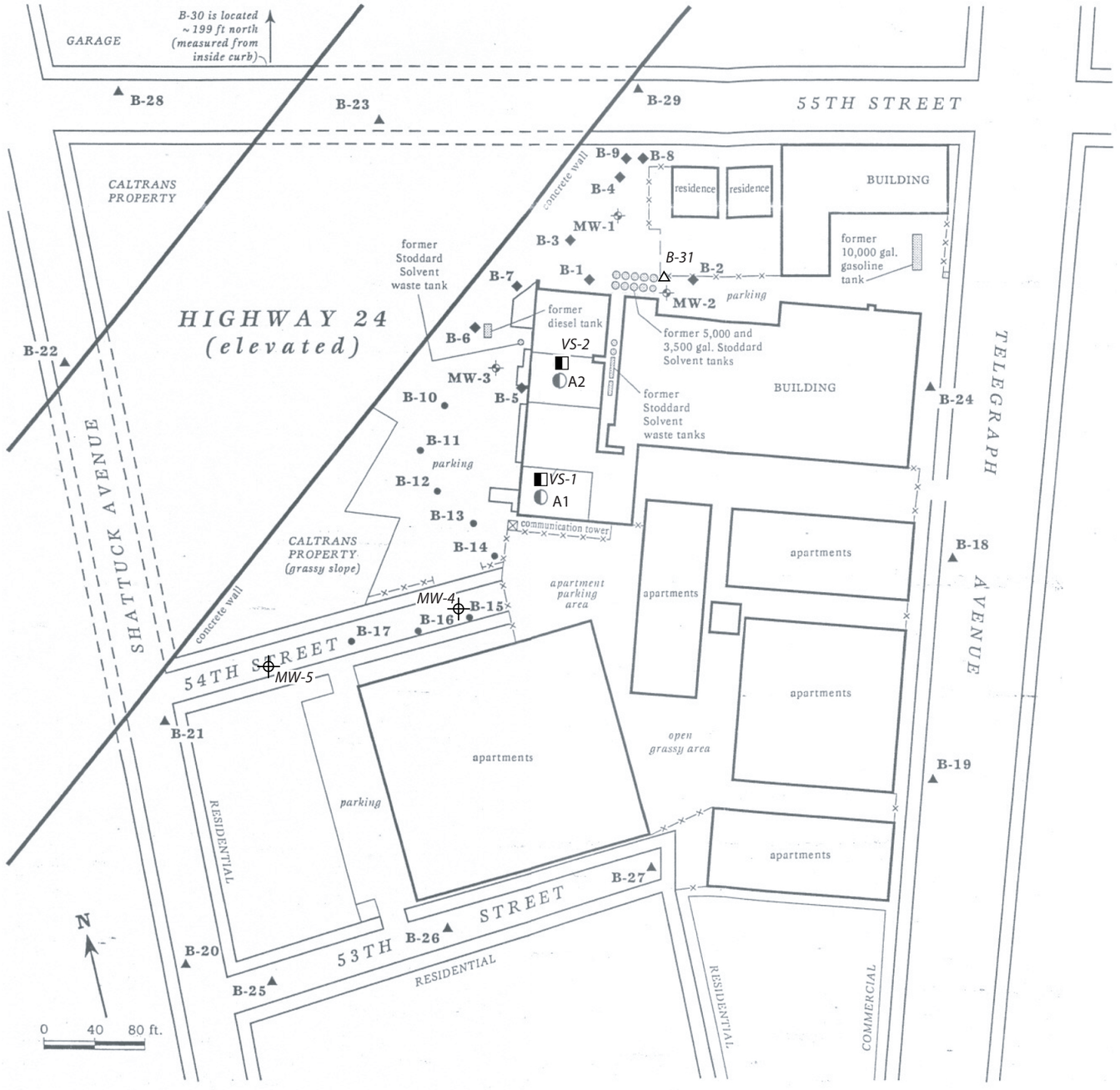


Figure 2. Monitoring Well Location and Ground Water Elevation Contour Map - December 4, 2008 - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

07-181-04 [GW 12-08] 1/23/09



EXPLANATION

⌖	**MW-3**	Monitoring well location
▲	**B-30**	Soil boring location (9/96 & 10/96)
◐	A2	8-Hour air sampling location (1996)
◆	**B-9**	Groundwater sampling location (12/93)
●	**B-17**	Groundwater sampling location (11/94 & 1/95)
⌖	*MW-4*	Proposed monitoring well
△	*B-31*	Proposed soil boring
◧	*VS-2*	Proposed sub-slab vapor sampling point

Figure 3. Monitoring Well, Soil Sampling, Air Sampling and Grab Groundwater Sampling Locations - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

07-181-10 [proposed locs] 2/10/09

APPENDIX B
TABLES

Table 1. Monitoring Well Survey Data, Well Construction Details, and Depth to Groundwater - 5427 Telegraph Avenue, Oakland, California.

Well ID	Date	DTW (Ft)	TOC (Ft, msl)	GWE (Ft, msl)	Screen Interval	Sand Pack Interval	Bentonite/ Grout Interval	Notes
MW-1	1/5/1994	6.40	115.05	108.65	5 - 20	4 - 20	0 - 4	
	2/1/1994	5.93		109.12				
	3/2/1994	5.09		109.96				
	4/6/1994	5.85		109.20				
	5/4/1994	6.37		108.68				
	6/3/1994	6.95		108.10				
	7/7/1994	7.00		108.05				
	8/3/1994	7.30		107.75				
	9/7/1994	7.70		107.35				
	10/11/1994	7.62		107.43				
	1/20/1995	4.78		110.27				
	4/7/1995	5.96		109.09				
	7/26/1995	7.19		107.86				
	10/25/1995	7.74		107.31				
	1/29/1996	4.67		110.38				
	4/26/1996	5.92		109.13				
	7/25/1996	7.10		107.95				
	10/28/1996	7.41		107.64				
	12/4/2008	**7.10**	120.65	**113.55**				Note 1: Wells resurveyed on 11/23/08 and 12/7/08 by Barry Kolstad, pls 5677
MW-2	1/5/1994	9.42	117.60	108.18	7 - 27	6 - 27	0 - 6	
	2/1/1994	9.15		108.45				
	3/2/1994	9.55		108.05				
	4/6/1994	9.09		108.51				
	5/4/1994	9.18		108.42				
	6/3/1994	9.44		108.16				
	7/7/1994	10.21		107.39				
	8/3/1994	10.96		106.64				
	9/7/1994	10.20		107.40				
	10/11/1994	10.18		107.42				
	1/20/1995	8.64		108.96				
	4/7/1995	9.84		107.76				
	7/26/1995	10.55		107.05				

Table 1. Monitoring Well Survey Data, Well Construction Details, and Depth to Groundwater - 5427 Telegraph Avenue, Oakland, California.

Well ID	Date	DTW (Ft)	TOC (Ft, msl)	GWE (Ft, msl)	Screen Interval	Sand Pack Interval	Bentonite/ Grout Interval	Notes
MW-2 cont.	10/25/1995	10.15	117.60	107.45	7 - 27	6 - 27	0 - 6	
	1/29/1996	9.35		108.25				
	4/26/1996	8.57		109.03				
	7/25/1996	10.73		106.87				
	10/28/1996	10.16		107.44				
	12/4/2008	**10.84**	123.36	**112.52**				See Note 1
MW-3	1/5/1994	10.14	115.33	105.19	5 - 20	4 - 20	0 - 4	
	2/1/1994	8.92		106.41				
	3/2/1994	7.56	115.14	107.58				Note 2: Wells resurveyed on 3/4/94 by Ronald C. Miller, pls 15816
	4/6/1994	10.24		104.90				
	5/4/1994	9.67		105.47				
	6/3/1994	10.38		104.76				
	7/7/1994	11.55		103.59				
	8/3/1994	11.76		103.38				
	9/7/1994	12.20		102.94				
	10/11/1994	12.02		103.12				
	1/20/1995	6.47		108.67				
	4/7/1995	7.98		107.16				
	7/26/1995	11.33		103.81				
	10/25/1995	12.29		102.85				
	1/29/1996	6.28		108.86				
	4/26/1996	9.09		106.05				
	7/25/1996	12.06		103.08				
	10/28/1996	12.32		102.82				
	12/4/2008	**11.82**	120.91	**109.09**				See Note 1

Table 1. Monitoring Well Survey Data, Well Construction Details, and Depth to Groundwater - 5427 Telegraph Avenue, Oakland, California.

Well ID	Date	DTW (Ft)	TOC (Ft, msl)	GWE (Ft, msl)	Screen Interval	Sand Pack Interval	Bentonite/ Grout Interval	Notes

Explanation:

DTW = Depth to Water
ft = feet
msl = Mean Sea Level
TOC = Top of Casing
GWE = Ground Water Elevation

Note: All values prior to 2008 taken from Sierra Enironmental Services, 1996, Quarterly Monitoring Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California, December 26, 1996.

Table 2. Analytic Results for Groundwater - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH-G	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<---------- parts per billion ---------->						
MW-1	1/5/1994	---	1,000	3.3	1.6	<0.3	6	
	4/6/1994	---	1,400	5.6	4.5	<0.3	11	
	7/7/1994	---	1,200	1.5	0.80	<0.3	1.9	
	10/11/1994	---	700	<0.3	<0.3	<0.3	<0.3	
	1/20/1995	---	1,500	3.9	2	<0.3	3.9	
	4/7/1995	---	500	3.2	1.1	<0.3	1.7	
	7/26/1995	---	1,500	3.1	3.2	12	16	
	10/25/1995	---	660	0.6	1.4	20	14	
	1/29/1996	---	2,500	1.8	0.7	8.0	13	
	4/26/1996	---	4,600	<2.5	<2.5	9.5	21	
	7/25/1996	---	2,200	1.6	1.6	11	51	
	10/28/1996	---	1,300	1.5	1.3	3.6	11	
	12/4/2008	**540**	**841**	**<0.50**	**6.55**	**<0.50**	**<1.50**	1
MW-2	1/5/1994	---	35,000	12	38	<3.0	150	
	4/6/1994	---	94,000	21	22	<6.0	110	
	7/7/1994	---	---	16	16	<1.5	1,510	
	7/11/1994	---	43,000	---	---	---	---	
	10/11/1994	---	31,000	17	13	14	0.3	
	1/20/1995	---	26,000	18	13	12	50	
	4/7/1995	---	70,000	17.5	11	<0.6	74.6	
	7/26/1995	---	21,000	17	<0.5	26	94	
	10/25/1995	---	38,000	63	70	440	1,100	
	1/29/1996	---	74,000	7.4	8.6	66	330	
	4/26/1996	---	81,000	<250	<250	3,100	15,000	
	7/25/1996	---	48,000	17	9.4	59	200	
	10/28/1996	---	6,200	19	30	58	310	
	12/4/2008	**6,300**	**120,000**	**<22.0**	**<22.0**	**<22.0**	**<66.0**	1
MW-3	1/5/1994	---	1,100	180	20	85	10	
	4/6/1994	---	1,000	140	13	60	<12	
	7/7/1994	---	---	120	7.5	8.0	<3.0	
	7/11/1994	---	1,000	---	---	---	---	
	10/11/1994	---	1,100	200	11	23	<0.3	
	1/20/1995	---	2,100	36	3.5	4.8	<0.3	

Table 2. Analytic Results for Groundwater - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH-G	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<---------- parts per billion ---------->						
MW-3 cont.	4/7/1995	---	600	32.7	1.7	4.7	1.9	
	7/26/1995	---	1,200	98	3.2	12	16	
	10/25/1995	---	2,300	32	3.4	4.7	9.6	
	1/29/1996	---	1,100	22	1.2	6.4	12	
	4/26/1996	---	1,300	5.6	0.6	4.6	14	
	7/25/1996	---	2,900	120	6.4	23	36	
	10/28/1996	---	2,000	170	6.6	16	26	
	12/4/2008	**1,600**	**708**	**1.15**	**<0.50**	**0.720**	**<1.50**	1
B-1	12/13/1993	---	93,000	---	---	---	---	
B-2	12/13/1993	---	1,400,000	---	---	---	---	
B-3	12/13/1993	---	780,000	---	---	---	---	
B-4	12/13/1993	---	15,000	---	---	---	---	
B-5	12/14/1993	---	1,600	---	---	---	---	
B-6	12/14/1993	---	9,000	---	---	---	---	
B-7	12/14/1993	---	18,000	---	---	---	---	
B-8	12/14/1993	---	<50	---	---	---	---	
B-9	12/14/1993	---	60	---	---	---	---	
B-10	11/30/1994	---	120,000	<0.3	<0.3	<0.3	<0.3	
B-11	11/30/1994	---	210	<0.3	<0.3	<0.3	<0.3	
B-12	11/30/1994	---	150	<0.3	<0.3	<0.3	<0.3	
B-13	11/30/1994	---	220	2.3	0.80	<0.3	4	

Table 2. Analytic Results for Groundwater - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH-G	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<---------- parts per billion ---------->						
B-14	11/30/1994	---	150	<0.3	<0.3	<0.3	0.80	
B-15	1/23/1995	---	9,100	40	<3.0	60	<3.0	
B-16	1/23/1995	---	52	<0.3	<0.3	<0.3	1.3	
B-17	1/23/1995	---	<50	<0.3	<0.3	<0.3	<0.3	
B-18	9/24/1996	---	<50	<0.5	0.5	<0.5	<0.5	
B-19	9/24/1996	---	<50	<0.5	0.7	<0.5	0.7	
B-20	9/24/1996	---	<50	<0.5	<0.5	<0.5	<0.5	
B-21	9/24/1996	---	---	---	---	---	---	
B-22	9/24/1996	---	---	---	---	---	---	
B-23	9/25/1996	---	4,600	<0.5	0.7	100	540	
B-24	9/25/1996	---	---	---	---	---	---	
B-25	9/25/1996	---	---	---	---	---	---	
B-26	9/25/1996	---	<50	<0.5	<0.5	<0.5	<0.5	
B-27	9/25/1996	---	<50	<0.5	0.5	<0.5	<0.5	
W-B28	10/31/1996	---	<50	<0.5	<0.5	<0.5	<0.5	
W-B29	10/31/1996	---	<50	<0.5	<0.5	<0.5	<0.5	
W-B30	10/31/1996	---	<50	1.4	0.6	3.0	5.1	

Table 2. Analytic Results for Groundwater - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH-G	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<---------- parts per billion ---------->						

Explanation:

TPH-G = Gasoline

TPH-D = Diesel

--- = not analyzed

Notes:

1 TPH(G) was not reported prior to 2008. Samples were analyzed for TPH(D) and Oil&Grease prior to 2008. All values prior to 2008 taken from Sierra Enironmental Services, 1996, Quarterly Monitoring Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California, December 26, 1996.

Table 3. Analytic Results for Groundwater - Oxygenates - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	MTBE	DIPE	ETBE	TAME	TBA	EDB	EDC (1,2 DCA)	Notes
		<---------- parts per billion ---------->							
MW-1	1/5/1994	---	---	---	---	---	---	<0.2	
	4/6/1994	---	---	---	---	---	---	<0.2	
	7/7/1994	---	---	---	---	---	---	<0.5	
	10/11/1994	---	---	---	---	---	---	<2	
	1/20/1995	---	---	---	---	---	---	<2	
	4/7/1995	---	---	---	---	---	---	0.5	
	7/26/1995	---	---	---	---	---	---	<0.5	
	10/25/1995	---	---	---	---	---	---	<0.5	
	1/29/1996	---	---	---	---	---	---	<0.5	
	4/26/1996	---	---	---	---	---	---	<0.5	
	7/25/1996	---	---	---	---	---	---	<0.5	
	10/28/1996	---	---	---	---	---	---	<0.5	
	12/4/2008	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<10.0**	**<0.50**	**<0.50**	1
MW-2	1/5/1994	---	---	---	---	---	---	2.7	
	4/6/1994	---	---	---	---	---	---	<0.2	
	7/7/1994	---	---	---	---	---	---	0.60	
	10/11/1994	---	---	---	---	---	---	<2	
	1/20/1995	---	---	---	---	---	---	<2	
	4/7/1995	---	---	---	---	---	---	1.4	
	7/26/1995	---	---	---	---	---	---	<0.5	
	10/25/1995	---	---	---	---	---	---	<0.5	
	1/29/1996	---	---	---	---	---	---	<0.5	
	4/26/1996	---	---	---	---	---	---	<0.5	
	7/25/1996	---	---	---	---	---	---	<0.5	
	10/28/1996	---	---	---	---	---	---	<2.5	
	12/4/2008	**<22.0**	**<22.0**	**<22.0**	**<22.0**	**<440**	**<22.0**	**<22.0**	1
MW-3	1/5/1994	---	---	---	---	---	---	0.20	
	4/6/1994	---	---	---	---	---	---	<0.2	
	7/7/1994	---	---	---	---	---	---	<0.5	
	10/11/1994	---	---	---	---	---	---	<2	
	1/20/1995	---	---	---	---	---	---	<2	
	4/7/1995	---	---	---	---	---	---	0.7	
	7/26/1995	---	---	---	---	---	---	<0.5	

Table 3. Analytic Results for Groundwater - Oxygenates - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	MTBE	DIPE	ETBE	TAME	TBA	EDB	EDC (1,2 DCA)	Notes
		<---------- parts per billion ---------->							
MW-3 cont.	10/25/1995	---	---	---	---	---	---	<0.5	
	1/29/1996	---	---	---	---	---	---	<0.5	
	4/26/1996	---	---	---	---	---	---	<0.5	
	7/25/1996	---	---	---	---	---	---	<0.5	
	10/28/1996	---	---	---	---	---	---	<0.5	
	12/4/2008	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<10.0**	**<0.50**	**<0.50**	1
B-10	11/30/1994	---	---	---	---	---	---	<2	
B-11	11/30/1994	---	---	---	---	---	---	<2	
B-12	11/30/1994	---	---	---	---	---	---	<2	
B-13	11/30/1994	---	---	---	---	---	---	<2	
B-14	11/30/1994	---	---	---	---	---	---	<2	
B-15	1/23/1995	---	---	---	---	---	---	<2	
B-16	1/23/1995	---	---	---	---	---	---	<2	
B-17	1/23/1995	---	---	---	---	---	---	<2	
B-18	9/24/1996	---	---	---	---	---	---	<1	
B-19	9/24/1996	---	---	---	---	---	---	<1	
B-20	9/24/1996	---	---	---	---	---	---	<1	
B-21	9/24/1996	---	---	---	---	---	---	---	
B-22	9/24/1996	---	---	---	---	---	---	---	
B-23	9/25/1996	---	---	---	---	---	---	<1	

Table 3. Analytic Results for Groundwater - Oxygenates - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	MTBE	DIPE	ETBE	TAME	TBA	EDB	EDC (1,2 DCA)	Notes
		<---------- parts per billion ---------->							
B-24	9/25/1996	---	---	---	---	---	---	---	
B-25	9/25/1996	---	---	---	---	---	---	---	
B-26	9/25/1996	---	---	---	---	---	---	<1	
B-27	9/25/1996	---	---	---	---	---	---	<1	
W-B28	10/31/1996	---	---	---	---	---	---	<1	
W-B29	10/31/1996	---	---	---	---	---	---	<1	
W-B30	10/31/1996	---	---	---	---	---	---	<1	

Explanation:

MTBE = Methyl tertiary butyl ether
DIPE = Di-isopropyl ether
ETBE = Ethyl tertiary butyl ether
TAME = Tertiary amyl methyl ether
TBA = Tertiary butyl alcohol
EDB = 1,2-Dibromoethane
EDC = 1,2-Dichloroethane

Notes:

1 MTBE, DIPE, ETBE, TAME, TBA and EDB were not reported prior to 2008. Samples were analyzed for Halogenated Volatile Organic Compounds (HVOCs) and Volatile Organic Compounds (VOCs) prior to 2008. All values prior to 2008 taken from Sierra Enironmental Services, 1996, Quarterly Monitoring Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California, December 26, 1996.

Table 4. Analytic Results for Soil - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	Depth feet, bgs	TPH-D	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
			<---------- parts per million ---------->						
B-1	12/13/1993	2.5	<10	980	---	---	---	---	
		8.5	<10	2,000	---	---	---	---	
B-2	12/13/1993	5.5	<10	1,640	---	---	---	---	
		10.5	<10	3,060	---	---	---	---	
B-3	12/13/1993	5.5	13	1,900	---	---	---	---	
B-4	12/13/1993	5.5	<10	100	---	---	---	---	
B-5	12/14/1993	5.5	<1.0	<1.0	---	---	---	---	
B-6	12/14/1993	5.5	190	110	---	---	---	---	
		10.5	11	150	---	---	---	---	
B-7	12/14/1993	5.5	11	1,380	---	---	---	---	
		10.5	14	920	---	---	---	---	
B-8	12/14/1993	5.5	<1.0	<1.0	---	---	---	---	
		10.5	<1.0	<1.0	---	---	---	---	
		15.5	<1.0	<1.0	---	---	---	---	
		20.5	<1.0	<1.0	---	---	---	---	
B-9	12/14/1993	5.5	<1.0	<1.0	---	---	---	---	
		10.5	<1.0	<1.0	---	---	---	---	
MW-1	12/14/1993	5.5		2,320	---	---	---	---	
		9.5	<1.0	1.2	---	---	---	---	
		15.5	<1.0	7.5	---	---	---	---	
		20.5	<1.0	<1.0	---	---	---	---	
MW-2	12/14/1993	5.5	<10	2,780	---	---	---	---	
		10.5	<10	6,500	---	---	---	---	
		15.5	<1.0	18	---	---	---	---	

Table 4. Analytic Results for Soil - Hydrocarbons - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	Depth feet, bgs	TPH-D	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
			<---------- parts per million ---------->						
MW-2 cont.	12/14/1993	20.5	<1.0	<1.0	---	---	---	---	
		25.5	<10	200	---	---	---	---	
MW-3	12/14/1993	5.5	2.9	2.6	---	---	---	---	
		10.5	<10	260	---	---	---	---	
		15.5	2.5	34	---	---	---	---	
B-21	9/24/1996	16.0	---	<10	<0.005	<0.005	<0.005	<0.005	1
B-22	9/24/1996	15.5	---	<10	<0.005	<0.005	<0.005	<0.005	1
B-23	9/25/1996	10.5	---	<10	<0.005	<0.005	<0.005	0.044	1
B-24	9/25/1996	16.0	---	<10	<0.005	<0.005	<0.005	<0.005	1
B-25	9/25/1996	16.0	---	<10	<0.005	<0.005	<0.005	<0.005	2

Explanation:

TPH-D = Diesel

--- = not analyzed

Notes:

1 Volatile Organic Compounds (VOCs) not detected at detection limits ranging from 0.005 to 0.2 ppm.

2 Sample contains 0.0052 ppm benzene. All other VOCs not detected at detection limits ranging from 0.005 to 0.2 ppm.

All values in Table 4 are taken from Sierra Environmental Services *Risk Screening Analysis* , Telegraph Business Park, 5427 Telegraph Avenue, Oakland, CA, March 6, 1997.

Table 5. Analytic Results for Air - Organic Compounds - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	1,2,4-TMB	Notes
		<----------ppbv---------->						
A-1	11/19/1996	<0.88	2.1	7.0	2.1	2.8	1.2	1
A-2	11/19/1996	<0.90	2.1	4.2	<0.90	1.3	<0.90	2

Explanation:

1,2,4-TMB = 1,2,4-Trimethylbenzene
ppbv = parts per billion by volume
TICs = tentatively identified compounds

Notes:

1 Other Volatile Organic Compounds (VOCs) were not detected at a laboratory reporting limit of 0.88 ppbv. Sample A-1 is reported to contain six TICs: acetaldehyde, 2-propanone, dichloromethane, butanal, hexanal and octanal at concentrations of 6.7, 10, 6.3, 20, 6.0 and 4.6 ppbv, respectively.

2 Other Volatile Organic Compounds (VOCs) were not detected at a laboratory reporting limit of 0.90 ppbv. Sample A-2 is reported to contain two TICs: 2-hydroxybenzaldehyde and (E)-4-dodecene at concentrations of 7.3 and 5.3 ppbv, respectively.

All values in Table 5 are taken from Sierra Environmental Services *Risk Screening Analysis* , Telegraph Business Park, 5427 Telegraph Avenue, Oakland, CA, March 6, 1997.

APPENDIX C
STANDARD OPERATING PROCEDURES

ECM STANDARD OPERATING PROCEDURE

LOGGING METHOD

Unconsolidated soil is classified and described by trained ECM field personnel. All available information is used, including the following: soil recovered in the sampler, including the soil visible on both ends of the sample retained for possible analysis; soil cuttings generated during drilling; and the drilling contractor's observations of the drill rig's behavior.

Classification and description of unconsolidated soil is accomplished using the American Society of Testing and Materials (ASTM) Methods D2487-85 (Unified Soil Classification System (USCS)) and/or D2488-69 (Description and Identification of Soils (Visual-Manual Procedure)).

The soil classification and description is recorded on the field log sheet by ECM field personnel and includes the following information:

1) Soil type;
2) Soil classification;
3) Soil color, including mottling;
4) Moisture content;
5) Plasticity and consistency (fine-grained material) or density (coarse-grained material);
6) Percentages of clay, silt, sand and gravel;
7) Grain size range of sands and gravels;
8) Angularity and largest diameter of gravel component;
9) Estimated permeability;
10) Odor; and

11)Any other observations which would assist in the interpretation of the depositional environment and/or differentiation between the various geologic units expected to be encountered.

In addition to the above, the ground water levels encountered during drilling and measured after the water stabilized is also recorded on the field log.

ECM STANDARD OPERATING PROCEDURE

SOIL SAMPLING - HOLLOW STEM AUGER DRILLING METHOD OR HYDRAULIC DIRECT-PUSH METHOD

The following describes sampling procedures used by ECM field personnel to collect, handle, and transport soil samples. Before samples are collected, careful consideration is given to the type of analysis to be performed so that precautions are taken to prevent loss of volatile components or contamination of the sample, and to preserve the sample for subsequent analysis.

All drilling and sampling equipment is steam-cleaned between boreholes to prevent cross-contamination. The sampler is washed with an EPA approved detergent (such as liquinox or trisodium phosphate) between sample collection. Collection methods specific to soil sampling are presented below.

Soil samples are collected at pre-specified depth intervals or at a sediment/lithologic change for hydrogeologic description and possible chemical analysis. If hydraulic direct-push methods are used, the soil sample is collected using appropriate direct-push equipment. If hollow-stem augers are used, samples are collected using a modified California split-barrel sampler lined with 2- or 2.5-inch I.D. x 4- or 6-inch long steam-cleaned or new stainless steel or brass tubes or poly-vinyl liners. The sampler is lowered into the borehole and driven 18 inches, using a 140-pound hammer falling 30 inches. The drilling contractor provides the ECM field personnel with the number of blows required to drive the sampler for each 6 inches of penetration.

The sampler is then extracted from the borehole and the middle or bottom brass tube is carefully removed for possible analysis. The soil material is immediately trimmed flush with the tube ends, and sealed with Teflon tape beneath polyethylene end caps. If the sample is to be analyzed for volatile constituents using EPA Method 8260, the soil sample is collected in accordance with EPA Method 5035. In this case, soil is immediately removed from the middle or bottom brass tube, using a syringe-type sampling device such as the Encore™ device, as described in section 6.2 of EPA

Method 5035. The sample is then labeled to include the date, boring number, depth of sample, project number, ECM, and the ECM field personnel's initials. The samples are put into a resealable plastic bag and placed into an ice chest maintained below 4˚C with blue ice or dry ice, for transport under chain of custody to the laboratory. The chain-of-custody form includes the project number, analysis requested, sample ID, date analysis and the ECM field personnel's name. The form is signed, dated and timed by each person who yields or receives the samples beginning with the field personnel and ending with the laboratory personnel.

ECM STANDARD OPERATING PROCEDURE

OVM READINGS

ECM uses an organic vapor meter (OVM) to determine the presence or absence of volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes in soil samples chosen for field screening. The OVM uses a photoionization detector (PID) and is calibrated daily to 100 parts per million of 1-liter of isobutylene. The OVM, which measures in parts per million by volume (ppmv), is used for qualitative, not quantitative, assessment because the correlation between the volume measurements of the OVM and the weight measurements of the laboratory instruments is not well defined.

A field screen sample is obtained from the brass tube immediately above or below the brass tube containing the sample selected for possible analysis. The soil to be screened is removed from the brass tube, and is placed in a pre-cleaned brass tube with aluminum foil and a polyethylene cap on one end. The brass tube is loosely filled to approximately 1/2 full. Another square of aluminum foil is placed on the open end and a polyethylene cap with crossed slits is placed over it.

The field screen sample is allowed to temperature equilibrate for approximately 15 to 30 minutes in the sun, allowing any VOCs which might be present in the soil to volatilize out into the brass tube's headspace. The OVM nozzle is then placed inside the sealed brass tube, through the slits in the cap, in order to measure the VOCs present, if any, in the headspace. The nozzle should remain inside the brass tube for approximately 15 to 30 seconds or until the maximum reading has been recorded on the OVM readout panel.

The depth from which the sample came and the corresponding OVM reading is recorded on the original field log sheet. Field observations, OVM and (odor and staining) readings are used in determining which soil samples are to be analyzed in the laboratory.

ECM STANDARD OPERATING PROCEDURE

DRILLING, CONSTRUCTION, AND DESTRUCTION OF TEMPORARY SAMPLING POINTS

The following describes the procedures used by ECM field personnel to drill and construct temporary sampling points (TSPs). Temporary sampling point locations are selected based on regulatory requirements and objectives of the sampling program. Prior to drilling or installation of hydraulic-pushed borings, appropriate permits are obtained and utilities are located by USA, the client, and/or an underground utility location company. All drilling/hydraulic push equipment is steam-cleaned prior to use and all sampling equipment is washed between samples using an EPA-approved detergent such as Liquinox and rinsed with potable water. The TSPs are drilled by a licensed drilling contractor using hollow-stem or solid flight augers, or by using hydraulic direct-push equipment. Borings are logged under the supervision of a California-certified professional engineer or California-registered geologist.

Soil samples are collected from the borings at intervals no greater than 5 feet in steam-cleaned or new brass/stainless steel or polyvinyl tubes in accordance with ECM Standard Operating Procedure - Soil Sampling. If possible, a soil sample is collected from immediately above the saturated zone. The soil samples are logged in accordance with ECM Standard Operating Procedure - Logging Method. The soil samples are field-screened with an organic vapor meter (OVM) in accordance with ECM Standard Operating - OVM Readings.

If augers are used, the field geologist will select either solid flight or hollow-stem augers for drilling, based on field observations. Borings with walls consisting primarily of fine-grained soils that remain stable following auger retrieval may be drilled using either auger type. Loose soils observed to cave in the boring are drilled using a hollow-stem auger.

Upon reaching the targeted boring depth, typically 3 to 5 ft below the first encountered ground water,

the auger is backed out and the appropriate length of 1- inch or 2-inch diameter 0.010-inch slotted and blank PVC casing is advanced into the ground water. When using a hollow-stem auger, the casing is placed in the center of the auger and the auger is backed out. If direct push equipment is used, the direct-push equipment is retracted sufficiently to expose casing which has been advanced with the direct-push equipment.

An MMC flexi-dip interface probe is used to measure depth to water from ground surface and to check for the presence of free-phase hydrocarbons in the boring. Product thickness (if present) and depth to water are measured to the nearest 0.010 ft. A disposable or steam-cleaned teflon bailer is lowered into the casing to collect a ground water sample. The water samples are poured into the appropriate container for the analysis to be performed. Pre-preserved sample containers may be used or the analytic laboratory may add preservative to the sample upon arrival. The samples are labeled to include the project number, sample ID, date, and preservative. The samples are placed in polyethylene bags and in an ice chest (maintained at 4 degrees C with blue ice or ice) for transport under chain of custody to the laboratory.

Upon completion of ground water sample collection, the temporary casing is lifted from the borehole and the boring is filled with bentonite hole plug chips and the appropriate amount of distilled water for hydration or grouted with Portland Cement and 3 to 5 % bentonite.

ECM STANDARD OPERATING PROCEDURE

MONITORING WELL DESIGN AND CONSTRUCTION

Where possible, information from published and unpublished reports is reviewed prior to installation of monitoring wells. Relevant data includes highest and lowest anticipated ground water elevations, aquifer materials, aquifer yield and contaminants expected. This information is used to aid the field geologist rather than to predetermine how the wells will be constructed. Well construction is based on *site specific conditions* and is determined in the field after discussion with the senior geologist.

Monitoring wells are constructed with flush-threaded, 2-inch or 4-inch diameter, slotted PVC, stainless steel or teflon well screen and PVC, stainless steel or teflon blank casing. Number 3 or #212 sand is used in the annular space around the well screen. The sand is placed into the annular space around the well screen to approximately 2 feet above the top of the well screen. If high ground water conditions exist, the sand may be placed 0 to 1 foot above the top of the well screen. Two feet of bentonite pellets are used to separate the sand from the sanitary surface seal (grout). If high ground water conditions exist 1/2 foot of bentonite may be used to separate the sand from the sanitary surface seal.

The grout (Portland cement with approximately 3-5% bentonite powder) is poured into the annular space above the bentonite pellets. If the surface seal is greater than 5 feet thick, grout consisting of cement mixed with 3-5% bentonite powder will be tremied or pumped into the annular space above the bentonite pellets to prevent the infiltration of surface water into the well. If the surface seal is less than 5 feet thick, the grout will be poured from the surface. The resulting seal will be checked for shrinkage within 24 hours and additional grout will be added, if necessary. The surface seal is used to prevent infiltration of surface water into the well.

The monitoring well(s) is locked with a stovepipe or cap and covered with a traffic-rated vault if it is located in a developed area. The well ID is clearly marked on the cap or casing.

ECM STANDARD OPERATING PROCEDURE

WELL DEVELOPMENT

ECM develops ground water monitoring wells not less than 48 hours after the placement of the surface seal (grouting) to allow sufficient time for the cement grout to set. The wells are developed to restore the natural hydraulic conductivity of the formation(s) to be monitored and to remove all sand and as much fine-grained material as possible.

Prior to development, ECM field personnel measure the depth to water and the total depth of the well. The total depth measurement is compared to the well completion diagram shown on the field log and any discrepancies are noted.

Well development consists of several cycles of surging and evacuation of water in the well, each ending with measurements of temperature, pH, conductivity, and observation of turbidity. Surging takes place for several minutes to loosen fines from the screened interval. The vented surge block is placed block several feet below the water surface and pulled upward.

Development shall continue for a period of at least four hours or when ten well volumes have been removed, whichever occurs first, and until ground water removed from the well is clear and visibly free of suspended materials. Note the time and the approximate volume of water removed prior to each determination of the following parameters (and whether well is bailed or pumped dry): pH, temperature, and specific conductivity. These measurements should be made a minimum of five times during well development.

If micro wells (well diameter 3/4" or less) are installed, the well may not be surged. In this case, a minimum of twenty casing volumes will be removed.

If the water is still cloudy after the four hour period but these three parameters have stabilized, then the well will be considered developed regardless of the volume of water purged from the well. Stabilization of pH, temperature, and specific conductivity will be considered to have occurred when these parameters undergo changes not exceeding $\pm$0.1, 0.5 degrees F, and 5 percent, respectively.

After development is completed, the depth to water and the total depth of the well are remeasured. The total depth of the well and the total depth noted on the field log should be approximately the same. All data measured during the procedures described herein are recorded on the ECM Well Development Form, which is part of the project file.

The ground water removed from the wells during development remains onsite in 55-gallon Department of Transportation-approved drums. The water is removed by a licensed hauler and taken to an approved disposal facility.

ECM STANDARD OPERATING PROCEDURE
GROUND WATER SAMPLING

The following describes sampling procedures used by ECM field personnel to collect and handle ground water samples. Before samples are collected, careful consideration is given to the type of analysis to be performed so that precautions are taken to prevent loss of volatile components or contamination of the sample, and to preserve the sample for subsequent analysis. Wells will be sampled no less than 24 hours after well development. Collection methods specific to ground water sampling are presented below.

Prior to sampling, each well is purged of a minimum of three well casing volumes of water using a steam-cleaned PVC bailer, or a pre-cleaned pump. Temperature, pH and electrical conductivity are measured at least three times during purging. Purging is continued until these parameters have stabilized (i.e., changes in temperature, and conductivity do not exceed 10% and changes in pH do not exceed 1.0).

Ground water samples are collected from the wells with steam-cleaned or disposable Teflon bailers. The water samples are decanted into the appropriate container for the analysis to be performed. Pre-preserved sample containers may be used or the analytic laboratory may add preservative to the sample upon arrival. Duplicate samples are collected from each well as a back-up sample and/or to provide quality control. The samples are labeled to include the project number, sample ID, date, preservative, and the field person's initials. The samples are placed in polyethylene bags and in an ice chest (maintained at 4˚C with blue ice or ice) for transport under chain-of-custody to the laboratory.

The chain-of-custody form includes the project number, analysis requested, sample ID, date of sampling, and the ECM field person's name. The form is signed and dated (with the transfer time) by each person who yields or receives the samples beginning with the field personnel and ending with the laboratory personnel.

ECM STANDARD OPERATING PROCEDURE
SUB-SLAB VAPOR SAMPLING

This document describes standard operating procedures (SOPs) used by ECM field personnel to collect and handle sub-slab soil vapor samples. This SOP has been prepared in accordance with the following guidance documents:

> Advisory - Active Soil Gas Investigations, Department of Toxic Substances Control and California Regional Water Quality Control Board, Los Angeles Region, January 28, 2003
>
> Guidance For the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Department of Toxic Substances Control and California Environmental Protection Agency, December 15, 2004, Revised February 7, 2005
>
> Chevron Soil Vapor Sampling Technical Toolkit, Version 1.6, Chevron Energy Technology Company, February 8, 2007

Many different conditions and circumstances may be encountered during sub-slab vapor sample collection. The above documents should be consulted if situations arise that are not covered in this SOP.

Probe Installation

Prior to sampling, it must be determined if the slab has a vapor barrier. If so, the vapor barrier must be repaired afterward. Do not drill through tension slabs, which contain embedded steel cables under tension. Probes should not be installed above utility trenching or near where a utility penetrates the slab. Prior to installation, remove carpet, if present, by cutting a small ½ inch flap which can be glued down afterwards, or by using other methods previously agreed upon with the building owner.

A rotary hammer drill is used to create a shallow (1-inch diameter) 'outer' hole that partially penetrates the slab. Next, the rotary hammer is used to drill an approximate 5/16-inch diameter 'inner' hole through the remainder of the slab and approximately 3 inches into sub-slab material.

Stainless steel or brass 1/4-inch outer diameter (approximately 0.18 inch inner diameter) tubing and stainless steel or brass compression to thread fittings are used to construct the probe. To avoid obstruction of the probe with sub-slab material, the tubing is cut to ensure it does not reach the bottom of the hole.

The probe is placed into the hole. The top of the probe is completed flush with the slab, such that it can be fitted with a plug so as not to interfere with day-to-day use of the building. Quick-drying Portland cement is mixed with water and used to seal the annular space between the probe and the outside of the 'outer' hole. Allow cement to cure for at least 24 hours prior to sampling.

Purging

Prior to collecting a soil vapor sample, the stagnant air in the sampling tubes must be removed. This ensures that the soil vapor sample that is collected is representative of actual soil vapor concentrations. Field notes containing information about the above-ground sampling equipment and below-ground tubing length and inner diameter should be used to calculate the "dead volume" to be purged. Three volumes will be purged unless a greater number of volumes are specified by the regulatory agency or other applicable guidance. A Summa canister evacuated by the lab to a pressure of -29.9 in Hg. is used to induce the flow for purging. A pressure gauge and flow control regulator with a flow gauge is used to control the flow. The flow rate and pressure for purging should be the same as the flow rate used for subsequent sampling (<200 ml/min at < 10 in Hg).

Leak Testing

Leakage during soil gas sampling may dilute samples with ambient air and produce results that underestimate actual site concentrations or contaminate the sample with external contaminants. Leak tests should be conducted at every soil gas probe. Various tracer compounds (i.e. pentane, isopropanol, isobutene, propane, or 1,1 Difluororoethane), may be used as leak check compounds. ECM uses 1,1 Difluoroethane in aerosol form (available in 'Dust-off' and other commonly available commercial products) unless another compound is specified for a site by the regulatory agency. During purging and sample collection, a containment shroud is assembled around the sampling equipment. The tracer compound is sprayed within the containment shroud to create an atmosphere containing the tracer compound. The soil vapor sample is then collected as specified below. Tracer compound detections are included on the analytic laboratory report. If the tracer compound is detected at unacceptably high concentrations (in general, at concentrations greater than 10 µg/l) sampling methodology must be re-evaluated.

Sample Collection

The soil vapor sample is collected in a Summa canister. The Summa cannister is supplied by the analytical lab and is evacuated by the lab to a pressure of -29.9 in Hg. A vacuum gauge and flow controller/flow gauge are used to monitor pressure and flow of formation air into the Summa canister. A low vacuum and low flow rate are used to aid in obtaining a representative soil vapor sample and to reduce the possibility of leakage of ambient air into the sampling equipment. The flow regulator is set by the lab to allow a flow volume of no greater than 200 ml/min.

Sample collection from a purged soil vapor probe should begin within 10 minutes of purging. Sample collection commences when all connections between the Summa canister, flow controller, and all other portions of the sampling equipment are tight. Leak testing should be performed concurrently with sampling as described above. To begin sampling, open the valve on the Summa Canister. As the canister fills, observe the pressure gauge on the flow controller to ensure that the vacuum in the canister is decreasing over time. Close the valve on the Summa canister when the pressure in the Summa canister has decreased to 5 in Hg.

All samples must be correctly and clearly labeled. The chain-of-custody form includes the final canister vacuums, canister serial number, analysis requested, project number, sample ID, date of sampling, and the ECM field person's name. The form is signed and dated (with the transfer

time) by each person who yields or receives the samples beginning with the field personnel and ending with the laboratory personnel.