

January 31, 2012

Bob Legallet
Telegraph Business Properties
1401 Griffith Street
San Francisco, CA 94214

RECEIVED

10:57 am, Feb 16, 2012

Alameda County
Environmental Health

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document are true and correct to the best of my knowledge.

Sincerely

A handwritten signature in black ink, appearing to read "Robert Ceyde", with a long horizontal flourish extending to the right.

Bob Legallet
Telegraph Business Properties

ECM group

January 31, 2012

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

Re: Subsurface Investigation/
Sub-slab Vapor Sampling Report
Telegraph Business Park
5427 Telegraph Avenue, Oakland, CA
ECM Group Project #07-181-11

Dear Mr. Legallet:

ECM Group has prepared this workplan to perform a subsurface investigation at the above referenced site. The purpose of the investigation is to further assess the impacts to soil and groundwater from a release of Chlorinated Volatile Organic Compounds (CVOCs), and to evaluate the potential for soil vapor intrusion in the onsite building.

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, benzene, toluene, ethylbenzene, and xylenes (BTEX) and other Volatile Organic Compounds (VOCs) were detected in soil sidewall samples collected from the UST excavations. Locations of the USTs, and locations of soil samples collected during UST removal, are shown in Figures 4 through 8 (Appendix A). Soil Sample analytical results are included in Tables 5 and 6 (Appendix B).

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

During several investigations conducted 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 (from monitoring wells and borings) 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.

2010 Subsurface Investigation

In response to concerns raised in a letter from Alameda County dated October 27, 2008, an additional subsurface investigation was conducted in April, 2010.² Two monitoring wells (MW-4 and MW-5), one soil boring (B-31), and two sub-slab vapor sampling points (VS-1 and VS-2) were installed. Well, boring, and sub-slab sampling point locations are shown on Figure 3, Appendix A. Analytic results for groundwater samples collected from the monitoring wells are included in Tables 2 and 3, Appendix B. Analytic results for soil samples collected from the monitoring wells and the boring are included in Table 4, Appendix B. Analytic results for sub-slab vapor samples are included in Table 8, Appendix B.

Stoddard solvent and Total Petroleum Hydrocarbons as Mineral Spirits (TPH(MS)) were detected in soil samples from B-31. Stoddard solvent, benzene, toluene, TBA and PCE were detected in one or both of the sub-slab vapor samples. Preliminary environmental screening levels (ESLs) were not exceeded for any compound.

Case Closure Proposal

The summary report for the 2010 subsurface investigation recommended case closure for the following reasons:

² ECM, 2010, Subsurface Investigation/Sub-slab Vapor Sampling Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland CA, July 20, 2010, 9 pages and 7 appendices.

- 1.) Results of investigations demonstrate that all potential exposure pathways at the site are incomplete.
- 2.) Due to the lack of analytes in soil or groundwater downgradient of the site, there is no potential risk to indoor air in buildings downgradient of the site.
- 3.) Sub-slab samples demonstrate that ESLs for soil gas have not been exceeded in the onsite building, so there is no potential risk to indoor air in on-site buildings.
- 4.) The 1997 sensitive receptor survey indicated that groundwater in the area is not being used as a source of drinking water. Due to the heavily urban character of the surrounding area, the proximity of San Francisco Bay, and the availability of municipal water, the potential for future development of groundwater as a drinking water source is virtually nonexistent.
- 5.) Site conditions do not present a potential threat to human health or safety, or to the environment.
- 6.) Residual hydrocarbons in soil and groundwater will continue to degrade.

A Preliminary 5-year review summary report, prepared by the State Water Resources Control Board (SWRCB) recommended that:

- 1.) The UST case for the site be considered for low risk closure; and
- 2.) That one additional round of groundwater monitoring be performed using EPA Method 8260 to identify any chlorinated solvents remaining as the result of the dry cleaning operation, and that if chlorinated solvents were found the site be moved to the appropriate county oversight group or be transferred to the appropriate State Agency.

An additional round of groundwater monitoring was performed in December 2010. No chlorinated compounds were detected. Accordingly, a Closure Proposal was included with the

report of the December 2010 monitoring event.³ A Closure Petition was filed with the SWRCB on March 21, 2011.⁴

In a letter dated May 16, 2011, Alameda County Environmental Health Services responded to the closure and petition. The letter requested:

- 1.) Additional investigation to assess the extent of potential impacts to indoor air from CVOCs; and
- 2.) Additional subsurface investigation to assess the vertical extent of CVOCs in groundwater. In particular the letter cited the detection of PCE at 210 parts per million (ppm) in soil sample IIB-1, collected in 1992 beneath a UST (Figure 6, Appendix A).

SCOPE OF WORK

In a conversation between ECM and Alameda County staff on December 15, 2011, the following scope of work for additional investigation was agreed upon:⁵

- 1.) Install one temporary soil boring at or near the location of the elevated PCE sample from 1992, to investigate the vertical extent of contamination in soil and groundwater;
- 2.) Install two additional sub-slab vapor sampling points to the south and east, respectively, of the former USTs located in the alleyway;
- 3.) Conduct a minimum of two rounds of sampling from the two existing and the two proposed sub-slab vapor sampling points, and analyze the samples collected for VOCs;

³ ECM, 2011, Groundwater Monitoring Report and Case Closure Proposal, Fourth Quarter 2010, Telegraph Business Park, 5427 Telegraph Avenue, Oakland CA, January 17, 2011, 3 pages and 6 appendices.

⁴ ECM, 2011, Case Closure Petition - UST Case, Telegraph Business Park, 5427 Telegraph Avenue, Oakland CA, March 21, 2011, 3 pages and 3 appendices.

⁵ ECM, 2011, Verbal Communication, Jim Green of ECM and Barbara J. Jakub, Alameda County Environmental Health Services, December 15, 2011.

- 4.) The need for additional investigation, if any, will be assessed following the completion of the above referenced tasks.

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 one soil boring at the location shown on Figure 3 (Appendix A). Collect soil samples from the soil boring for laboratory analysis. Survey soil samples from the boring with an organic vapor meter (OVM) to determine whether organic vapors are present in the samples.
3. Analyze soil samples from the boring for VOCs by EPA Method 8260. At a minimum, soil samples will be collected and analyzed at the soil/groundwater interface and thereafter at 10 foot intervals to 40 ft bgs or until refusal.
4. Install sub-slab vapor sampling points at the locations shown on Figure 3, Appendix A.
5. Conduct a minimum of two rounds of sampling from the two existing and the two proposed sub-slab vapor sampling points, and analyze the samples collected for VOCs by Method TO-15.
6. Report the results, including a recommendation for closure or for additional work as appropriate.

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) identifies potential site hazards and specifies procedures to protect site workers. The SSP will be on-site during field operations.

Task 2 - Boring Installation

The proposed boring location is shown on Figure 3 (Appendix A). The soil boring will be installed to a minimum of 40 ft bgs or to refusal.

Prior to installation, utilities will be located by USA and a private underground utility detection company. The boring will be installed by a California licensed drilling contractor, under the supervision of a California Registered Engineer. The boring will be installed in accordance with ECM Standard Operating Procedure - Drilling, Construction, and Destruction of Temporary Sampling Points (Appendix C). Soil samples will be collected in pre-cleaned tubes in accordance with ECM Standard Operating Procedure - Soil Sampling - (Appendix C).

The boring will be logged in accordance with ECM Standard Operating Procedure - Logging Method (Appendix C). The soil samples will be field screened with an OVM in accordance with ECM Standard Operating Procedure - OVM Readings (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. Following soil sample collection, the boring will be grouted to surface with a cement grout containing 3% to 5% bentonite.

Task 3 - Soil Analysis

Soil samples from the boring will be analyzed for VOCs by EPA Method 8260. At a minimum, soil samples will be collected and analyzed at the soil/groundwater interface and thereafter at 10 foot intervals to 40 ft bgs or until refusal.

Task 4 - Sub-Slab Vapor Sampling Point Installation

Sub-slab vapor sampling points will be installed at the locations shown on Figure 3, Appendix A in accordance with ECM Standard Operating Procedures - Sub-Slab Vapor Sampling (Appendix C).

Task 5 - Sub-Slab Vapor Sampling

A minimum of two rounds of samples will be collected from the two existing and the two proposed sub-slab vapor sampling points. Samples will be collected in accordance with ECM Standard Operating Procedures - Sub-Slab Vapor Sampling (Appendix C).

Task 6 - 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 closure or for additional investigation, if appropriate. In addition to hard copy submission, ECM will upload the report and site data to the ESI system

Subsurface Investigation/
Sub-slab Vapor Sampling Report
Telegraph Business Park
5427 Telegraph Avenue, Oakland, CA

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Thank you for allowing ECM to provide environmental consulting services. Please call if you have questions or require additional information.

Sincerely,
ECM Group



Rachel Guptel
Staff Scientist



Jim Green
Professional Engineer #C58482

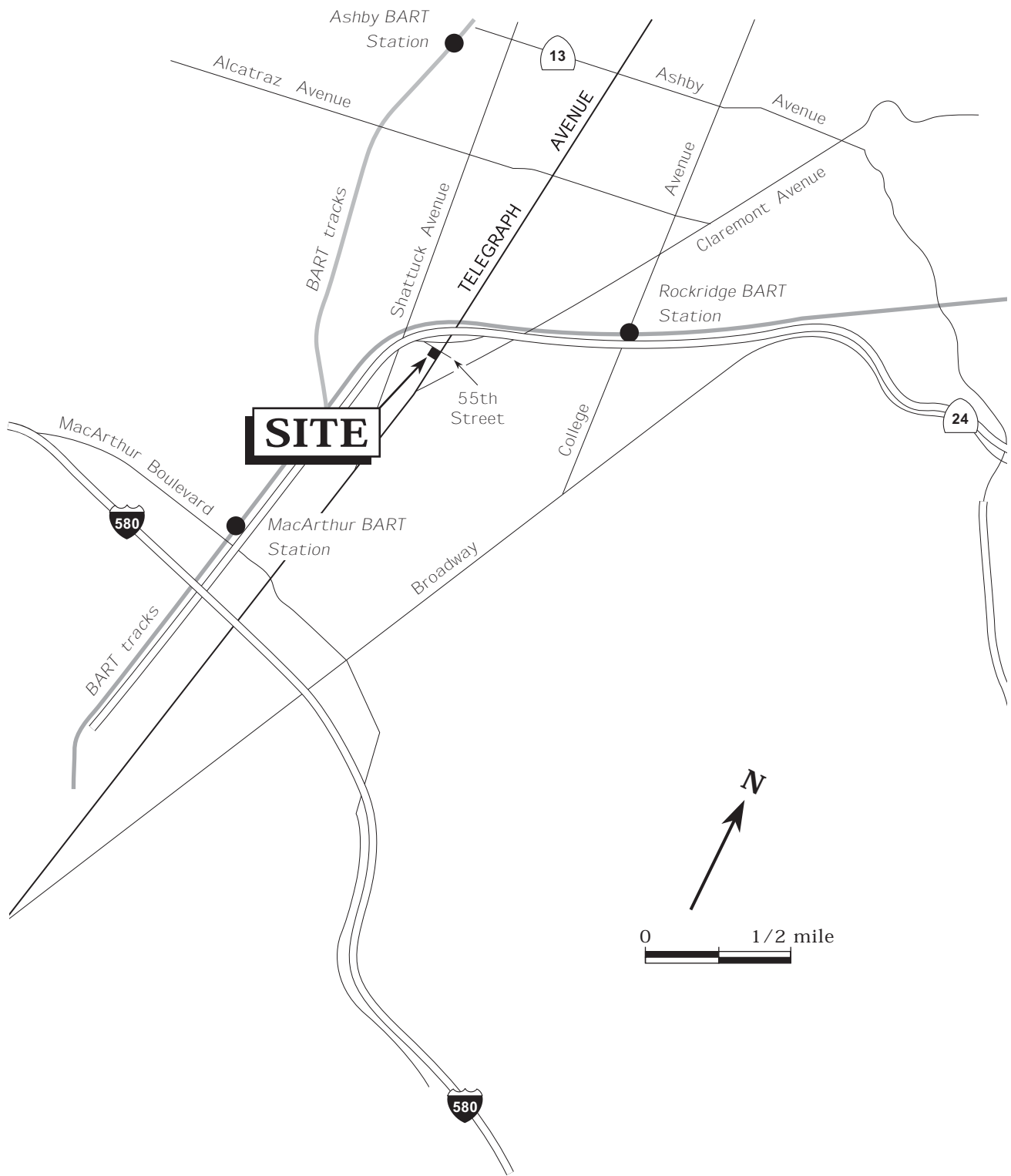


Attachments:

Appendix A - Figures
Appendix B - Tables
Appendix C - Standard Operating Procedures

cc: Barbara J. Jakub, Alameda County Health Care Services Agency
Leroy Griffin, Oakland Fire Department

APPENDIX A
FIGURES



Base map ref: California State Automobile Association (AAA)

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

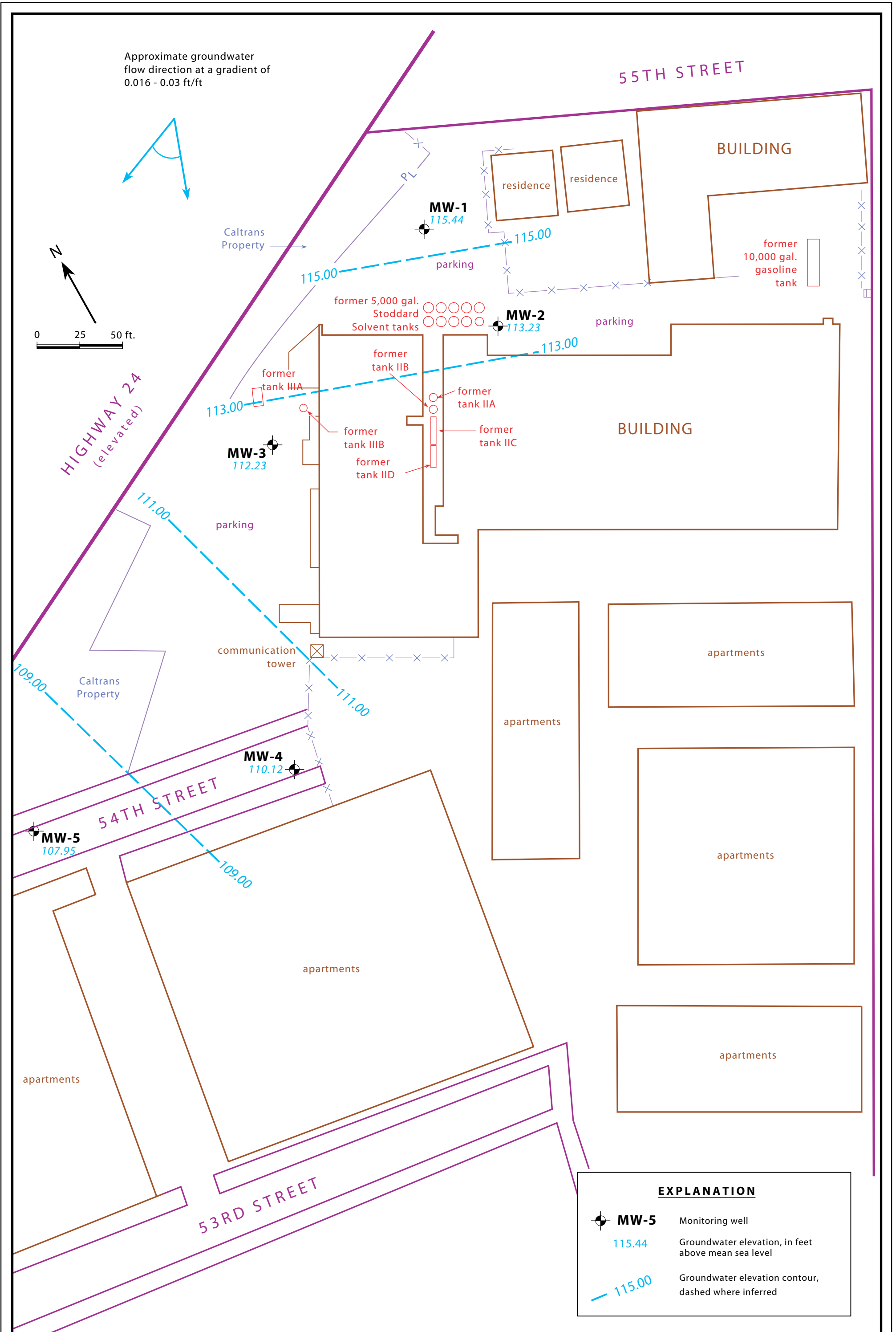
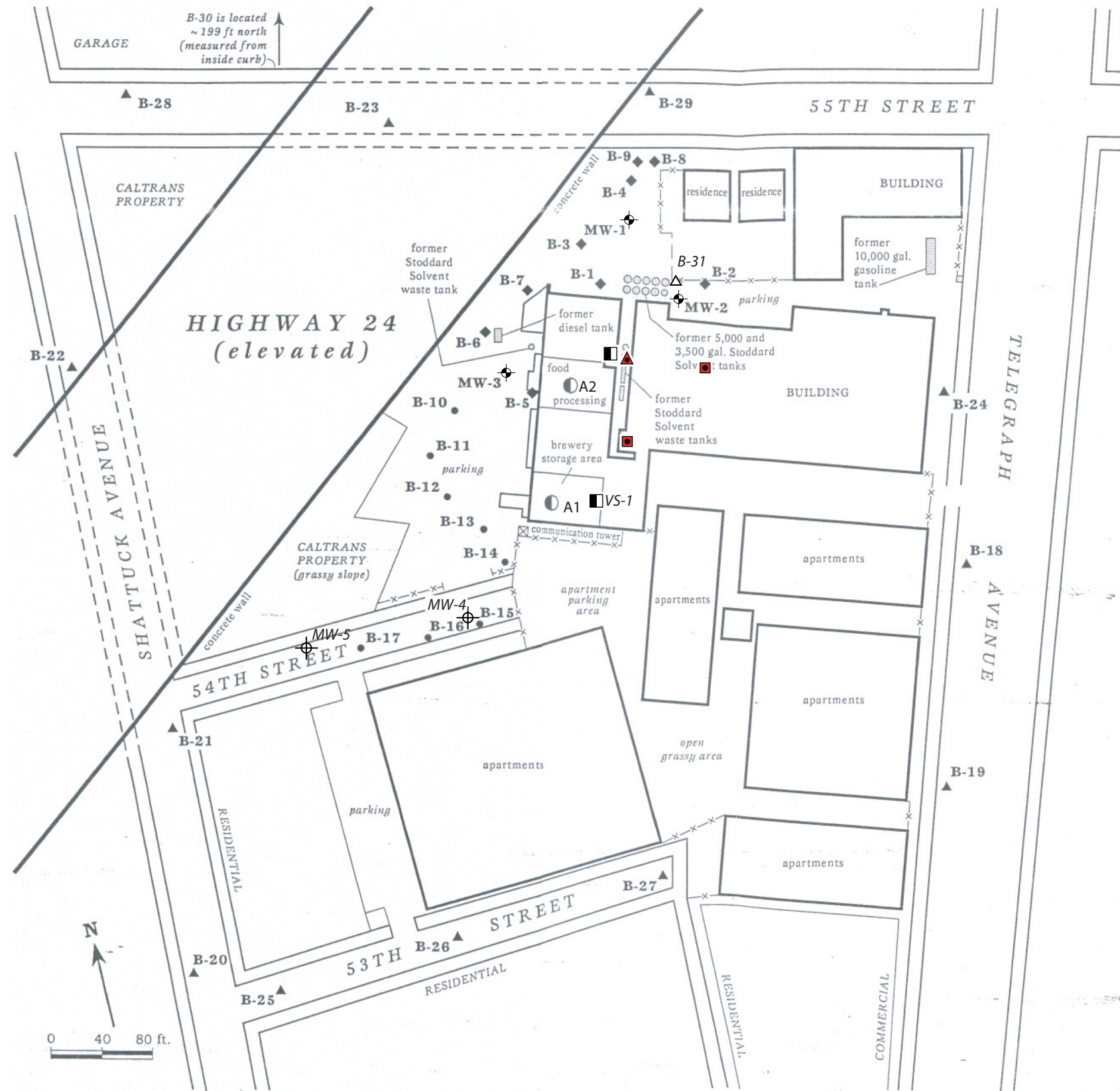


Figure 2. Monitoring Well Location and Groundwater Elevation Contour Map - December 7, 2010 - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California



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-5 Newly installed monitoring well
	B-31 Soil boring location (April 2010)
	VS-2 Sub-slab vapor sampling point (April 2010)
	Proposed boring location
	Proposed sub-slab vapor sampling point

Figure 3. □ Site Plan and Proposed Boring/Sub-slab Vapor Sampling Points - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

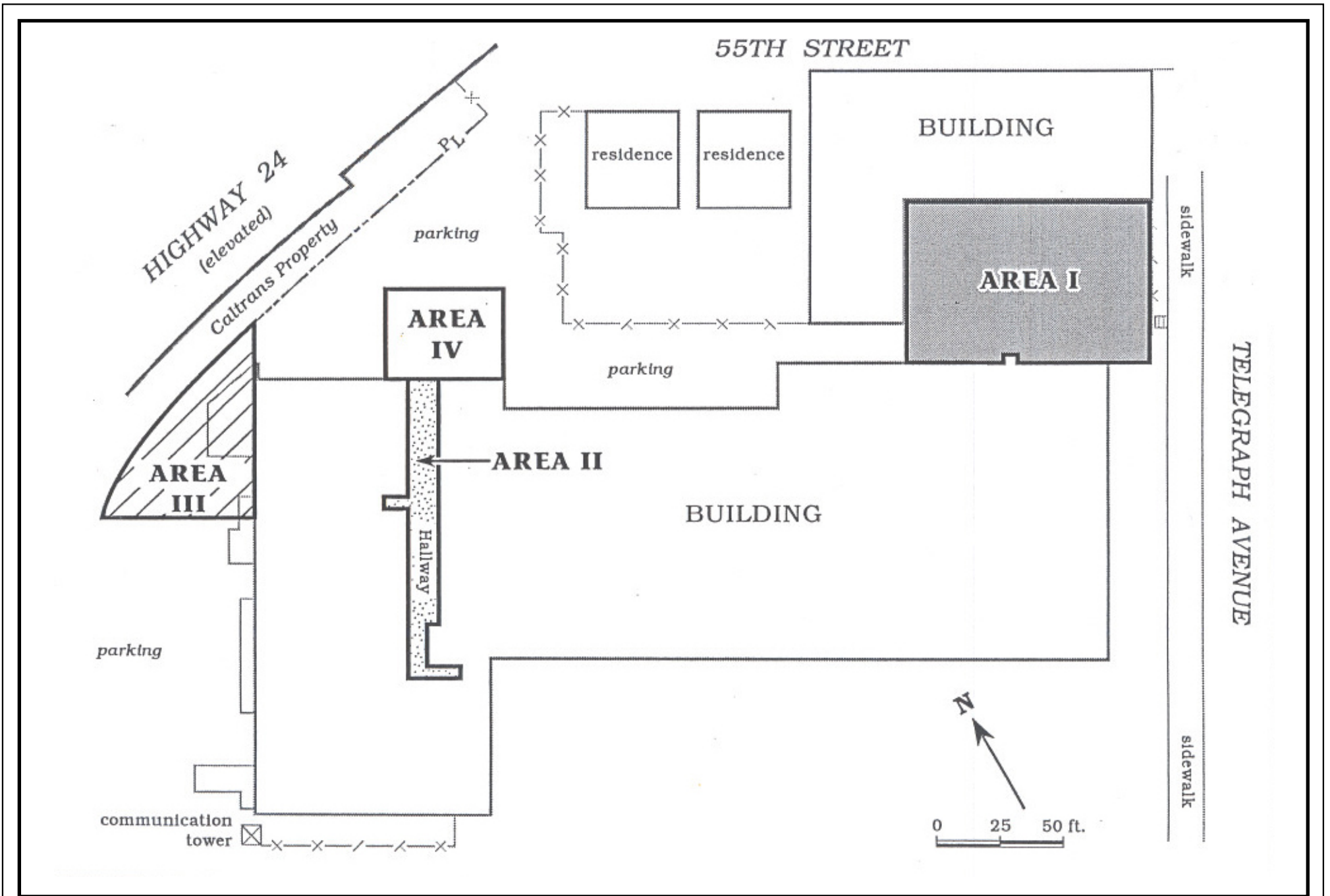


Figure 4. □ Work Areas I Through IV - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

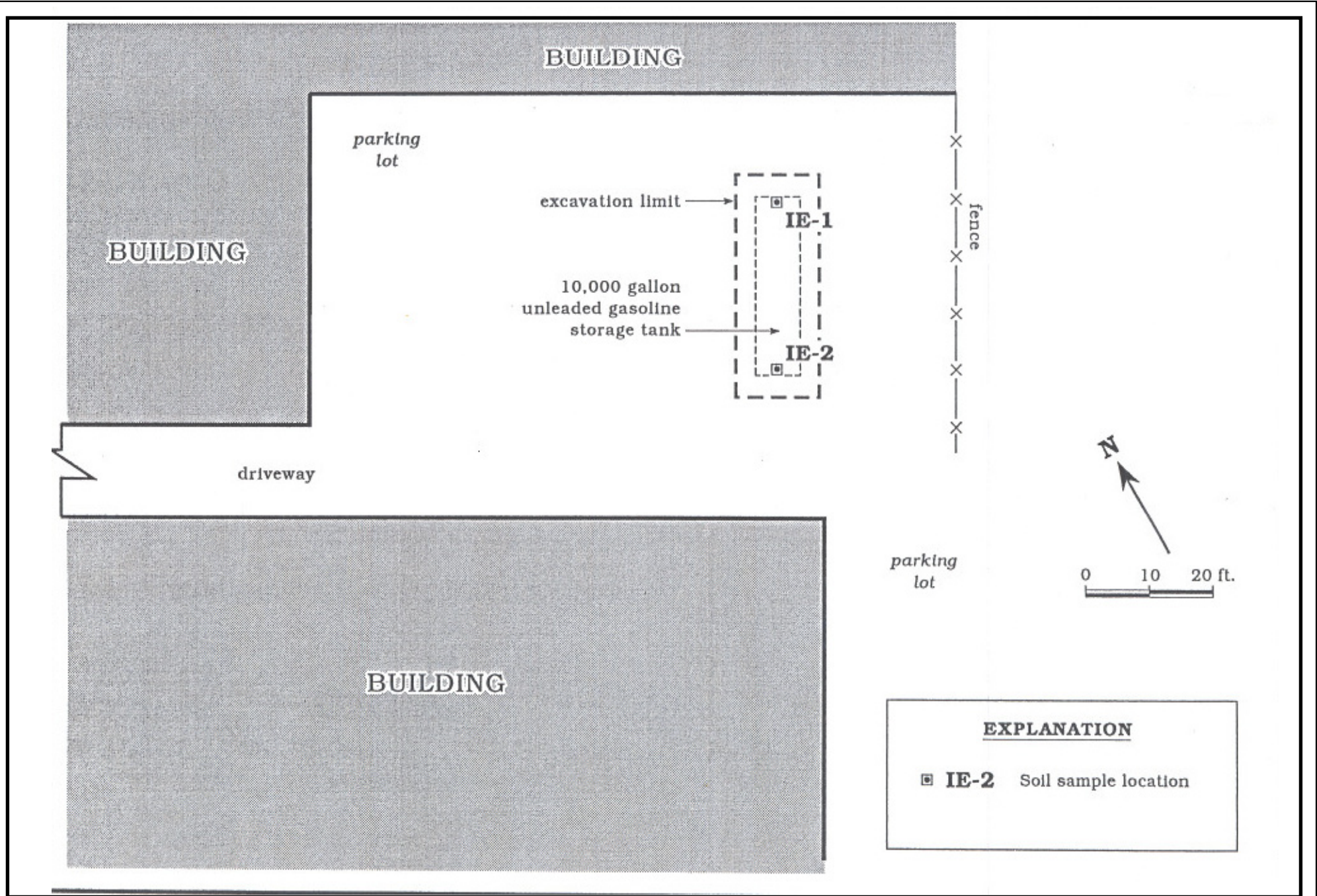
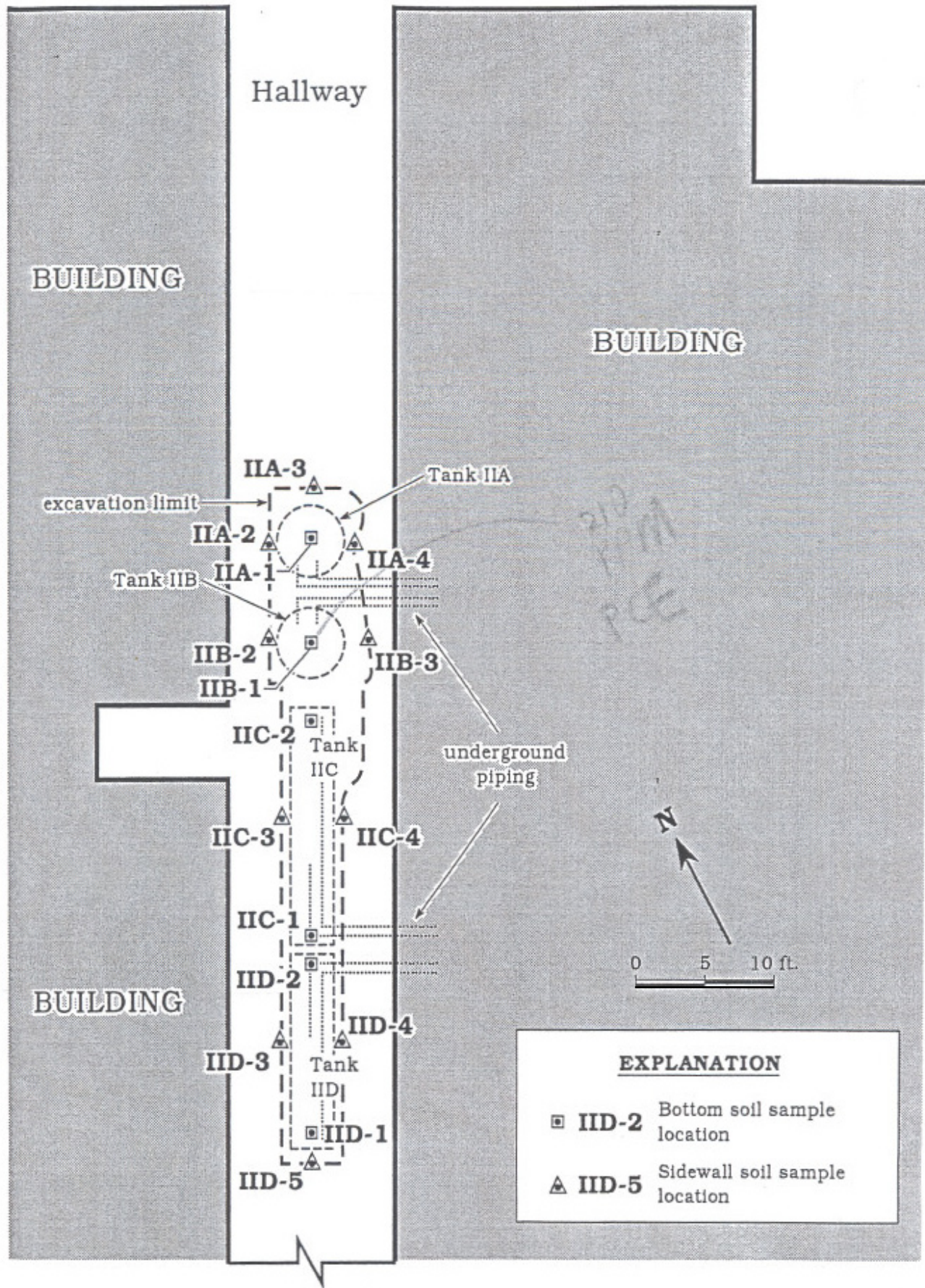


Figure 5. □ Work Area I - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California



EXPLANATION	
□ IID-2	Bottom soil sample location
△ IID-5	Sidewall soil sample location

Figure 6. □ Work Area II - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

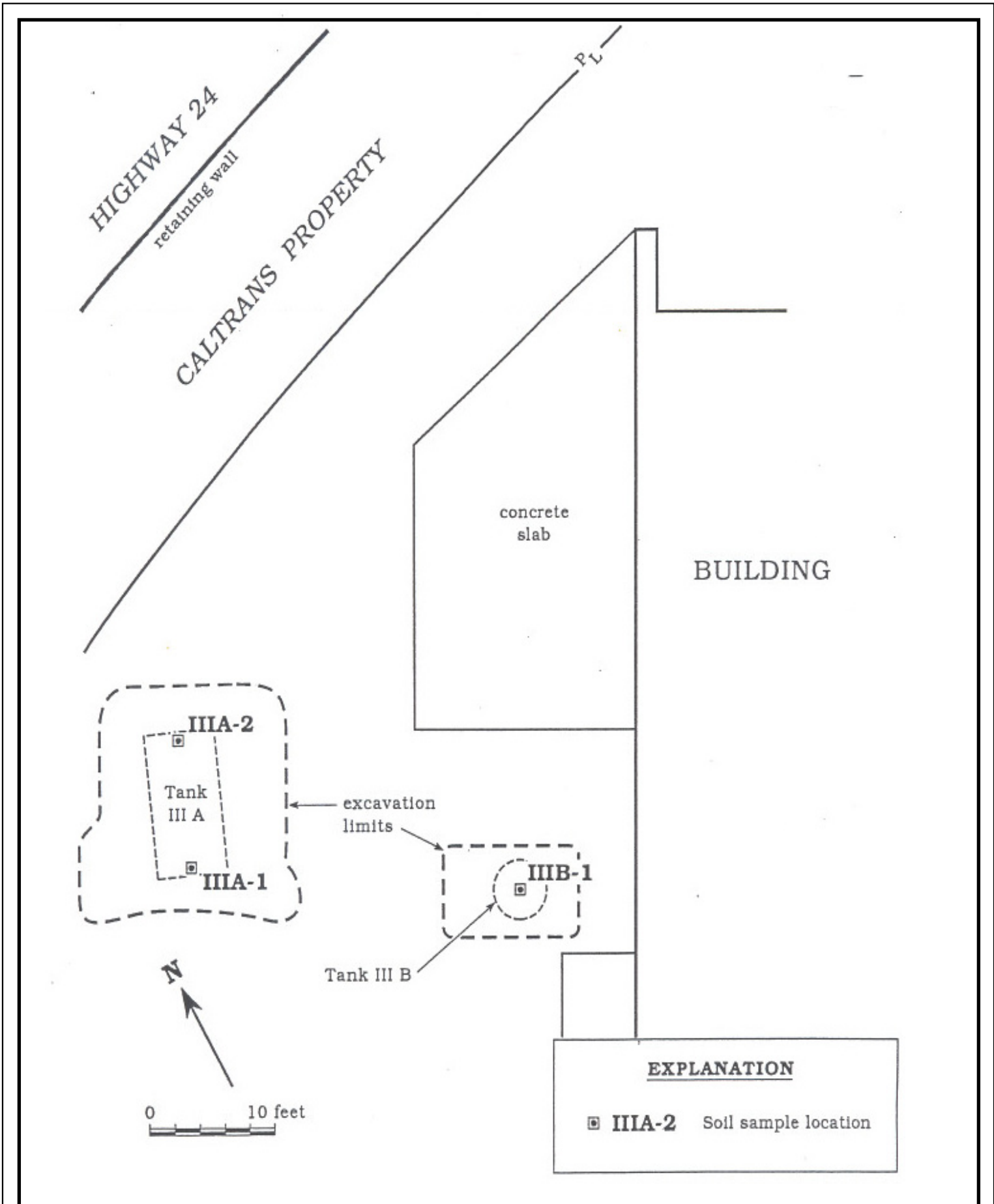
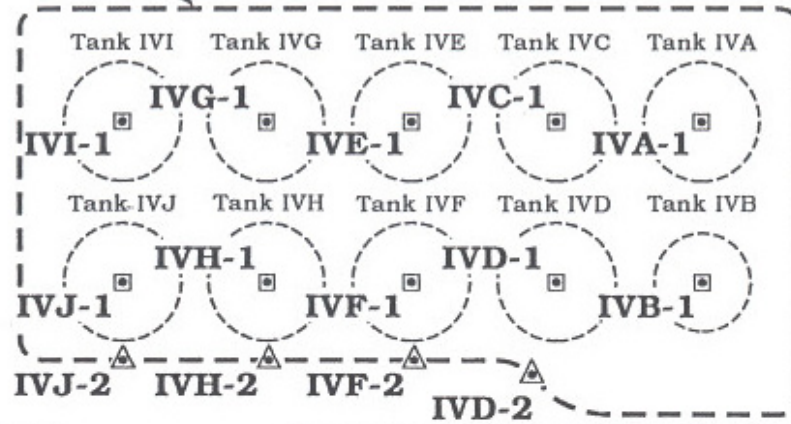


Figure 7. □ Work Area III - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

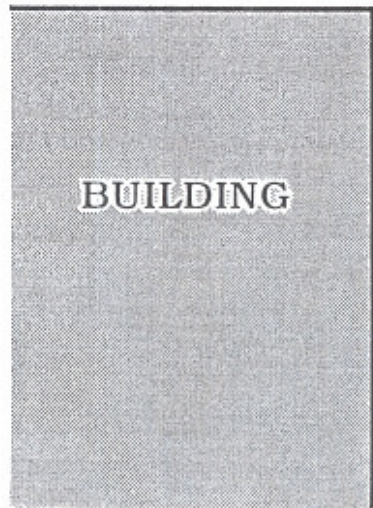
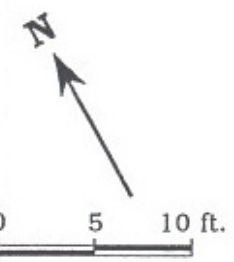
Parking

excavation limit

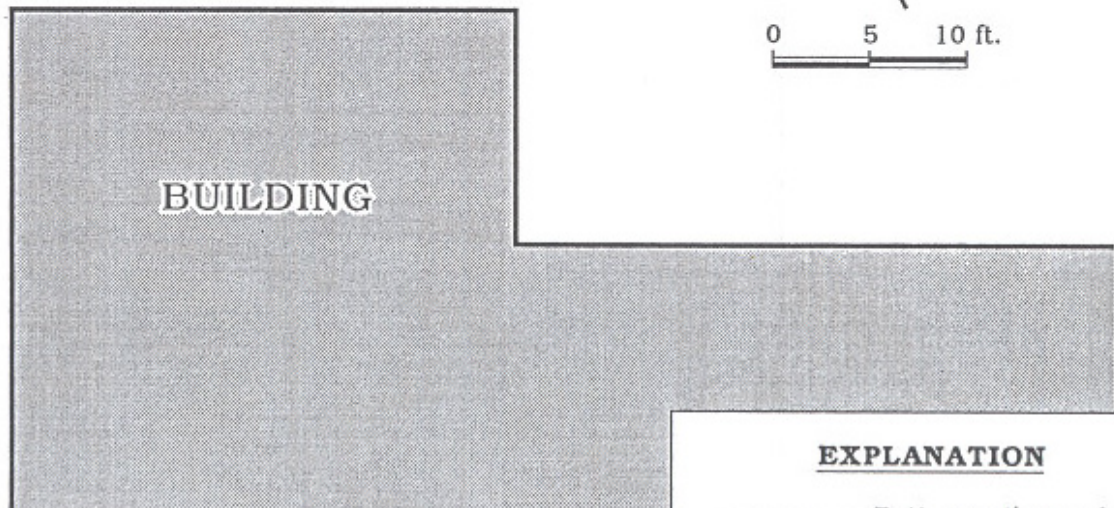
Parking



Parking



Hallway



EXPLANATION

- IVJ-1 Bottom soil sample location
- △ IVJ-2 Sidewall soil sample location

Figure 8. □ Work Area IV - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

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				
	8/28/2009	7.65		113.00				See Note 1
12/1/2009	7.15	113.50						
6/9/2010	5.95	114.70						
12/7/2010	5.21	115.44						
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				

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.	4/7/1995	9.84	117.60	107.76	7 - 27	6 - 27	0 - 6	
	7/26/1995	10.55		107.05				
	10/25/1995	10.15		107.45				
	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
	8/28/2009	11.58	111.78					
	12/1/2009	11.06	112.30					
	6/9/2010	11.26	112.10					
	12/7/2010	10.13	113.23					
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
	8/28/2009	13.16		107.75				
12/1/2009	11.43		109.48					

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-3	6/9/2010	9.80	120.91	111.11	5 - 20	4 - 20	0 - 4	
	12/7/2010	8.68		112.23				
MW-4	6/9/2010	6.79	116.44	109.65	5 - 20	4 - 20	0 - 4	well surveyed on 5/2/10 by Barry Kolstad, pls 5677
	12/7/2010	6.32		110.12				
MW-5	6/9/2010	5.60	113.03	107.43	5 - 20	4 - 20	0 - 4	well surveyed on 5/2/10 by Barry Kolstad, pls 5677
	12/7/2010	5.08		107.95				

Explanation:

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

Notes:

- Well boxes were replaced, TOC elevations changed, and wells were resurveyed on 11/23/08 and 12/7/08 by Barry Kolstad, pls 5677

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
	8/28/2009	510	169	<0.50	6.55	<0.50	<1.50	2
12/1/2009	<220	480	<2.2	<2.2	<2.2	<6.6	3	
6/9/2010	610	410	<2.2	<2.2	<2.2	<6.6	5	
12/7/2010	610	<100	<2.2	<2.2	<2.2	<6.6	6,8	
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
	8/28/2009	3,600	19,500	16	0.69	<0.50	<1.50	2
12/1/2009	440	4,000	12	<4.4	<4.4	13	3	
6/9/2010	5,000	69,000	17	<4.4	<4.4	<13.2	5	

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-2	12/20/2010	1,600	12,000	13	<2.2	<2.2	<6.6	5,8
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	
	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
	8/28/2009	2,200	434	2.8	0.66	1.6	<1.50	2
12/1/2009	3,900	<220	2.2	<2.2	<2.2	<6.6	2,4	
6/9/2010	3,100	990	5.5	<2.2	<2.2	<6.6	2	
12/7/2010	2,000	330	4.4	<4.4	<4.4	<13.2	6,7,8	
MW-4	6/14/2010	<50	<100	<0.50	<0.50	<0.50	<1.50	
	12/7/2010	<50	<100	<0.50	<0.50	<0.50	<1.50	8
MW-5	6/9/2010	<50	<100	<0.50	<0.50	<0.50	<1.50	
	12/7/2010	<50	<100	<0.50	<0.50	<0.50	<1.50	8

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

--- = not analyzed

Notes:

- 1 TPH(G) was not reported prior to 2008. Samples were analyzed for TPH(D) and Oil&Grease prior to 2008. See report: Sierra Environmental Services, 1996, Quarterly Monitoring Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California, December 26, 1996.
- 2 Sample chromatogram does not resemble gasoline standard pattern. Reported TPH value due to the presence of non-target heavy end hydrocarbons within range of C5-C12 quantified as gasoline.
- 3 The reporting limits were raised due to a high concentration of heavy end hydrocarbons within range quantified as Mineral Spirits.
- 4 The reporting limits were raised due to contribution of unidentified hydrocarbons within the C5-C12 range quantified as gasoline.
- 5 Results not typical of Gasoline standard pattern. Result reported as Gasoline but pattern best matches Mineral Spirits/Stoddard Solvent.
- 6 Hydrocarbons within C5-C12 range quantified as gasoline but pattern does not match reference gasoline standard (possibly heavily aged gasoline).
- 7 Not typical of stoddard standard pattern (possibly aged stoddard).
- 8 Sample analyzed for VOCs by EPA method 8260B. No chlorinated solvents detected. See analytical laboratory report (Appendix C) for reporting limits.

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
	8/28/2009	<0.50	<0.50	<0.50	<0.50	<10.0	<0.50	<0.50	
12/1/2009	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2		
6/9/2010	<2.2	<2.2	<2.2	<2.2	<22	<2.2	<2.2		
12/7/2010	<2.2	<2.2	<2.2	<2.2	<22	<2.2	<2.2	2	
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
	8/28/2009	<0.50	<0.50	<0.50	<0.50	<10.0	<0.50	<0.50	
12/1/2009	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4		
6/9/2010	<4.4	<4.4	<4.4	<4.4	<44	<4.4	<4.4		

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-2	12/7/2010	<2.2	<2.2	<2.2	<2.2	<22	<2.2	<2.2	2	
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		
	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	<0.50	1
	8/28/2009	<0.50	<0.50	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	
12/1/2009	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2		
6/9/2010	<2.2	<2.2	<2.2	<2.2	<22	<2.2	<2.2	<2.2		
12/7/2010	<4.4	<4.4	<4.4	<4.4	<44	<4.4	<4.4	<4.4	2	
MW-4	6/14/2010	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50		
	12/7/2010	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	2	
MW-5	6/9/2010	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50		
	12/7/2010	<0.50	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	2	

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 ----->									

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. See report: Sierra Environmental Services, 1996, Quarterly Monitoring Report, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California, December 26, 1996.
- 2 Sample analyzed for VOCs by EPA method 8260B. No chlorinated solvents detected. See analytical laboratory report (Appendix C) for reporting limits.

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

Sample ID	Sample Date	Depth feet, bgs	TPH (G)	TPH (D)	TPH (MS)	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Oxygenates/Lead scavengers	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	---	---	---	---	---	
	12/14/1993	20.5	---	<1.0	---	<1.0	---	---	---	---	---	
		25.5	---	<10	---	200	---	---	---	---	---	

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

Sample ID	Sample Date	Depth feet, bgs	TPH (G)	TPH (D)	TPH (MS)	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylenes	Oxygenates/Lead scavengers	Notes
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
B-31	4/12/2010	5.0	<13.0	---	190	22	<0.015	<0.015	<0.015	<0.015	ND	
		10.0	<94.0	---	960	480	<0.94	<0.94	<0.94	<0.94	ND	
		15.0	<10.0	---	74	11	<1.0	<1.0	<1.0	<1.0	ND	
		20.0	<0.11	---	0.4	<3.3	<0.011	<0.011	<0.011	<0.011	ND	
		25.0	<13.0	---	20	<3.3	<0.0099	<0.0099	<0.0099	<0.0099	ND	
		30.0	<10.0	---	27	7.4	<0.015	<0.015	<0.015	<0.015	ND	
		35.0	<26.0	---	95	99	<1.1	<1.1	<1.1	<1.1	ND	
MW-4	4/12/2010	6.0	<0.098	---	---	<3.3	<0.0098	<0.0098	<0.0098	<0.0098	ND	
		11.0	<0.13	---	---	<3.3	<0.013	<0.013	<0.013	<0.013	ND	
		16.0	<0.12	---	---	<3.3	<0.012	<0.012	<0.012	<0.012	ND	
		20.0	<0.13	---	---	<3.3	<0.013	<0.013	<0.013	<0.013	ND	
MW-5	4/12/2010	11.0	<0.1	---	---	<3.3	<0.01	<0.01	<0.01	<0.01	ND	

Explanation:

- TPH (G) = Gasoline
- TPH (D) = Diesel
- PH (MS) = Mineral Spirits
- = not analyzed
- ND = not detected

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,

Table 5. Analytic Results for Soil - 1992 UST Removal - Hydrocarbons - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH (G)	TPH (D)	Stoddard Solvent	O&G	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<----- parts per million ----->								
IE-1	4/29/1992	<1(1)	---	---	---	<0.005	<0.005	<0.005	0.007	
IE-2	4/29/1992	<1(1)	---	---	---	<0.005	<0.005	<0.005	0.009	
IIA-1	5/11/1992	<6	45	1,430	<50	<0.3	<0.3	<0.3	6.4	
IIA-2	5/11/1992	<6	120	1,470	<50	<0.3	<0.3	<0.3	5.8	
IIA-3	5/11/1992	<6	47	1,390	<50	<0.3	<0.3	<0.3	4.8	
IIA-4	5/11/1992	<6	24	1,320	<50	<0.3	<0.3	<0.3	4.4	
IIB-1	5/11/1992	<6	33	1,720	2,285	<0.3	<0.3	<0.3	11	
IIB-2	5/11/1992	<6	32	200	<50	<0.06	<0.06	<0.06	0.54	
IIB-3	5/11/1992	<6	120	1,580	240	<0.06	<0.06	<0.06	9	
IIC-1	5/15/1992	---	17(1)	---	---	<0.03	<0.03	<0.03	14	
IIC-2	5/15/1992	---	60(1)	---	---	<0.03	<0.03	<0.03	12	
IIC-3	5/15/1992	---	220(1)	---	---	<0.03	<0.03	<0.03	5.6	
IIC-4	5/15/1992	---	3.8(1)	---	---	<0.005	<0.005	<0.005	<0.005	
IID-1	5/15/1992	---	14(1)	---	---	<0.03	<0.03	<0.03	8.1	
IID-2	5/15/1992	---	31(1)	---	---	<0.03	<0.03	<0.03	26	
IID-3	5/15/1992	---	<1(1)	---	---	<0.005	<0.005	<0.005	<0.005	

Table 5. Analytic Results for Soil - 1992 UST Removal - Hydrocarbons - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH (G)	TPH (D)	Stoddard Solvent	O&G	Benzene	Toluene	Ethyl-benzene	Xylenes	Notes
		<----- parts per million ----->								
IID-4	5/15/1992	---	<1(1)	---	---	<0.005	<0.005	<0.005	<0.005	
IID-5	5/15/1992	---	<1(1)	---	---	<0.005	<0.005	<0.005	0.038	
IIIA-1	5/11/1992	---	260(1)	---	---	<0.3	<0.3	<0.3	1.8	2
IIIA-2	5/11/1992	---	<1	---	---	<0.03	<0.03	<0.03	0.62	
IIIB-1	5/11/1992	<6	<1	570	<50	<0.3	<0.3	<0.3	1.9	3
IVA-1	5/11/1992	---	<1(1)	---	---	<0.005	<0.005	<0.005	0.022	
IVB-1	5/11/1992	---	<1(1)	---	---	<0.005	<0.005	<0.005	0.22	
IVC-1	5/19/1992	---	21(1)	---	---	<0.03	<0.03	<0.03	5.2	
IVD-1	5/19/1992	---	3.9(1)	---	---	<0.03	<0.03	<0.03	9.4	
IVD-2	5/19/1992	---	16(1)	---	---	<0.03	<0.03	<0.03	14	
IVE-1	5/20/1992	---	130(1)	---	---	<0.03	<0.03	<0.03	15	
IVF-1	5/20/1992	---	100(1)	---	---	<0.03	<0.03	<0.03	4.4	
IVF-2	5/20/1992	---	40(1)	---	---	<0.03	<0.03	<0.03	5.8	
IVG-1	5/21/1992	---	<1(1)	---	---	<0.03	<0.03	<0.03	5.7	
IVH-1	5/21/1992	---	<1(1)	---	---	<0.03	<0.03	<0.03	6.9	
IVH-2	5/21/1992	---	<1(1)	---	---	<0.03	<0.03	<0.03	4.6	

Table 5. Analytic Results for Soil - 1992 UST Removal - Hydrocarbons - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH (G)	TPH (D)	Stoddard Solvent	O&G	Benzene	Toluene	Ethylbenzene	Xylenes	Notes
		<----- parts per million ----->								
IVI-1	5/22/1992	---	50(1)	---	---	<0.03	<0.03	<0.03	27	
IVJ-1	5/22/1992	---	12(1)	---	---	<0.03	<0.03	<0.03	3.9	
IVJ-2	5/22/1992	---	<1(1)	---	---	<0.03	<0.03	<0.03	0.58	

Explanation:

TPH (G) = Gasoline

TPH (D) = Diesel

--- = not analyzed

ND = not detected

O&G = Oil and Grease (non polar)

B = Benzene

T = Toluene

E = Ethylbenzene

X = Xylenes

PPM = Parts per million

Notes:

- 1 The analytic laboratory reported that a stoddard solvent pattern was observed in the chromatogram
- 2 Quantified by the analytical laboratory as "diesel range" hydrocarbons.
- 3 Cadmium, Chromium, nickel, lead, and zinc detected at 20, 47.5, <1.5, <3, and 67.8 ppm respectively.

All values in Table 5 are taken from Sierra Environmental Services Tank Pull, Excavation Activities, Telegraph Business Park, 5427 Telegraph Avenue,

Table 6. Analytic Results for Soil - 1992 UST Removal - Volatile Organic Compounds - Telegraph Business Park, 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	Analytic Method	1,2-DCE	TCE	PCE	BEP	PA	DNO	OTHER VOCs	Notes
			----- parts per million -----							
IIA-1	5/11/1992	8010	1.6	3.9	43	---	---	---	ND	1
		8270	---	---	---	0.35	<0.1	<0.13	ND	2
IIA-2	5/11/1992	8010	0.86	2.1	6	---	---	---	ND	1
		8270	---	---	---	2	0.23	<0.13	ND	2
IIA-3	5/11/1992	8010	2.1	0.54	1.4	---	---	---	ND	1
		8270	---	---	---	0.82	<0.1	0.49	ND	2
IIA-4	5/11/1992	8010	1.9	0.1	0.18	---	---	---	ND	1
		8270	---	---	---	0.7	<0.1	0.9	ND	2
IIAB-1	5/11/1992	8010	1.8	35	210	---	---	---	ND	1
		8270	---	---	---	<0.1	0.32	<0.13	ND	2
IIB-2	5/11/1992	8010	3.4	0.034	0.16	---	---	---	ND	1
		8270	---	---	---	0.9	0.1	<0.13	ND	2
IIB-3	5/11/1992	8010	5.2	1.2	4.6	---	---	---	ND	1
		8270	---	---	---	3	<0.1	<0.13	ND	2
IIIB-1	5/11/1992	8010	<0.008	<0.005	<0.018	---	---	---	ND	1
		8270	---	---	---	<0.1	<0.1	<0.13	ND	2

Explanation:

- 1,2-DCE = Cis- 1,2-dichloroethene
- TCE = Trichloroethene
- PCE = Tetrachloroethene
- BEP = Bis-(2-ethylhexyl)phthalate
- PA = Phenanthracene
- DNO = di-n-octylphthalate
- ppm = Parts per million
- = not analyzed
- ND = not detected
- HVOCs = Halogenated Volatile Organic Compounds
- SVOCs = Semi-volatile Organic Compounds

Notes:

- 1 Other HVOCs were not detected at detection limits ranging from 0.003 to 0.0251 ppm.
- 2 Other SVOCs were not detected at detection limits ranging from 0.04 to 1 ppm.

All values in Table 6 are taken from Sierra Environmental Services Tank Pull, Excavation Activities, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, CA, July 21, 1992.

Table 7. 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
		<-----µg/m3----->						
A-1	11/19/1996	<4.6	6.8	26.8	9.3	12.3	6.0	1
A-2	11/19/1996	<5.2	6.8	16.0	<4.0	5.7	<4.5	2
Preliminary Screening Concentration								
	Residential	---	0.0842 ⁴	313 ⁴	210 ³	730 ⁴	---	
	Commercial	---	0.141 ⁴	438 ⁴	290 ³	1,020 ⁴	---	

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.
- 3 Preliminary screening concentration numbers are based on Region 2 ESLs (Interim Final - May 2008) Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, California Regional Water Quality Control Board - San Francisco Bay Region.
- 4 Preliminary screening concentration numbers are based on California Environmental Protection Agency, 2005, Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties, January, 2005.

Results for A-1 and A-2 are taken from Sierra Environmental Services *Risk Screening Analysis*, Telegraph Business Park, 5427 Telegraph Avenue, Oakland, CA, March 6, 1997. Concentrations have been converted from ppbv into µg/m3.

Table 8. Sub-Slab Vapor Sample Results - 5427 Telegraph Avenue, Oakland, California

Sample ID	Sample Date	TPH(G)	Stoddard Solvent	Benzene	Toluene	Ethyl-benzene	Xylene	MTBE	TBA	DIPE	ETBE	TAME	PCE	IPA ⁴	Notes
		←-----µg/m ³ -----→													
VS-1	4/14/2010	<120	<120	1.264	<0.95	<1.1	<2.2	<0.9	114.744	<1.05	<1.05	<1.05	189.414	<5.0	2
VS-2	4/14/2010	<130	2,410	1.17	1.20	<1.1	<2.2	<0.90	303	<1.1	<1.1	<1.1	191	12.5	3
Preliminary Screening Concentration ¹															
	Residential	10,000	---	84	63,000	980	21,000	9,400	---	---	---	---	410	---	
	Commercial	29,000	---	280	180,000	3,300	58,000	31,000	---	---	---	---	1,400	---	

TBA = t-Butyl alcohol
 DIPE = Diisopropyl ether
 ETBE = Ethyl t-butyl ether
 TAME = t-Amyl methyl ether
 PCE = Tetrachloroethylene
 IPA = isopropyl alcohol
 µg/m³ = micrograms per cubic meter
 --- = Not available

Notes:

- 1.) Preliminary screening concentration numbers are from Table E, Environmental Screening Levels (ESLs) Indoor Air and Soil Gas (Vapor Intrusion Concerns), Region 2 ESLs, Interim Final - November 2007 (Revised May, 2008), Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater, California Regional Water Quality Control Board, San Francisco Bay Region, 1515 Clay Street, Suite 1400, Oakland, California 94612.
- 2.) Sample VS-1 was analyzed for VOCs by ETO15. Other VOCs detected were: methylene chloride (8.82µg/m³); acetone (9.312 µg/m³); and 1,1,1-trichloroethane (1.43 µg/m³).
- 3.) VS-2 was analyzed for VOCs by ETO15. Other VOCs detected were: methylene chloride (1.35µg/m³); acetone (13.2 µg/m³); 1,1,1-trichloroethane (1.93 µg/m³); and 2-Butanone (2.10 µg/m³).
- 4.) IPA was introduced as tracer compound.

APPENDIX C
STANDARD OPERATING PROCEDURES

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

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

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
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 EncoreTM 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 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 Difluoroethane), 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.