APPENDIX A

MIP REPORT

Valley Gas

2008 1St Street
Livermore, CA

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Client: Golder Assoc.
2580 Wyandotte St., Suite G
Mountain View, CA 94043

Start Date: 3/20/2006
Completed Date: 3/24/2006

Site Address: 2008 1st St. Livermore, CA
Project Name Valley Gas

Project Scope: Collected Membrane Interface Probe logs from 17 boring locations from approximately surface to as deep as 54 feet to identify BTEX and MTBE source zone for preparation of a remedial action.

Project Information:

MIP-1	Replaced MIP probe membrane before next boring. Repaired hole in Nitrogen line at the probe to equalize the pressure.
MIP-2	Refusal at 47.95 ft. bgs.
MIP-3	Replaced MIP probe.
MIP-4	Added (3) 4 ft. rods after MIP 3. Refusal at 32.45 ft. bgs. Replace MIP probe.
MIP-4b	String pot malfunctioned at 24 ft. bgs Replaced MIP probe membrane.
MIP-5	Hand auger to 4 ft. by Vironex. Lost MIP probe and rods at the end of run. Replaced MIP probe.
MIP-6	Refusal at 45.25, client called a stop.
MIP-8	Replaced MIP probe membrane before Response Test. Problems with changing attenuation of FID detector at 47 ft. bgs.
MIP-9	Replaced MIP probe membrane before response test.
MIP-10	Probe temperature went bad at 8ft. Bgs. Replaced probe with new one.
MIP-10b	Replaced MIP probe with new one. Cleared to 5 ft. with auger by Vironex.
MIP-11	Cleared to 5 ft. with auger by Vironex.
MIP-12	Cleared to 5 ft. with auger by Vironex.
MIP-13	Cleared to 5 ft. with auger by Vironex.
MIP-14	New MIP probe due membrane malfunction (stripped threads). Cleared to 5 ft. with auger by Vironex.
MIP-15	Cleared to 5 ft. with auger by Vironex.
MIP-16	Stopped at 39.25 ft. bgs to wait for probe to reach higher temperature. Cleared to 5 ft. by Vironex.
MIP-17	Hand augered to 2.5 ft bgs by Vironex & Cleared to 4ft. by Macro-core as per request by Golder. Replaced MIP probe membrane.

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MIP Boring and Confirmation Sampling Summary

Date Sampled	Time Sampled	Boring Name	Total Depth	Confirmation Samples Soil	Confirmation Samples Groundwater
Mar 20 2006	09:06	MIP-1	50.45		
Mar 20 2006	11:33	MIP-2	47.95		
Mar 20 2006	14:47	MIP-3	50.45		
Mar 21 2006	08:15	MIP-4	32.45		
Mar 21 2006	10:22	MIP-4b	49.95		
Mar 21 2006	13:18	MIP-5	43.75		
Mar 21 2006	16:54	MIP-6	45.25		
Mar 22 2006	08:56	MIP-8	54.15		
Mar 22 2006	11:44	MIP-9	54.05		
Mar 22 2006	13:42	MIP-10	8.45		
Mar 22 2006	14:48	MIP-10b	54.15		
Mar 22 2006	16:34	MIP-11	54.25		
Mar 23 2006	08:36	MIP-12	54.15		
Mar 23 2006	10:53	MIP-13	54.35		
Mar 23 2006	14:08	MIP-14	53.85		
Mar 23 2006	16:22	MIP-15	47.65		
Mar 24 2006	08:24	MIP-16	47.75		
Mar 24 2006	10:52	MIP-17	52.25		

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Quality Control: Vironex utilizes a response test* prior to each MIP boring. A solution containing water, Trichloroethene & Toluene are mixed and transferred into a galvanized test pipe. The MIP is then lowered into the test pipe for 45 seconds and then extracted. The trip time** is then noted and entered into the SC4000 MIP computer.

**Response Test - A test that ensures that the MIP system is working correctly.*
***Trip Time - Time it takes for the standard to enter the MIP probe, at the probe membrane, till the time a significant response is noticed on the SC 4000 Computer*

MIP Components Used:
- Geoprobe 6600
- FC 4000 MIP Computer
- Flow Control Box
- HP Gas Chromatograph
- ECD (Electron Capture Detector)
- PID (Photo Ionization Detector)
- FID (Flame Ionization Detector)
- 150' Trunk Line
- 1.5" MIP Probe
- 1.5" Drive Rods

Soil Confirmation Soil Confirmation data provided by Golder Associates.

Qualitative Analysis (Identification): The MIP system will detect most VOC's (Volatile Organic Compounds) which have the capability of migrating through the membrane. The ECD (Electron Capture Detector) will typically detect chlorinated compounds. The PID will typically detect aromatic and double bonded compounds, typical of gasoline components and some solvents. At high concentrations the ECD, PID and FID may detect other compounds not normally associated with the detector. Physical soil samples which are prepared by EPA Method 5035, and analyzed by EPA Method 8260, may be semi correlated with the MIP responses. The MIP responses are semi-correlated with most detected compounds, even those which are not reported nor detected by EPA Method 8260.

Lithology: The conductivity of soils is different for each type of media. Finer grained sediments, such as silts or clays, will have a higher EC signal. While coarser grained sediments, sands and gravel, will have a lower EC signal. Lithology should be correlated with a physical soil sample.

Frank Stolfi
National Director of MIP Services

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Start Date: 3/20/2006
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Project Name: Valley Gas

MIP Quality Control

Standard Summary

Boring Name	Date	Time	Standard	PID Response	ECD Response	Pressure (PSI)	Response Time (s)
QA QC 1	Mar 20 2006	08:45	1 ppm TCE & Toluene	Yes	Yes	11.23	76
MIP-1	Mar 20 2006	09:06				9.60	76
QA QC 2	Mar 20 2006	11:25	1 ppm TCE & Toluene	Yes	Yes	11.17	72
MIP-2	Mar 20 2006	11:33				10.86	72
QA QC 3	Mar 20 2006	14:30	1 ppm TCE & Toluene	Yes	Yes	11.32	62
MIP-3	Mar 20 2006	14:47				11.15	62
QA QC 4	Mar 21 2006	08:03	1 ppm TCE & Toluene	Yes	Yes	12.02	60
MIP-4	Mar 21 2006	08:15				11.87	60
QA QC 5	Mar 21 2006	10:10	1 ppm TCE & Toluene	Yes	Yes	11.52	69
MIP-4b	Mar 21 2006	10:22				11.47	69
QA QC 6	Mar 21 2006	12:18	1 ppm TCE & Toluene	Yes	Yes	11.44	70
MIP-5	Mar 21 2006	13:18				11.23	70
QA QC 7	Mar 21 2006	16:43	1 ppm TCE & Toluene	Yes	Yes	15.03	100
MIP-6	Mar 21 2006	16:54				15.18	100
QA QC 8	Mar 22 2006	08:43	1 ppm TCE & Toluene	Yes	Yes	14.26	83
MIP-8	Mar 22 2006	08:56				13.94	83
QA QC 9	Mar 22 2006	11:38	1 ppm TCE & Toluene	Yes	Yes	13.54	77
MIP-9	Mar 22 2006	11:44				13.50	77
QA QC 10	Mar 22 2006	13:13	1 ppm TCE & Toluene	Yes	Yes	13.73	86
MIP-10	Mar 22 2006	13:42				13.98	86
QA QC 11	Mar 22 2006	14:41	1 ppm TCE & Toluene	Yes	Yes	13.84	88
MIP-10b	Mar 22 2006	14:48				13.57	88
QA QC 12	Mar 22 2006	16:24	1 ppm TCE & Toluene	Yes	Yes	13.03	76
MIP-11	Mar 22 2006	16:34				13.32	76
QA QC 13	Mar 23 2006	07:49	1 ppm TCE & Toluene	Yes	Yes	14.02	71
MIP-12	Mar 23 2006	08:36				13.72	71
QA QC 14	Mar 23 2006	10:23	1 ppm TCE & Toluene	Yes	Yes	12.48	75
MIP-13	Mar 23 2006	10:53				13.07	75

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Standard Summary Cont.

Boring Name	Date	Time	Standard	PID Response	ECD Response	Pressure (PSI)	Response Time (s)
QA QC 15	Mar 23 2006	14:01	1 ppm TCE & Toluene	Yes	Yes	13.65	95
MIP-14	Mar 23 2006	14:08				13.67	95
QA QC 16	Mar 23 2006	16:12	1 ppm TCE & Toluene	Yes	Yes	13.24	95
MIP-15	Mar 23 2006	16:22				13.12	180
QA QC 17	Mar 24 2006	08:00	1 ppm TCE & Toluene	Yes	Yes	14.22	83
MIP-16	Mar 24 2006	08:24				13.53	83
QA QC 18	Mar 24 2006	10:07	1 ppm TCE & Toluene	Yes	Yes	13.10	95
MIP-17	Mar 24 2006	10:52				13.00	95

End of Day QA QC Summary

Boring Name	Date	Time	Standard	PID Response	ECD Response	Pressure (PSI)	Response Time (s)
End of Day 1	Mar 20 2006	16:33	1 ppm TCE & Toluene	Yes	Yes	11.40	68
End of Day 2	Mar 21 2006	18:18	1 ppm TCE & Toluene	Yes	Yes	14.93	97
End of Day 3	Mar 22 2006	17:57	1 ppm TCE & Toluene	Yes	Yes	13.23	75
End of Day 4	Mar 23 2006	17:47	1 ppm TCE & Toluene	Yes	Yes	13.08	89
End of Day 5	March 24, 2006 - No end of day due to MIP probe membrane failure.						

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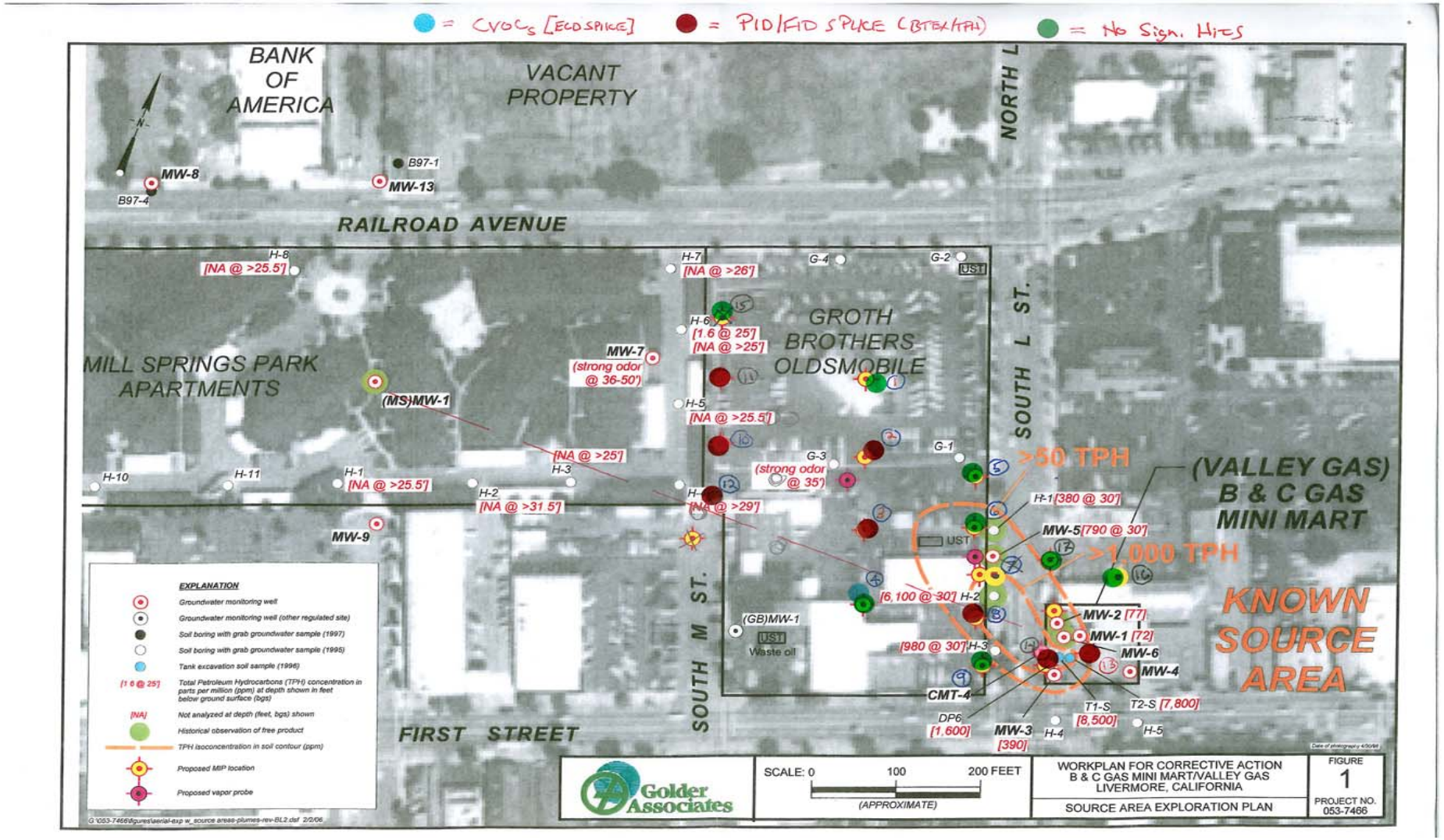
SITE MAP

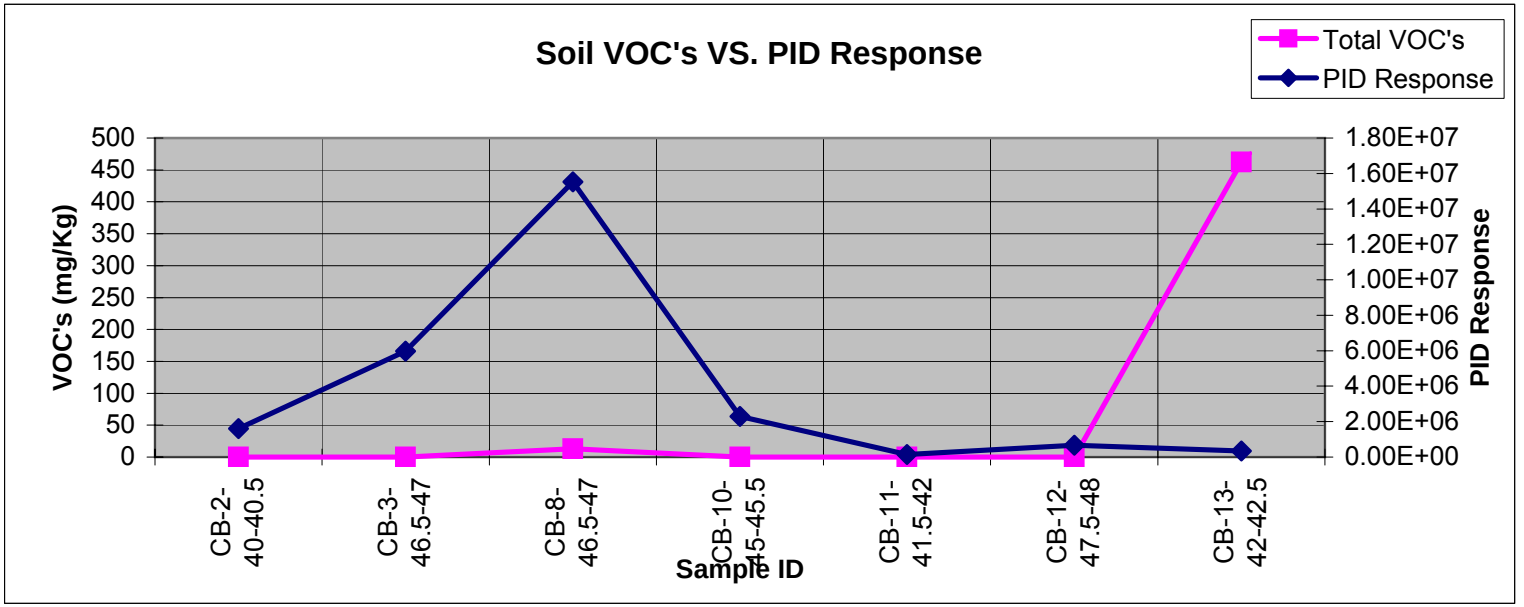


Map provided by Golder Environmental

Soil Sample Confirmation

Compound	CB-2	CB-3	CB-8	CB-10	CB-11	CB-12	CB-13
Depth	**40-40.5**	**46.5-47**	**46.5-47**	**45-45.5**	**41.5-42**	**47.5-48**	**42-42.5**
TPH-Gas	<1.0	<1.0	**13**	<1.0	<1.0	<1.0	**460**
Benzene	<0.0050	<0.0050	0.0081	<0.0050	<0.0050	<0.0050	**0.081**
Toluene	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	**0.058**
Ethylbenzene	<0.0050	**0.014**	**0.066**	<0.0050	0.0051	<0.0050	**2.1**
Xylenes	<0.0050	**0.0088**	**0.11**	<0.0050	<0.0050	<0.0050	**0.36**
MTBE	**0.02**	<0.0050	**0.018**	**0.0057**	<0.0050	<0.0050	<0.025
DIPE	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025
ETBE	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025
TAME	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025
Tert-Butanol	**0.0066**	<0.0050	<0.015	<0.0050	<0.0050	<0.0050	<0.015
Methanol	<0.2	<0.2	<0.25	<0.2	<0.2	<0.2	<5.0
Ethanol	<0.010	<0.010	<0.025	<0.010	<0.010	<0.010	<5.0
Total VOC's	**0.0266**	**0.0228**	**13.194**	**0.0057**	**0**	**0**	**462.599**

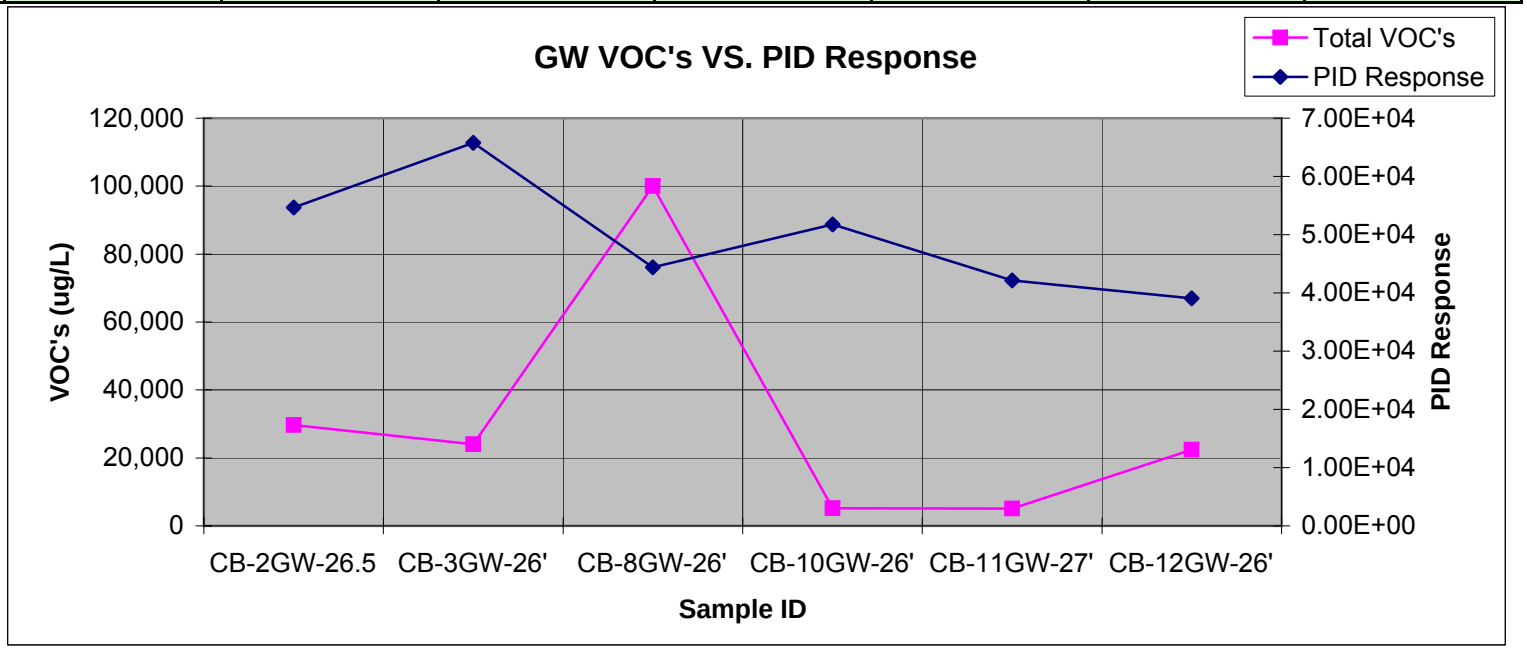
Notes:
mg/Kg = miligram per kilogram
TPH = Total petroleum hydrocarbons
MTBE = Methyl tert-butyl ether
DIPE = Di-issopropyl ether
ETBE = Ethyl tert-butyl ether
TAME = tert-Amyl methyl ether



Groundwater Sample Confirmation

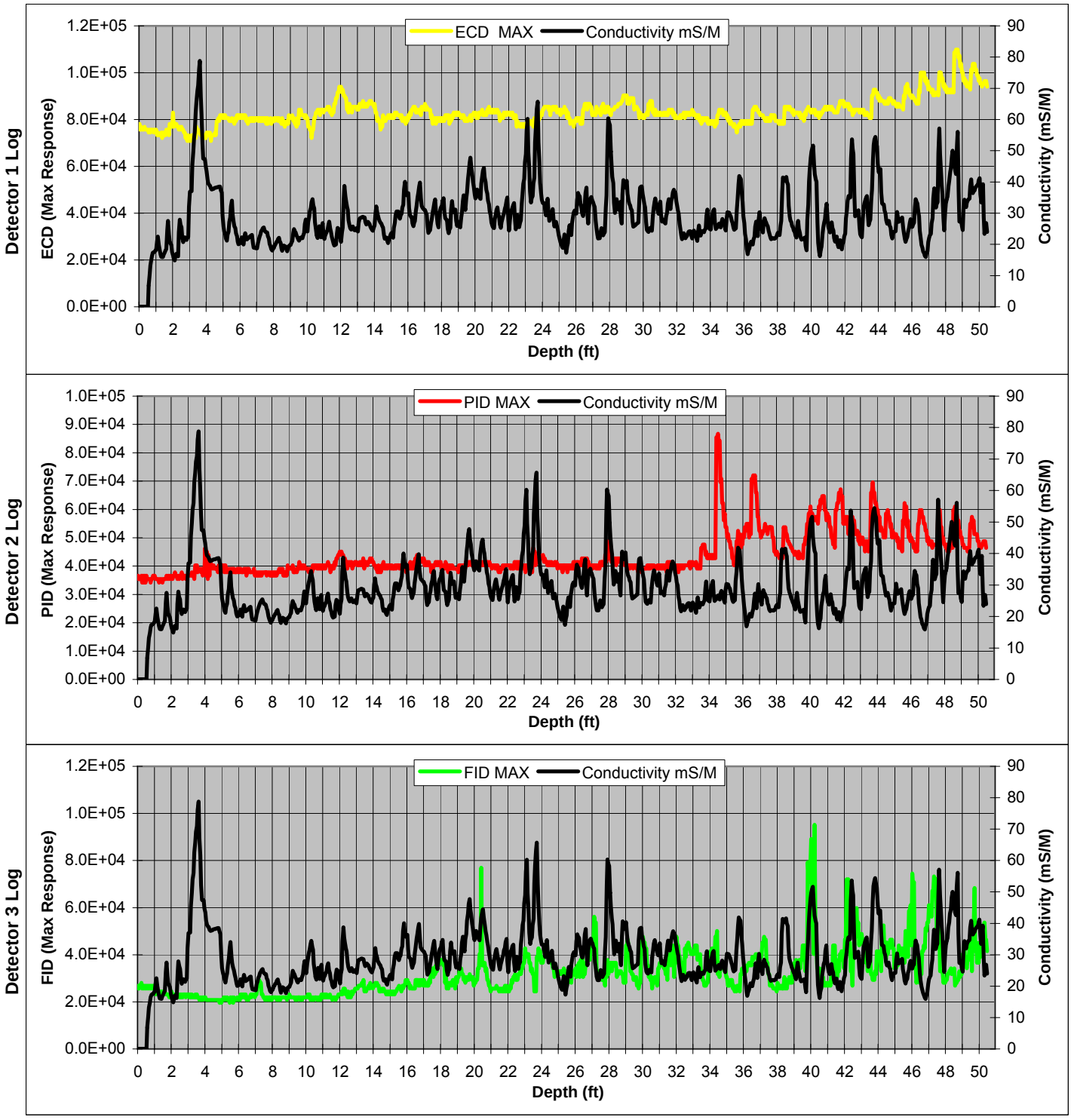
Compound	CB-2GW	CB-3GW	CB-8GW	CB-10GW	CB-11GW	CB-12GW	
Depth							
TPH-Gas	25,000	23,000	82,000	4,800	4,900	21,000	
Benzene	340	61	2,000	5	22	<2.5	
Toluene	56	13	1,100	2	2.1	5.6	
Ethylbenzene	1,400	580	4,100	170	100	700	
Xylenes	2,400	280	10,000	160	44	720	
MTBE	460	46	830	20	43	<2.5	
DIPE	<5.0	<4.0	<9.0	<0.5	<0.5	<2.5	
ETBE	<5.0	<4.0	<9.0	<0.5	<0.5	<2.5	
TAME	11	<4.0	38	0.53	1.1	<2.5	
Tert-Butanol	43	<20	<50	<5.0	<5.0	<15	
Methanol	<500	<400	<900	<50	<50	<250	
Ethanol	<50	<40	<100	<15	<20	<25	
Total VOC's	**29,710**	**23,980**	**100,068**	**5,158**	**5,112**	**22,426**	

Notes:
ug/L = miligram per Liter
TPH = Total petroleum hydrocarbons
MTBE = Methyl tert-butyl ether
DIPE = Di-issopropyl ether
ETBE = Ethyl tert-butyl ether
TAME = tert-Amyl methyl ether



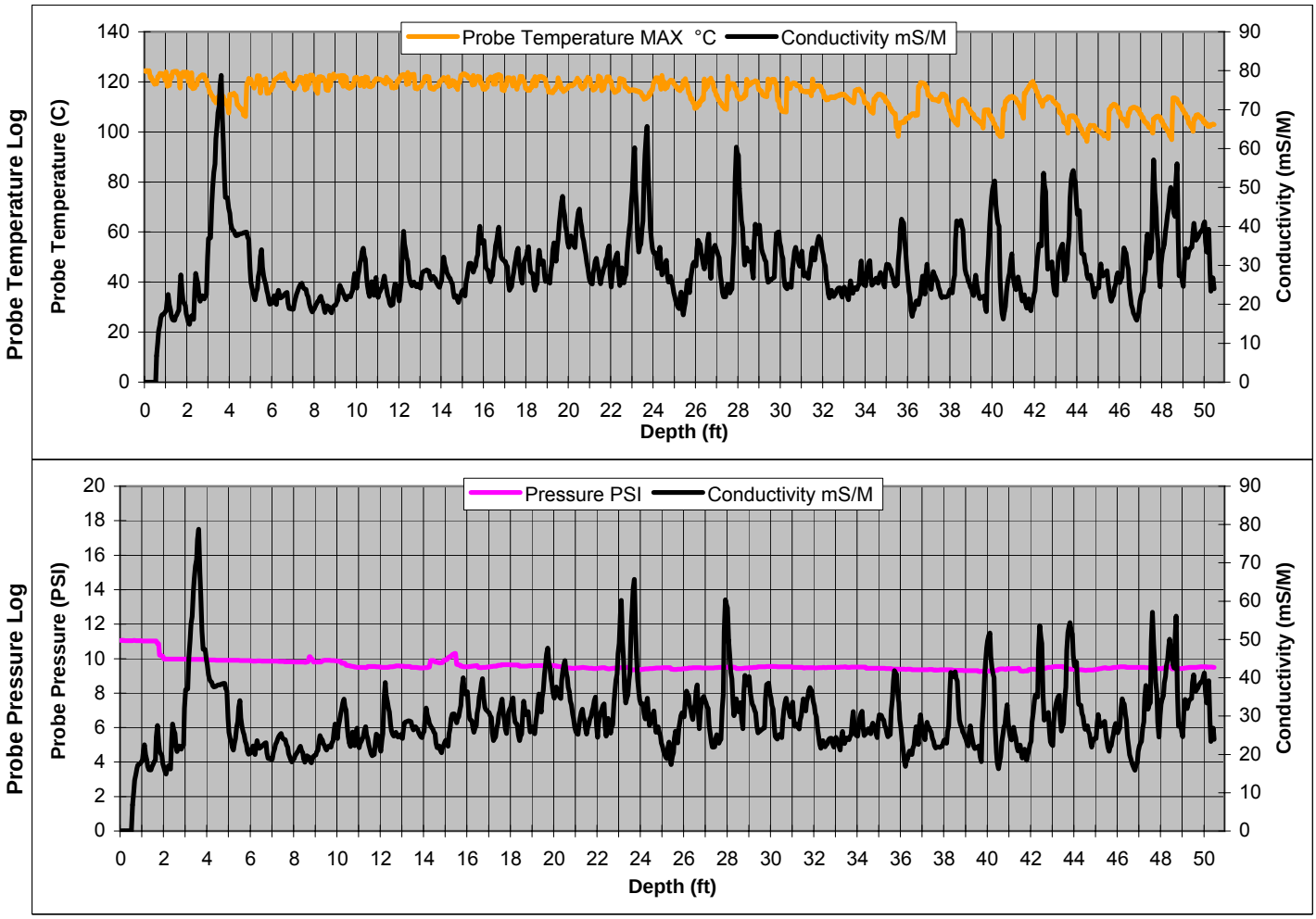
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-1	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 20 2006	Detector 2 :	Photo Ionization (PID)
		Time:	09:06	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

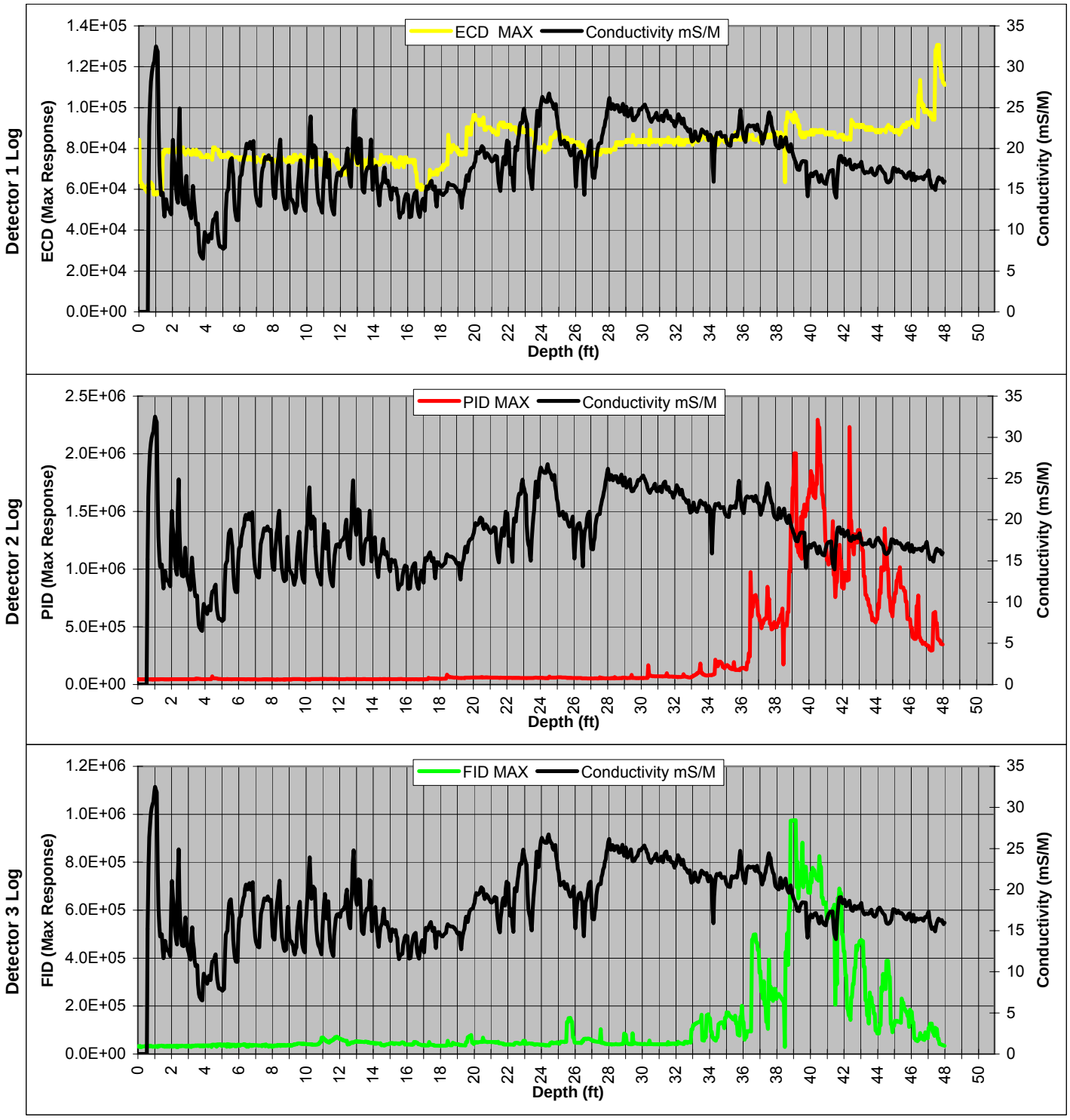
Client:	Golder Assoc.	Boring I.D.:	MIP-1	Graph 1 :	Probe Temperature (C)
		Date:	Mar 20 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	09:06		



Explanation: Replaced MIP probe membrane before next boring. Repaired hole in Nitrogen line at the probe to equalize the pressure.

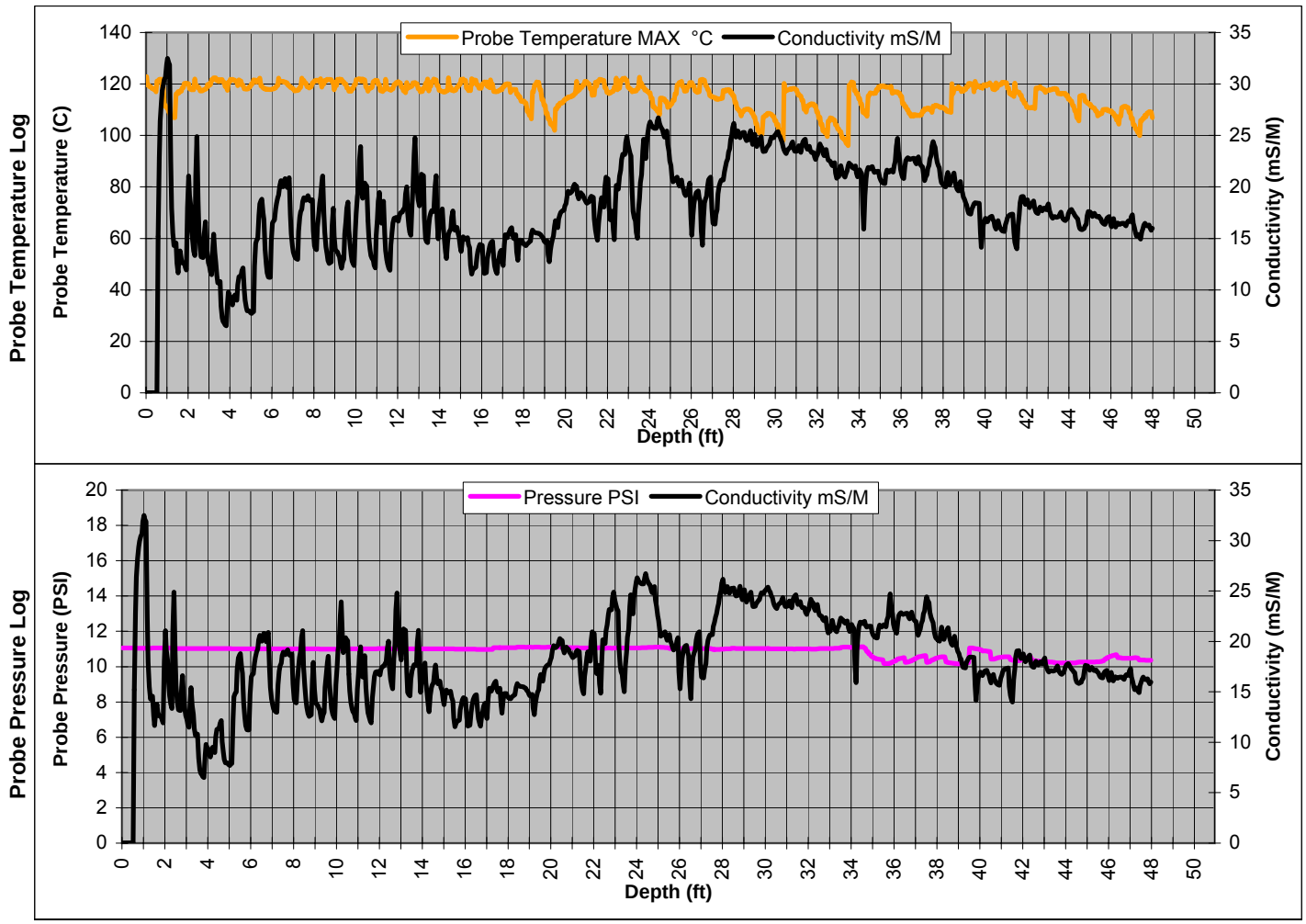
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-2	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 20 2006	Detector 2 :	Photo Ionization (PID)
		Time:	11:33	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

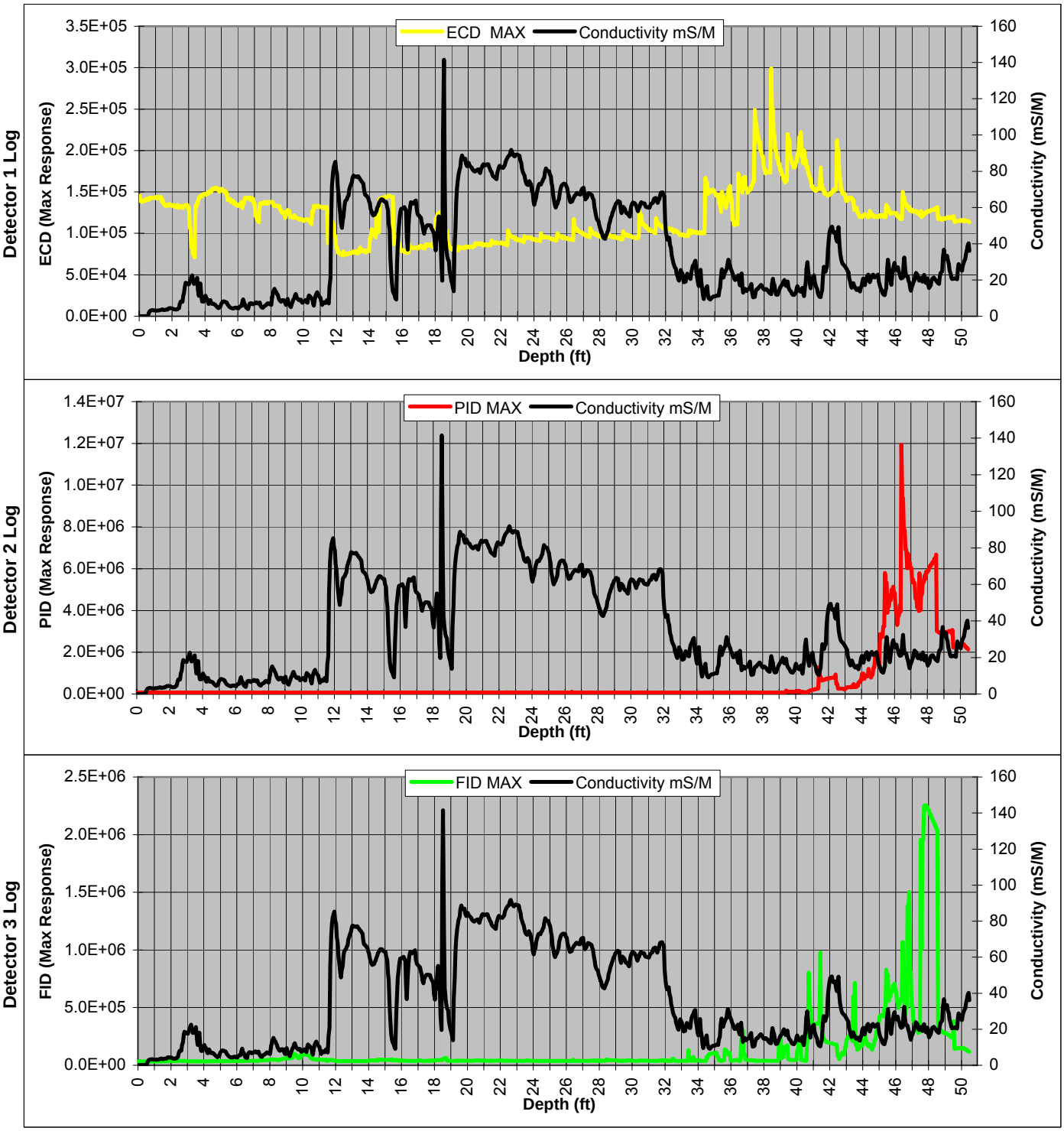
Client:	Golder Assoc.	Boring I.D.:	MIP-2	Graph 1 :	Probe Temperature (C)
		Date:	Mar 20 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	11:33		



Explanation: Refusal at 47.95 ft. bgs.

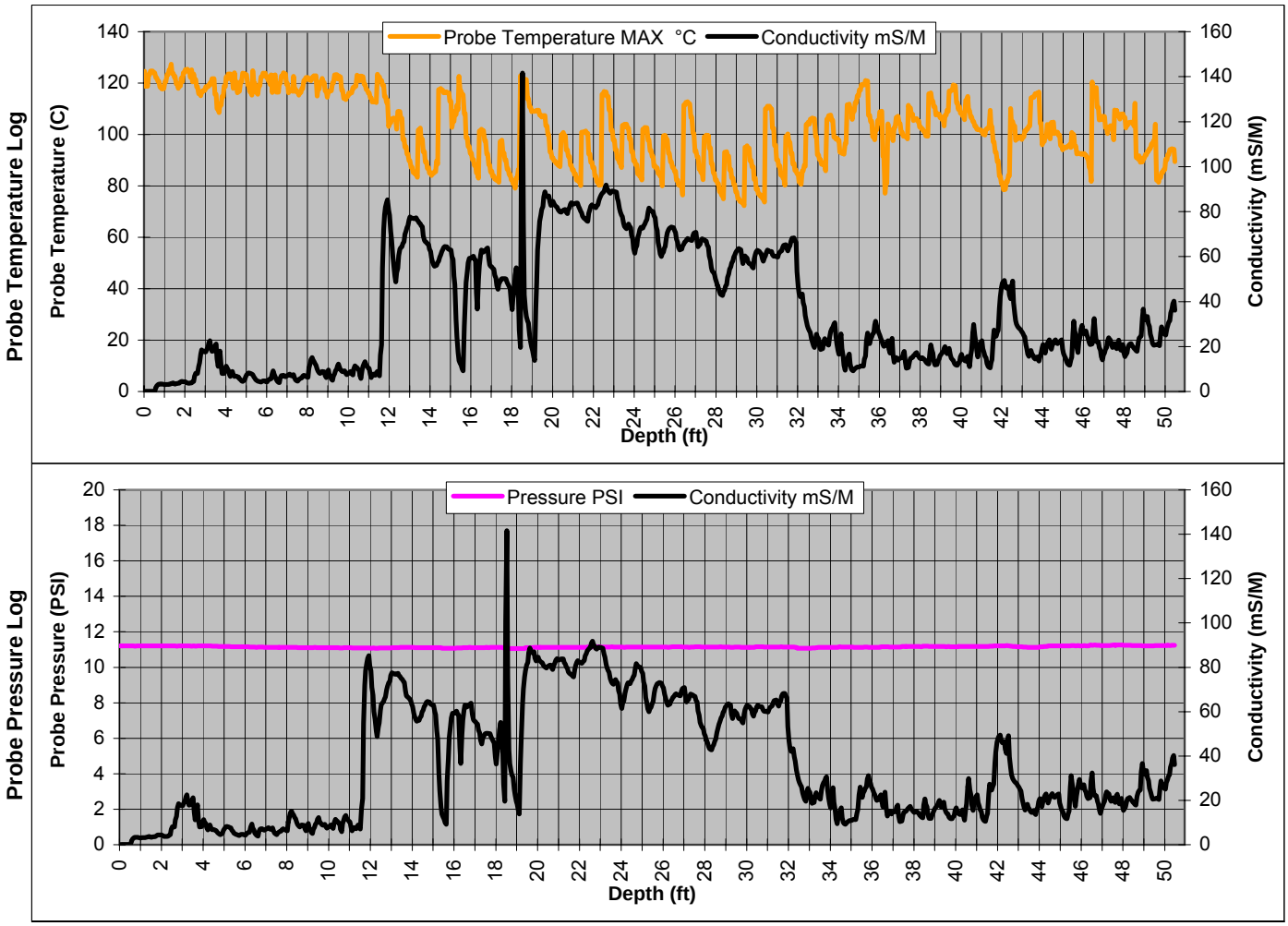
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-3	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 20 2006	Detector 2 :	Photo Ionization (PID)
		Time:	14:47	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

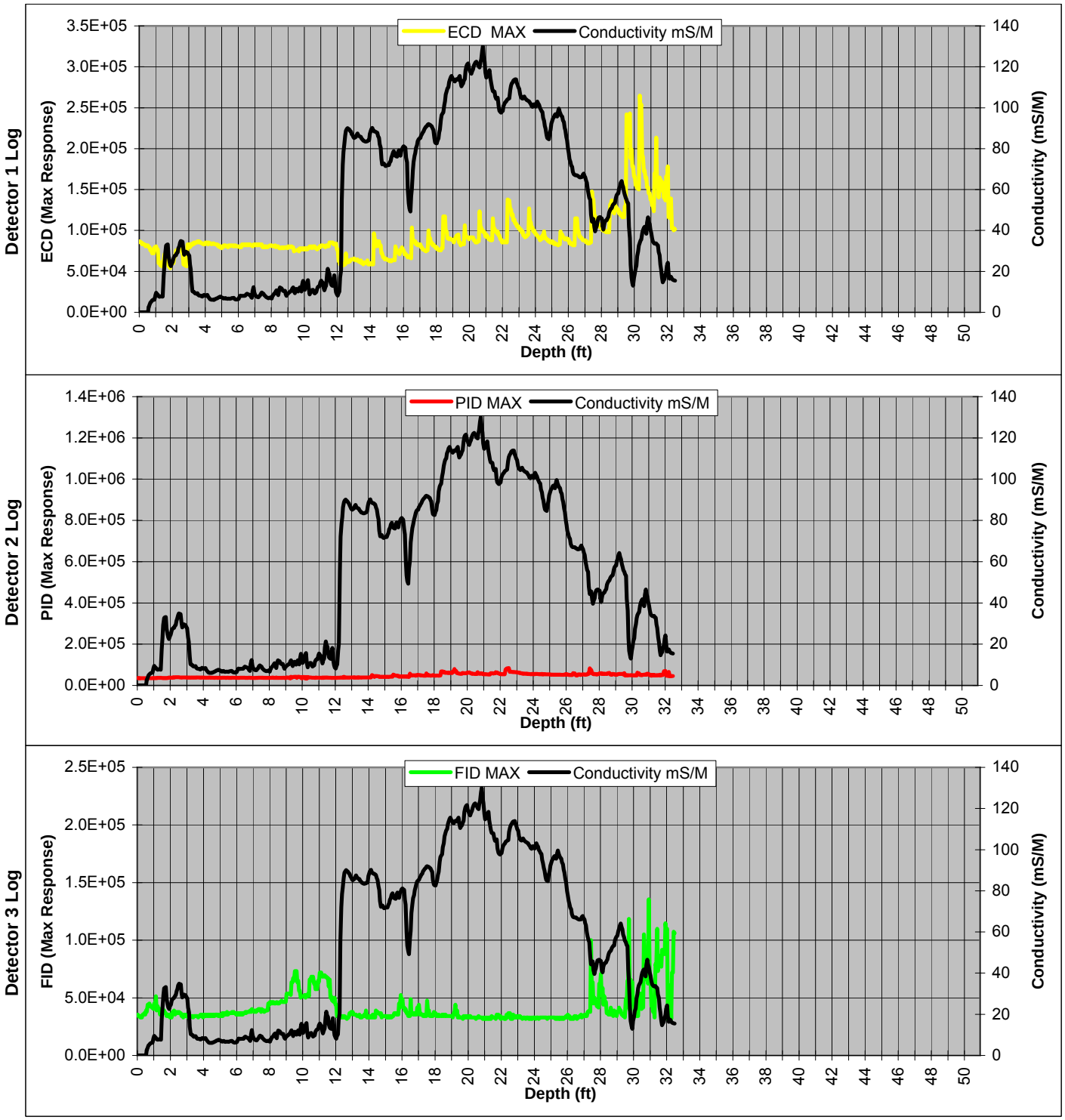
Client:	Golder Assoc.	Boring I.D.:	MIP-3	Graph 1 :	Probe Temperature (C)
		Date:	Mar 20 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	14:47		



Explanation: Replaced MIP probe.

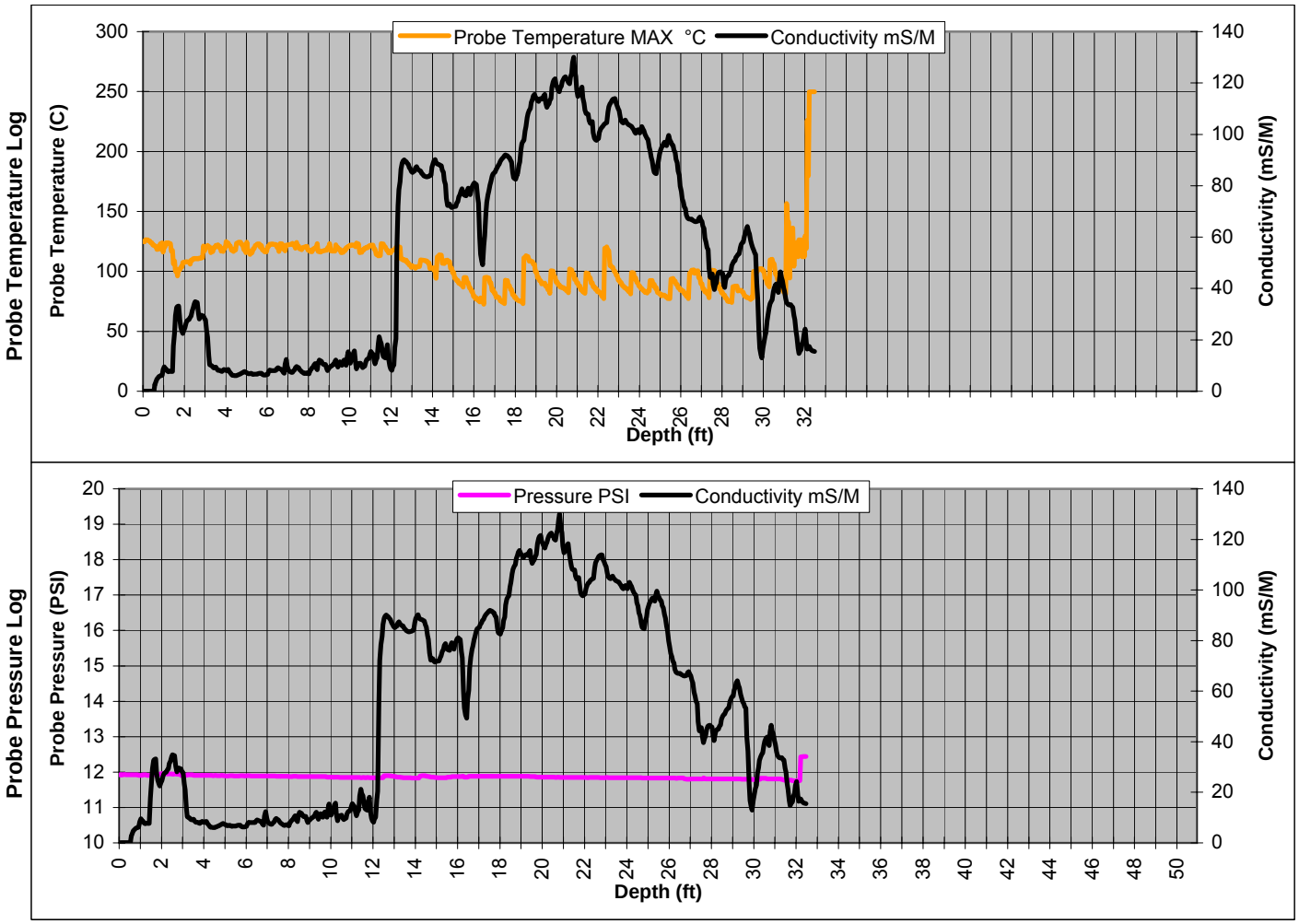
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-4	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 21 2006	Detector 2 :	Photo Ionization (PID)
		Time:	08:15	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

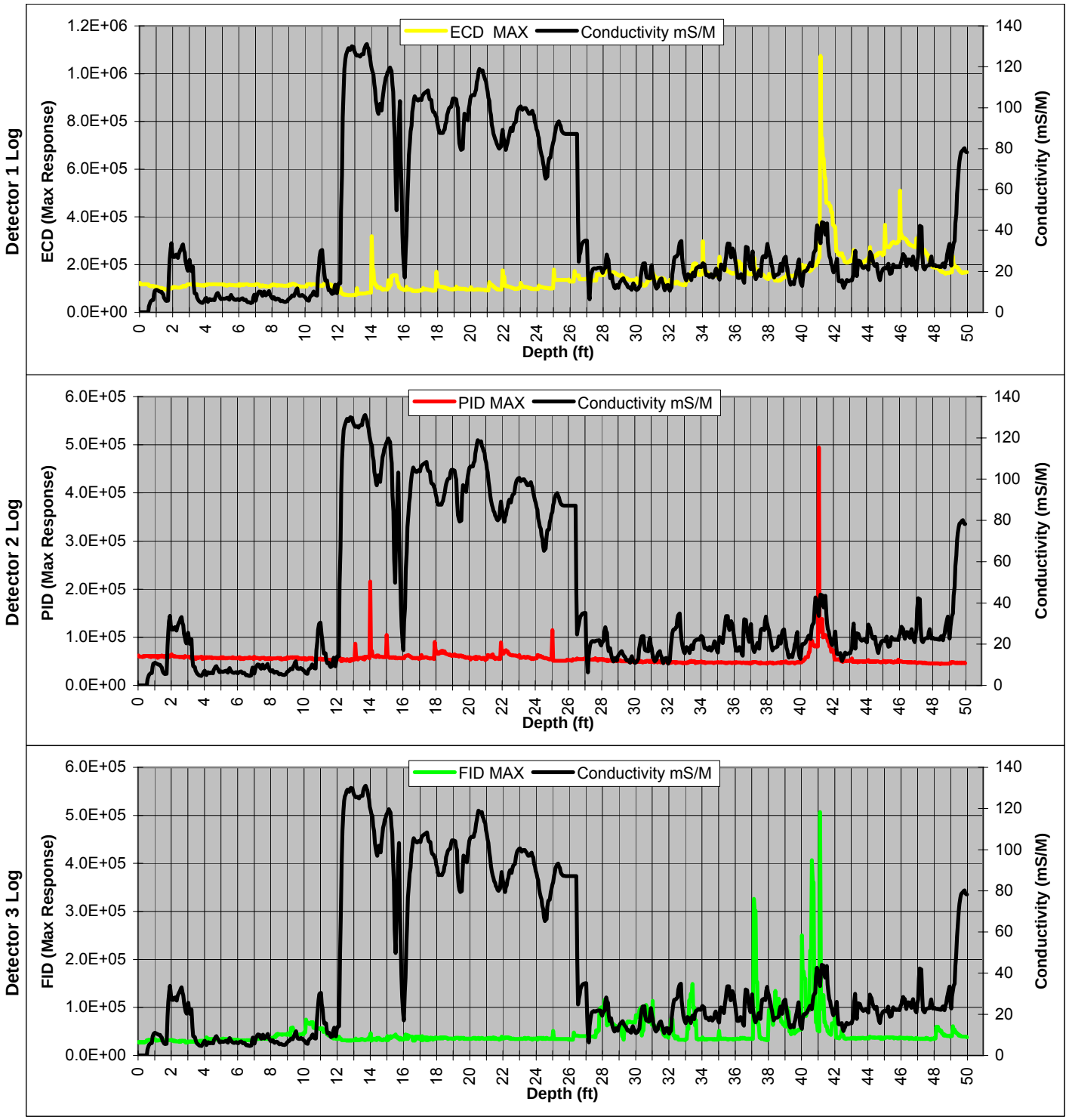
Client:	Golder Assoc.	Boring I.D.:	MIP-4	Graph 1 :	Probe Temperature (C)
		Date:	Mar 21 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	08:15		



Explanation: Added (3) 4 ft. rods after MIP 3. Refusal at 32.45 ft. bgs. Replace MIP probe.

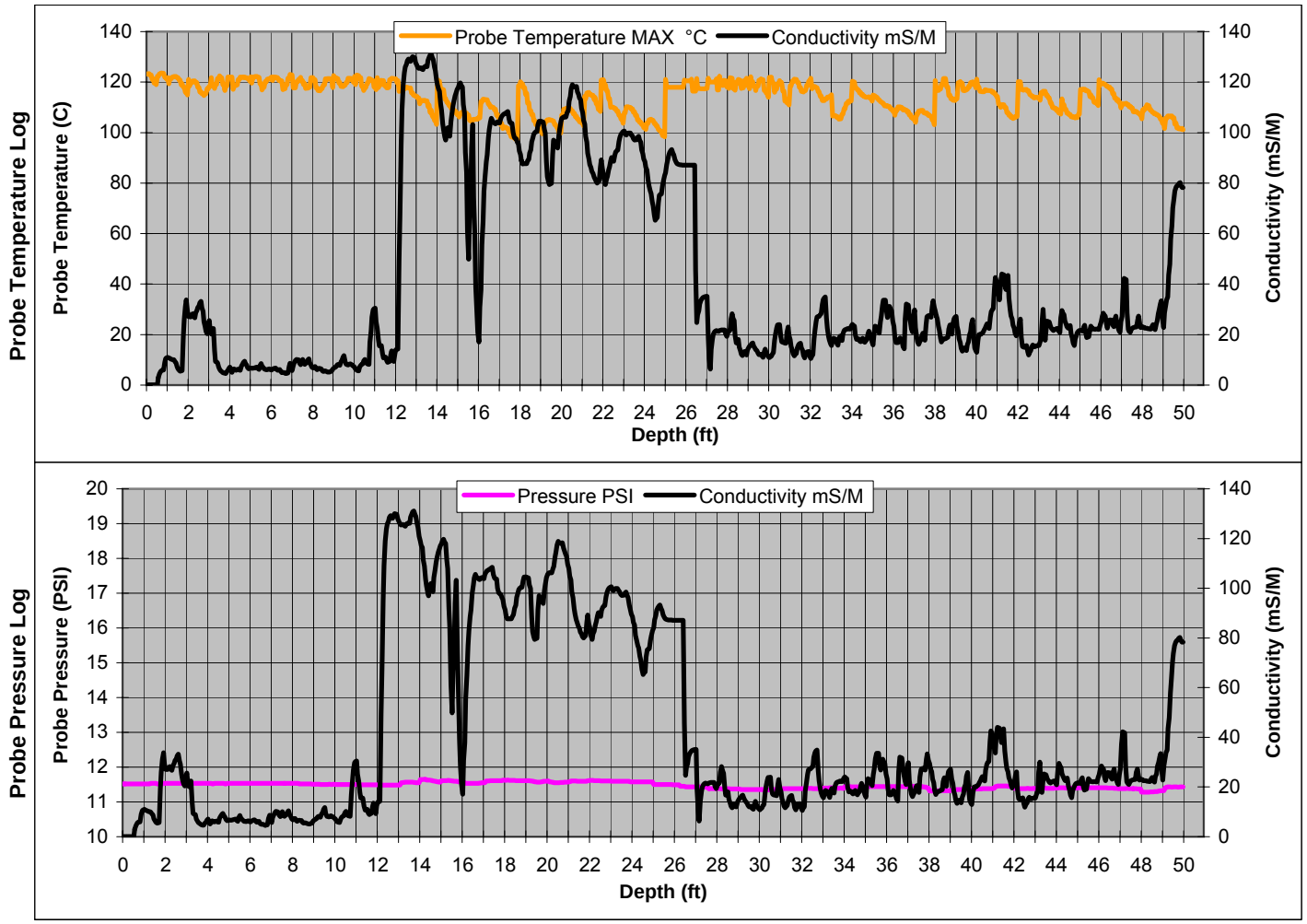
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-4b	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 21 2006	Detector 2 :	Photo Ionization (PID)
		Time:	10:22	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

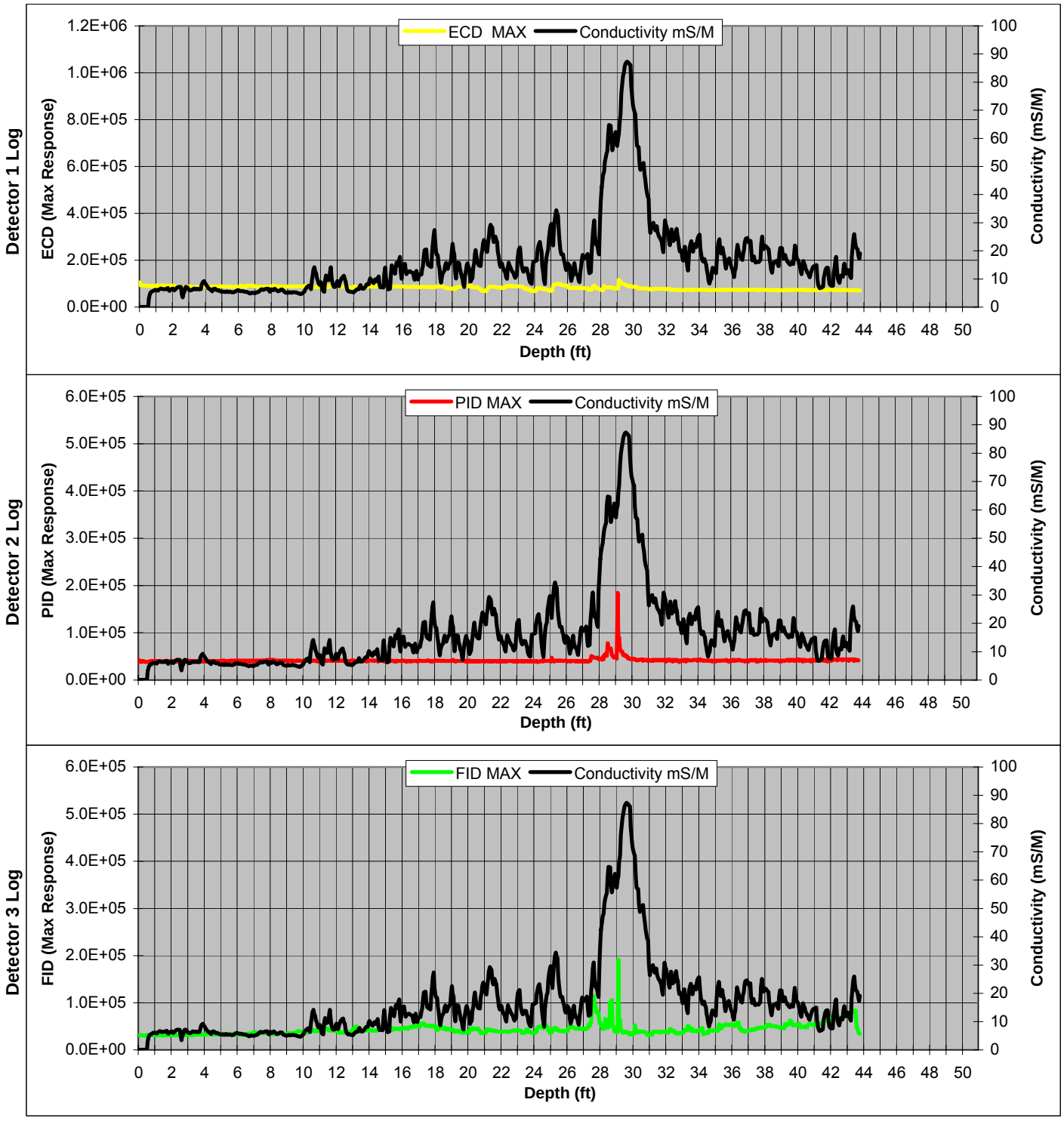
Client:	Golder Assoc.	Boring I.D.:	MIP-4b	Graph 1 :	Probe Temperature (C)
		Date:	Mar 21 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	10:22		



Explanation: String pot malfunctioned at 24 ft. bgs Replaced MIP probe membrane.

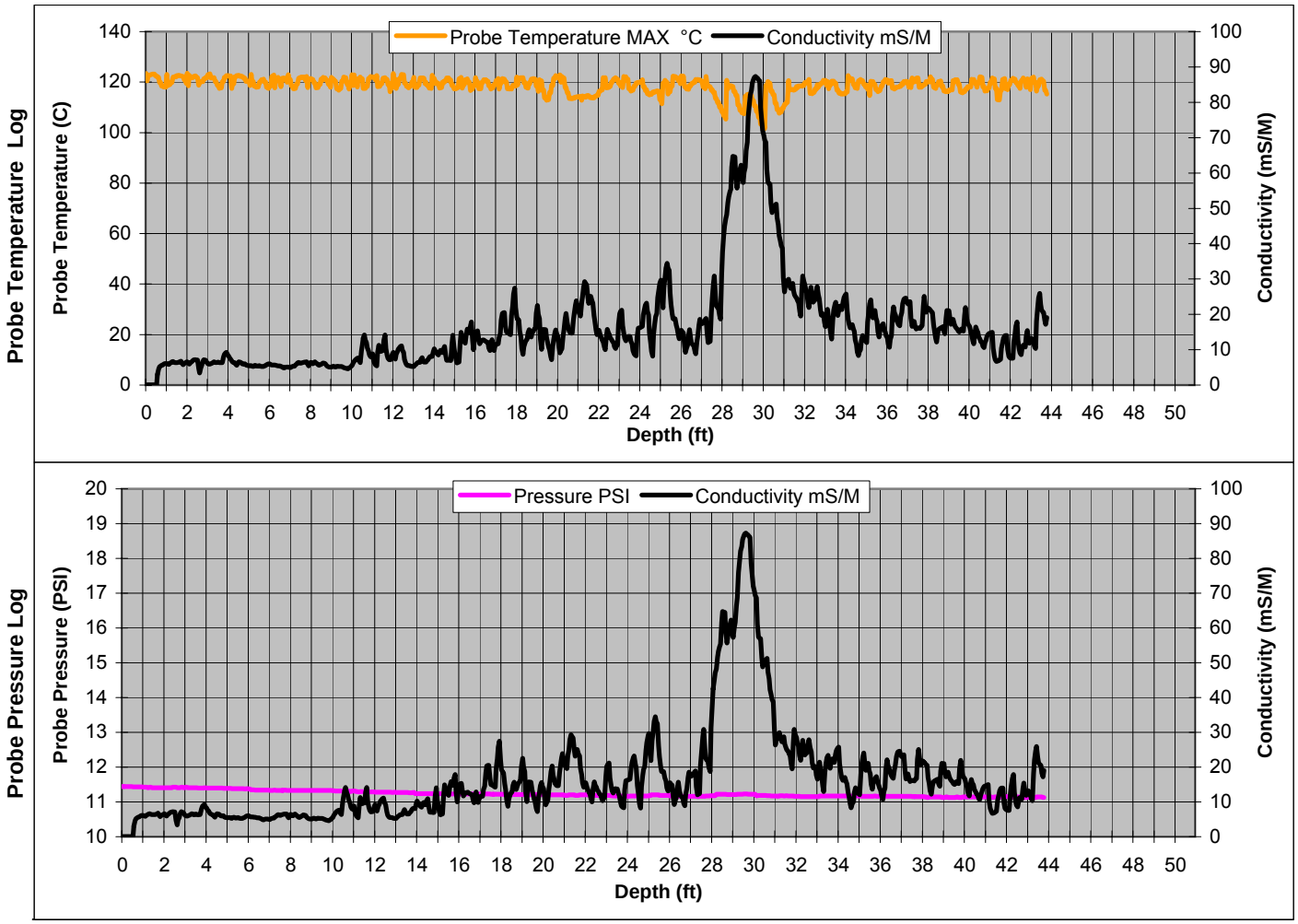
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-5	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 21 2006	Detector 2 :	Photo Ionization (PID)
		Time:	13:18	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

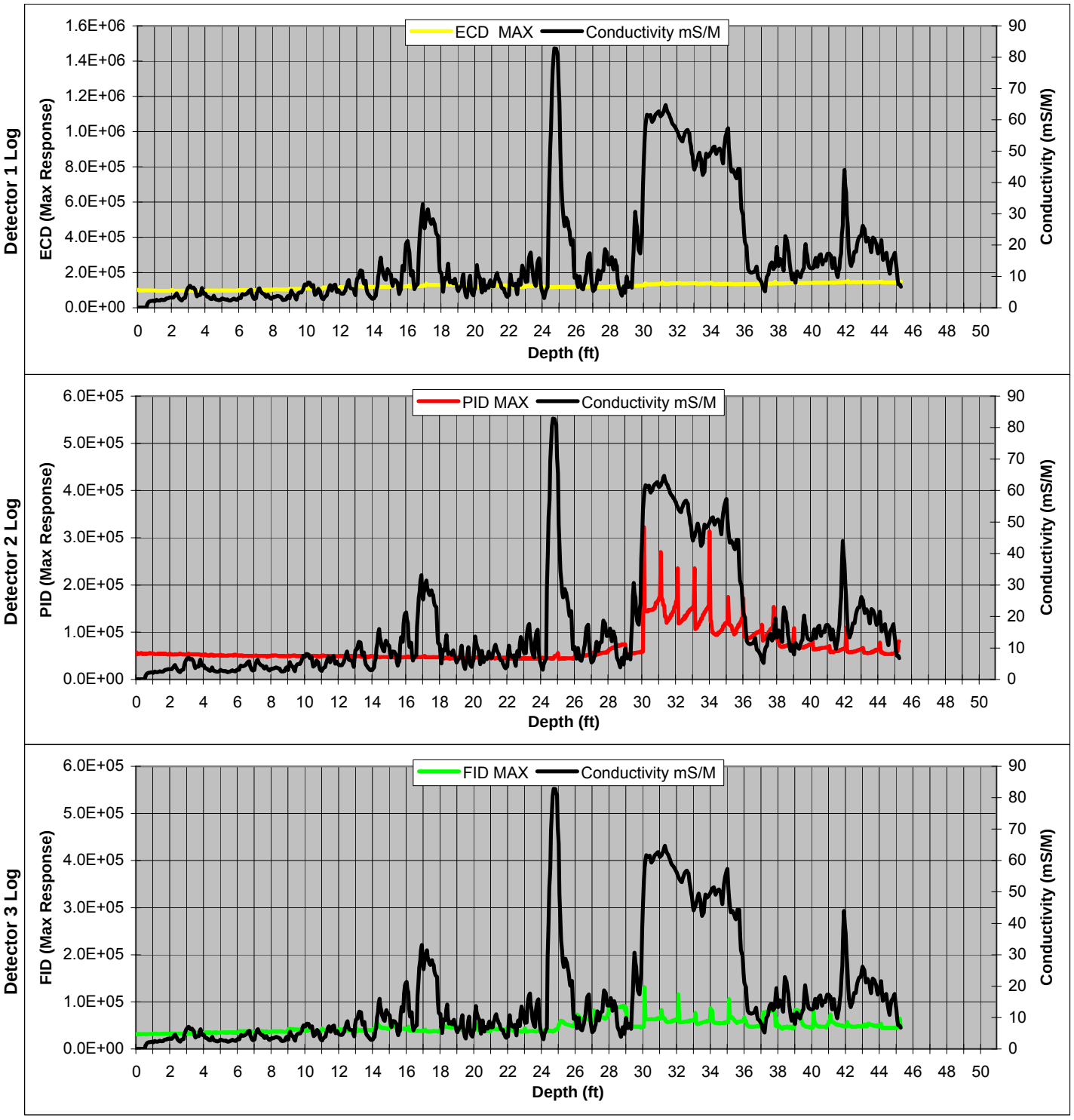
Client:	Golder Assoc.	Boring I.D.:	MIP-5	Graph 1 :	Probe Temperature (C)
		Date:	Mar 21 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	13:18		



Explanation: Hand auger to 4 ft. by Vironex. Lost MIP probe and rods at the end of run. Replaced MIP probe.

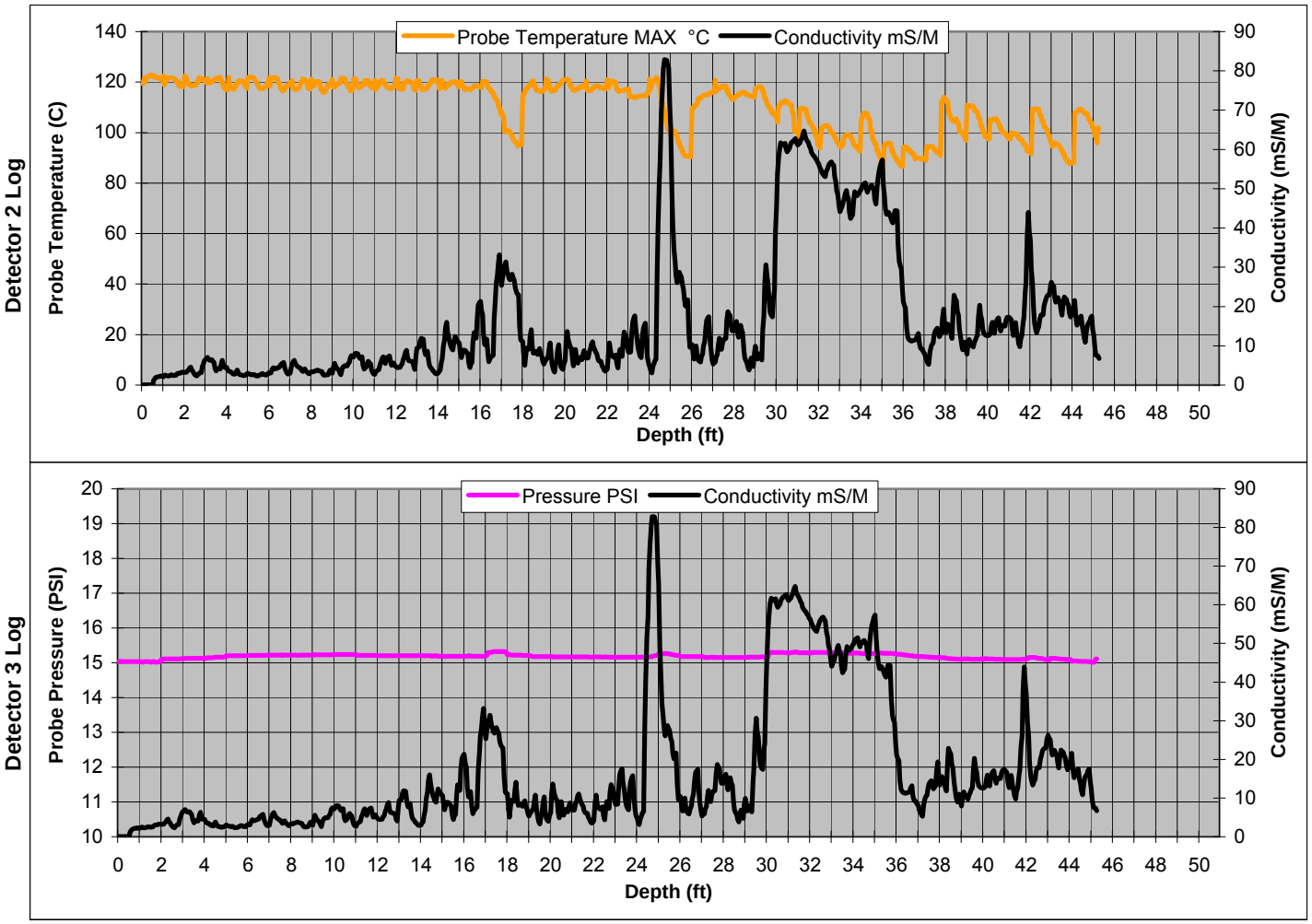
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-6	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 21 2006	Detector 2 :	Photo Ionization (PID)
		Time:	16:54	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

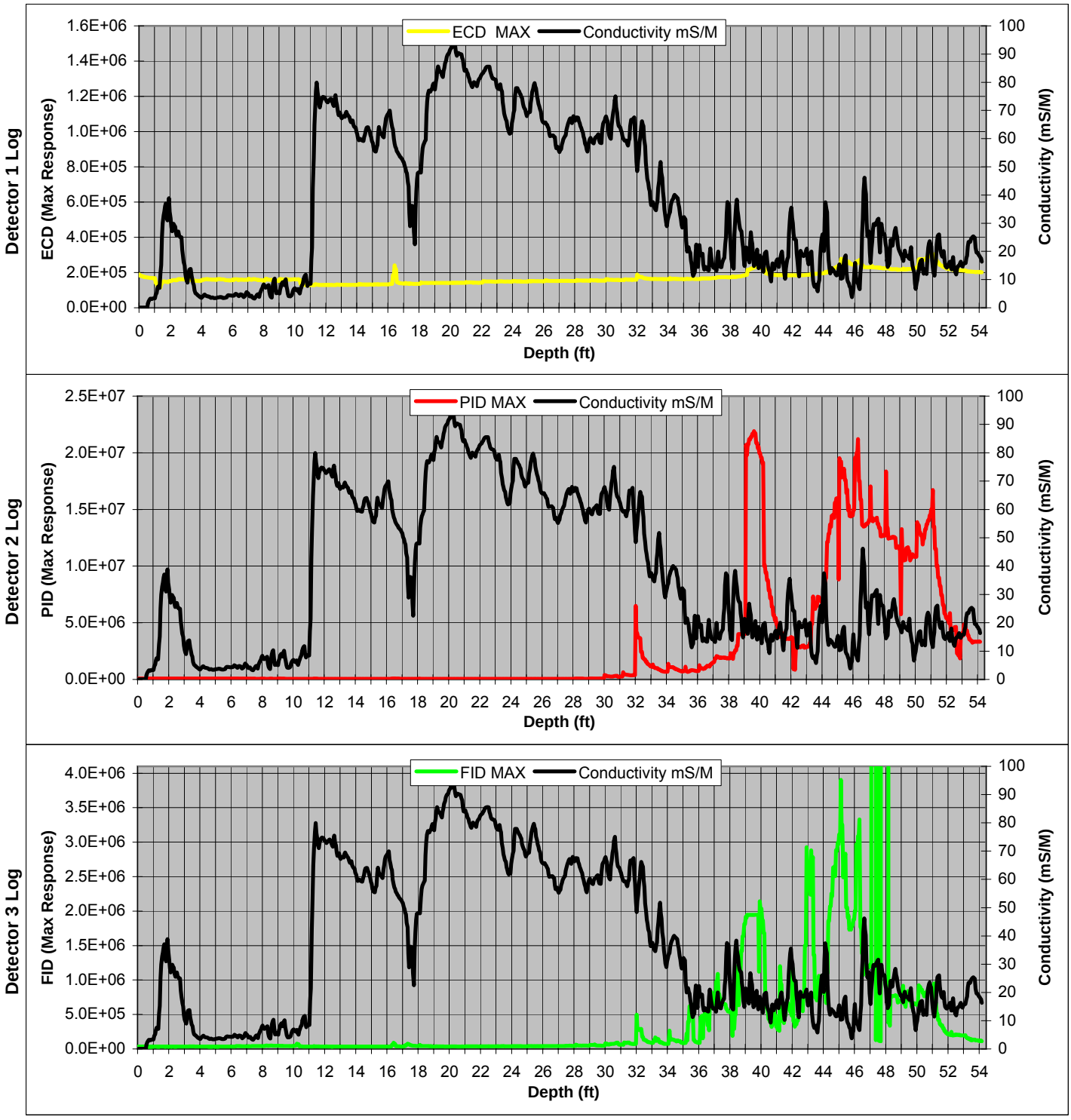
Client:	Golder Assoc.	Boring I.D.:	MIP-6	Graph 1 :	Probe Temperature (C)
		Date:	Mar 21 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	16:54		



Explanation: Refusal at 45.25, client called a stop.

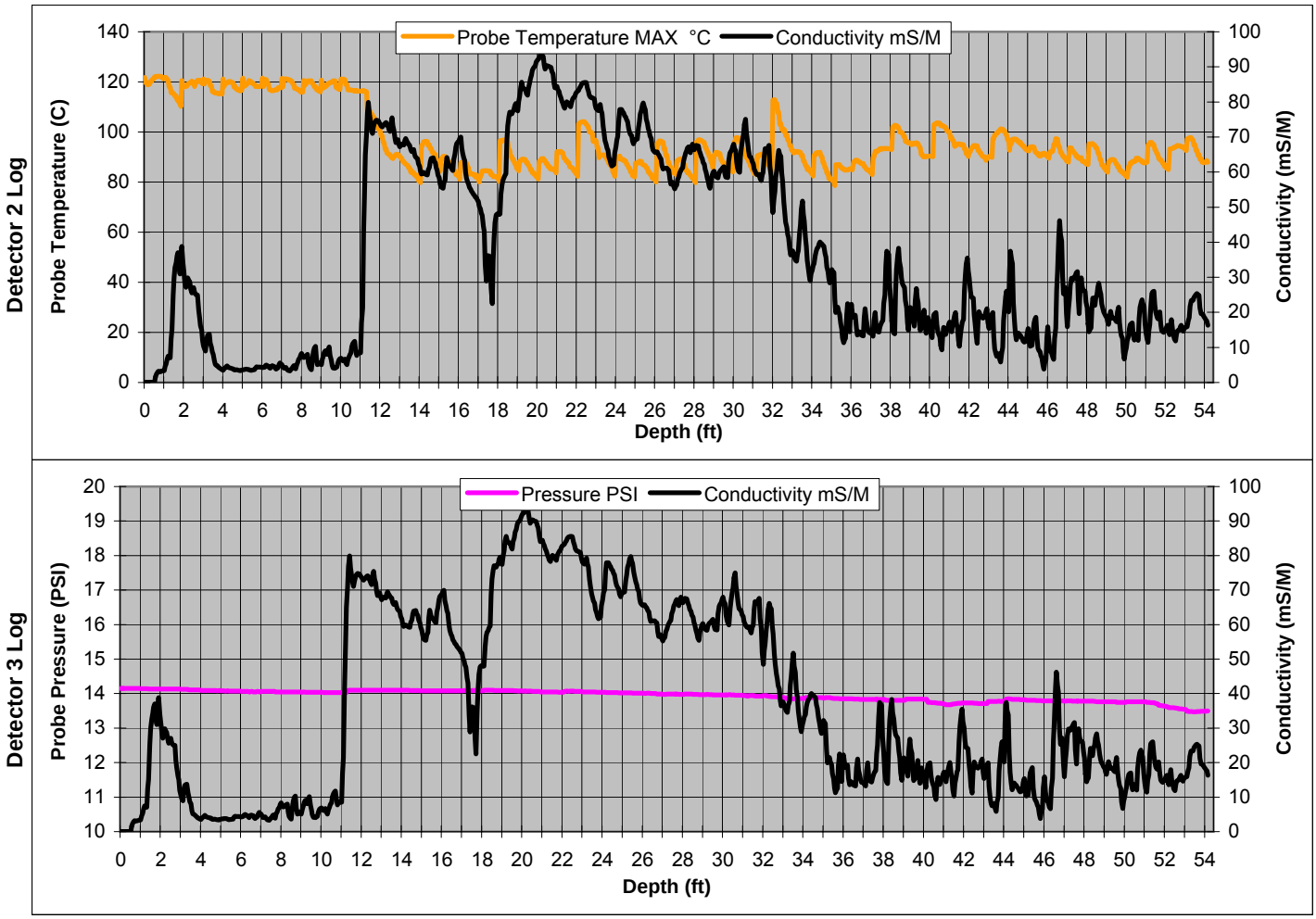
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-8	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 22 2006	Detector 2 :	Photo Ionization (PID)
		Time:	08:56	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

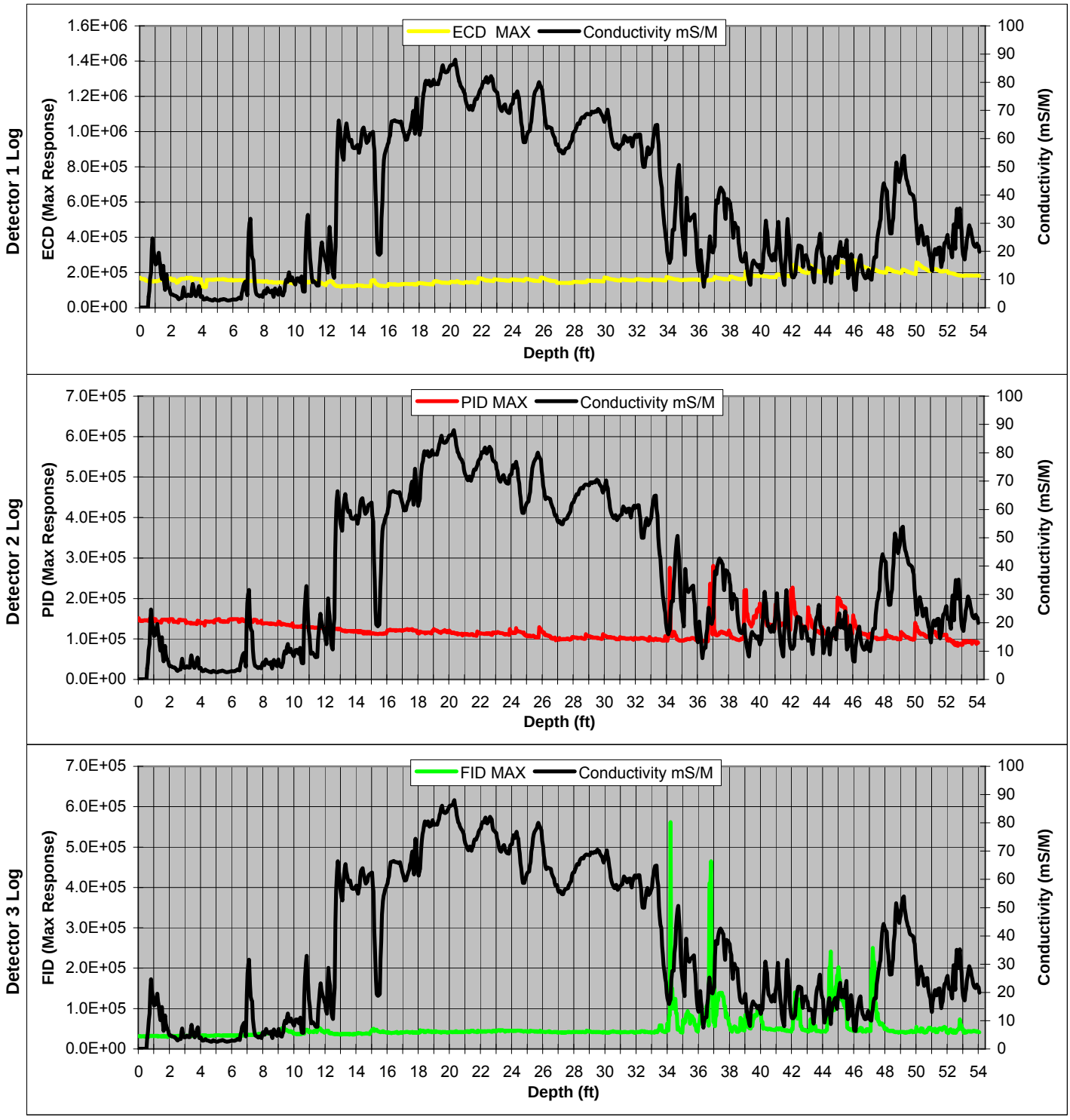
Client:	Golder Assoc.	Boring I.D.:	MIP-8	Graph 1 :	Probe Temperature (C)
		Date:	Mar 22 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	08:56		



Explanation: Replaced MIP probe membrane before Response Test. Problems with changing attenuation of FID detector at 47 ft. bgs.

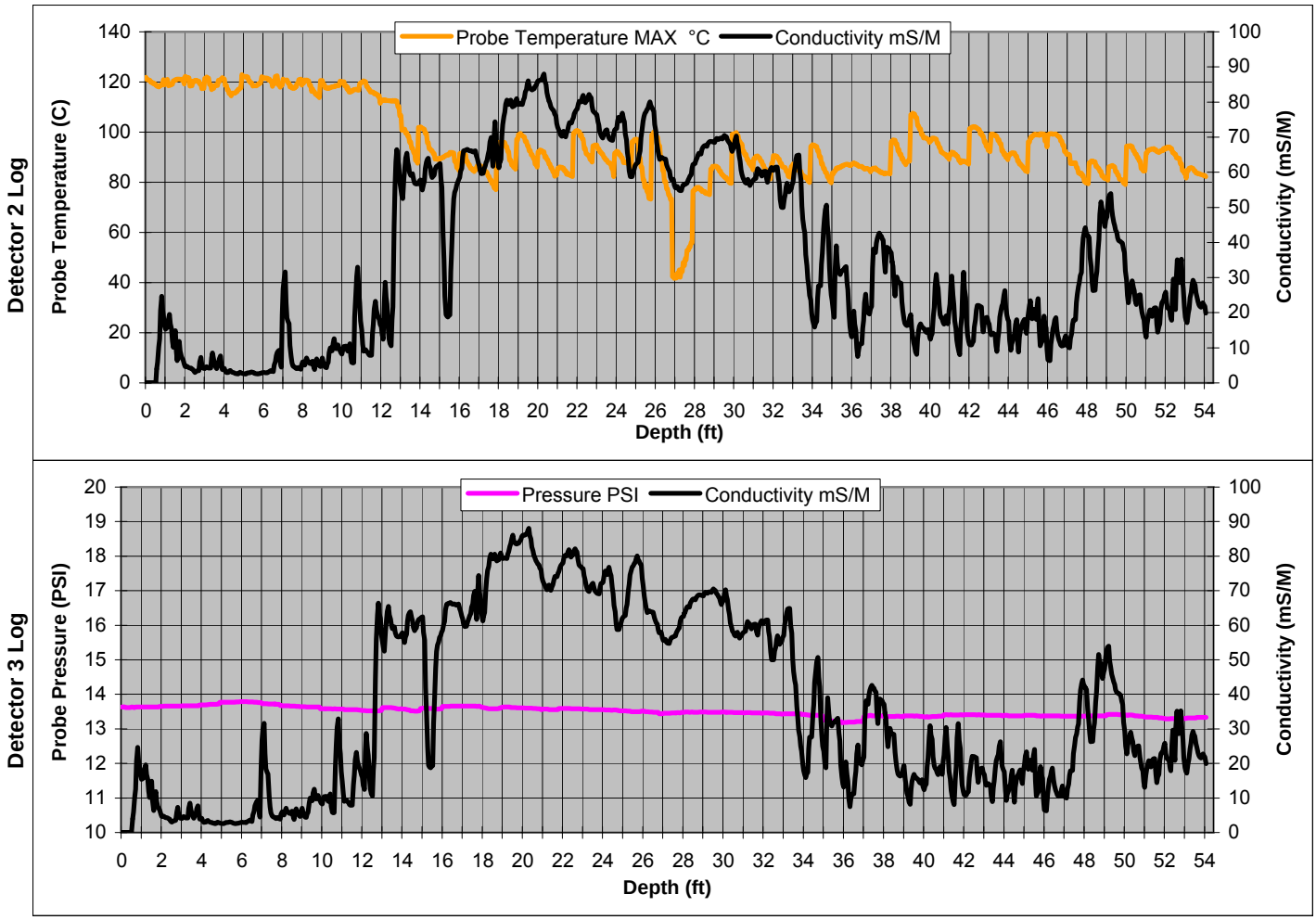
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-9	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 22 2006	Detector 2 :	Photo Ionization (PID)
		Time:	11:44	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

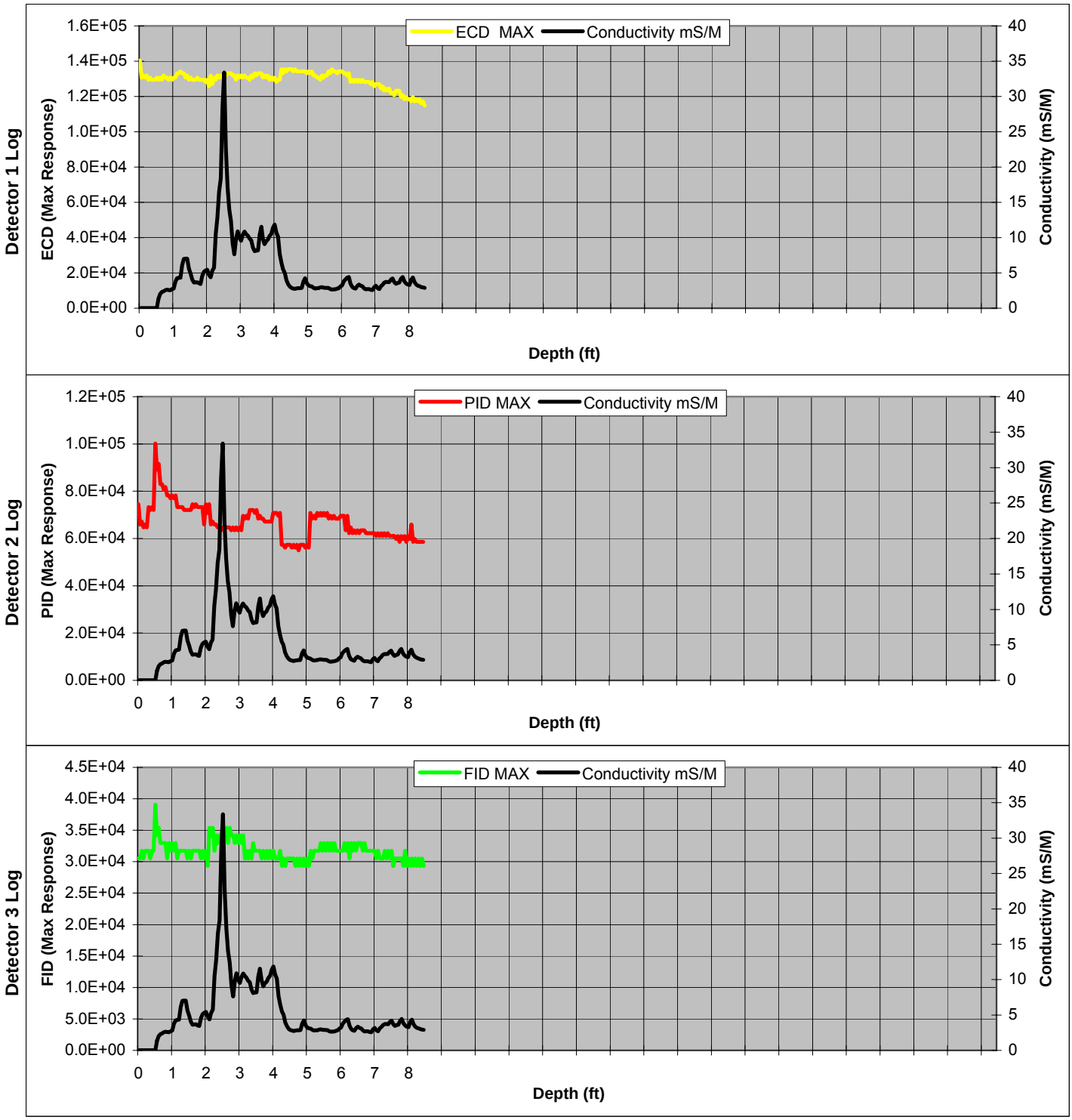
Client:	Golder Assoc.	Boring I.D.:	MIP-9	Graph 1 :	Probe Temperature (C)
		Date:	Mar 22 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	11:44		



Explanation: Replaced MIP probe membrane before response test.

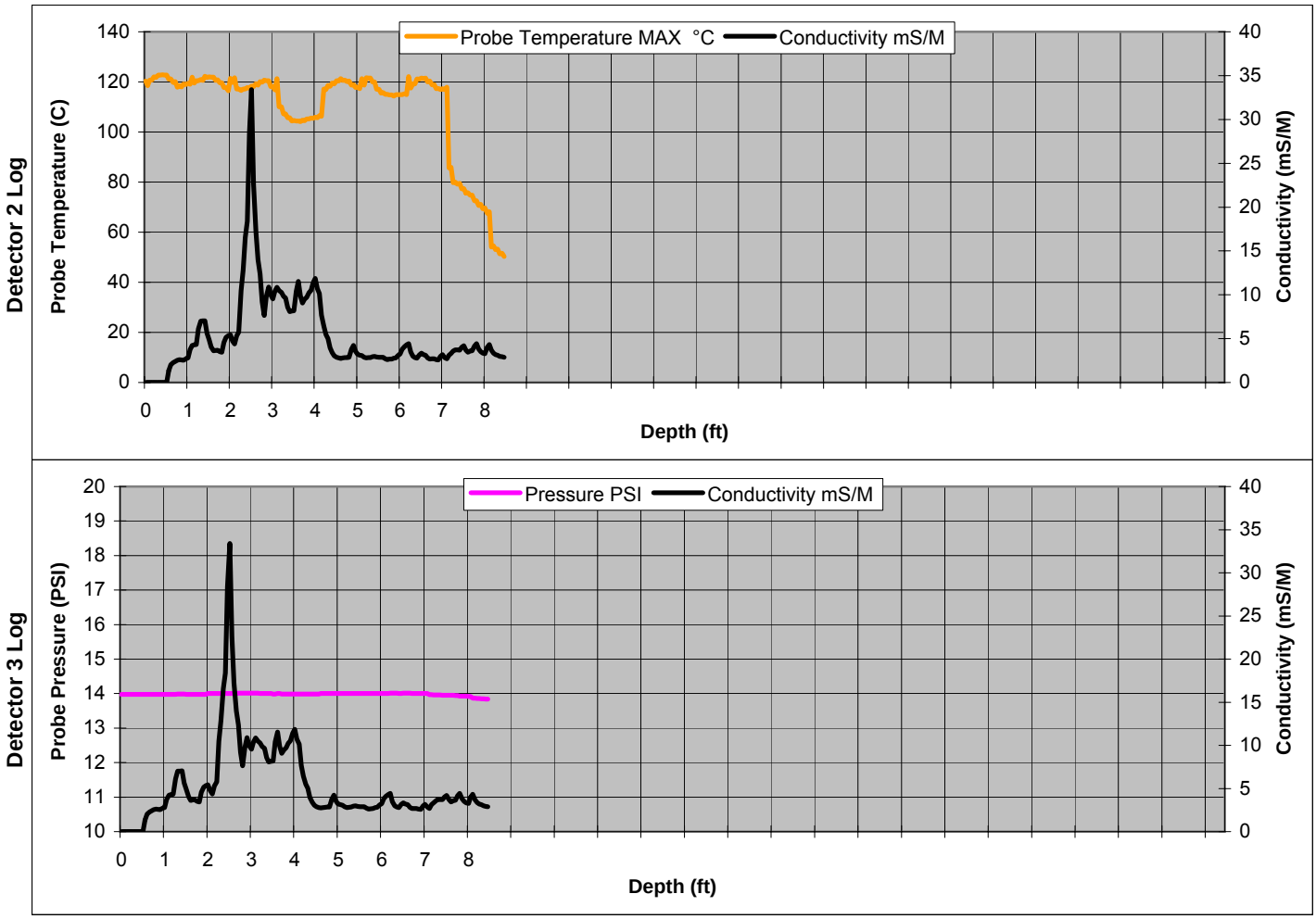
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-10	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 22 2006	Detector 2 :	Photo Ionization (PID)
		Time:	13:42	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

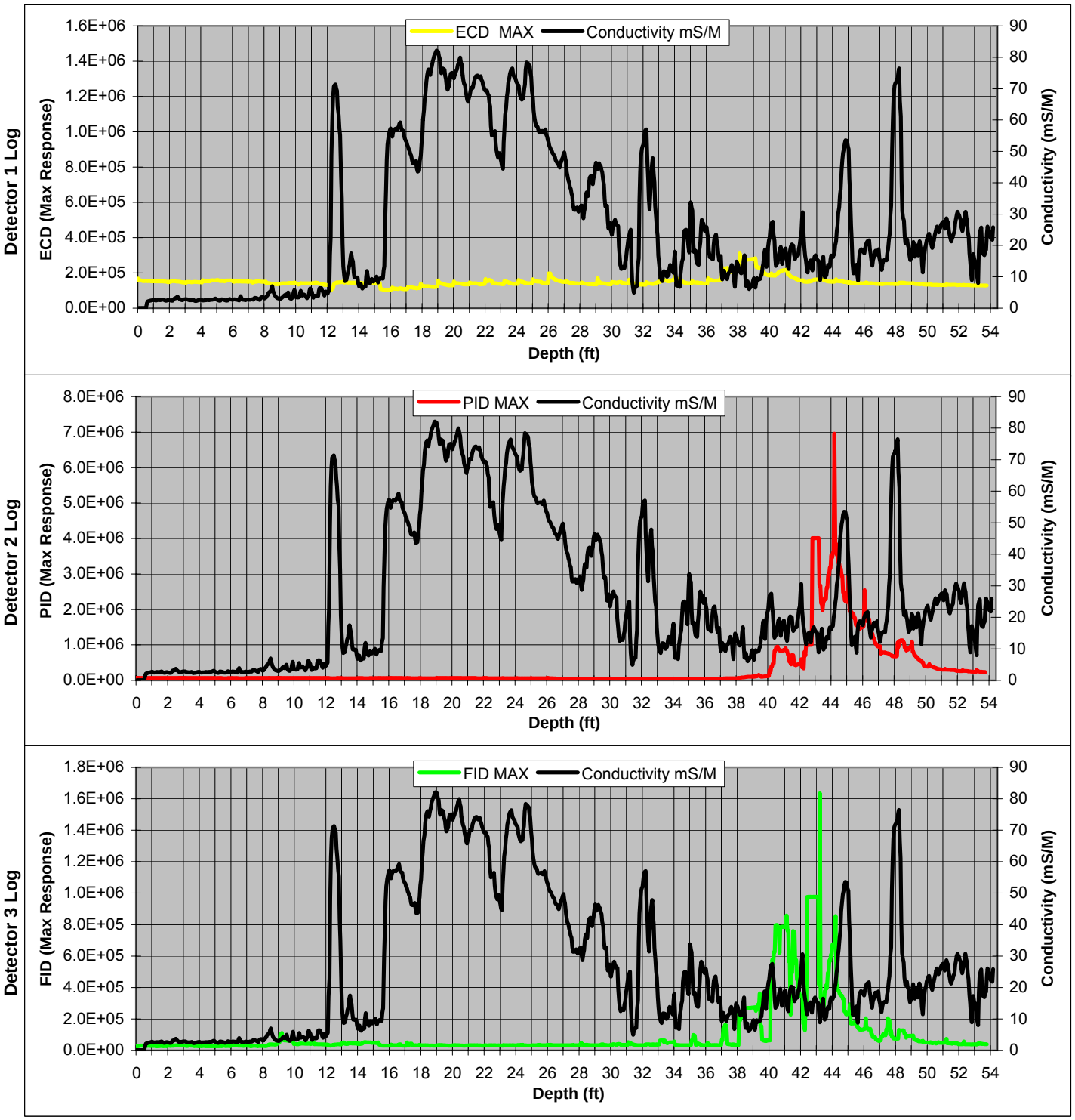
Client:	Golder Assoc.	Boring I.D.:	MIP-10	Graph 1 :	Probe Temperature (C)
		Date:	Mar 22 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	13:42		



Explanation: Probe temperature went bad at 8ft. Bgs. Replaced probe with new one.

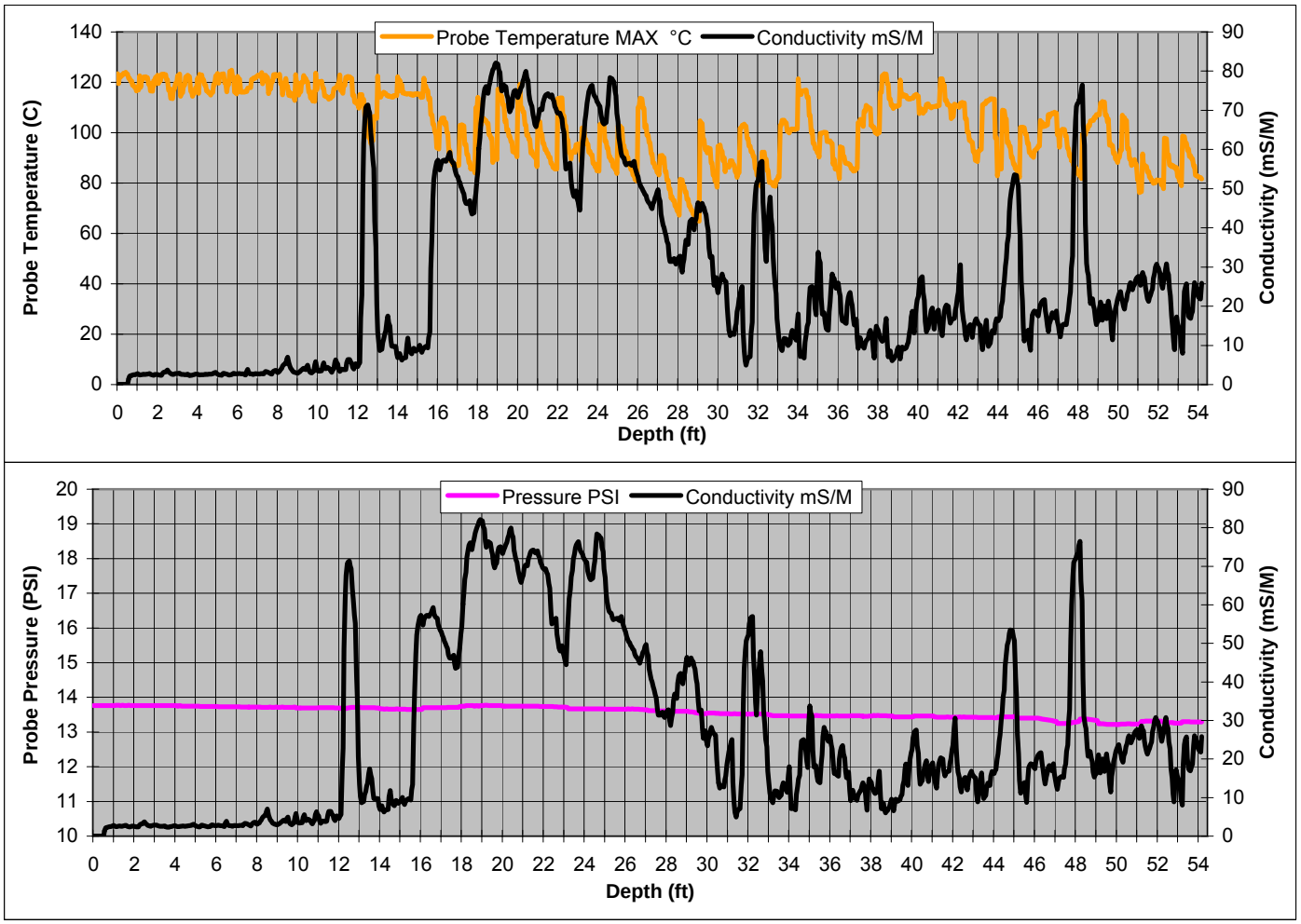
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-10b	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 22 2006	Detector 2 :	Photo Ionization (PID)
		Time:	14:48	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

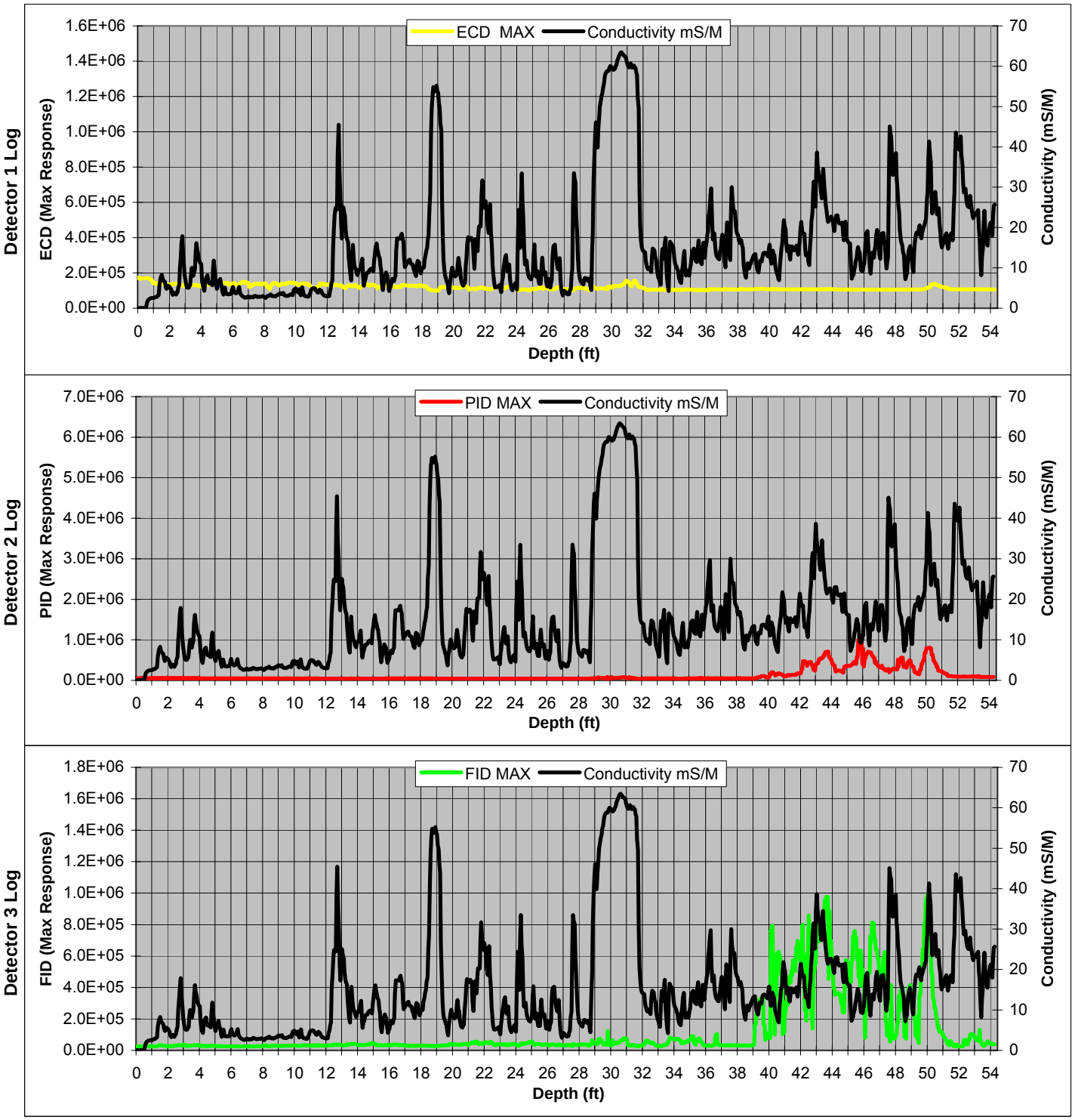
Client:	Golder Assoc.	Boring I.D.:	MIP-10b	Graph 1 :	Probe Temperature (C)
		Date:	Mar 22 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	14:48		



Explanation: Replaced MIP probe with new one. Cleared to 5 ft. with auger by Vironex.

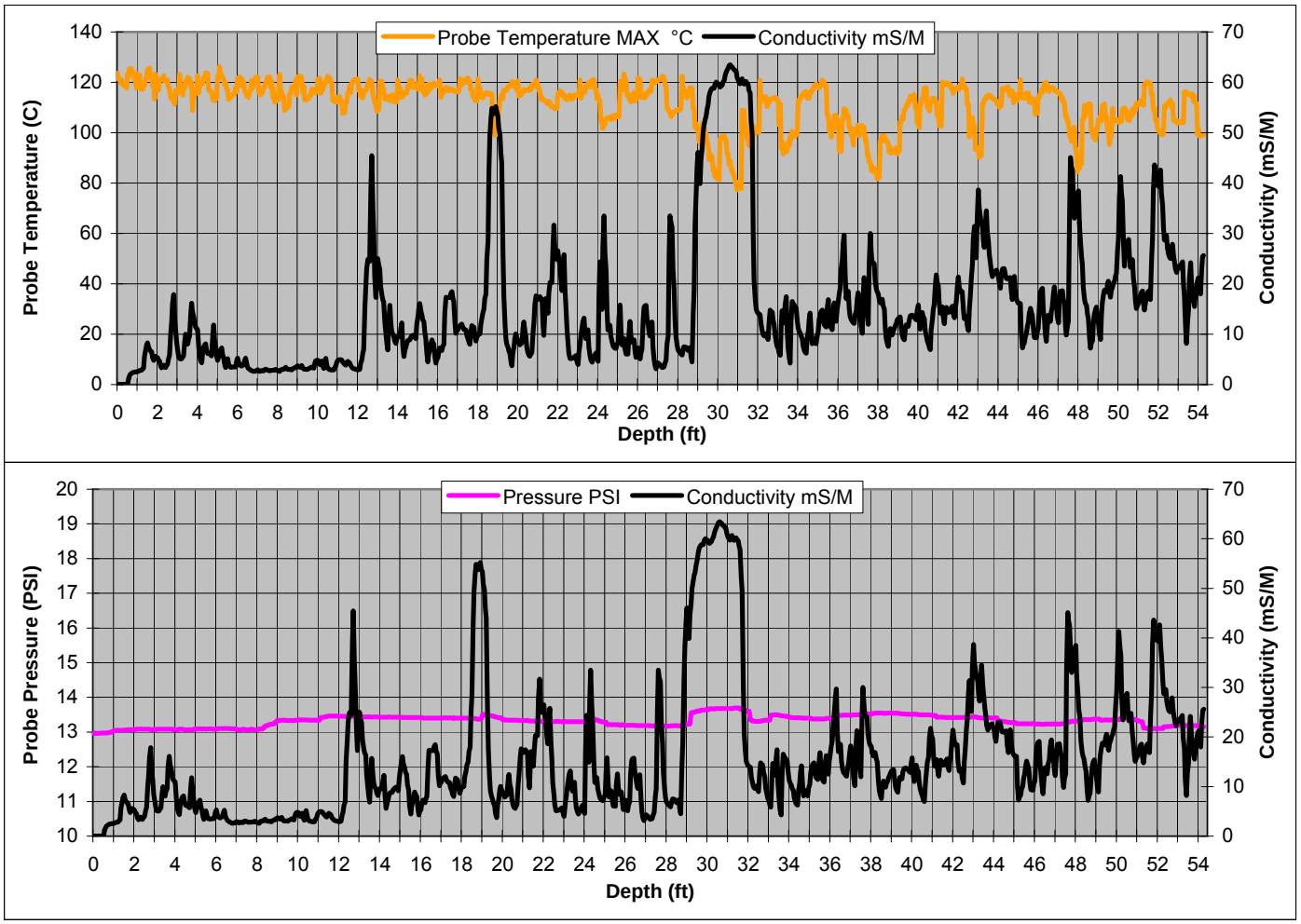
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-11	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 22 2006	Detector 2 :	Photo Ionization (PID)
		Time:	16:34	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

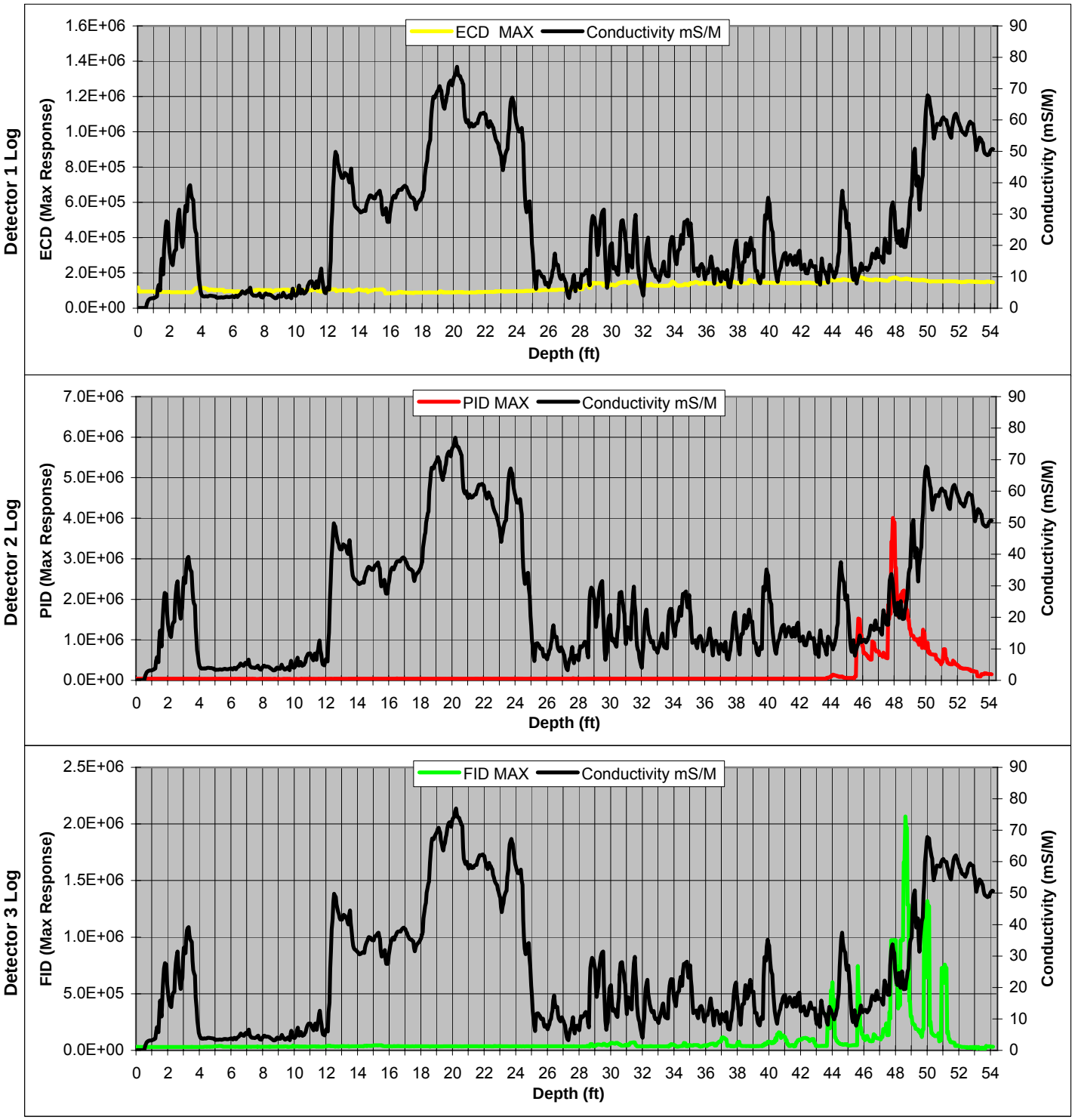
Client:	Golder Assoc.	Boring I.D.:	MIP-11	Graph 1 :	Probe Temperature (C)
		Date:	Mar 22 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	16:34		



Explanation: Cleared to 5 ft. with auger by Vironex.

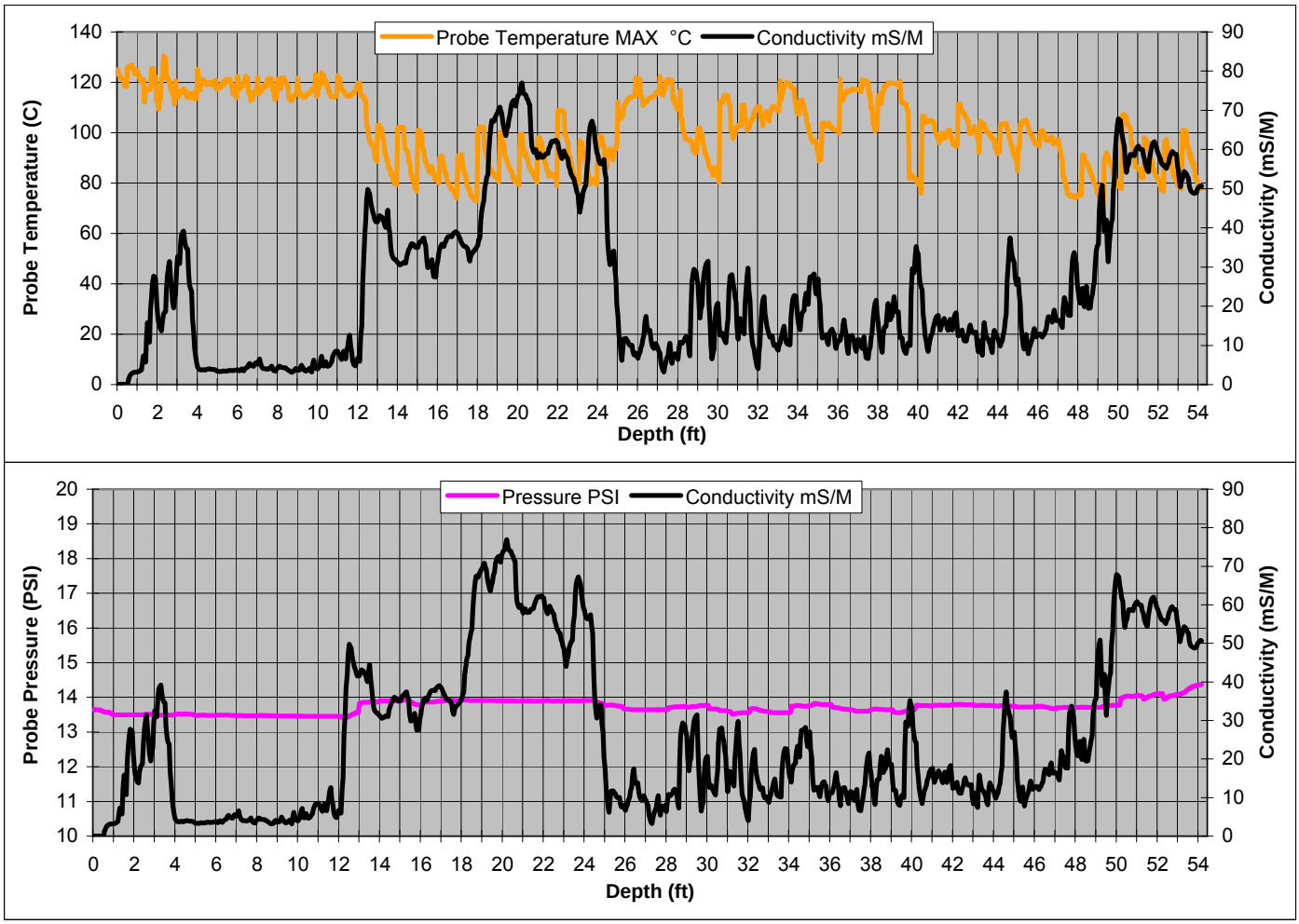
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-12	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 23 2006	Detector 2 :	Photo Ionization (PID)
		Time:	08:36	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

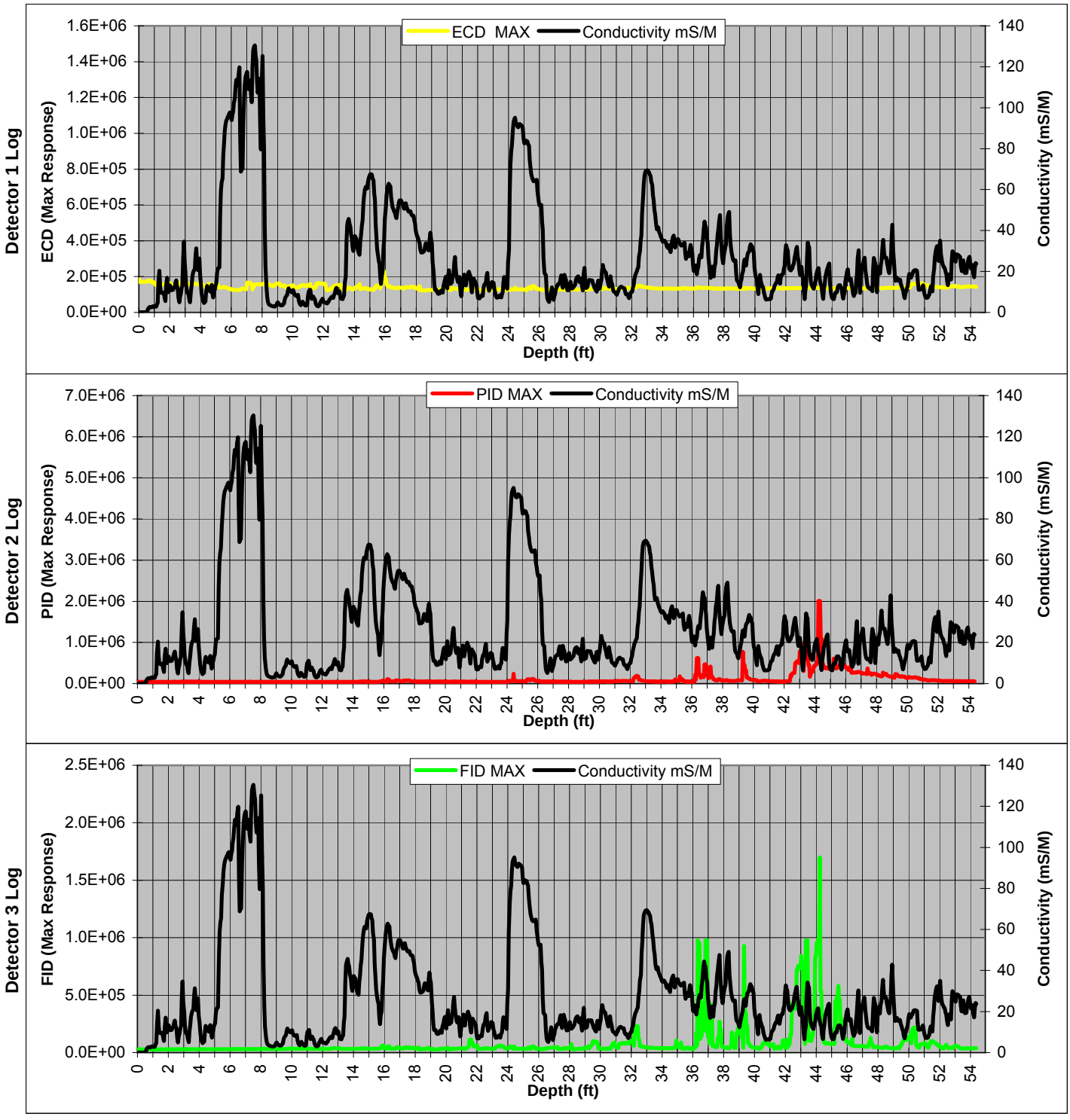
Client:	Golder Assoc.	Boring I.D.:	MIP-12	Graph 1 :	Probe Temperature (C)
		Date:	Mar 23 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	08:36		



Explanation: Cleared to 5 ft. with auger by Vironex.

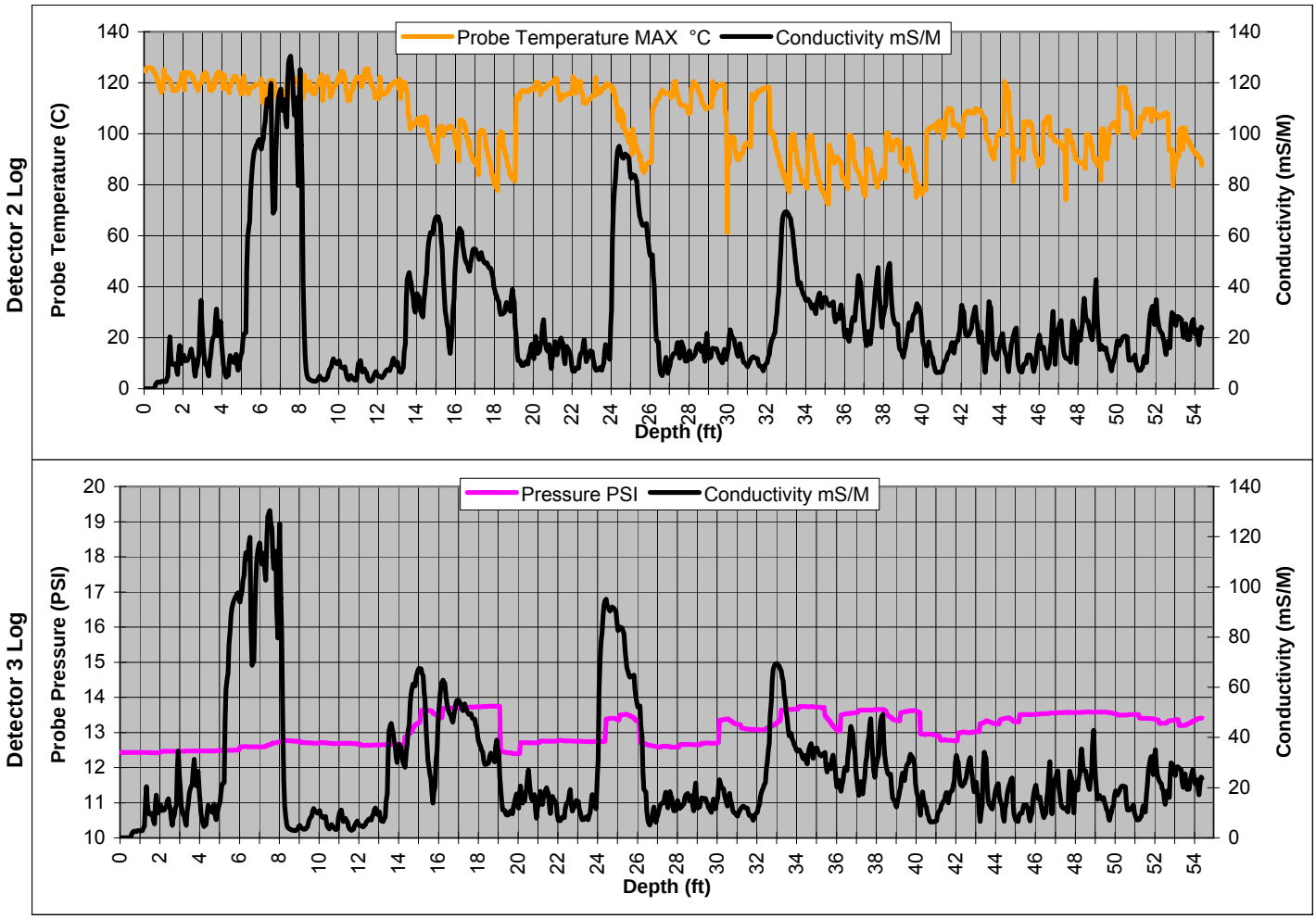
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-13	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 23 2006	Detector 2 :	Photo Ionization (PID)
		Time:	10:53	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

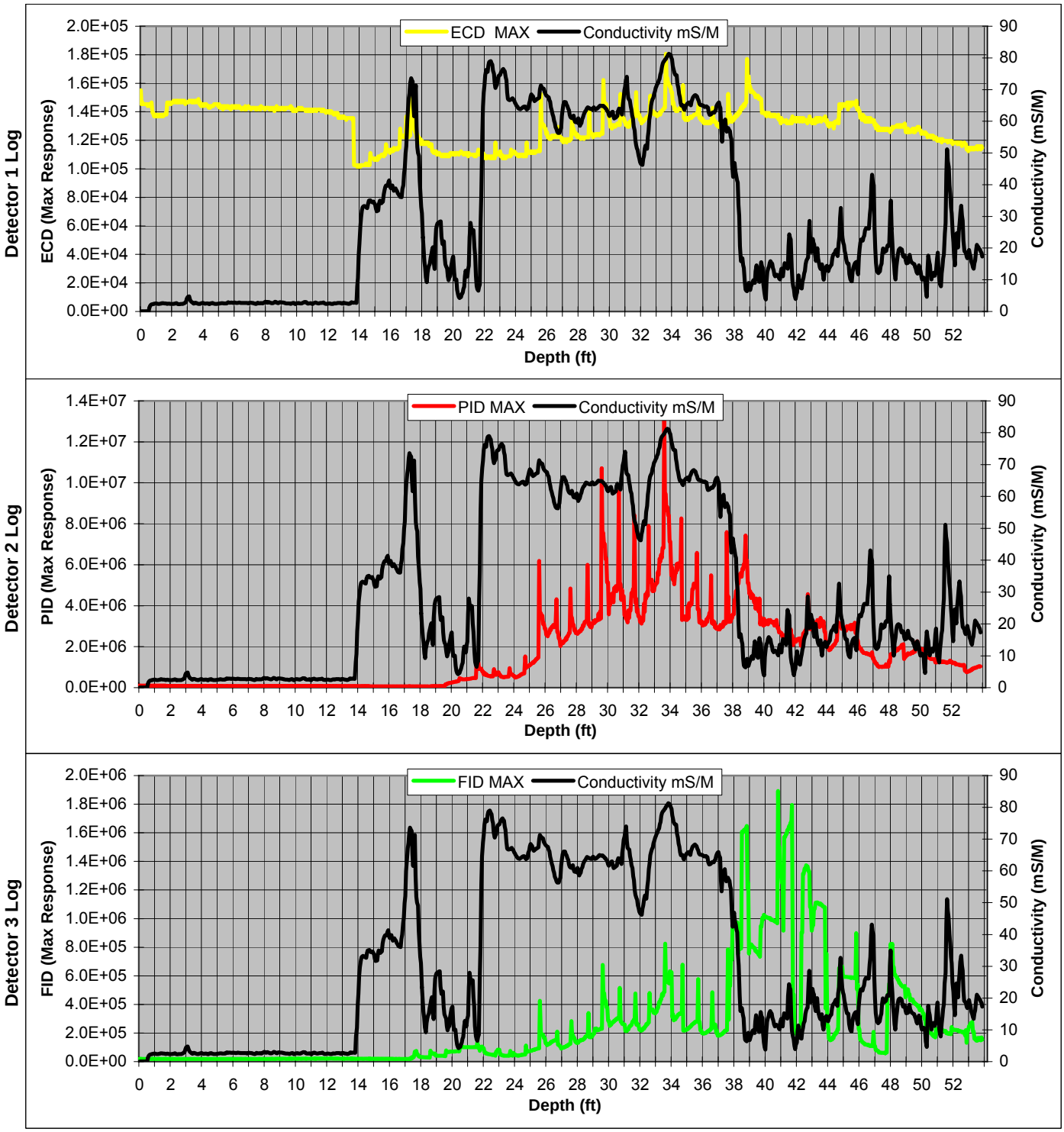
Client:	Golder Assoc.	Boring I.D.:	MIP-13	Graph 1 :	Probe Temperature (C)
		Date:	Mar 23 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	10:53		



Explanation: Cleared to 5 ft. with auger by Vironex.

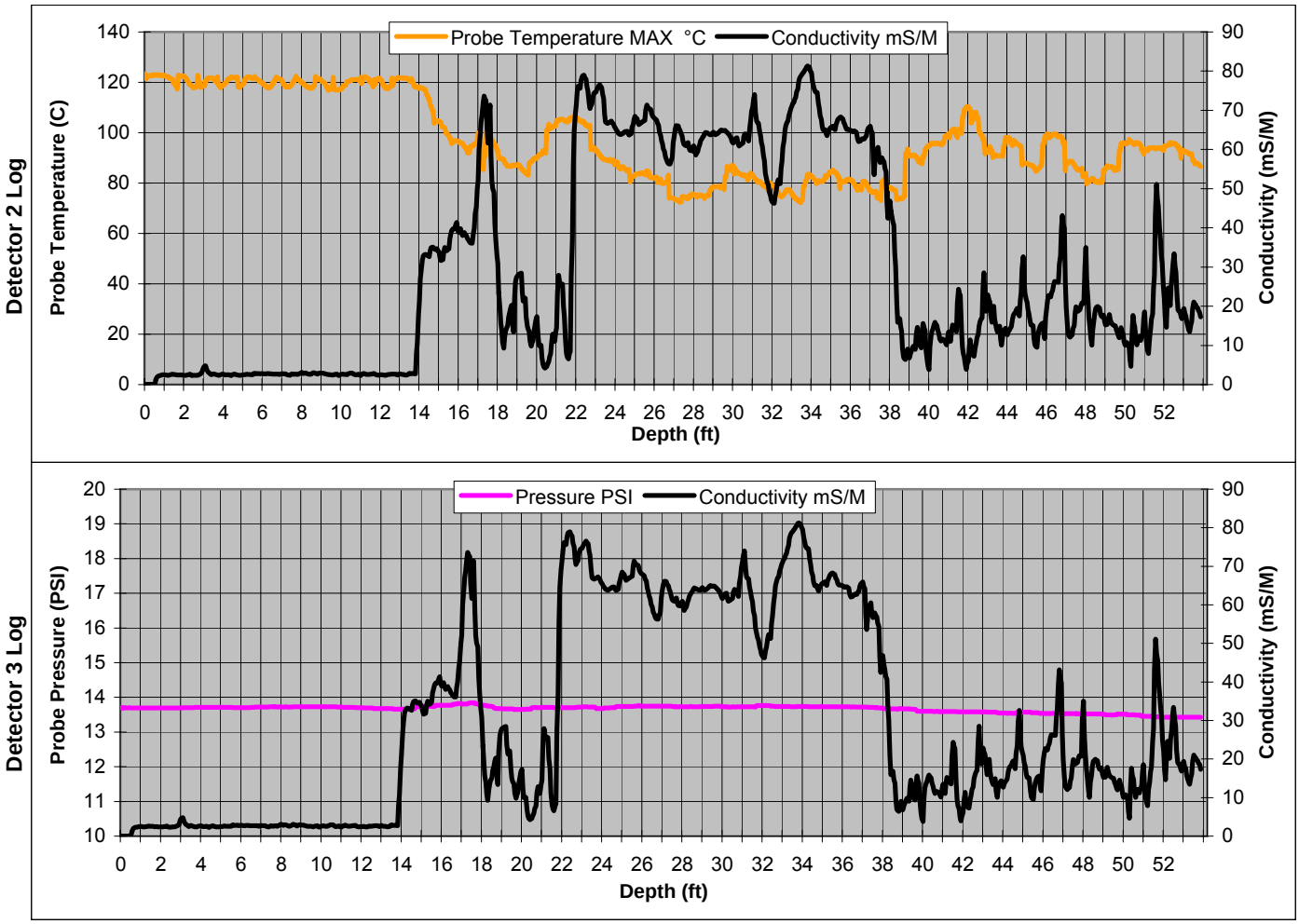
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-14	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 23 2006	Detector 2 :	Photo Ionization (PID)
		Time:	14:08	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

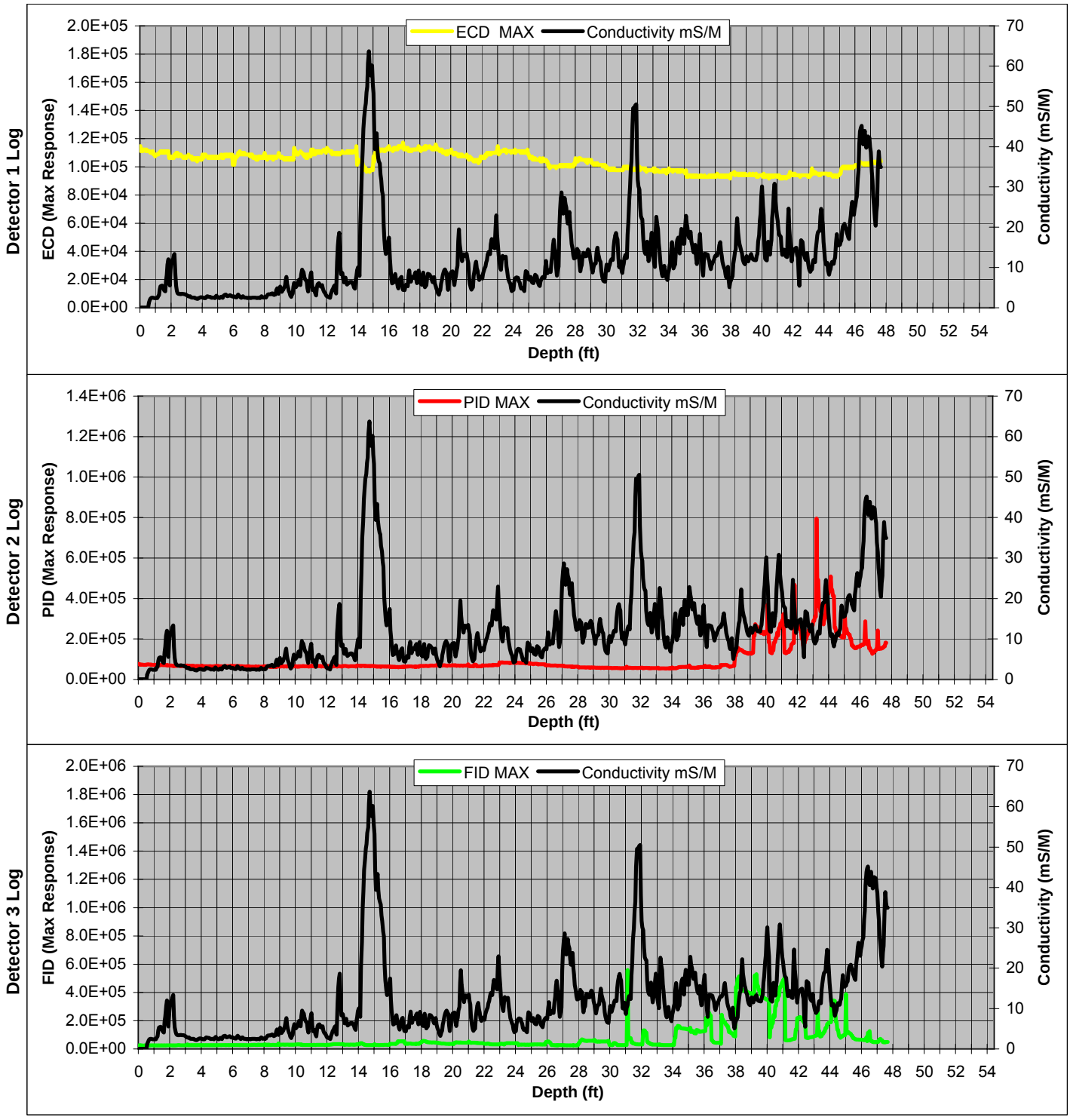
Client:	Golder Assoc.	Boring I.D.:	MIP-14	Graph 1 :	Probe Temperature (C)
		Date:	Mar 23 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	14:08		



Explanation: New MIP probe due membrane malfunction (stripped threads). Cleared to 5 ft. with auger by Vironex.

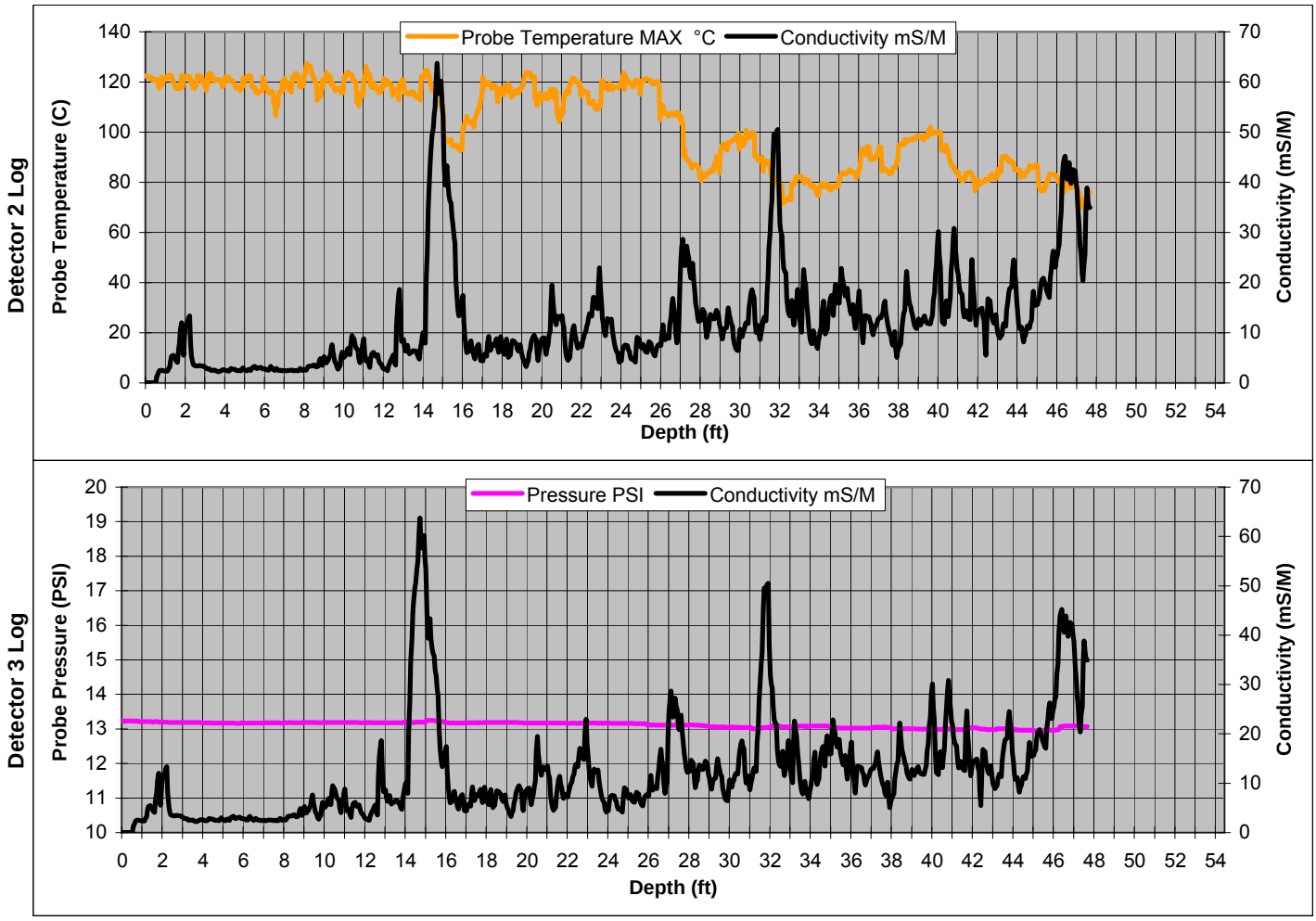
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-15	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 23 2006	Detector 2 :	Photo Ionization (PID)
		Time:	16:22	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

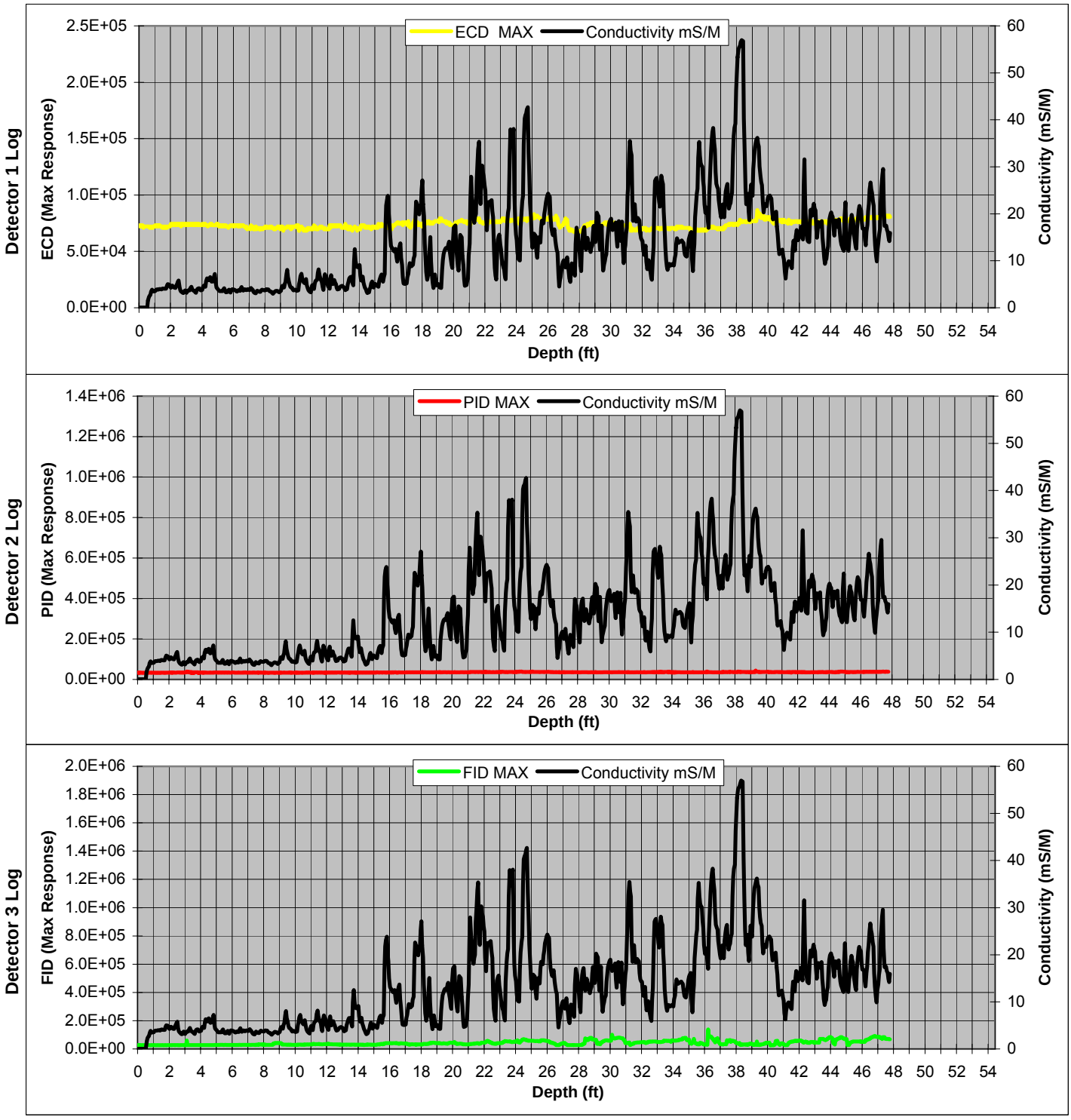
Client:	Golder Assoc.	Boring I.D.:	MIP-15	Graph 1 :	Probe Temperature (C)
		Date:	Mar 23 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	16:22		



Explanation: Cleared to 5 ft. with auger by Vironex.

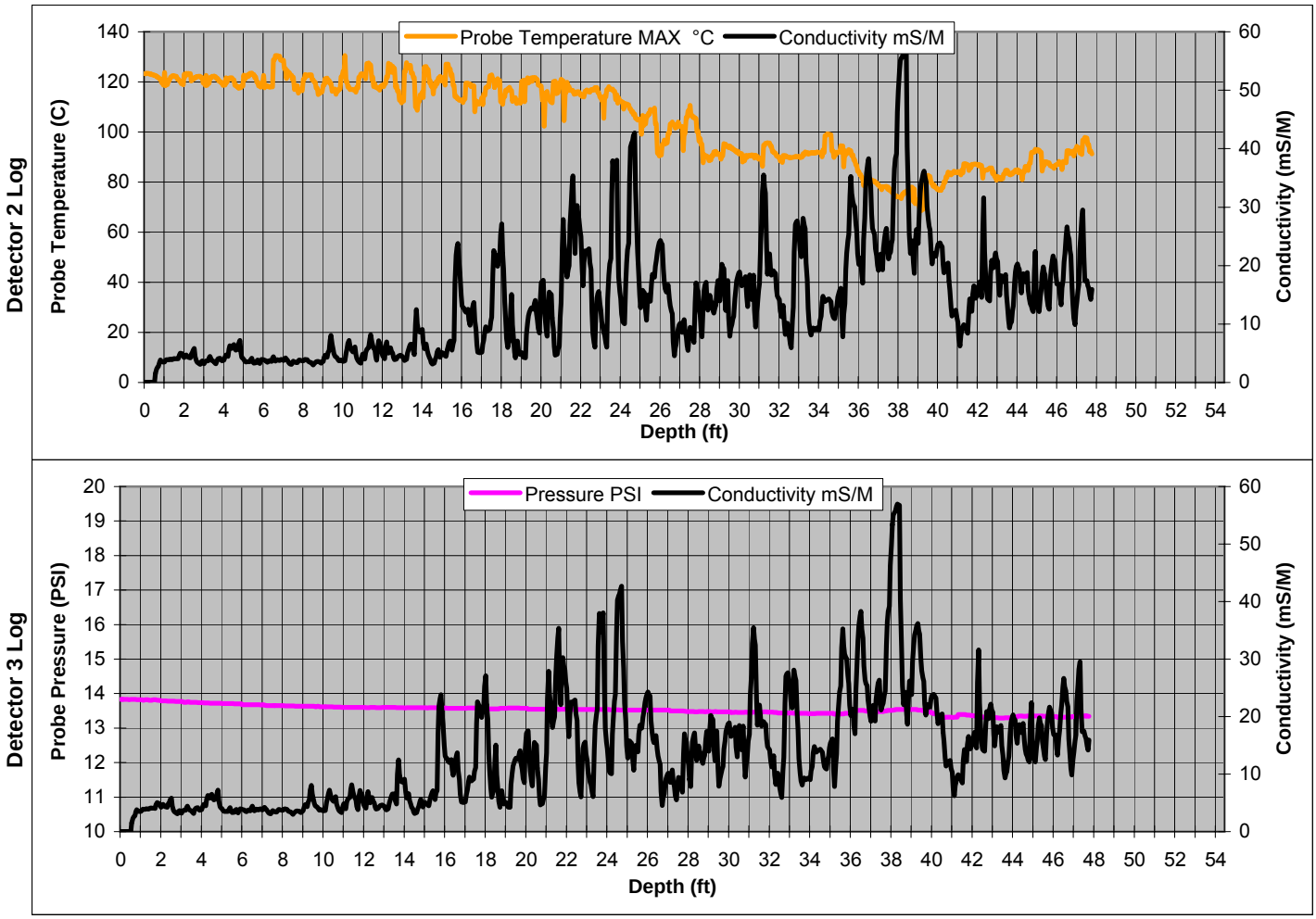
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-16	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 24 2006	Detector 2 :	Photo Ionization (PID)
		Time:	08:24	Detector 3 :	Flame Ionization (FID)



MIP Log Results by Boring - Detector Reading vs. Depth

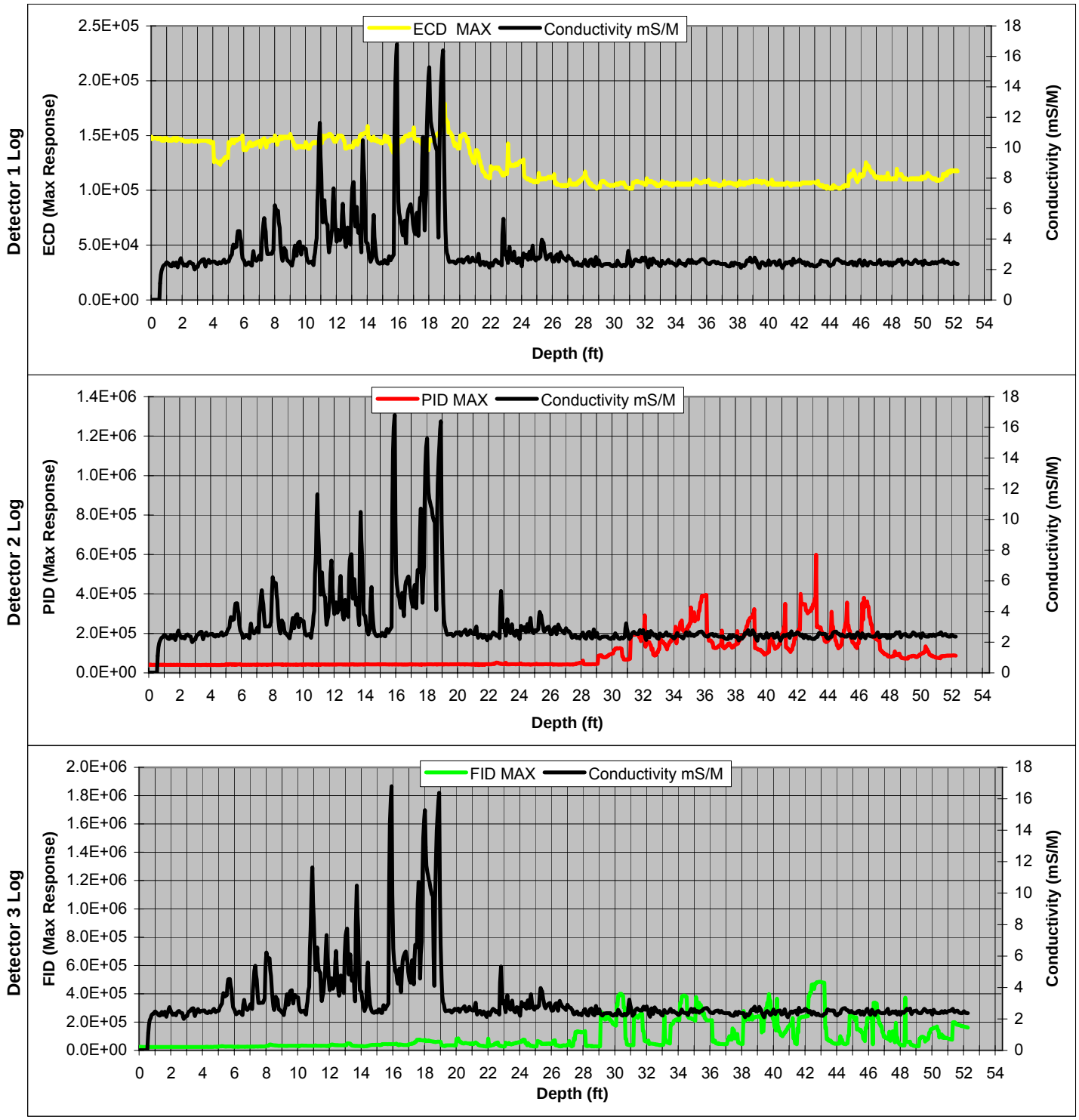
Client:	Golder Assoc.	Boring I.D.:	MIP-16	Graph 1 :	Probe Temperature (C)
		Date:	Mar 24 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	08:24		



Explanation: Stopped at 39.25 ft. bgs to wait for probe to reach higher temperature. Cleared to 5 ft. by Vironex.

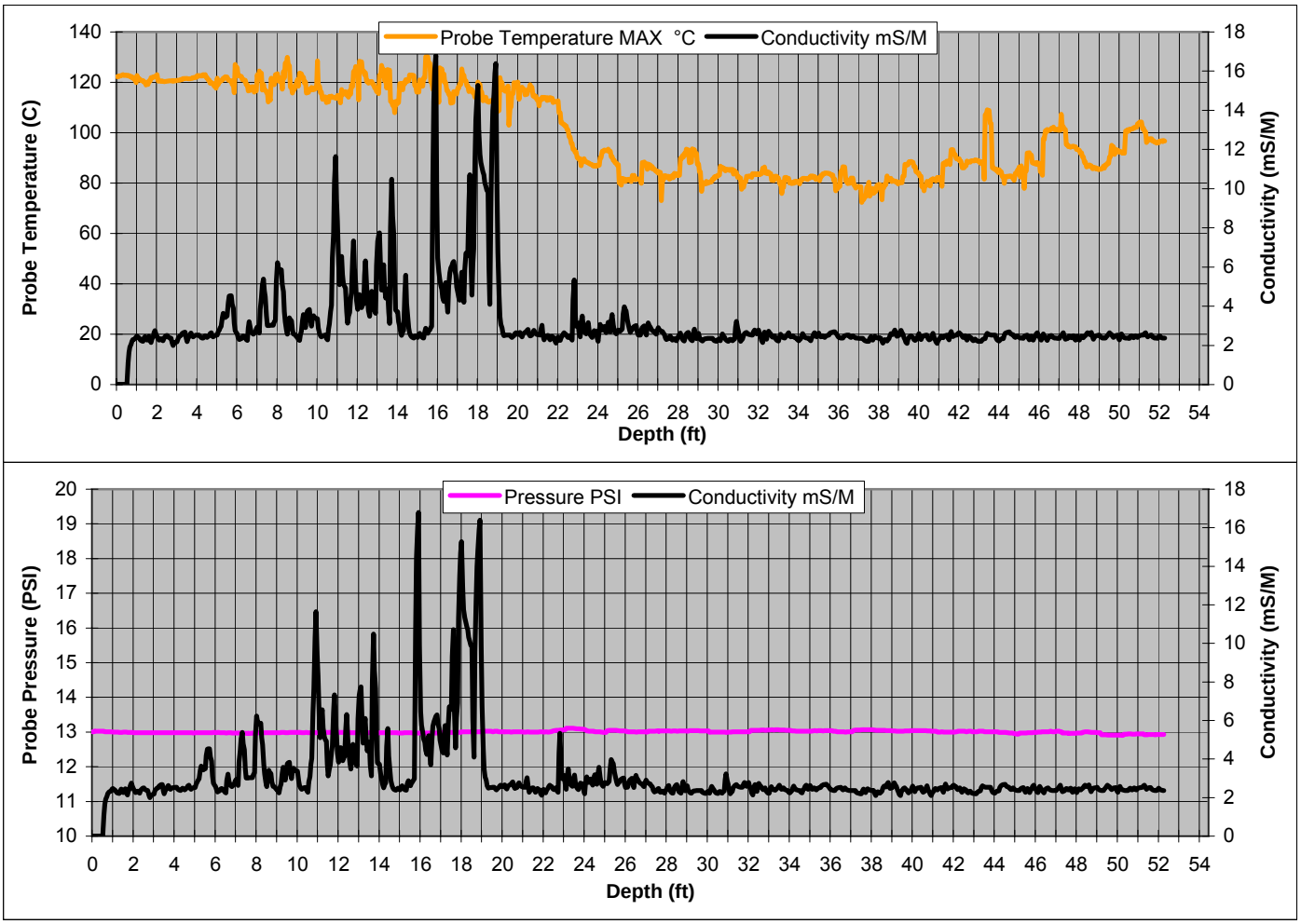
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-17	Detector 1 :	Electron Capture (ECD)
		Date:	Mar 24 2006	Detector 2 :	Photo Ionization (PID)
		Time:	10:52	Detector 3 :	Flame Ionization (FID)



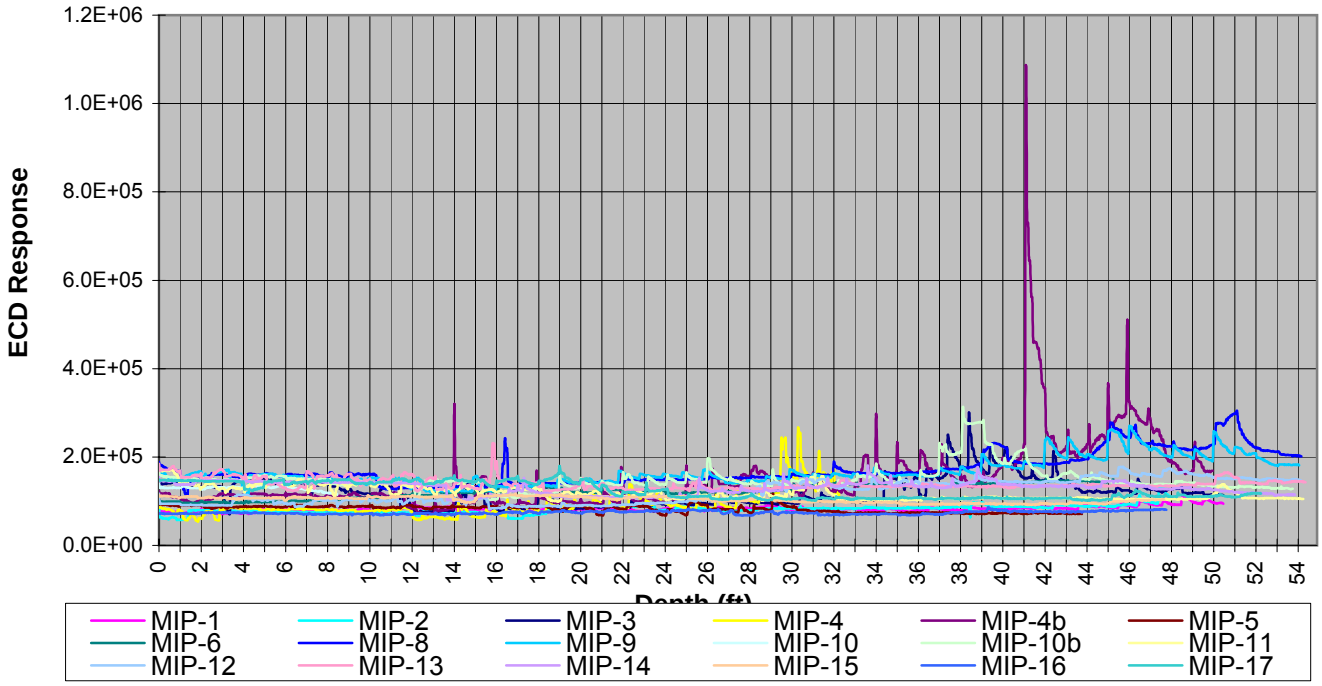
MIP Log Results by Boring - Detector Reading vs. Depth

Client:	Golder Assoc.	Boring I.D.:	MIP-17	Graph 1 :	Probe Temperature (C)
		Date:	Mar 24 2006	Graph 2 :	Probe Pressure (PSI)
		Time:	10:52		

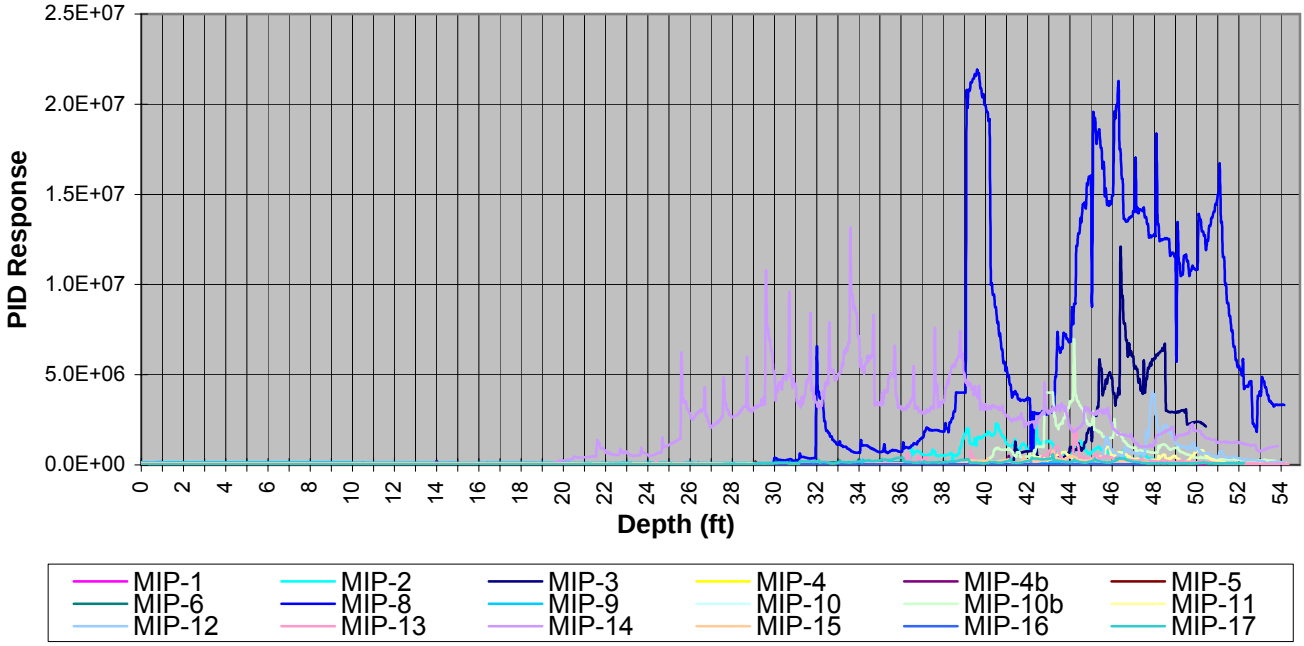


Explanation: Hand augered to 2.5 ft bgs by Vironex & Cleared to 4ft. by Macro-core as per request by Golder. Replaced MIP probe membrane.

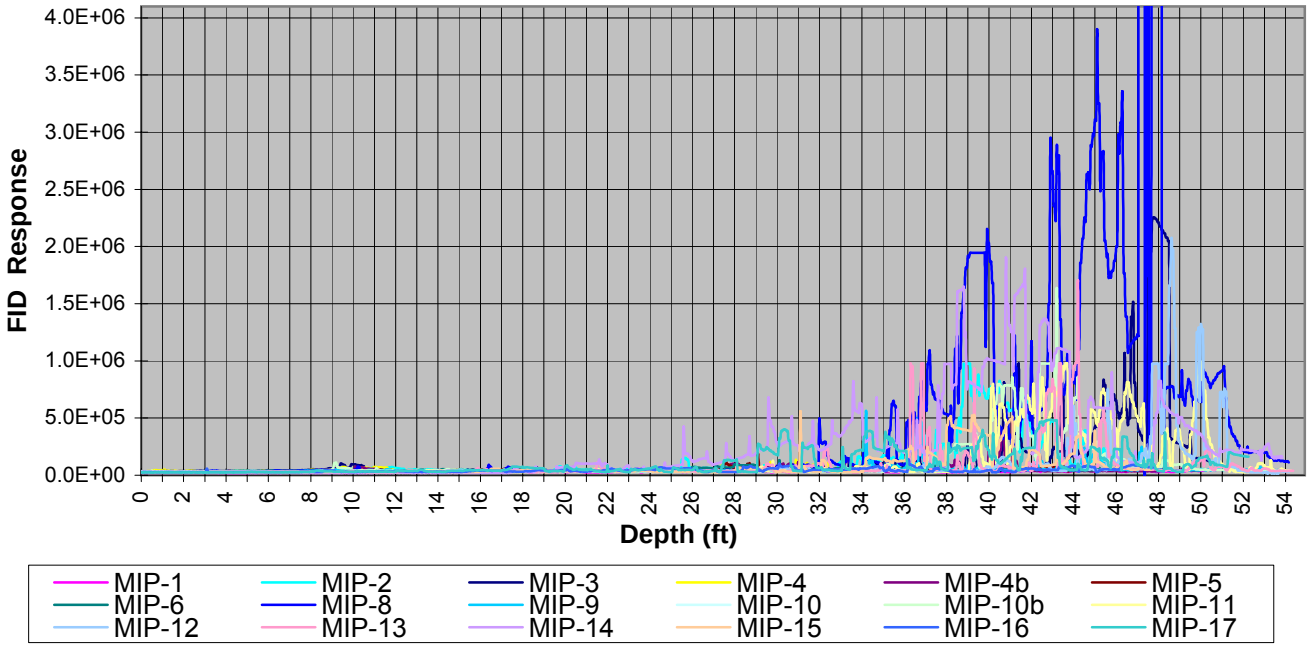
Maximum ECD Response Same Scale



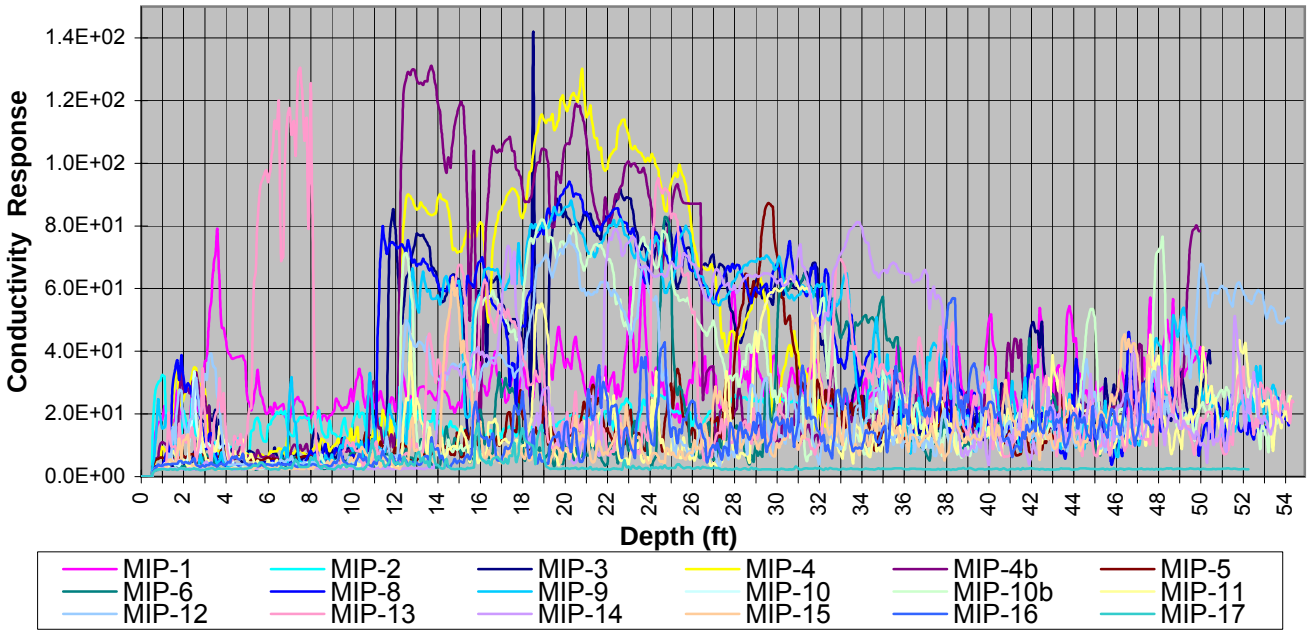
Maximum PID Response Same Scale



Maximum FID Response Same Scale



Conductivity Response Same Scale



Summary:
Data was collected at 2008 1st Street, Livermore, CA using the MIP (Membrane Interface Probe) and a Geoprobe 6600 at 18 sampling locations, collecting data from the surface to as deep as 54' bgs. An ECD (Electron Capture Detector), PID (Photo Ionization Detector) and a FID (Flame Ionization Detector) were used with a Hewlett Packard 5890 Gas Chromatograph.

The purpose of this MIP project was to determine if the MIP could provide a better definition of subsurface contaminant distribution over traditional soil and groundwater sampling in addition to identify the BTEX and MTBE source zone for preparation of a remedial action.

Contaminant Mass:
ECD detections were noted at MIP-3 and MIP-4. ECD detections were primarily located between 29' and 42'bgs. The highest ECD detection 1.0E+6 was noted at MIP-4 which was at approximately 41-42 bgs. ECD detections are an indication of halogenated compounds.

PID detections were noted at all MIP borings with exception of MIP-4, MIP-6, and MIP-16. PID detections were primarily located as shallow as 25' bgs and as deep as 51' bgs. The highest PID detection 2.0E+7 was noted at MIP-8 which was noted approximately 39' bgs. PID detections are an indication of double bonded compounds.

FID detections were noted at all MIP boring exception of MIP-5, MIP-6, and MIP-16. FID detections were primarily located shallow as 20' bgs and as deep as 52' bgs. The highest FID detection 4.0E+6 was noted at MIP-8 which was noted approximately 47' bgs. FID detections are an indication of combustible hydrocarbons.

Soil Conductivity:
A higher conductive or lower permeable zone was noted from 11' bgs to 32' bgs. A lower conductive or higher permeable zone was noted from 33' bgs to as deep as 54' bgs. The conductivity of soils is different for each type of media. Finer grained sediments, such as silts or clays, will have a higher EC signal. While coarser grained sediments, sands and gravel, will have a lower EC signal.

Confirmation Samples:
Based on soil confirmation results and information provided by Golder Associates, PID, and FID responses may be a result of petroleum hydrocarbons. ECD response noted at MIP-4b at 41' bgs, may be a response of halogenated compounds, but is not known due to soil confirmation provided by Golder Associates. PID and FID responses were primarily located between 30' bgs to 51' bgs. MIP-14 seemed to have shallower detection responses in comparison to all other MIP borings. This would be consistent with the possible prior location of one of the former UST tanks illustrated on page 8 of this report.

Soil and groundwater samples provided by Golder Associates indicated some MIP/PID correlation in the saturated and unsaturated zones.

APPENDIX B

REPORT OF BOREHOLE: CB-2

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/28/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push			0							0'-35' - Direct push with no sampling				
		▼ 3/28		26.6	CB-2GW					Sample collected for chemical analysis				
Direct Push with Sampling	1530			35.0	Sierra Testing				ML	Silt at 35' transitioning to silty sand at 37'				
				37.0						No sample recovery				
	1535		40	40.5	CB-2 40-40.5 Sierra Testing				SC	Clayey, gravelly sand				
				42.0						No sample recovery				
				45.0						Total depth of borehole - 45 FT BGS				

Report of borehole must be read in conjunction with accompanying notes and abbreviations

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

REPORT OF BOREHOLE: CB-3

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/29/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push		▽	0							0'-40' - Direct push with no sampling				
			10											
			20											
				26.0	CB-3GW					Sample collected for chemical analysis (approximate location)				
			30											
Direct Push with Sampling			40	40.0					SC	Clayey, gravelly sand, PID 25.8 ppm at 41' BGS				
				41.0						No sample recovery				
				43.0	Bench Test				CL	Clay. Sample collected for Bench Test analysis.				
				44.5	CB-3 46.5-47 Bench Test				SP SM	Gravelly, coarse sand with silt, saturated. Sample collected for chemical analysis 46.5-47 feet.				
				48.0					CL	Hard gravelly clay. Sample collected for Bench Test analysis.				
			50	50.0						Total depth of borehole - 50 FT BGS				

Report of borehole must be read in conjunction with accompanying notes and abbreviations

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

REPORT OF BOREHOLE: CB-8

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/29/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push			0							0'-38' - Direct Push with no sampling				
		▽		26.0	CB-8GW					Sample collected for chemical analysis (approximate location)				
Direct Push with Sampling				38.0	Bench Test					Sample 38'-42' - sample liner stuck inside barrel - retrieved soil from drive casing for bench test analysis				
				45.0						No sample recovery - jammed liner				
	1555			46.5	CB-8 46.5-47 Bench Test					Sample collected for chemical analysis Sample collected for Bench Test analysis				
				50.0						Total depth of borehole - 50 FT BGS				

Report of borehole must be read in conjunction with accompanying notes and abbreviations

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

REPORT OF BOREHOLE: CB-10

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/29/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push			0							0'-40' - Direct push with no sampling				
			10											
			20											
		▽		26.0	CB-10GW					Approximate sample location.				
			30											
Direct Push with Sampling			40	40.0						No sample recovery - sample liner stuck in core barrel. PID 0.3 ppm at shoe.				
	1035			45.0	CB-10 45-45.5 Bench Test				CL	Sample collected for chemical analysis Gravelly clay. Sample collected for Bench Test analysis.				
				47.5						No sample recovery				
			50	50.0						Total depth of borehole - 50 FT BGS				

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: CB-11

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/28/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct push			0							0'-40' - Direct push with no sampling				
	1050	▼ 3/28		27.0	CB-11GW					Sample collected for chemical analysis				
Direct push with sampling	1100		40	40.0	Sierra Testing				SM	Silty, gravelly sand. Sample collected for physical testing.				
					CB-11 41.5-42					Collect sample for chemical analysis.				
				42.0						No sample recovery				
				45.0	Sierra Testing				CL	Gravelly clay. Sample collected for physical testing.				
				47.5						No sample recovery				
			50	50.0						Total depth of borehole - 50 FT BGS				

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: CB-12

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/28/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push			0							0'-40' - Direct push with no sampling				
		▼ 3/28		26.0	CB-12GW					Sample collected for chemcial analysis				
Direct Push with Sampling	1310		40	40.0	Sierra Testing				GC	Clayey gravel. Sample collected for physical testing.				
				42.0						No sample recovery				
				45.0	Sierra Testing				GM	Silty gravel transition to silt with some clay. Sample collected for physical testing. Sample collected for chemical analysis.				
				48.0	CB-12 47.5-48					No sample recovery				
			50	50.0						Total depth of borehole - 50 FT BGS				

Report of borehole must be read in conjunction with accompanying notes and abbreviations

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

REPORT OF BOREHOLE: CB-13

CLIENT: B & C Gas
PROJECT: Corrective Action Investigation
LOCATION: 2008 1st Street, Livermore, CA
PROJECT NO.: 053-7020

DRIVE WEIGHT:
DROP DISTANCE:
BOREHOLE: N:, E:
ELEVATION: GS DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 1.5 inches

SHEET: 1 OF 1
DRILLER: Vironex
DRILL RIG: Geo Probe
LOGGED: C. Griffith DATE: 3/29/06
CHECKED: DATE:

Drilling					Sampling			Material Description						
METHOD	DRILL TIME	WATER	DEPTH feet	LAYER ELEVATION	SAMPLE OR FIELD TEST	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	SOIL NAME, density, plasticity or particle size, color, moisture, minor components	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING	
Direct Push			0							0'-40' - Direct push with no sampling				
			10											
			20											
			30											
Direct Push with Sampling	0850		40	40.0	Sierra Testing					PID 323 ppm at 42.5' BGS. Sample collected for physical testing.				
					CB-13 42-42.5					Sample collected for chemical analysis.				
				42.5						No sample recovery				
				45.0						Total depth of borehole - 45 FT BGS				

Report of borehole must be read in conjunction with accompanying notes and abbreviations

GEOTECH WITH MATERIAL GRAPHICS AND USCS 053-7020 DIRECT PUSH BORINGS.GPJ GLDR_IRV.GDT 6/6/06

APPENDIX C

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Bill Fowler
Golder Associates Inc.
2580 Wyandotte Street, Suite G
Mountain View, CA 94043

Subject : 7 Soil Samples and 6 Water Samples
Project Name : B&C Gas
Project Number : 053-7020

Dear Mr. Fowler,

Chemical analysis of the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. US EPA protocols for sample storage and preservation were followed.

Kiff Analytical is certified by the State of California (# 2236). If you have any questions regarding procedures or results, please call me at 530-297-4800.

Sincerely,

Joel Kiff

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Subject : 7 Soil Samples and 6 Water Samples
Project Name : B&C Gas
Project Number : 053-7020

Case Narrative

The Method Reporting Limit for Ethanol has been increased due to the presence of an interfering compound for samples CB-11 GW, CB-8 GW and CB-2 40-40.5.

Matrix Spike/Matrix Spike Duplicate Results associated with samples CB-2 40-40.5, CB-10 45-45.5, CB-3 46.5-47, CB-12 47.5-48, CB-8 46.5-47 for the analyte Methyl-t-butyl ether were affected by the analyte concentrations already present in the un-spiked sample.

Samples CB-2 GW, CB-10 GW, CB-3 GW, and CB-8 GW were analyzed by EPA Method 8260B using bottles that contained headspace bubbles greater than 1/4 inch in diameter. No other vials were available.

Approved By: Joel Kiff

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-11 GW** Matrix : Water Lab Number : 49229-01
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**22**	0.50	ug/L	EPA 8260B	03/31/2006
Toluene	**2.1**	0.50	ug/L	EPA 8260B	03/31/2006
Ethylbenzene	**100**	0.50	ug/L	EPA 8260B	03/31/2006
Total Xylenes	**44**	0.50	ug/L	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**43**	0.50	ug/L	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.50**	0.50	ug/L	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.50**	0.50	ug/L	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**1.1**	0.50	ug/L	EPA 8260B	03/31/2006
Tert-Butanol	**< 5.0**	5.0	ug/L	EPA 8260B	03/31/2006
Methanol	**< 50**	50	ug/L	EPA 8260B	03/31/2006
Ethanol	**< 20**	20	ug/L	EPA 8260B	03/31/2006
TPH as Gasoline	**4900**	50	ug/L	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	94.4		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	95.2		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-12 GW** Matrix : Water Lab Number : 49229-02
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 2.5**	2.5	ug/L	EPA 8260B	04/01/2006
Toluene	**5.6**	2.5	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	**700**	2.5	ug/L	EPA 8260B	04/01/2006
Total Xylenes	**720**	2.5	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**< 2.5**	2.5	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 2.5**	2.5	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 2.5**	2.5	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**< 2.5**	2.5	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	**< 15**	15	ug/L	EPA 8260B	04/01/2006
Methanol	**< 250**	250	ug/L	EPA 8260B	04/01/2006
Ethanol	**< 25**	25	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	**21000**	250	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	89.1		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	100		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

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KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-2 GW** Matrix : Water Lab Number : 49229-03
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**340**	5.0	ug/L	EPA 8260B	04/01/2006
Toluene	**56**	5.0	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	**1400**	5.0	ug/L	EPA 8260B	04/01/2006
Total Xylenes	**2400**	5.0	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**460**	5.0	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 5.0**	5.0	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 5.0**	5.0	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**11**	5.0	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	**43**	25	ug/L	EPA 8260B	04/01/2006
Methanol	**< 500**	500	ug/L	EPA 8260B	04/01/2006
Ethanol	**< 50**	50	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	**25000**	500	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	94.3		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	101		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

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KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-10 GW** Matrix : Water Lab Number : 49229-04
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**5.0**	0.50	ug/L	EPA 8260B	04/01/2006
Toluene	**2.0**	0.50	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	**170**	0.50	ug/L	EPA 8260B	04/01/2006
Total Xylenes	**160**	0.50	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**20**	0.50	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 0.50**	0.50	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 0.50**	0.50	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**0.53**	0.50	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	**< 5.0**	5.0	ug/L	EPA 8260B	04/01/2006
Methanol	**< 50**	50	ug/L	EPA 8260B	04/01/2006
Ethanol	**< 15**	15	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	**4800**	150	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	84.8		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	101		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

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KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-3 GW** Matrix : Water Lab Number : 49229-05
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**61**	4.0	ug/L	EPA 8260B	04/01/2006
Toluene	**13**	4.0	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	**580**	4.0	ug/L	EPA 8260B	04/01/2006
Total Xylenes	**280**	4.0	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**46**	4.0	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 4.0**	4.0	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 4.0**	4.0	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**< 4.0**	4.0	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	**< 20**	20	ug/L	EPA 8260B	04/01/2006
Methanol	**< 400**	400	ug/L	EPA 8260B	04/01/2006
Ethanol	**< 40**	40	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	**23000**	400	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	89.4		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	106		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

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KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-8 GW** Matrix : Water Lab Number : 49229-06
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**2000**	9.0	ug/L	EPA 8260B	04/01/2006
Toluene	**1100**	9.0	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	**4100**	9.0	ug/L	EPA 8260B	04/01/2006
Total Xylenes	**10000**	250	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**830**	9.0	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 9.0**	9.0	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 9.0**	9.0	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**38**	9.0	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	**< 50**	50	ug/L	EPA 8260B	04/01/2006
Methanol	**< 900**	900	ug/L	EPA 8260B	04/01/2006
Ethanol	**< 100**	100	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	**82000**	25000	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	85.1		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	99.7		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

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KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-11 41.5-42** Matrix : Soil Lab Number : 49229-07
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Ethylbenzene	**0.0051**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	04/01/2006
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	04/01/2006
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	04/01/2006
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	99.6		% Recovery	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	92.3		% Recovery	EPA 8260B	04/01/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-12 47.5-48** Matrix : Soil Lab Number : 49229-08
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	03/31/2006
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	100		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	95.5		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-2 40-40.5** Matrix : Soil Lab Number : 49229-09
Sample Date :03/28/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**0.020**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	**0.0066**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	03/31/2006
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	99.5		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	92.7		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-13 42-42.5** Matrix : Soil Lab Number : 49229-10
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**0.081**	0.050	mg/Kg	EPA 8260B	04/03/2006
Toluene	**0.058**	0.050	mg/Kg	EPA 8260B	04/03/2006
Ethylbenzene	**2.1**	0.050	mg/Kg	EPA 8260B	04/03/2006
Total Xylenes	**0.36**	0.050	mg/Kg	EPA 8260B	04/03/2006
Methyl-t-butyl ether (MTBE)	**< 0.025**	0.025	mg/Kg	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	**< 0.025**	0.025	mg/Kg	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	**< 0.025**	0.025	mg/Kg	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	**< 0.025**	0.025	mg/Kg	EPA 8260B	04/01/2006
Tert-Butanol	**< 0.15**	0.15	mg/Kg	EPA 8260B	04/01/2006
Methanol	**< 5.0**	5.0	mg/Kg	EPA 8260B	04/03/2006
Ethanol	**< 0.50**	0.50	mg/Kg	EPA 8260B	04/03/2006
TPH as Gasoline	**460**	9.0	mg/Kg	EPA 8260B	04/04/2006
Toluene - d8 (Surr)	96.1		% Recovery	EPA 8260B	04/03/2006
4-Bromofluorobenzene (Surr)	112		% Recovery	EPA 8260B	04/03/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-10 45-45.5** Matrix : Soil Lab Number : 49229-11
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**0.0057**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	03/31/2006
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	100		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	97.1		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-3 46.5-47** Matrix : Soil Lab Number : 49229-12
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	**0.014**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	**0.0088**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	03/31/2006
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	99.8		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	96.6		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF Analytical LLC

Report Number : 49229
Date : 04/04/2006

Project Name : **B&C Gas**
Project Number : **053-7020**

Sample : **CB-8 46.5-47** Matrix : Soil Lab Number : 49229-13
Sample Date :03/29/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**0.0081**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	**0.066**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	**0.11**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	**0.018**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	**< 0.015**	0.015	mg/Kg	EPA 8260B	03/31/2006
Methanol	**< 0.25**	0.25	mg/Kg	EPA 8260B	03/31/2006
Ethanol	**< 0.025**	0.025	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	**13**	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	99.8		% Recovery	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	96.3		% Recovery	EPA 8260B	03/31/2006

Approved By: Joel Kiff

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

Date : 04/04/2006

QC Report : Method Blank Data

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Toluene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Ethylbenzene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Total Xylenes	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Methyl-t-butyl ether (MTBE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Diisopropyl ether (DIPE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Ethyl-t-butyl ether (ETBE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Tert-amyl methyl ether (TAME)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Tert-Butanol	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/30/2006
Methanol	< 0.20	0.20	mg/Kg	EPA 8260B	03/30/2006
Ethanol	< 0.010	0.010	mg/Kg	EPA 8260B	03/30/2006
TPH as Gasoline	< 1.0	1.0	mg/Kg	EPA 8260B	03/30/2006
Toluene - d8 (Surr)	106		%	EPA 8260B	03/30/2006
4-Bromofluorobenzene (Surr)	102		%	EPA 8260B	03/30/2006
Benzene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Toluene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethylbenzene	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Total Xylenes	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Tert-Butanol	< 0.0050	0.0050	mg/Kg	EPA 8260B	03/31/2006
Methanol	< 0.20	0.20	mg/Kg	EPA 8260B	03/31/2006
Ethanol	< 0.010	0.010	mg/Kg	EPA 8260B	03/31/2006
TPH as Gasoline	< 1.0	1.0	mg/Kg	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	97.5		%	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	117		%	EPA 8260B	03/31/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	04/01/2006
Methanol	< 50	50	ug/L	EPA 8260B	04/01/2006
Ethanol	< 5.0	5.0	ug/L	EPA 8260B	04/01/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	97.9		%	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	106		%	EPA 8260B	04/01/2006
Benzene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	03/31/2006
Methanol	< 50	50	ug/L	EPA 8260B	03/31/2006
Ethanol	< 5.0	5.0	ug/L	EPA 8260B	03/31/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	96.8		%	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	98.2		%	EPA 8260B	03/31/2006

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

Date : 04/04/2006

QC Report : Method Blank Data

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Diisopropyl ether (DIPE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Ethyl-t-butyl ether (ETBE)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Tert-amyl methyl ether (TAME)	< 0.50	0.50	ug/L	EPA 8260B	04/01/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	04/01/2006
Methanol	< 50	50	ug/L	EPA 8260B	04/01/2006
Ethanol	< 5.0	5.0	ug/L	EPA 8260B	04/01/2006
Toluene - d8 (Surr)	98.8		%	EPA 8260B	04/01/2006
4-Bromofluorobenzene (Surr)	101		%	EPA 8260B	04/01/2006
Benzene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Diisopropyl ether (DIPE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Ethyl-t-butyl ether (ETBE)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Tert-amyl methyl ether (TAME)	< 0.50	0.50	ug/L	EPA 8260B	03/31/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	03/31/2006
Methanol	< 50	50	ug/L	EPA 8260B	03/31/2006
Ethanol	< 5.0	5.0	ug/L	EPA 8260B	03/31/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	03/31/2006
Toluene - d8 (Surr)	99.4		%	EPA 8260B	03/31/2006
4-Bromofluorobenzene (Surr)	91.6		%	EPA 8260B	03/31/2006

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

QC Report : Matrix Spike/ Matrix Spike Duplicate

Date : 04/04/2006

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Spiked Sample	Sample Value	Spike Level	Spike Dup. Level	Spiked Sample Value	Duplicate Spiked Sample Value	Units	Analysis Method	Date Analyzed	Spiked Sample Percent Recov.	Duplicate Spiked Sample Percent Recov.	Relative Percent Diff.	Spiked Sample Percent Recov. Limit	Relative Percent Diff. Limit
Benzene	49199-16	<0.0050	0.0398	0.0397	0.0396	0.0415	mg/Kg	EPA 8260B	3/30/06	99.5	105	4.98	70-130	25
Toluene	49199-16	<0.0050	0.0398	0.0397	0.0392	0.0410	mg/Kg	EPA 8260B	3/30/06	98.3	103	4.91	70-130	25
Tert-Butanol	49199-16	<0.0050	0.199	0.198	0.184	0.188	mg/Kg	EPA 8260B	3/30/06	92.6	94.6	2.16	70-130	25
Methyl-t-Butyl Ether	49199-16	0.046	0.0398	0.0397	0.0837	0.0572	mg/Kg	EPA 8260B	3/30/06	94.9	28.5	108	70-130	25
Benzene	49260-02	<0.0050	0.0381	0.0366	0.0378	0.0373	mg/Kg	EPA 8260B	4/1/06	99.4	102	2.63	70-130	25
Toluene	49260-02	<0.0050	0.0381	0.0366	0.0391	0.0384	mg/Kg	EPA 8260B	4/1/06	102	105	2.47	70-130	25
Tert-Butanol	49260-02	<0.0050	0.190	0.183	0.171	0.180	mg/Kg	EPA 8260B	4/1/06	90.0	98.5	9.11	70-130	25
Methyl-t-Butyl Ether	49260-02	<0.0050	0.0381	0.0366	0.0349	0.0336	mg/Kg	EPA 8260B	4/1/06	91.6	92.0	0.397	70-130	25
Benzene	49280-18	<0.50	40.0	40.0	38.8	37.9	ug/L	EPA 8260B	4/1/06	96.9	94.7	2.32	70-130	25
Toluene	49280-18	<0.50	40.0	40.0	37.4	37.0	ug/L	EPA 8260B	4/1/06	93.5	92.4	1.17	70-130	25
Tert-Butanol	49280-18	<5.0	200	200	193	190	ug/L	EPA 8260B	4/1/06	96.4	94.8	1.70	70-130	25
Methyl-t-Butyl Ether	49280-18	<0.50	40.0	40.0	38.2	37.5	ug/L	EPA 8260B	4/1/06	95.6	93.7	2.04	70-130	25
Benzene	49241-05	<0.50	40.0	40.0	40.2	39.7	ug/L	EPA 8260B	3/31/06	100	99.2	1.28	70-130	25
Toluene	49241-05	1.0	40.0	40.0	40.3	40.2	ug/L	EPA 8260B	3/31/06	98.1	97.9	0.244	70-130	25
Tert-Butanol	49241-05	<5.0	200	200	192	203	ug/L	EPA 8260B	3/31/06	96.0	101	5.43	70-130	25
Methyl-t-Butyl Ether	49241-05	15	40.0	40.0	52.2	52.4	ug/L	EPA 8260B	3/31/06	92.8	93.1	0.400	70-130	25
Benzene	49280-19	<0.50	40.0	40.0	41.8	40.2	ug/L	EPA 8260B	4/1/06	105	100	4.04	70-130	25
Toluene	49280-19	<0.50	40.0	40.0	41.4	39.7	ug/L	EPA 8260B	4/1/06	104	99.4	4.16	70-130	25

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

QC Report : Matrix Spike/ Matrix Spike Duplicate

Date : 04/04/2006

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Spiked Sample	Sample Value	Spike Level	Spike Dup. Level	Spiked Sample Value	Duplicate Spiked Sample Value	Units	Analysis Method	Date Analyzed	Spiked Sample Percent Recov.	Duplicate Spiked Sample Percent Recov.	Relative Percent Diff.	Spiked Sample Percent Recov. Limit	Relative Percent Diff. Limit
Tert-Butanol	49280-19	<5.0	200	200	196	200	ug/L	EPA 8260B	4/1/06	97.8	99.9	2.13	70-130	25
Methyl-t-Butyl Ether	49280-19	<0.50	40.0	40.0	40.3	39.5	ug/L	EPA 8260B	4/1/06	101	98.9	1.80	70-130	25
Benzene	49216-04	<0.50	40.0	40.0	36.5	33.3	ug/L	EPA 8260B	3/31/06	91.3	83.3	9.18	70-130	25
Toluene	49216-04	<0.50	40.0	40.0	37.0	34.3	ug/L	EPA 8260B	3/31/06	92.5	85.7	7.60	70-130	25
Tert-Butanol	49216-04	12	200	200	194	180	ug/L	EPA 8260B	3/31/06	91.3	84.0	8.34	70-130	25
Methyl-t-Butyl Ether	49216-04	9.2	40.0	40.0	46.8	45.1	ug/L	EPA 8260B	3/31/06	94.0	89.8	4.57	70-130	25

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

QC Report : Laboratory Control Sample (LCS)

Date : 04/04/2006

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Benzene	0.0400	mg/Kg	EPA 8260B	3/30/06	106	70-130
Toluene	0.0400	mg/Kg	EPA 8260B	3/30/06	104	70-130
Tert-Butanol	0.200	mg/Kg	EPA 8260B	3/30/06	90.5	70-130
Methyl-t-Butyl Ether	0.0400	mg/Kg	EPA 8260B	3/30/06	101	70-130
Benzene	0.0400	mg/Kg	EPA 8260B	3/31/06	96.4	70-130
Toluene	0.0400	mg/Kg	EPA 8260B	3/31/06	96.2	70-130
Tert-Butanol	0.200	mg/Kg	EPA 8260B	3/31/06	98.8	70-130
Methyl-t-Butyl Ether	0.0400	mg/Kg	EPA 8260B	3/31/06	99.6	70-130
Benzene	40.0	ug/L	EPA 8260B	4/1/06	91.1	70-130
Toluene	40.0	ug/L	EPA 8260B	4/1/06	90.6	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/1/06	91.5	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/1/06	91.1	70-130
Benzene	40.0	ug/L	EPA 8260B	3/31/06	96.8	70-130
Toluene	40.0	ug/L	EPA 8260B	3/31/06	97.2	70-130
Tert-Butanol	200	ug/L	EPA 8260B	3/31/06	92.2	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	3/31/06	90.8	70-130
Benzene	40.0	ug/L	EPA 8260B	4/1/06	98.7	70-130

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49229

QC Report : Laboratory Control Sample (LCS)

Date : 04/04/2006

Project Name : **B&C Gas**

Project Number : **053-7020**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Toluene	40.0	ug/L	EPA 8260B	4/1/06	98.4	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/1/06	91.8	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/1/06	92.9	70-130
Benzene	40.0	ug/L	EPA 8260B	3/31/06	90.0	70-130
Toluene	40.0	ug/L	EPA 8260B	3/31/06	91.8	70-130
Tert-Butanol	200	ug/L	EPA 8260B	3/31/06	89.1	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	3/31/06	92.8	70-130

Approved By: Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Calscience Environmental Laboratories, Inc.

April 06, 2006

Joel Kiff
Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Subject: **Calscience Work Order No.: 06-03-1818**
Client Reference: B&C Gas

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 3/31/2006 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Stephen Nowak
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

Kiff Analytical		Date Received:	03/31/06
2795 2nd Street, Suite 300		Work Order No:	06-03-1818
Davis, CA 95616-6593		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg

Project: B&C Gas

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-10 45-45.5	**06-03-1818-4**	**03/29/06**	**Solid**	**03/31/06**	**04/04/06**	**060331L05**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	1.31	0.75	1		Copper	26.3	0.5	1	
Barium	133	0.500	1		Lead	7.59	0.50	1	
Cadmium	ND	0.500	1		Selenium	ND	0.750	1	
Chromium	61.9	0.2	1		Iron	20300	5	1	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-3 46.5-47	**06-03-1818-5**	**03/29/06**	**Solid**	**03/31/06**	**04/04/06**	**060331L05**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	1.43	0.75	1		Copper	22.8	0.5	1	
Barium	94.9	0.5	1		Lead	3.83	0.50	1	
Cadmium	ND	0.500	1		Selenium	ND	0.750	1	
Chromium	63.4	0.2	1		Iron	20600	5	1	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-8 46.5-47	**06-03-1818-6**	**03/29/06**	**Solid**	**03/31/06**	**04/04/06**	**060331L05**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	0.97	0.750	1		Copper	18.8	0.5	1	
Barium	62.4	0.5	1		Lead	4.84	0.50	1	
Cadmium	ND	0.500	1		Selenium	ND	0.750	1	
Chromium	37.1	0.2	1		Iron	16100	5	1	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**097-01-002-7,419**	**N/A**	**Solid**	**03/31/06**	**03/31/06**	**060331L05**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.750	1		Copper	ND	0.500	1	
Barium	ND	0.500	1		Lead	ND	0.500	1	
Cadmium	ND	0.500	1		Selenium	ND	0.750	1	
Chromium	ND	0.250	1		Iron	ND	5.00	1	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

Kiff Analytical		Date Received:	03/31/06
2795 2nd Street, Suite 300		Work Order No:	06-03-1818
Davis, CA 95616-6593		Preparation:	EPA 3010A Total
		Method:	EPA 6010B
		Units:	mg/L

Project: B&C Gas

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-10 GW	**06-03-1818-1**	**03/29/06**	**Aqueous**	**03/31/06**	**04/03/06**	**060331L04**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.0500	5		Copper	2.48	0.02	5	
Barium	18.8	0.0500	5		Lead	0.959	0.050	5	
Cadmium	ND	0.0250	5		Selenium	ND	0.0750	5	
Chromium	4.86	0.02	5		Iron	1580	0.500	5	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-3 GW	**06-03-1818-2**	**03/29/06**	**Aqueous**	**03/31/06**	**04/03/06**	**060331L04**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.0500	5		Copper	4.16	0.02	5	
Barium	26.1	0.0500	5		Lead	1.24	0.05	5	
Cadmium	ND	0.0250	5		Selenium	ND	0.0750	5	
Chromium	7.33	0.02	5		Iron	2280	0.500	5	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
CB-8 GW	**06-03-1818-3**	**03/29/06**	**Aqueous**	**03/31/06**	**04/03/06**	**060331L04**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.0500	5		Copper	6.92	0.02	5	
Barium	41.3	0.0500	5		Lead	1.80	0.05	5	
Cadmium	ND	0.0250	5		Selenium	ND	0.0750	5	
Chromium	9.70	0.02	5		Iron	4800	5	50	

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**097-01-003-5,970**	**N/A**	**Aqueous**	**03/31/06**	**04/03/06**	**060331L04**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Arsenic	ND	0.0100	1		Copper	ND	0.00500	1	
Barium	ND	0.0100	1		Lead	ND	0.0100	1	
Cadmium	ND	0.00500	1		Selenium	ND	0.0150	1	
Chromium	ND	0.00500	1		Iron	ND	0.100	1	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received: 03/31/06
Work Order No: 06-03-1818
Preparation: EPA 3050B
Method: EPA 6010B

Project B&C Gas

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
CB-10 45-45.5	**Solid**	**ICP 3300**	**03/31/06**	**04/04/06**	**060331S05**

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	97	93	75-125	3	0-20	
Barium	4X	4X	75-125	4X	0-20	Q
Cadmium	92	95	75-125	4	0-20	
Chromium	96	63	75-125	10	0-20	3
Copper	109	95	75-125	7	0-20	
Lead	101	100	75-125	1	0-20	
Selenium	67	73	75-125	8	0-20	3
Iron	4X	4X	75-125	4X	0-20	Q

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received: 03/31/06
Work Order No: 06-03-1818
Preparation: EPA 3010A Total
Method: EPA 6010B

Project B&C Gas

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
06-03-1815-1	**Aqueous**	**ICP 3300**	**03/31/06**	**04/03/06**	**060331S04**

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	109	110	80-140	1	0-11	
Barium	104	107	87-123	2	0-6	
Cadmium	105	106	82-124	1	0-7	
Chromium	105	107	86-122	1	0-8	
Copper	93	94	78-126	2	0-7	
Lead	104	105	84-120	1	0-7	
Selenium	108	105	79-127	3	0-9	
Iron	98	112	65-149	3	0-21	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received: N/A
Work Order No: 06-03-1818
Preparation: EPA 3050B
Method: EPA 6010B

Project: B&C Gas

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
097-01-002-7,419	**Solid**	**ICP 3300**	**03/31/06**	**03/31/06**	**060331L05**

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Arsenic	90	93	80-120	3	0-20	
Barium	96	92	80-120	4	0-20	
Cadmium	98	96	80-120	2	0-20	
Chromium	96	94	80-120	3	0-20	
Copper	90	88	80-120	2	0-20	
Lead	97	96	80-120	1	0-20	
Selenium	89	88	80-120	1	0-20	
Iron	98	93	80-120	5	0-20	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - Laboratory Control Sample

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received: N/A
Work Order No: 06-03-1818
Preparation: EPA 3010A Total
Method: EPA 6010B

Project: B&C Gas

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-003-5,970	**Aqueous**	**ICP 3300**	**03/31/06**	**060331-I-04**	**060331L04**

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Arsenic	0.500	0.497	99	80-120	
Barium	0.500	0.515	103	80-120	
Cadmium	0.500	0.550	110	80-120	
Chromium	0.500	0.500	100	80-120	
Copper	0.500	0.504	101	80-120	
Lead	0.500	0.511	102	80-120	
Selenium	0.500	0.504	101	80-120	
Iron	0.500	0.498	100	80-120	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 06-03-1818

Qualifier	Definition
*	See applicable analysis comment.
1	Surrogate compound recovery was out of control due to a required sample dilution, therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike or Matrix Spike Duplicate compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
N	Nontarget Analyte.
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

KIFF Analytical LLC

2795 Second Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Cal Science Environmental
7440 Lincoln Way
Garden Grove, CA 92841
714-895-5494

Lab No. 1818

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF to): Scott Forbes

EDF Report? ___ Yes _X_No

Company/Address: Kiff Analytical, LLC

Recommended but not mandatory to complete this section:

Sampling Company Log Code:

Global ID:

Phone No.: FAX No.:

EDF Deliverable to (Email Address):

Project Number: 053-7020 P.O. No.: 49229

E-mail address: inbox@kiffanalytical.com

Project Name: B&C Gas

Project Address:

Sample Designation	Sampling		Container					Preservative					Matrix			Analysis Request								Date due:	For Lab Use Only
	Date	Time	Glass	Poly	Sleeve	Amber		HCl	HNO3		NONE	H2SO4	WATER	SOIL		Metals (EPA 6010B)*								April 6, 2006	
CB-10 GW	03/29/06	1025		2					X				X			X								X	
CB-3 GW	03/29/06	1245		2					X				X			X								X	
CB-8 GW	03/29/06	1545		2					X				X			X								X	
CB-10 45-45.5	03/29/06	1035	1								X			X		X								X	
CB-3 46.5-47	03/29/06	1255	1								X			X		X								X	
CB-8 46.5-47	03/29/06	1555	1								X			X		X								X	

	Date	Time	
Relinquished by: Mark Cagle Kiff Analytical	033006	1900	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date 3-31-06	Time 8:45	Received by Laboratory:

Remarks: *Metals:As, Ba, Cd, Cr, Cu, Fe, Pb, Se

Bill to: Accounts Payable

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 06 - 03 - 1818

Cooler 1 **of** 1

SAMPLE RECEIPT FORM

CLIENT: KIFF ANALYTICAL **DATE:** 3-31-06

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
_____ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.

_____ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

3.6 °C Temperature blank.
_____ °C IR thermometer.
_____ Ambient temperature.

Initial: WB

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: ✓ No (Not Intact) : _____ Not Applicable (N/A): _____

Initial: WB

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers for analyses requested	✓		
Proper preservation noted on sample label(s)	✓		
VOA vial(s) free of headspace.			✓
Tedlar bag(s) free of condensation			✓

Initial: WB

COMMENTS:

CALIFORNIA LABORATORY SERVICES

3249 Fitzgerald Road Rancho Cordova, CA 95742

April 06, 2006

CLS Work Order #: CPC0949
COC #: 49229

Scott Forbes
KIFF Analytical
2795 Second St. Suite 300
Davis, CA 95616

Project Name: B&C Gas

Enclosed are the results of analyses for samples received by the laboratory on 03/30/06 10:04. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

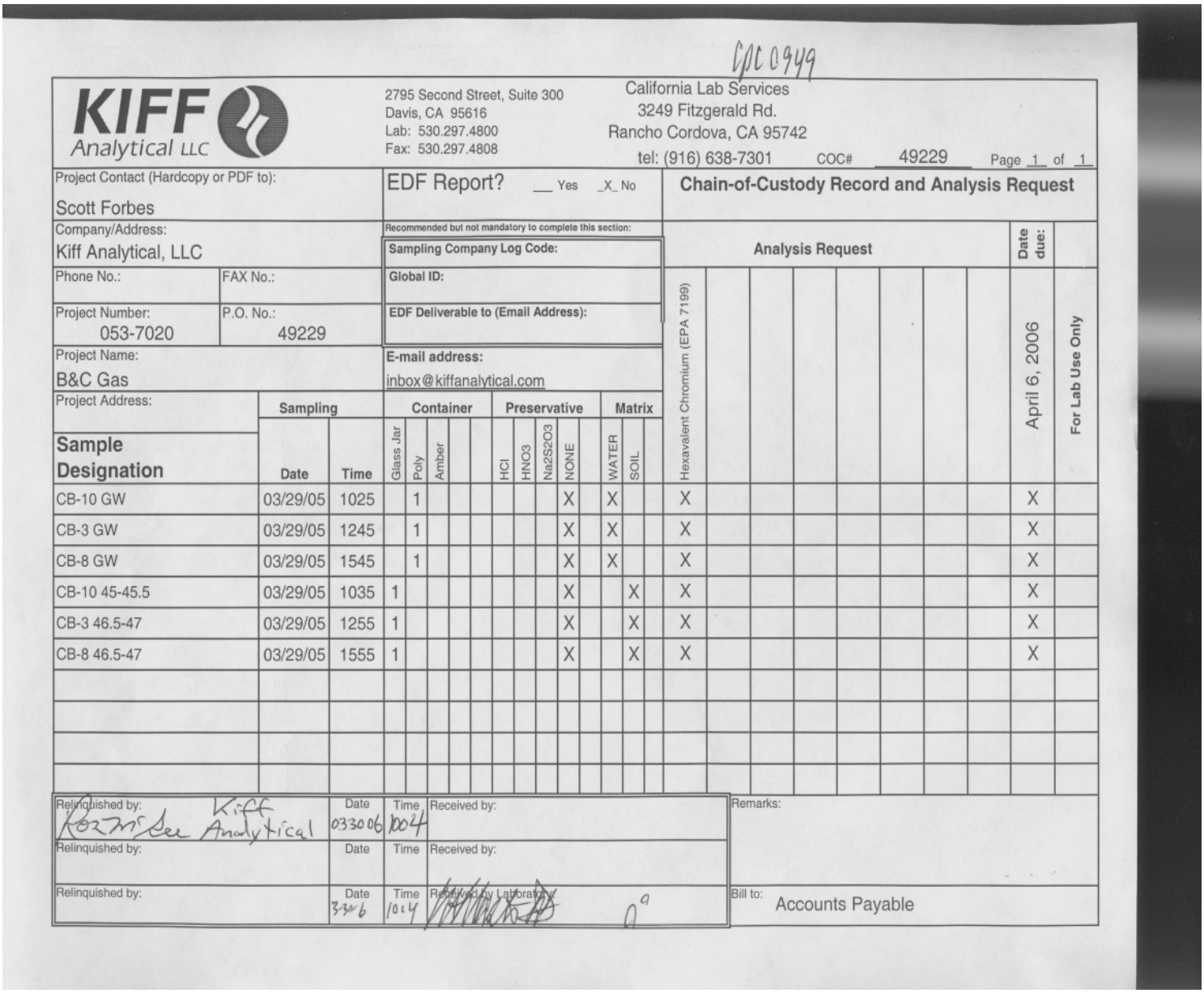
CA DOHS ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES

KIFF Analytical
2795 Second St. Suite 300
Davis, CA 95616

Project: B&C Gas
Project Number: 053-7020
Project Manager: Scott Forbes

CLS Work Order #: CPC0949
COC #: 49229



CPC 0949

KIFF Analytical LLC
2795 Second Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

California Lab Services
3249 Fitzgerald Rd.
Rancho Cordova, CA 95742
tel: (916) 638-7301 COC# 49229 Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF to): Scott Forbes
EDF Report? __ Yes _X_ No
Company/Address: Kiff Analytical, LLC
Recommended but not mandatory to complete this section:
Sampling Company Log Code:
Phone No.: FAX No.:
Global ID:
Project Number: 053-7020 P.O. No.: 49229
EDF Deliverable to (Email Address):
Project Name: B&C Gas
E-mail address: inbox@kiffanalytical.com
Project Address:

Analysis Request — Date due: April 6, 2006 — For Lab Use Only

Sample Designation	Sampling Date	Sampling Time	Container: Glass Jar	Container: Poly	Container: Amber	Container:	Container:	Preservative: HCl	Preservative: HNO3	Preservative: Na2S2O3	Preservative: NONE	Preservative:	Matrix: WATER	Matrix: SOIL	Matrix:	Hexavalent Chromium (EPA 7199)								Date due: April 6, 2006	For Lab Use Only
CB-10 GW	03/29/05	1025		1							X		X			X								X	
CB-3 GW	03/29/05	1245		1							X		X			X								X	
CB-8 GW	03/29/05	1545		1							X		X			X								X	
CB-10 45-45.5	03/29/05	1035	1								X			X		X								X	
CB-3 46.5-47	03/29/05	1255	1								X			X		X								X	
CB-8 46.5-47	03/29/05	1555	1								X			X		X								X	

Relinquished by:	Date	Time	Received by:	Remarks:
Kiff Analytical	033006	1004		
Relinquished by:	Date	Time	Received by:	
Relinquished by:	Date 3-30-6	Time 1014	Received by Laboratory:	Bill to: Accounts Payable

KIFF Analytical
2795 Second St. Suite 300
Davis, CA 95616

Project: B&C Gas
Project Number: 053-7020
Project Manager: Scott Forbes

CLS Work Order #: CPC0949
COC #: 49229

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
CB-10 GW (CPC0949-01) Water Sampled: 03/29/06 10:25 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	1.0	µg/L	1	CP02408	03/30/06	03/30/06	EPA 7199	
CB-3 GW (CPC0949-02) Water Sampled: 03/29/06 12:45 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	1.0	µg/L	1	CP02408	03/30/06	03/30/06	EPA 7199	
CB-8 GW (CPC0949-03) Water Sampled: 03/29/06 15:45 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	1.0	µg/L	1	CP02408	03/30/06	03/30/06	EPA 7199	
CB-10 45-45.5 (CPC0949-04) Soil Sampled: 03/29/06 10:35 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	10	µg/kg	1	CP02568	04/04/06	04/05/06	EPA 7199	
CB-3 46.5-47 (CPC0949-05) Soil Sampled: 03/29/06 12:55 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	10	µg/kg	1	CP02568	04/04/06	04/05/06	EPA 7199	
CB-8 46.5-47 (CPC0949-06) Soil Sampled: 03/29/06 15:55 Received: 03/30/06 10:04									
Hexavalent Chromium	ND	10	µg/kg	1	CP02568	04/04/06	04/05/06	EPA 7199	

KIFF Analytical
2795 Second St. Suite 300
Davis, CA 95616

Project: B&C Gas
Project Number: 053-7020
Project Manager: Scott Forbes

CLS Work Order #: CPC0949
COC #: 49229

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CP02408 - General Prep										
Blank (CP02408-BLK1)				Prepared & Analyzed: 03/30/06						
Hexavalent Chromium	ND	1.0	µg/L							
LCS (CP02408-BS1)				Prepared & Analyzed: 03/30/06						
Hexavalent Chromium	5.43	1.0	µg/L	5.00		109	80-120			
LCS Dup (CP02408-BSD1)				Prepared & Analyzed: 03/30/06						
Hexavalent Chromium	4.74	1.0	µg/L	5.00		94.8	80-120	13.6	20	
Matrix Spike (CP02408-MS1)		**Source: CPC0949-01**		Prepared & Analyzed: 03/30/06						
Hexavalent Chromium	5.86	1.0	µg/L	5.00	ND	117	75-125			
Matrix Spike Dup (CP02408-MSD1)		**Source: CPC0949-01**		Prepared & Analyzed: 03/30/06						
Hexavalent Chromium	5.95	1.0	µg/L	5.00	ND	119	75-125	1.52	25	
Batch CP02568 - General Prep										
Blank (CP02568-BLK1)				Prepared: 04/04/06 Analyzed: 04/05/06						
Hexavalent Chromium	ND	10	µg/kg							
LCS (CP02568-BS1)				Prepared: 04/04/06 Analyzed: 04/05/06						
Hexavalent Chromium	51.0	10	µg/kg	50.0		102	80-120			
LCS Dup (CP02568-BSD1)				Prepared: 04/04/06 Analyzed: 04/05/06						
Hexavalent Chromium	57.6	10	µg/kg	50.0		115	80-120	12.2	20	
Matrix Spike (CP02568-MS1)		**Source: CPC0949-04**		Prepared: 04/04/06 Analyzed: 04/05/06						
Hexavalent Chromium	52.0	10	µg/kg	50.0	ND	104	75-125			

KIFF Analytical
2795 Second St. Suite 300
Davis, CA 95616

Project: B&C Gas
Project Number: 053-7020
Project Manager: Scott Forbes

CLS Work Order #: CPC0949
COC #: 49229

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch CP02568 - General Prep										
Matrix Spike Dup (CP02568-MSD1)		**Source: CPC0949-04**		Prepared: 04/04/06 Analyzed: 04/05/06						
Hexavalent Chromium	64.2	10	µg/kg	50.0	ND	128	75-125	21.0	25	QM-5

KIFF Analytical	Project: B&C Gas	
2795 Second St. Suite 300	Project Number: 053-7020	**CLS Work Order #: CPC0949**
Davis, CA 95616	Project Manager: Scott Forbes	COC #: 49229

Notes and Definitions

QM-5	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

KIFF Analytical LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4802

SRG # / Lab No. 49229

Page 1 of 2

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): Bill Fowler	California EDF Report? ☑ Yes ☐ No
Company / Address: Golder Associates, 2520 Wyandotte St., Suite G, Mountain View, CA 94043	Sampling Company Log Code:
Phone #: (650) 386-3328 / Fax #: (650) 386-3815	Global ID:
Project #: 053-7020 / P.O. #:	EDF Deliverable To (Email Address): bfowler@golder.com cc cgriffin@golder.com
Project Name: B&C Gas	Sampler Signature: Cheryl Griffin
Project Address: 2008 2st Street Livermore, CA	

TAT: ☐ 12 hr ☐ 24 hr ☐ 48 hr ☐ 72 hr ☒ 1 wk

Sample Designation	Sampling: Date	Sampling: Time	Container: 40 ml VOA	Container: Sleeve	Container: Poly	Container: Glass	Container: Tedlar	Preservative: HCl	Preservative: HNO_3	Preservative: None	Matrix: Water	Matrix: Soil	Matrix: Air	MTBE (EPA 8260B) per EPA 8021 level @ 5.0 ppb	MTBE (EPA 8260B) @ 0.5 ppb	BTEX (EPA 8260B)	TPH Gas (EPA 8260B)	5 Oxygenates (EPA 8260B)	7 Oxygenates (EPA 8260B)	Lead Scav.(1,2 DCA & 1,2 EDB-EPA 8260B)	Volatile Halocarbons (EPA 8260B)	Volatile Organics Full List (EPA 8260B)	Volatile Organics (EPA 524.2 Drinking Water)	TPH as Diesel (EPA 8015M)	TPH as Motor Oil (EPA 8015M)	Total Lead (EPA 6010)	W.E.T. Lead (STLC)	Metals EPA 6010B	Hexavalent Chromium EPA 7199	For Lab Use Only
CB-11 GW	3/29/06	1050	3					X			X				X	X	X		X											01
CB-12 GW	↓	1305	3					X			X				X	X	X		X											02
CB-2 GW	↓	1530	3					X			X				X	X	X		X											03
CB-10 GW	3/29/06	1025	3		3			X³	X²	X¹	X				X	X	X		X								X	X		04
CB-3 GW	↓	1245	3		3			3	2	1	X				X	X	X		X								X	X		05
CB-8 GW	↓	1545	3		3			3	2	1	X				X	X	X		X								X	X		06
CB-11 41.5-42	3/28/06	~~1050~~ 1100		1						X		X			X	X	X		X											07
CB-12 ~~42~~ 42.5-48	↓	1310		1						X		X			X	X	X		X											08
CB-2 40-40.5	↓	1535		1						X		X			X	X	X		X											09
CB-13 42-42.5	3/29/06	0850		1						X		X			X	X	X		X											10

Relinquished by: Cheryl Griffin	Date: 3/29/06	Time: 1946	Received by:
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date: 032906	Time: 1946	Received by Laboratory: Kiff Analytical

Remarks: Metals: Arsenic, barium, cadmium, chromium copper, iron, lead & selenium

Bill to:

For Lab Use Only: Sample Receipt

Temp °C	Initials	Date	Time	Therm. ID #	Coolant Present
13.6	JLB	032906	1946	IR-4	(Yes) / No

Distribution: White - Lab; Pink - Originator
Rev: 051805

KIFF ANALYTICAL LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Lab No. 49229 Page 2 of 2

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): Bill Fowler

Company/Address: 2580 Wyandotte St. Suite G Mountain View, CA 94043

Phone No.: (650) 386-3828 FAX No.: (650) 386-3815

Project Number: 053-702 P.O. No:

Project Name: BLC GCJ

Project Address: 2008 1st Street Livermore, CA

California EDF Report? ☑ Yes ☐ No

Recommended but not mandatory to complete this section:

Sampling Company Log Code: - - -

Global ID: - - - - - - - - - - -

EDF Deliverable To (Email Address): bfowler@soldw.com

Sampler Signature: Cheryl Min

Analysis Request

Sample Designation	Sampling: Date	Sampling: Time	Container: 40 ml VOA	Container: SLEEVE	Preservative: HCl	Preservative: HNO_3	Preservative: ICE	Preservative: NONE	Matrix: WATER	Matrix: SOIL	BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2) TOTAL (X) W.E.T. (X)	Metals 6010B	Hexavalent Chromium (7197)		TAT: 12 hr/24 hr/48 hr/72 hr/1wk	For Lab Use Only
CB-10 45-45.5	3/29/06	1035		1			X	X		X		X			X		X							X	X			11
CB-3 46.5-47	↓	1255		1			X	X		X					X		X							X	X			12
CB-8 46.5-47	↓	1555		1			X	X		X					X		X							X	X			13

Relinquished by:	Date	Time	Received by:
Cheryl Min	3/29/06	1946	
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
	032906	1946	CB Kiff Analytical

Remarks: Metals: See page 1

Bill to:

Distribution: White - Lab, Pink - Originator

Forms/coc 121001.fhS

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This electronic report includes the following:

- Work order Summary;
- Laboratory Narrative;
- Results; and
- Chain of Custody (copy).

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WORK ORDER #: 0604580B

Work Order Summary

CLIENT:	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661	**BILL TO:**	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661
PHONE:	916-786-2424	**P.O. #**	
FAX:	916-786-2434	**PROJECT #**	053-7020 B&C Gas Mini-Mart
DATE RECEIVED:	04/27/2006	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/10/2006		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	MW-2	Modified ASTM D-1946	3.5 "Hg
02A	MW-4	Modified ASTM D-1946	2.5 "Hg
03A	MIP-2	Modified ASTM D-1946	4.0 "Hg
03AA	MIP-2 Duplicate	Modified ASTM D-1946	4.0 "Hg
04A	MIP-8-5'	Modified ASTM D-1946	5.0 "Hg
05A	MIP-8-10'	Modified ASTM D-1946	5.0 "Hg
06A	MIP-8-15'	Modified ASTM D-1946	3.0 "Hg
07A	MIP-10	Modified ASTM D-1946	4.5 "Hg
08A	MIP-13	Modified ASTM D-1946	3.5 "Hg
09A	Lab Blank	Modified ASTM D-1946	NA
10A	LCS	Modified ASTM D-1946	NA

CERTIFIED BY: Linda D. Fruman DATE: 05/10/06

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004
NY NELAP - 11291, UT NELAP - 9166389892
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/05, Expiration date: 06/30/06
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

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(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1946
Golder Associates, Inc.
Workorder# 0604580B

Five 1 Liter Summa Canister and Three 1 Liter Silonite Canister samples were received on April 27, 2006. The laboratory performed analysis via Modified ASTM Method D-1946 for Methane and fixed gases in air using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples include:

Requirement	***ASTM D-1946***	***ATL Modifications***
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A 3-point calibration curve is performed. Quantitation is based on a daily calibration standard which may or may not resemble the composition of the associated samples.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Summary of Detected Compounds
MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

Client Sample ID: MW-2

Lab ID#: 0604580B-01A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	18
Methane	0.00023	0.0011
Carbon Dioxide	0.023	2.4

Client Sample ID: MW-4

Lab ID#: 0604580B-02A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.22	20
Methane	0.00022	0.0026
Carbon Dioxide	0.022	1.0

Client Sample ID: MIP-2

Lab ID#: 0604580B-03A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	18
Methane	0.00023	0.0010
Carbon Dioxide	0.023	2.6

Client Sample ID: MIP-2 Duplicate

Lab ID#: 0604580B-03AA

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	18
Methane	0.00023	0.0010
Carbon Dioxide	0.023	2.6

Client Sample ID: MIP-8-5'

Lab ID#: 0604580B-04A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	17
Methane	0.00024	0.0040

Summary of Detected Compounds
MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

Client Sample ID: MIP-8-5'

Lab ID#: 0604580B-04A

Carbon Dioxide	0.024	3.0

Client Sample ID: MIP-8-10'

Lab ID#: 0604580B-05A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	17
Methane	0.00024	0.0045
Carbon Dioxide	0.024	3.2

Client Sample ID: MIP-8-15'

Lab ID#: 0604580B-06A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.22	20
Methane	0.00022	0.010
Carbon Dioxide	0.022	0.26

Client Sample ID: MIP-10

Lab ID#: 0604580B-07A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	19
Methane	0.00024	0.0022
Carbon Dioxide	0.024	2.5

Client Sample ID: MIP-13

Lab ID#: 0604580B-08A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	21
Methane	0.00023	0.0021
Carbon Dioxide	0.023	0.58

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Client Sample ID: MW-2

Lab ID#: 0604580B-01A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050517**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.29**	**Date of Analysis: 5/5/06 02:36 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	18
Methane	0.00023	0.0011
Carbon Dioxide	0.023	2.4

Container Type: 1 Liter Summa Canister

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Client Sample ID: MW-4

Lab ID#: 0604580B-02A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050518**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.20**	**Date of Analysis: 5/5/06 03:02 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.22	20
Methane	0.00022	0.0026
Carbon Dioxide	0.022	1.0

Container Type: 1 Liter Summa Canister

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-2

Lab ID#: 0604580B-03A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050520**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.33**	**Date of Analysis: 5/5/06 03:49 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	18
Methane	0.00023	0.0010
Carbon Dioxide	0.023	2.6

Container Type: 1 Liter Silonite Canister

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Client Sample ID: MIP-2 Duplicate

Lab ID#: 0604580B-03AA

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050519**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.33**	**Date of Analysis: 5/5/06 03:27 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	18
Methane	0.00023	0.0010
Carbon Dioxide	0.023	2.6

Container Type: 1 Liter Silonite Canister

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-8-5'

Lab ID#: 0604580B-04A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050521**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.42**	**Date of Analysis: 5/5/06 04:12 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.24	17
Methane	0.00024	0.0040
Carbon Dioxide	0.024	3.0

Container Type: 1 Liter Summa Canister

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Client Sample ID: MIP-8-10'

Lab ID#: 0604580B-05A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050522**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.42**	**Date of Analysis: 5/5/06 04:34 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.24	17
Methane	0.00024	0.0045
Carbon Dioxide	0.024	3.2

Container Type: 1 Liter Silonite Canister

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Client Sample ID: MIP-8-15'

Lab ID#: 0604580B-06A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050524**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.24**	**Date of Analysis: 5/5/06 05:23 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.22	20
Methane	0.00022	0.010
Carbon Dioxide	0.022	0.26

Container Type: 1 Liter Silonite Canister

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Client Sample ID: MIP-10

Lab ID#: 0604580B-07A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050526**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.38**	**Date of Analysis: 5/5/06 06:13 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.24	19
Methane	0.00024	0.0022
Carbon Dioxide	0.024	2.5

Container Type: 1 Liter Summa Canister

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-13

Lab ID#: 0604580B-08A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050527**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.29**	**Date of Analysis: 5/5/06 06:36 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	21
Methane	0.00023	0.0021
Carbon Dioxide	0.023	0.58

Container Type: 1 Liter Summa Canister

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Client Sample ID: Lab Blank

Lab ID#: 0604580B-09A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050506**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/5/06 08:07 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.10	Not Detected
Methane	0.00010	Not Detected
Carbon Dioxide	0.010	Not Detected

Container Type: NA - Not Applicable

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Client Sample ID: LCS

Lab ID#: 0604580B-10A

MODIFIED NATURAL GAS ANALYSIS BY ASTM D-1946

File Name:	**9050531**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/5/06 08:08 PM**	

Compound	%Recovery
Oxygen	100
Methane	101
Carbon Dioxide	102

Container Type: NA - Not Applicable

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- Work order Summary;
- Laboratory Narrative;
- Results; and
- Chain of Custody (copy).

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WORK ORDER #: 0604580AR1

Work Order Summary

CLIENT:	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661	**BILL TO:**	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661
PHONE:	916-786-2424	**P.O. #**	
FAX:	916-786-2434	**PROJECT #**	053-7020 B&C Gas Mini-Mart
DATE RECEIVED:	04/27/2006	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/31/2006		
DATE REISSUED:	05/31/2006		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	MW-2	Modified TO-15	3.5 "Hg
02A	MW-4	Modified TO-15	2.5 "Hg
03A	MIP-2	Modified TO-15	4.0 "Hg
04A	MIP-8-5'	Modified TO-15	5.0 "Hg
05A	MIP-8-10'	Modified TO-15	5.0 "Hg
06A	MIP-8-15'	Modified TO-15	3.0 "Hg
06AA	MIP-8-15' Duplicate	Modified TO-15	3.0 "Hg
07A	MIP-10	Modified TO-15	4.5 "Hg
08A	MIP-13	Modified TO-15	3.5 "Hg
09A	Lab Blank	Modified TO-15	NA
09B	Lab Blank	Modified TO-15	NA
09C	Lab Blank	Modified TO-15	NA
10A	CCV	Modified TO-15	NA
10B	CCV	Modified TO-15	NA
10C	CCV	Modified TO-15	NA
11A	LCS	Modified TO-15	NA
11B	LCS	Modified TO-15	NA

Continued on next page

WORK ORDER #: 0604580AR1

Work Order Summary

CLIENT:	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661	**BILL TO:**	Ms. Cheryl Griffith Golder Associates, Inc. 1009 Enterprise Way Suite 350 Roseville, CA 95661
PHONE:	916-786-2424	**P.O. #**	
FAX:	916-786-2434	**PROJECT #**	053-7020 B&C Gas Mini-Mart
DATE RECEIVED:	04/27/2006	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/31/2006		
DATE REISSUED:	05/31/2006		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
11C	LCS	Modified TO-15	NA

CERTIFIED BY: Linda D. Frumarn DATE: 05/31/06

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
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LABORATORY NARRATIVE
Modified TO-15
Golder Associates, Inc.
Workorder# 0604580AR1

Five 1 Liter Summa Canister and Three 1 Liter Silonite Canister samples were received on April 27, 2006. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the full scan mode. The method involves concentrating up to 0.2 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

Method modifications taken to run these samples are summarized in the below table. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-15***	***ATL Modifications***
Daily CCV	+- 30% Difference	</= 30% Difference with two allowed out up to </=40%.; flag and narrate outliers
Sample collection media	Summa canister	ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

THE WORK ORDER WAS RE-ISSUED PER CLIENT REQUEST ON 05/31/2006 TO REPORT TPHG.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates

as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: MW-2

Lab ID#: 0604580AR1-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	1.1	1.6	3.6	5.1
Toluene	1.1	3.0	4.3	11
m,p-Xylene	1.1	2.2	5.0	9.6
TPH ref. to Gasoline (MW=100)	23	230	94	930

Client Sample ID: MW-4

Lab ID#: 0604580AR1-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.4	21	11	52
Benzene	1.1	3.6	3.5	12
Toluene	1.1	150	4.1	580
Ethyl Benzene	1.1	3.6	4.8	16
m,p-Xylene	1.1	14	4.8	62
o-Xylene	1.1	3.9	4.8	17
TPH ref. to Gasoline (MW=100)	22	920	90	3700

Client Sample ID: MIP-2

Lab ID#: 0604580AR1-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.7	14	11	36
Toluene	1.2	280	4.4	1000
Ethyl Benzene	1.2	7.3	5.0	32
m,p-Xylene	1.2	29	5.0	120
o-Xylene	1.2	8.9	5.0	38
TPH ref. to Gasoline (MW=100)	23	840	95	3400

Client Sample ID: MIP-8-5'

Lab ID#: 0604580AR1-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.8	11	12	26
Benzene	1.2	2.7	3.9	8.6
Toluene	1.2	57	4.6	210

Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: MIP-8-5'

Lab ID#: 0604580AR1-04A

Ethyl Benzene	1.2	2.1	5.2	9.1
m,p-Xylene	1.2	6.9	5.2	30
o-Xylene	1.2	2.5	5.2	11
TPH ref. to Gasoline (MW=100)	24	540	99	2200

Client Sample ID: MIP-8-10'

Lab ID#: 0604580AR1-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	1.2	2.3	3.9	7.3
Toluene	1.2	1.3	4.6	4.9
TPH ref. to Gasoline (MW=100)	24	330	99	1300

Client Sample ID: MIP-8-15'

Lab ID#: 0604580AR1-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	13	18	31	44
Benzene	3.2	19	10	61
Toluene	3.2	430	12	1600
Ethyl Benzene	3.2	7.0	14	30
m,p-Xylene	3.2	22	14	97
o-Xylene	3.2	5.8	14	25
TPH ref. to Gasoline (MW=100)	64	4300	260	18000

Client Sample ID: MIP-8-15' Duplicate

Lab ID#: 0604580AR1-06AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.5	23	11	57
Benzene	1.1	17	3.6	55
Toluene	1.1	480 E	4.2	1800 E
Ethyl Benzene	1.1	7.9	4.9	34
m,p-Xylene	1.1	25	4.9	110
o-Xylene	1.1	7.0	4.9	30
TPH ref. to Gasoline (MW=100)	22	4000	92	16000

Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: MIP-10

Lab ID#: 0604580AR1-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.8	6.7	12	16
Benzene	1.2	3.4	3.8	11
Toluene	1.2	180	4.5	660
Ethyl Benzene	1.2	7.6	5.2	33
m,p-Xylene	1.2	31	5.2	130
o-Xylene	1.2	8.9	5.2	39
TPH ref. to Gasoline (MW=100)	24	860	97	3500

Client Sample ID: MIP-13

Lab ID#: 0604580AR1-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	9.2	14	22	34
Benzene	2.3	3.9	7.3	12
Toluene	2.3	690	8.6	2600
Ethyl Benzene	2.3	11	9.9	49
m,p-Xylene	2.3	42	9.9	180
o-Xylene	2.3	12	9.9	50
TPH ref. to Gasoline (MW=100)	46	2300	190	9400

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MW-2

Lab ID#: 0604580AR1-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050409**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.29**	**Date of Analysis: 5/4/06 05:30 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.6	Not Detected	11	Not Detected
Methyl tert-butyl ether	1.1	Not Detected	4.1	Not Detected
Benzene	1.1	1.6	3.6	5.1
Toluene	1.1	3.0	4.3	11
Ethyl Benzene	1.1	Not Detected	5.0	Not Detected
m,p-Xylene	1.1	2.2	5.0	9.6
o-Xylene	1.1	Not Detected	5.0	Not Detected
TPH ref. to Gasoline (MW=100)	23	230	94	930

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	98	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MW-4

Lab ID#: 0604580AR1-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050410**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.20**	**Date of Analysis: 5/4/06 06:13 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.4	21	11	52
Methyl tert-butyl ether	1.1	Not Detected	4.0	Not Detected
Benzene	1.1	3.6	3.5	12
Toluene	1.1	150	4.1	580
Ethyl Benzene	1.1	3.6	4.8	16
m,p-Xylene	1.1	14	4.8	62
o-Xylene	1.1	3.9	4.8	17
TPH ref. to Gasoline (MW=100)	22	920	90	3700

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	104	70-130
4-Bromofluorobenzene	105	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-2

Lab ID#: 0604580AR1-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050411**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.33**	**Date of Analysis: 5/4/06 06:55 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.7	14	11	36
Methyl tert-butyl ether	1.2	Not Detected	4.2	Not Detected
Benzene	1.2	Not Detected	3.7	Not Detected
Toluene	1.2	280	4.4	1000
Ethyl Benzene	1.2	7.3	5.0	32
m,p-Xylene	1.2	29	5.0	120
o-Xylene	1.2	8.9	5.0	38
TPH ref. to Gasoline (MW=100)	23	840	95	3400

Container Type: 1 Liter Silonite Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	106	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-8-5'

Lab ID#: 0604580AR1-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050412**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.42**	**Date of Analysis: 5/4/06 07:38 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.8	11	12	26
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Benzene	1.2	2.7	3.9	8.6
Toluene	1.2	57	4.6	210
Ethyl Benzene	1.2	2.1	5.2	9.1
m,p-Xylene	1.2	6.9	5.2	30
o-Xylene	1.2	2.5	5.2	11
TPH ref. to Gasoline (MW=100)	24	540	99	2200

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	97	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-8-10'

Lab ID#: 0604580AR1-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050413**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.42**	**Date of Analysis: 5/4/06 08:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.8	Not Detected	12	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Benzene	1.2	2.3	3.9	7.3
Toluene	1.2	1.3	4.6	4.9
Ethyl Benzene	1.2	Not Detected	5.2	Not Detected
m,p-Xylene	1.2	Not Detected	5.2	Not Detected
o-Xylene	1.2	Not Detected	5.2	Not Detected
TPH ref. to Gasoline (MW=100)	24	330	99	1300

Container Type: 1 Liter Silonite Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	94	70-130
1,2-Dichloroethane-d4	95	70-130
4-Bromofluorobenzene	99	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-8-15'

Lab ID#: 0604580AR1-06A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**1051008**	**Date of Collection: 4/25/06**	
Dil. Factor:	**6.36**	**Date of Analysis: 5/10/06 04:15 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	13	18	31	44
Methyl tert-butyl ether	3.2	Not Detected	11	Not Detected
Benzene	3.2	19	10	61
Toluene	3.2	430	12	1600
Ethyl Benzene	3.2	7.0	14	30
m,p-Xylene	3.2	22	14	97
o-Xylene	3.2	5.8	14	25
TPH ref. to Gasoline (MW=100)	64	4300	260	18000

Container Type: 1 Liter Silonite Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	95	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-8-15' Duplicate

Lab ID#: 0604580AR1-06AA

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050414**	**Date of Collection: 4/25/06**	
Dil. Factor:	**2.24**	**Date of Analysis: 5/4/06 09:02 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.5	23	11	57
Methyl tert-butyl ether	1.1	Not Detected	4.0	Not Detected
Benzene	1.1	17	3.6	55
Toluene	1.1	480 E	4.2	1800 E
Ethyl Benzene	1.1	7.9	4.9	34
m,p-Xylene	1.1	25	4.9	110
o-Xylene	1.1	7.0	4.9	30
TPH ref. to Gasoline (MW=100)	22	4000	92	16000

E = Exceeds instrument calibration range.

Container Type: 1 Liter Silonite Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	102	70-130
4-Bromofluorobenzene	98	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-10

Lab ID#: 0604580AR1-07A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050508**	**Date of Collection:**	**4/25/06**
Dil. Factor:	**2.38**	**Date of Analysis:**	**5/5/06 09:13 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	4.8	6.7	12	16
Methyl tert-butyl ether	1.2	Not Detected	4.3	Not Detected
Benzene	1.2	3.4	3.8	11
Toluene	1.2	180	4.5	660
Ethyl Benzene	1.2	7.6	5.2	33
m,p-Xylene	1.2	31	5.2	130
o-Xylene	1.2	8.9	5.2	39
TPH ref. to Gasoline (MW=100)	24	860	97	3500

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	98	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: MIP-13

Lab ID#: 0604580AR1-08A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050509**	**Date of Collection: 4/25/06**	
Dil. Factor:	**4.58**	**Date of Analysis: 5/5/06 09:51 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	9.2	14	22	34
Methyl tert-butyl ether	2.3	Not Detected	8.2	Not Detected
Benzene	2.3	3.9	7.3	12
Toluene	2.3	690	8.6	2600
Ethyl Benzene	2.3	11	9.9	49
m,p-Xylene	2.3	42	9.9	180
o-Xylene	2.3	12	9.9	50
TPH ref. to Gasoline (MW=100)	46	2300	190	9400

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	102	70-130
4-Bromofluorobenzene	103	70-130

Client Sample ID: Lab Blank

Lab ID#: 0604580AR1-09A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050408**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/4/06 04:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	2.0	Not Detected	4.9	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
TPH ref. to Gasoline (MW=100)	10	Not Detected	41	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	101	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: Lab Blank

Lab ID#: 0604580AR1-09B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050506**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/5/06 07:47 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	2.0	Not Detected	4.9	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
TPH ref. to Gasoline (MW=100)	10	Not Detected	41	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	101	70-130

Client Sample ID: Lab Blank

Lab ID#: 0604580AR1-09C

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**1051007**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/10/06 03:03 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Propanol	2.0	Not Detected	4.9	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
TPH ref. to Gasoline (MW=100)	10	Not Detected	41	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	97	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: CCV

Lab ID#: 0604580AR1-10A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050406**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/4/06 01:41 PM**	

Compound	**%Recovery**
2-Propanol	109
Methyl tert-butyl ether	97
Benzene	96
Toluene	115
Ethyl Benzene	103
m,p-Xylene	106
o-Xylene	106
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	104	70-130
1,2-Dichloroethane-d4	102	70-130
4-Bromofluorobenzene	103	70-130

Client Sample ID: CCV

Lab ID#: 0604580AR1-10B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050502**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/5/06 05:09 PM**	

Compound	**%Recovery**
2-Propanol	96
Methyl tert-butyl ether	93
Benzene	90
Toluene	108
Ethyl Benzene	98
m,p-Xylene	104
o-Xylene	106
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	96	70-130
4-Bromofluorobenzene	109	70-130

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: CCV

Lab ID#: 0604580AR1-10C

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**1051002**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/10/06 10:35 AM**	

Compound	**%Recovery**
2-Propanol	96
Methyl tert-butyl ether	95
Benzene	102
Toluene	105
Ethyl Benzene	96
m,p-Xylene	93
o-Xylene	91
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCS

Lab ID#: 0604580AR1-11A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050403**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/4/06 11:14 AM**	

Compound	**%Recovery**
2-Propanol	100
Methyl tert-butyl ether	95
Benzene	85
Toluene	103
Ethyl Benzene	100
m,p-Xylene	97
o-Xylene	85
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	103	70-130

Client Sample ID: LCS

Lab ID#: 0604580AR1-11B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**8050503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/5/06 05:36 PM**	

Compound	**%Recovery**
2-Propanol	106
Methyl tert-butyl ether	107
Benzene	88
Toluene	110
Ethyl Benzene	111
m,p-Xylene	106
o-Xylene	96
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	105	70-130
4-Bromofluorobenzene	112	70-130

Client Sample ID: LCS

Lab ID#: 0604580AR1-11C

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**1051003**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/10/06 11:19 AM**	

Compound	**%Recovery**
2-Propanol	93
Methyl tert-butyl ether	92
Benzene	104
Toluene	104
Ethyl Benzene	99
m,p-Xylene	89
o-Xylene	81
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	100	70-130

APPENDIX D

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

Table 1

Organic Content (ASTM D2974)

B&C Gas Station

STL Job # 06-166

Sample Name	Moisture Content (%)	Organic Content (%)
CB-2	12.8	3.26
CB-11	10.3	3.33
CB-12	8.91	2.96

Notes:

5040 Robert J. Mathews Parkway, El Dorado Hills, CA ph: 916-939-3460 fax: 916-939-3507

MOISTURE CONTENT & UNIT WEIGHT TEST RESULTS

Sample Identification	Depth, ft.	Wet Unit Weight, lb/ft.^{3}	Dry Unit Weight, lb/ft.^{3}	Moisture Content, %	Specific Gravity	Porosity
CB-2		160.3	142.1	12.8	2.65	0.14
CB-11		150.5	136.5	10.2	2.62	0.16
CB-12		162.3	149.0	8.9	2.73	0.13

Test Method: ASTM D2216, ASTM D2937

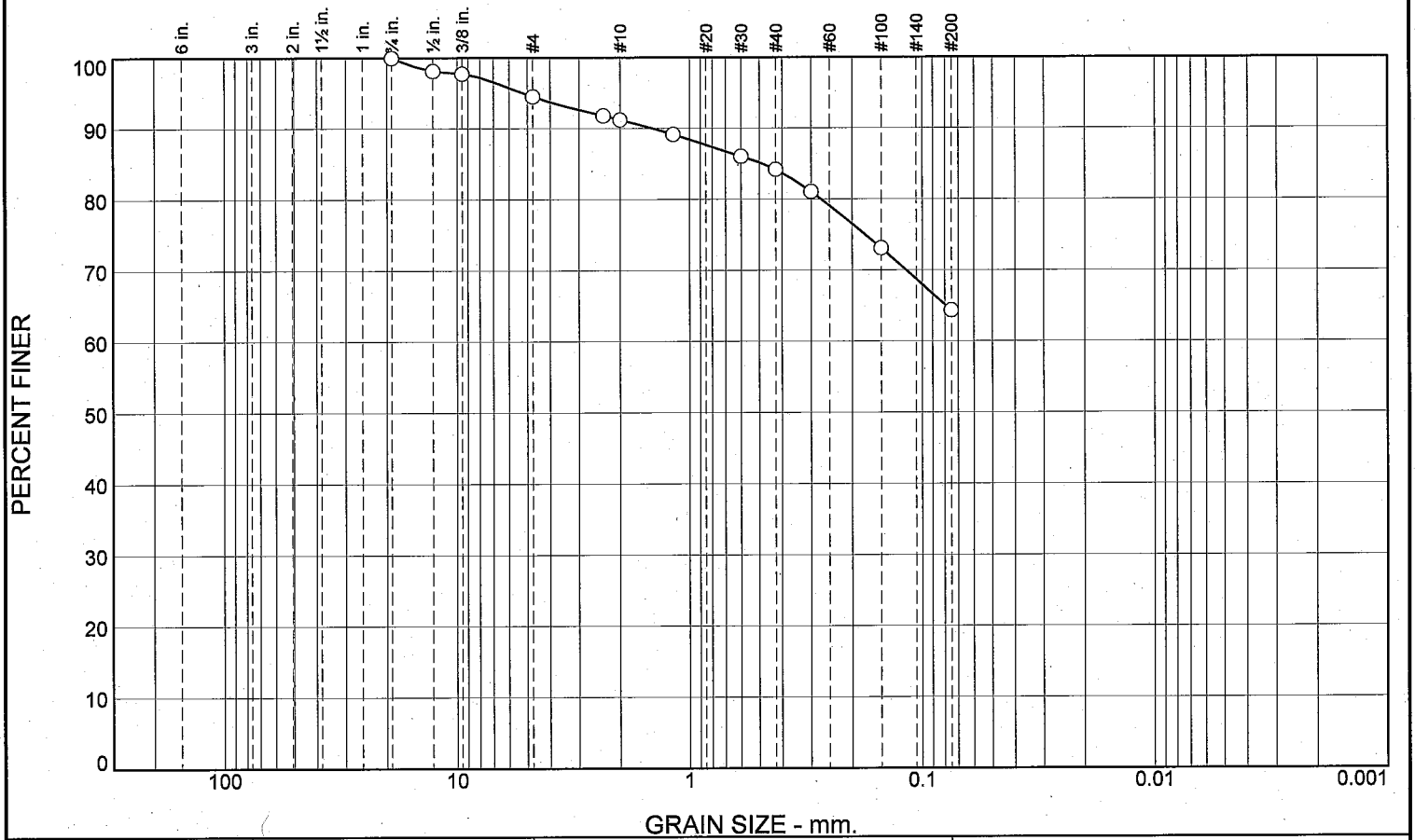
PROJECT NUMBER: 06-166 March 31, 2006

B&C Gas Station

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

5040 Robert J. Mathews Blvd., El Dorado Hills, CA 95762
Phone: (916) 939-3460 FAX: (916) 939-3507

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.5	3.3	7.0	19.8	64.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 Inch	100.0		
1/2 Inch	98.2		
3/8 Inch	97.8		
#4	94.5		
#8	91.8		
#10	91.2		
#16	89.2		
#30	86.1		
#40	84.2		
#50	81.1		
#100	73.1		
#200	64.4		

* (no specification provided)

Material Description

sandy lean clay

Atterberg Limits (ASTM D 4318)

PL= 16 LL= 24 PI= 8

Classification

USCS= CL AASHTO= A-4(2)

Coefficients

D_{85}= 0.4803 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: **Tested By:**

Remarks

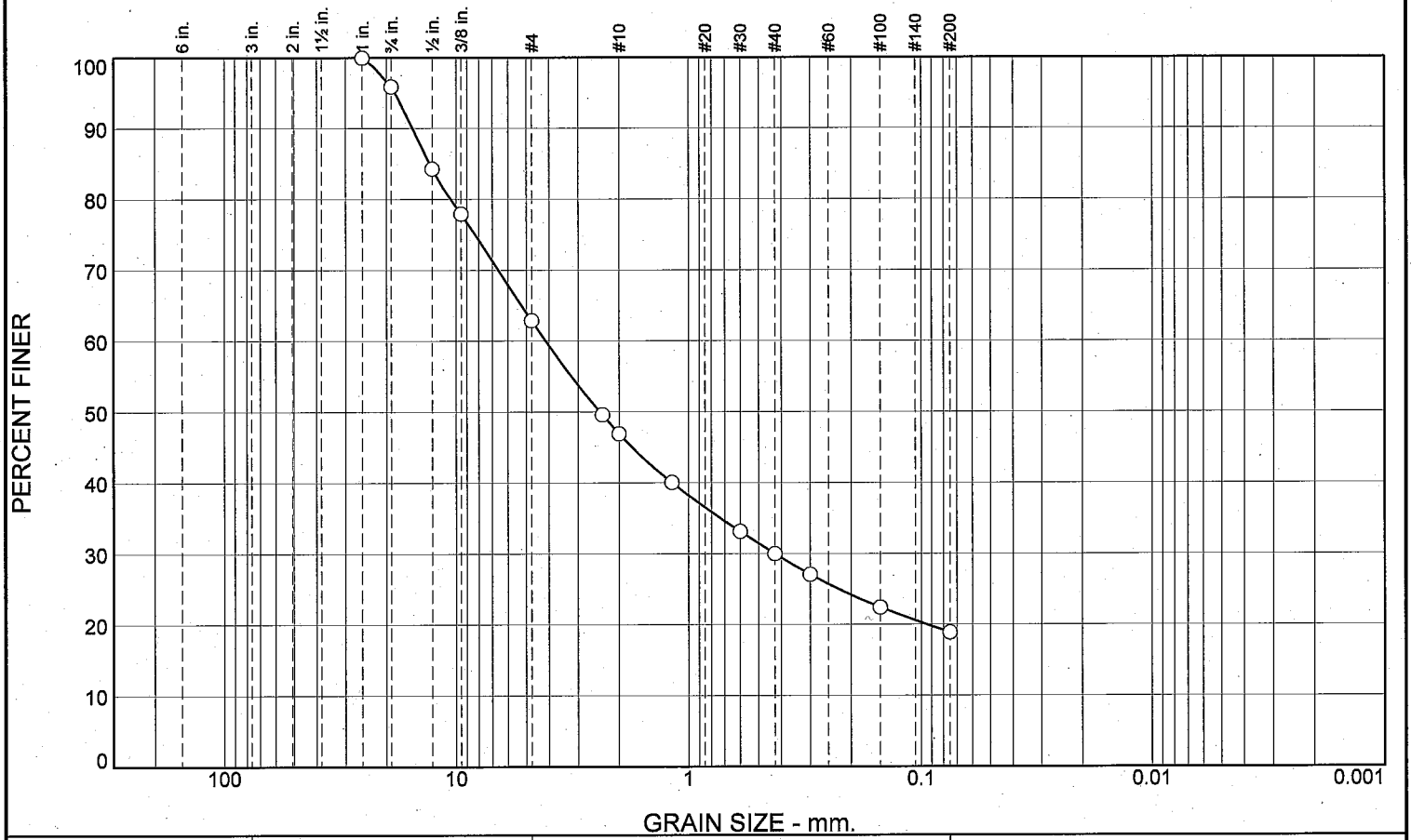
Sample No.: CB-2 **Source of Sample:** CB-2 **Date Sampled:** 3/31/06
Location: **Elev./Depth:**
Checked By: **Title:**

SIERRA TESTING LABS, INC.
El Dorado Hills, CA

Client: Golder Associate, Inc.
Project: B&C Gas Station
Job No: 053-7020
Project No: 06-166 **Figure**

Tested By: LD **Checked By:** AA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.1	33.0	16.0	16.9	11.1	18.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 Inch	100.0		
3/4 Inch	95.9		
1/2 Inch	84.3		
3/8 Inch	77.9		
#4	62.9		
#8	49.6		
#10	46.9		
#16	40.1		
#30	33.2		
#40	30.0		
#50	27.1		
#100	22.4		
#200	18.9		

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 29 PI= 12

Classification

USCS= SC AASHTO= A-2-6(0)

Coefficients

D_{85}= 13.0222 D_{60}= 4.1277 D_{50}= 2.4149
D_{30}= 0.4244 D_{15}= D_{10}=
C_u= C_c=

Date Tested: **Tested By:**

Remarks

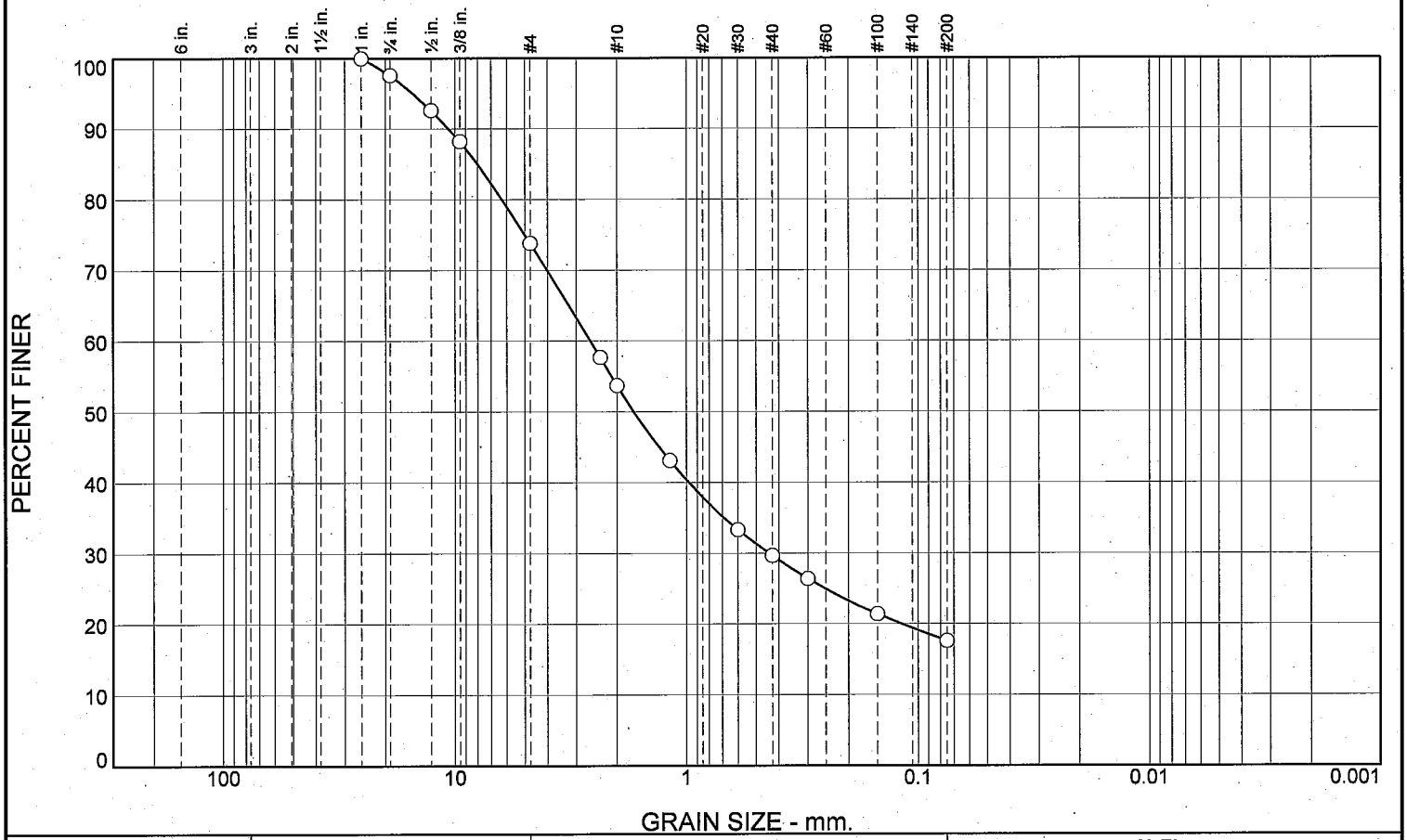
Sample No.: CB-11 **Source of Sample:** CB-11 **Date Sampled:** 3/31/06
Location: **Elev./Depth:**
Checked By: **Title:**

SIERRA TESTING LABS, INC.
El Dorado Hills, CA

Client: Golder Associate, Inc.
Project: B&C Gas Station
Job No: 053-7020
Project No: 06-166 **Figure**

Tested By: LD **Checked By:** AA

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.4	23.8	20.1	24.0	12.1	17.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 Inch	100.0		
3/4 Inch	97.6		
1/2 Inch	92.6		
3/8 Inch	88.3		
#4	73.8		
#8	57.7		
#10	53.7		
#16	43.2		
#30	33.3		
#40	29.7		
#50	26.4		
#100	21.4		
#200	17.6		

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits (ASTM D 4318)

PL= 16 LL= 26 PI= 10

Classification

USCS= SC AASHTO= A-2-4(0)

Coefficients

D_{85}= 7.9781 D_{60}= 2.5958 D_{50}= 1.6896
D_{30}= 0.4387 D_{15}= D_{10}=
C_u= C_c=

Date Tested: **Tested By:**

Remarks

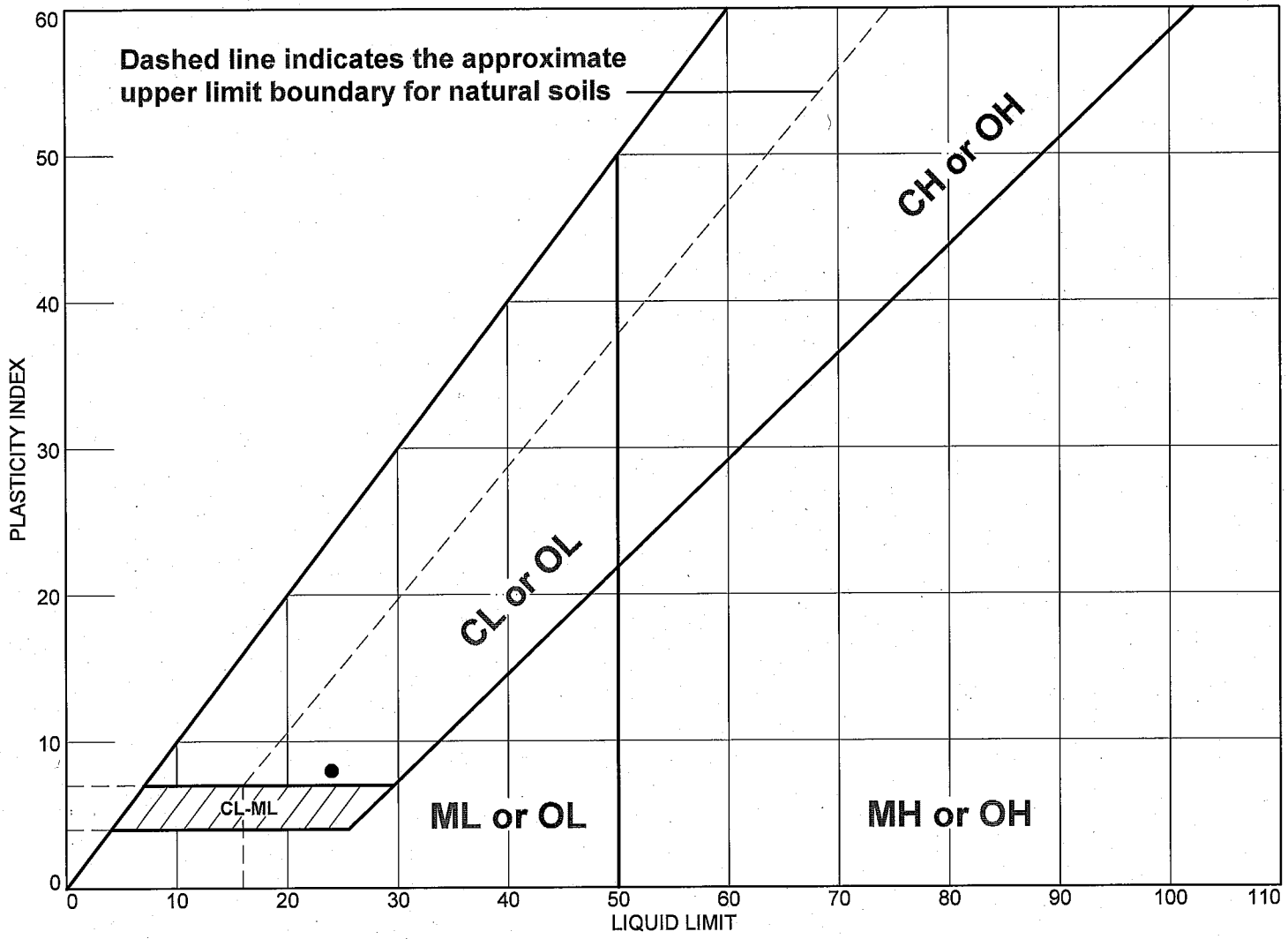
Sample No.: CB-12 **Source of Sample:** CB-12 **Date Sampled:** 3/31/06
Location: **Elev./Depth:**
Checked By: **Title:**

SIERRA TESTING LABS, INC.
El Dorado Hills, CA

Client: Golder Associate, Inc.
Project: B&C Gas Station
Job No: 053-7020
Project No: 06-166 **Figure**

Tested By: LD **Checked By:** AA

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	sandy lean clay	24	16	8	84.2	64.4	CL

Project No. 06-166 **Client:** Golder Associate, Inc.

Project: B&C Gas Station

Job No: 053-7020

● **Source of Sample:** CB-2 **Sample Number:** CB-2

Remarks:

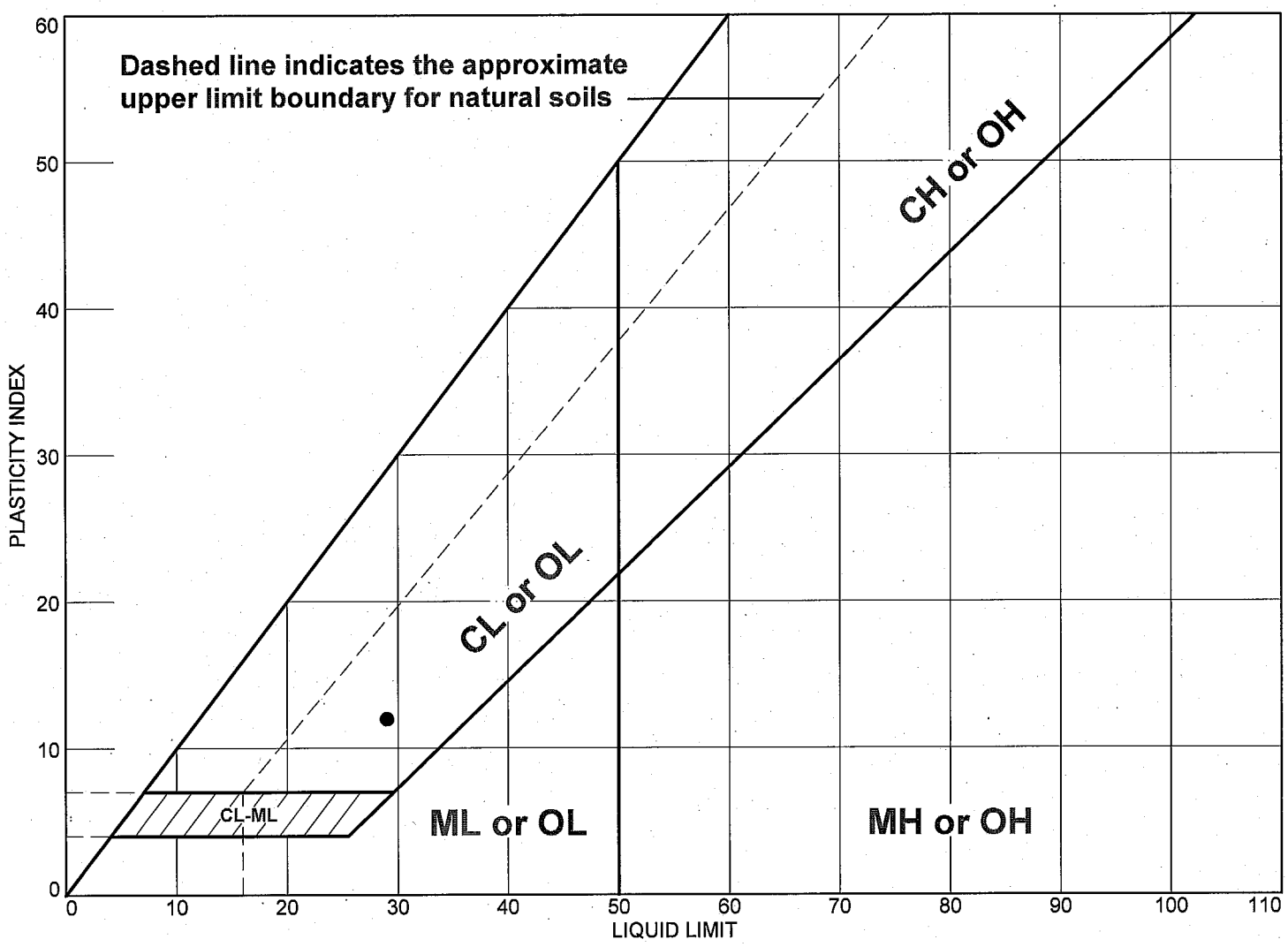
SIERRA TESTING LABS, INC.

El Dorado Hills, CA

Figure

Tested By: KL **Checked By:** CMW

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	clayey sand with gravel	29	17	12	30.0	18.9	SC

Project No. 06-166 **Client:** Golder Associate, Inc.

Project: B&C Gas Station

Job No: 053-7020

● **Source of Sample:** CB-11 **Sample Number:** CB-11

Remarks:

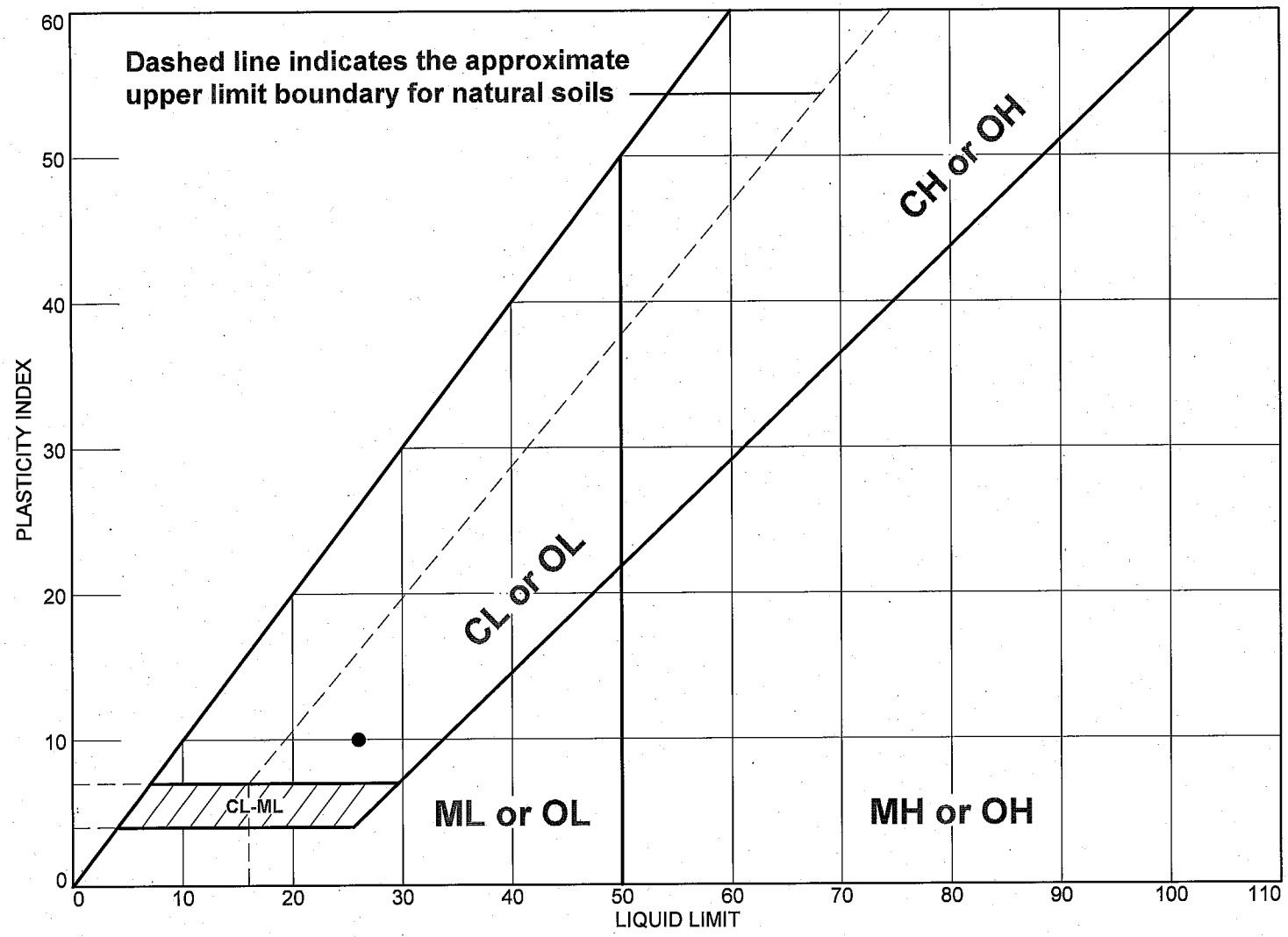
SIERRA TESTING LABS, INC.

El Dorado Hills, CA

Figure

Tested By: KL **Checked By:** AA

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	clayey sand with gravel	26	16	10	29.7	17.6	SC

Project No. 06-166 **Client:** Golder Associate, Inc.

Project: B&C Gas Station

Job No: 053-7020

● **Source of Sample:** CB-12 **Sample Number:** CB-12

Remarks:

SIERRA TESTING LABS, INC.

El Dorado Hills, CA

Figure

Tested By: KL **Checked By:** CMW

HYDRAULIC CONDUCTIVITY TEST REPORT

SAMPLE DATA

Sample Identification: CB-2
Visual Description: N/A
Remarks:

Sample Depth, ft.: N/A
Sample Type: Liner Sample

TEST RESULTS

Permeability, cm/sec.: 3.07E-08

Average Hydraulic Gradient: 5.8

Effective Cell Pressure, psi: 5

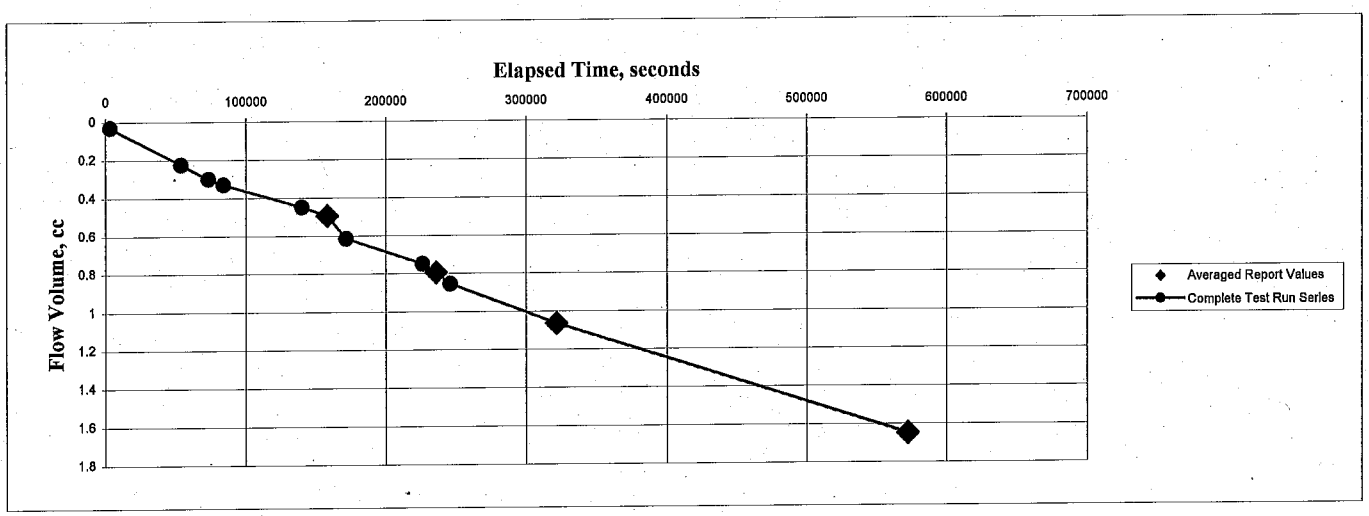
TEST SAMPLE DATA

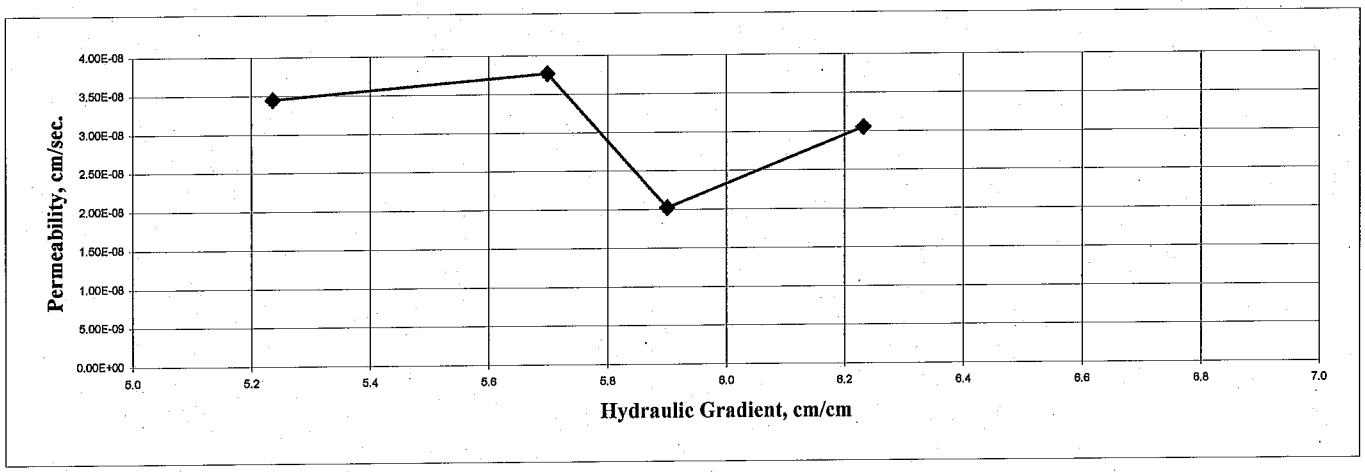
Before Test

Specimen Height, cm: 5.87
Specimen Diameter, cm: 4.06
Dry Unit Weight, pcf: 142.3
Moisture Content, % 11.7
Specific Gravity, Assumed
Percent Saturation:

After Test

Specimen Height, cm: 5.72
Specimen Diameter, cm: 4.06
Dry Unit Weight, pcf: 140.8
Moisture Content, % 10.9





Test Method: ASTM D5084 Method C

PROJECT NUMBER:	06-166	March 31, 2006

B&C Gas Station

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

5040 Robert J. Mathews Blvd., El Dorado Hills, CA 95762
Phone: (916) 939-3460 FAX: (916) 939-3507

HYDRAULIC CONDUCTIVITY TEST REPORT

SAMPLE DATA

Sample Identification: CB-11
Visual Description: N/A
Remarks:

Sample Depth, ft.: N/A
Sample Type: Liner Sample

TEST RESULTS

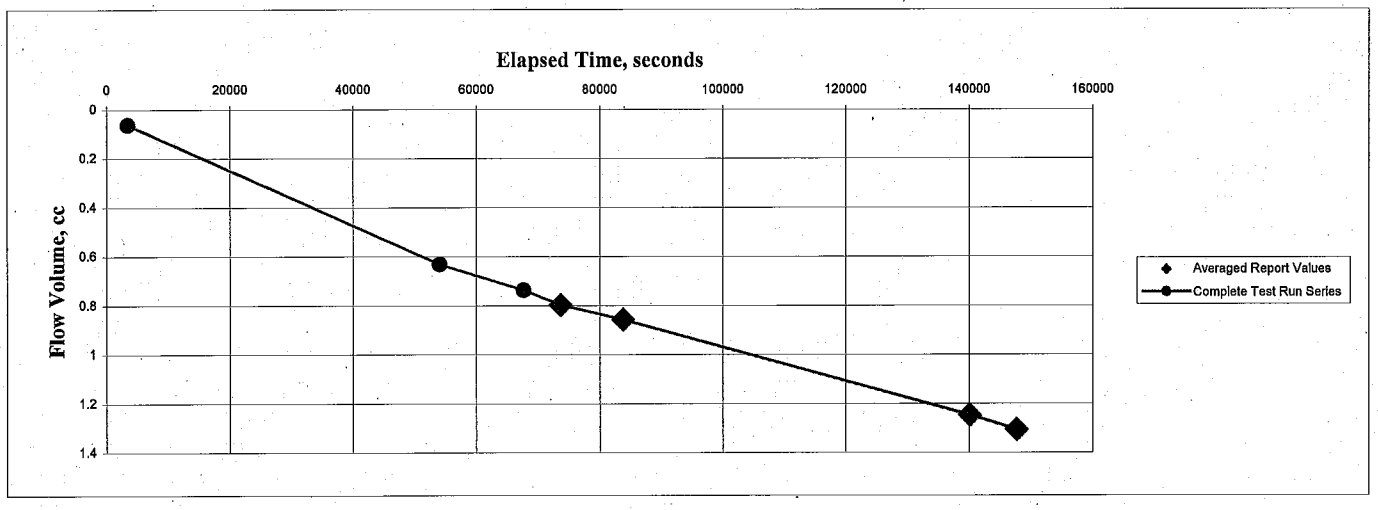
Permeability, cm/sec.: 1.23E-07

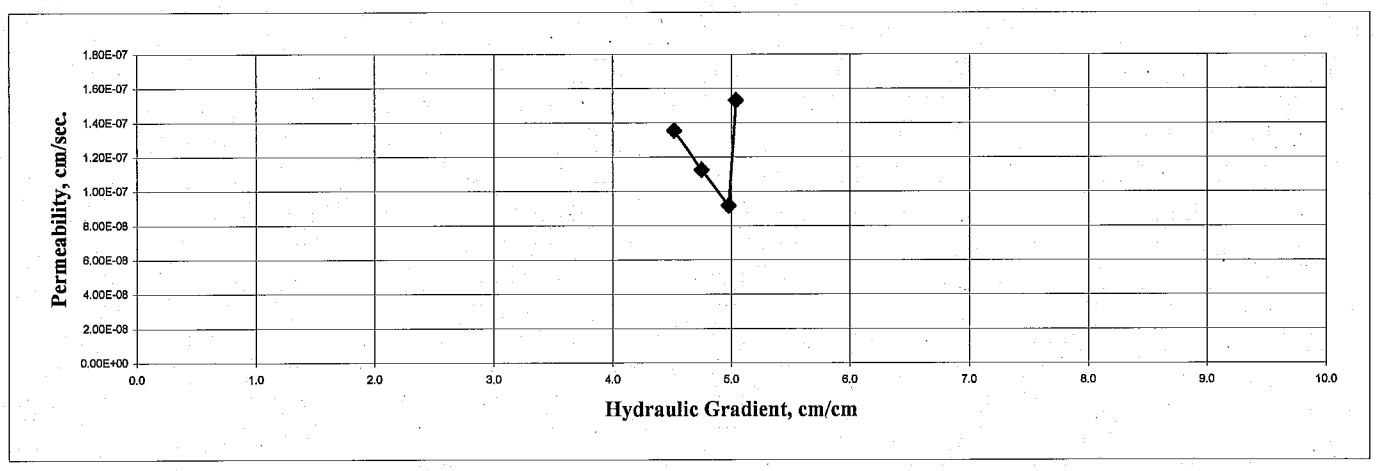
Average Hydraulic Gradient: 4.8

Effective Cell Pressure, psi: 5

TEST SAMPLE DATA

Before Test		After Test	
Specimen Height, cm:	6.60	Specimen Height, cm:	6.53
Specimen Diameter, cm:	4.06	Specimen Diameter, cm:	4.06
Dry Unit Weight, pcf:	144.4	Dry Unit Weight, pcf:	147.9
Moisture Content, %	11.6	Moisture Content, %	12.4
Specific Gravity, Assumed			
Percent Saturation:			





Test Method: ASTM D5084 Method C

PROJECT NUMBER:	06-166	March 31, 2006	B&C Gas Station

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

5040 Robert J. Mathews Blvd., El Dorado Hills, CA 95762
Phone: (916) 939-3460 FAX: (916) 939-3507

HYDRAULIC CONDUCTIVITY TEST REPORT

SAMPLE DATA

Sample Identification: CB-12
Visual Description: N/A
Remarks:

Sample Depth, ft.: N/A
Sample Type: Sample Liner

TEST RESULTS

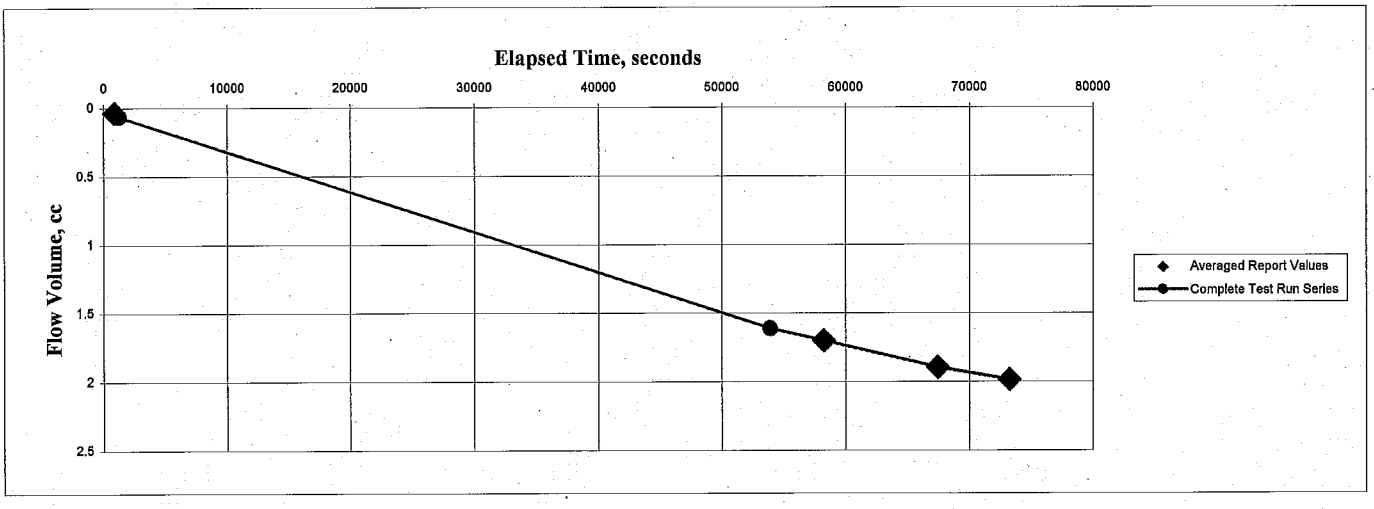
Permeability, cm/sec.: 3.64E-07

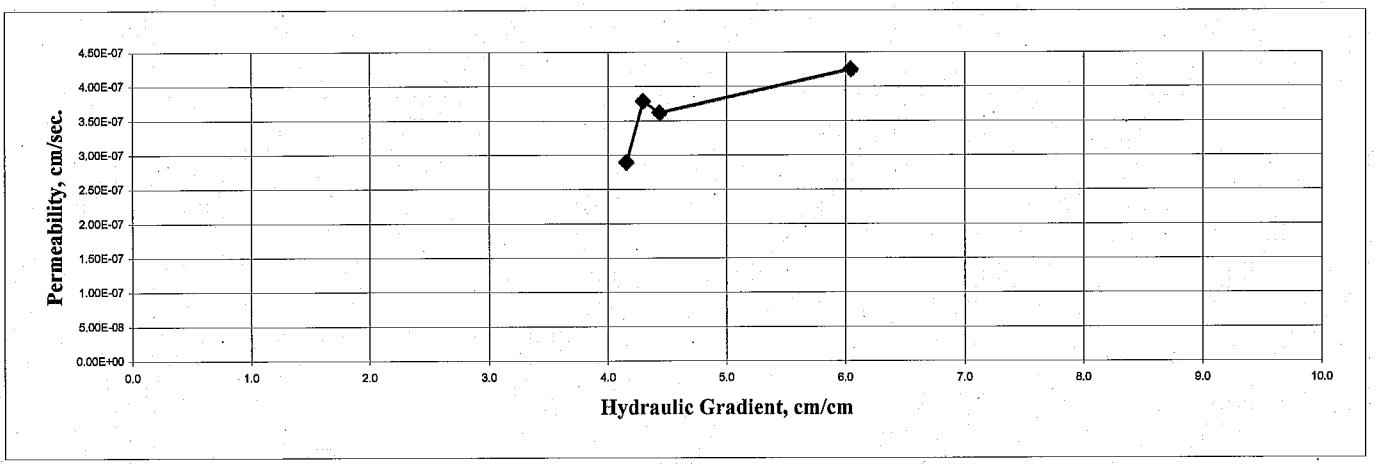
Average Hydraulic Gradient: 4.7

Effective Cell Pressure, psi: 5

TEST SAMPLE DATA

Before Test		After Test	
Specimen Height, cm:	6.81	Specimen Height, cm:	6.78
Specimen Diameter, cm:	4.06	Specimen Diameter, cm:	4.06
Dry Unit Weight, pcf:	146.6	Dry Unit Weight, pcf:	141.7
Moisture Content, %	9.3	Moisture Content, %	9.7
Specific Gravity, Assumed			
Percent Saturation:			





Test Method: ASTM D5084 Method C

PROJECT NUMBER:	06-166	March 31, 2006

B&C Gas Station

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

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APPENDIX E

SCREENING VAPOR INTRUSION
RISK ASSESSMENT
GROTH BROTHERS OLDSMOBILE PROPERTY
59 SOUTH L STREET
LIVERMORE, CALIFORNIA

Submitted to:

Golder Associates Inc.
Mountainview, California

Prepared by:

Ian Hers, Ph.D.
Golder Associates Ltd.
Burnaby, British Columbia

May 31, 2006 053-7020C

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1.0 INTRODUCTION

Previous subsurface investigations at 2008 1st Street, Livermore California (the "B&C Mini Mart", or "B&C") and the adjacent property at 59 South L Street, Livermore California (the "Groth Brothers site") indicated gasoline-related contamination and hydrocarbon concentrations in groundwater that exceeded the San Francisco Bay (SF Bay) Regional Water Quality Control Board's (RWQCB) Environmental Screening Levels (ESLs) for the evaluation of potential vapor intrusion concerns. As part of on-going investigations at the site, soil vapor data was acquired to assess the vapor intrusion pathway. This appendix addresses the soil vapor data and evaluates the risk to human health associated with soil vapor at the Groth Brothers property, with respect to contamination originating from the B&C Mini Mart property. Details regarding the site history, geology and hydrogeology are contained in the main body of the report. A brief summary is provided here for the reader's convenience.

2.0 BACKGROUND INFORMATION

2.1 Site Hydrogeology, Topography and Surface Water

The site is located in the Livermore Valley groundwater basin, a relatively flat-lying alluvial valley containing braided channel systems with complex interfingering. Subsurface investigations conducted at the site, and in the site vicinity, indicate the near subsurface is characterized by an upper unconfined water-bearing zone consisting primarily of gravels with sand in a silty clay matrix. Within this unit are layers and lenses of finer-grained materials which are interpreted as discontinuous flood plain remnants. A relatively continuous low-permeability clayey unit is found at depths of approximately 75 to 110 feet below ground surface (bgs). Over the last 15 years, static water levels have ranged from a low of 69 feet bgs (January 1992) to a high of 17 feet bgs (February 1997).

The site and nearby vicinity are located in downtown Livermore. As such, the area is almost entirely paved with either asphalt or concrete with the exception of relatively small planter medians and islands. Surface water runoff is via sheetflow to the City's storm drain system. There are no surface water bodies nearby to the Site.

2.2 Current and Proposed Land Use

Current land use is commercial, with the B&C site still an operating retail service station. The Groth Brothers site located west of B&C is an operating automobile dealership and repair center. As part of a redevelopment effort being conducted by the City of

Livermore, the Groth Brothers site is to be redeveloped as mixed high-density residential with integrated retail stores. The proposed redevelopment is the driver for an accelerated evaluation of potential vapor risk at the site and remedial action (as necessary).

2.3 Climatic Information

The City of Livermore is located in an inland valley east of San Francisco Bay. Regionally, the climate is characterized as Mediterranean with cool, wet winters and hot, dry summers. The rainfall season typically extends from mid-October to early April with the majority of the rainfall occurring November through February. Average rainfall for the Livermore area is about 15 inches. Average temperature in the cool winter months are about 45 to 50 degrees with summer averages around 70 to 75 degrees.

The rainfall season extended later than usual this year with nearly daily rainfall occurring throughout March and well into the first two weeks of April. Because of this, the vapor sampling program was delayed from early April until the end of April after two weeks of dry weather had occurred.

2.4 Site Contaminant Characterization

The site is impacted with petroleum hydrocarbons associated with leaking underground gasoline storage tanks. The releases occurred on the B&C property over multiple years with major releases of product to groundwater documented in 1994 and 1995. At that time, groundwater levels were near historic lows of approximately 60 feet below ground surface. Groundwater rose approximately 30 to 35 feet over the next three to five years effectively smearing the product up through the alluvial sediments.

By the late 1990's, it was determined that the MTBE component of the dissolved contaminant plume had extended approximately 1500 feet downgradient of the site. The BTEX components of the plume were generally limited to about 600 to 800 ft. downgradient of the site. The primary contaminant source zone was determined to be between approximately 30 to 45 feet bgs below the surface of the ground water table and was estimated to extend about 150 to 200 feet west of the site.

In 2003, additional work was performed to better evaluate the risk to regional drinking water supplies. This work demonstrated several important findings:

- The northwest extent of the dissolved contaminant plume was generally defined and was shown not to have reached municipal water supply wells.

- At approximately 70 feet bgs, a regional-scale aquitard consisting of highly plastic clay was identified. This aquitard protects the underlying drinking water aquifer from the release.

- Concentrations of MTBE and BTEX have been declining throughout the plume since 1995. Declining concentrations appear to be due to natural attenuation based on positive chemical indicators of natural attenuation and the shrinking dimensions of the BTEX plume.

The current work effort is focused on increased definition and characterization of the source area and evaluation of potential vapor risk associated with the remaining source.

3.0 2006 FIELD PROGRAM

3.1 Rationale

Previous subsurface investigations at the Groth Brothers site indicated gasoline-related contamination and hydrocarbon concentrations in groundwater that exceeded the San Francisco Bay (SF Bay) Regional Water Quality Control Board's (RWQCB) Environmental Screening Levels (ESLs) for the evaluation of potential vapor intrusion concerns. Since the use of soil vapor data is preferred by SF RWQCB, the primary rationale for the 2006 program was to obtain soil vapor data, in addition to the groundwater data, to assess the vapor intrusion pathway.

The soil vapour samples were analyzed for target indicator compounds (BTEX and MTBE) and Total Petroleum Hydrocarbon (TPH) consistent with SF Bay RWQCB (2005) and CalEPA (1996a). Trimethylbenzenes, butylbenzenes, methylnaphthalenes and a number of other common constituents of petroleum products (especially gasolines), while sometimes reported separately in analyses, should be collectively evaluated under "TPH" and do not need to be evaluated separately.

3.2 Scope and Methods

The scope of the Golder 2006 field investigation program consisted of sampling and analysis of soil vapour and groundwater samples, hydrogeologic testing (e.g., groundwater water levels), and MIP testing to provide data on the contaminant distribution and concentrations in both the unsaturated and saturated zone. The discussion below is limited to a summary of the scope and methods of the soil vapor program; a more detailed description of soil vapor methods and other aspects of the site characterization are discussed in the main body of this report.

The soil vapor sampling program was completed on April 25, 2006. Soil vapor samples from 5 foot below grade were obtained from: three locations on the B&C site, one location on South L Street, and two locations on the Groth Brothers site. At the location on South L Street (immediately adjacent the Groth Brothers site), soil vapor samples were also obtained from 10 and 15 feet below grade.

Soil vapor samples were collected using direct push probe rods. The vapor point holder was advanced to the target sample depth and a tool string was pulled back to expose the vapor inlet. Prior to sample collection, approximately three probe volumes of air were purged from each probe location at a flow rate of 175 mL/minute. Soil vapor samples were collected at a flow rate of 175 mL/minute in one liter Summa canisters. Summa canisters were shipped to Air Toxics Ltd. laboratory for analysis according to modified EPA Method TO-15, which uses Gas Chromatography/Mass spectrometry (GC/MS) method.

During the soil vapour sampling program, the weather conditions consisted of cool and partly cloudy conditions. There was approximately two weeks of dry weather prior to sampling on April 26, 2006. On April 25, 2006 the groundwater elevation is reported to been located approximately 25 feet below grade.

3.3 Quality Assurance/Quality Control

Standard Golder and industry established field procedures were used throughout the field investigation to improve the accuracy, precision and reproducibility of the results. Chain-of-custody procedures were followed during the soil vapor sampling event.

During the field program, a leak detection compound, 2-propanol (rubbing alcohol), was used to test for leaks in the sampling train and annulus between the soil gas probe and soil. The 2-proponal was added to clean rags, which were wrapped around the base of the soil gas probes and probe joints. The results of the leak detection compound analyses are presented in Table 3. The presence of 2-proponol in the sample results is indicative of a potential leak in the sampling train. As shown, 2-propanol was detected in six of the eight soil vapor samples at concentrations between 16 and 57 $\mu g/m^3$. While these results indicate that leaks may have occurred in the sample train, these concentrations are considered to be quite low and leaks are considered unlikely to have significantly impacted (i.e. diluted) the soil vapor concentrations based on the following:

1. The State of California Department of Toxic Substances Control (DTSC)'s 2003 advisory entitled "*Advisory - Active Soil Gas Investigations*" recommends a detection limit for 2-proponal analysis lower than 10 $\mu g/L$ (10,000 $\mu g/m^3$). The

DTSC maximum detection limit is inferred to represent the concentration at which point a leak is considered likely to impact sampling results. The results of Golder's soil vapor investigation indicated 2-proponal concentrations that were 175 times less than this recommended detection limit;

2. An evaluation of leak detection compounds conducted by Air Toxics[1] demonstrated that a leak as small as 0.0005 mL/minute can produce a 2-propanol concentration of 12 μg/L (12,000 μg/m^3) under similar sampling conditions; and

3. Air Toxics personnel indicated that the concentrations of 2-proponal measured during Golder's investigation were "quite low" with respect to the potential for leaks.

It is considered likely that the low concentrations (maximum of 57 μg/m^3) of 2-propanol could be attributed to the following:

1. Diffusion of the leak detection compound through the polyethylene tubing;

2. A potential leak with a flow rate less than 0.0005 ml/minute (which would indicate negligible dilution from ambient air)[2];

3. Cross contamination during handling of the sampling media and the (highly concentrated) leak detection compound.

As part of the soil vapor program, successive field duplicate samples were collected from soil gas probes MIP-25 and MIP-8. The results of the duplicate sample analyses are shown in Table 4. The relative percent difference (RPD), which is the absolute difference between the two values divided by the mean, is commonly used to evaluate the variability in sample concentrations. When vapor samples are split (i.e. the samples are collected at the same time into two separate canisters), a RPD value of less than approximately 0.2 (20%) is considered an indication of acceptable sample precision. For successive samples (i.e., samples are collected one after another) there may be greater variability due to slight temporal changes in soil vapor concentrations. For this reason, a somewhat higher RPD would be acceptable for successive samples. As shown in Table 4, the RPD values for the soil vapor samples were well below 20 percent indicating acceptable precision.

[1] Air Toxics Ltd. (2005), "Evaluating Leaks in a Soil Gas Sample Train", Paper #45, Folsom, CA. (http://www.airtoxics.com/literature/AirToxicsLeakCheckStudy.pdf)
[2] Based on the findings of the leak detection compounds study conducted by Air Toxics Ltd. (2005)

A review of the laboratory data determined that the laboratory met its own internal standards and targets for the vapor analyses. The results of Air Toxics internal QA/QC analyses are included in the laboratory certificates in Appendix C.

In summary, based on the QA/QC procedures implemented for this program, the data quality is considered acceptable for decision-making purposes.

3.4 Results of Soil Vapor Testing

The results of the vapor sampling program conducted on April 25, 2006 are presented in Table 3. The results are discussed below while comparisons to screening levels are provided in Section 4.

The results for the vapor samples collected from 5 feet below grade indicated:

- TPH concentrations ranged from 930 $\mu g/m^3$ at MW-2 to 9,400 $\mu g/m^3$ at MIP-13;
- Benzene concentrations ranged from less than the laboratory reporting (detection) limit (3.7 $\mu g/m^3$) at MIP-2 to 12 $\mu g/m^3$ at MIP-13;
- Toluene concentrations ranged from 4.9 $\mu g/m^3$ at MIP-8 to 2,600 $\mu g/m^3$ at MIP-13;
- Ethylbenzene concentrations ranged from less than the reporting limit (5.0 $\mu g/m^3$) at MW-2 to 49 $\mu g/m^3$ at MIP-13; and
- Total xylenes concentrations ranged from less than the reporting limit (14.6 $\mu g/m^3$) at MW-2 to 230 $\mu g/m^3$ at MIP-13.

At MIP-8, soil vapor samples were collected from three different depths: 5, 10 and 15 feet below grade. For TPH_g and BTEX parameters, the concentrations were highest in the deepest (15 foot) vapor sampling location with a TPH_g concentration of 18,000 $\mu g/m^3$, a benzene concentration of 61 $\mu g/m^3$, a toluene concentration of 1,600 $\mu g/m^3$, an ethylbenzene concentration of 30 $\mu g/m^3$, and a total xylenes concentration of 122 $\mu g/m^3$. Concentrations of TPH and BTEX were lowest in the 10 foot deep sample location.

The Methyl Tertbutyl Ether (MTBE) concentrations were below the reporting limits in all vapor sampling locations. The concentrations of oxygen in the soil gas samples ranged

from 17 to 21 %; concentrations of carbon dioxide ranged from 0.26 to 3.2 %; and concentrations of methane ranged from 0.001 to 0.01 %.

3.5 Results of Soil Testing

During the MIPs field investigation, three soil samples were selected for analysis of physical parameters. These soil samples were collected from borings CB-2, CB-11, and CB-12. The intent of collecting these samples was to provide physical soil data for input into a vapor migration model, and for feasibility evaluation of potential remedial methods. The physical soil parameters tested include: permeability, porosity, moisture content; grain size analysis, and total organic carbon.

Of relevance was the grain size analysis, which indicated that the higher permeability materials at the Groth Brothers site consisted of 26 to 37 percent gravel, 44 to 56 percent sand, and 18 to 19 percent fines. Based on our analysis of the data, the soil type used for modeling was determined to be a US Soil Conservation Service (SCS) Loamy Sand.

3.6 Discussion

The results of the soil vapor investigation revealed the presence of TPH_g and BTEX vapors in the sub-surface of the Site. Results from the 5 foot deep sampling locations varied across the Site, with the highest concentrations measured at MIP-13 located on the B&C property. Of the 5 foot deep sample results, the next highest TPH_g and BTEX concentrations were measured at MW-4, MIP-2, and MIP-10, with MW-4 located on the B&C property, and MIP-2 and MIP-10 located on the Groth Brothers property. Of the five foot deep sample results, the lowest TPH_g and BTEX concentrations were measured at MW-2 and MIP-8, located on and adjacent (respectively) the B&C property. It is considered likely that the low concentrations measured in these two locations are due to the finer grained soils present in this area, which may be restricting the migration of vapors. Results of the MIP investigation at MIP-8 and MIP-14 indicated an approximately 20 to 25 foot thick layer of fine-grained soils between approximately 10 and 35 feet below grade (based on conductivity results).

The results from the sampling location at MIP-8, where soil vapor samples were collected over three different sampling depths, indicated the lowest vapor concentrations from the mid-depth (10 foot) location. Electrical conductivity results in this location indicate the presence of fine grained materials between approximately 11 and 34 feet below grade, potentially limiting the migration of vapors at the lower depths.

In general, the results indicate that the heterogeneous nature of the soils in the area of the Groth Brothers and B&C properties appear to have a significant effect on vapor migration. As shown on cross-section in Figure 5 through 9 (main body of the report), a thick unit of fine-grained materials, which appears to be limiting subsurface vapor migration, is present on and adjacent the B&C property. However, this unit becomes much thinner, or is not present in areas of the Groth Brothers property above the water table.

Concentrations of oxygen, carbon dioxide, and methane measured in the soil vapor samples indicated a relatively aerobic subsurface atmosphere in the areas sampled. This was consistent in both the shallow and the deeper sampling locations. The highest concentrations of oxygen were measured on and adjacent the B&C property (MIP-4, MIP-8, and MIP-13) where fine-grained materials are suspected to limit subsurface vapor migration. Elevated oxygen and relatively low hydrocarbon concentrations were measured at the deep probe suggesting aerobic conditions at depth.

The soil vapor investigation, coupled with the MIP conductivity data, provide useful information of the concentrations of TPH_g and BTEX in the sub-surface and potential migration pathways. However, the investigation was conducted during a period of time with a relatively high groundwater table. On April 25, 2006, the depth to groundwater was approximately 26 feet below grade. Based on the MIP analysis, the NAPL smear zone generally appears to be situated between 32 to 52 feet below grade. This indicates that the smear zone was submerged during the soil vapor sampling. Historical data indicates that the groundwater depths at the Site have ranged between approximately 25 and 60 feet below grade. During periods of time when the groundwater table is lower than the top of the smear zone, higher concentrations of TPH_g and BTEX vapors in the deeper vadose zone would be expected.

4.0 COMPARISON OF MEASURED CONCENTRATIONS TO SCREENING LEVELS (TIER 1 ASSESSMENT)

4.1 Applicable Screening Levels

To evaluate the results of the soil vapor program, the measured concentrations were compared to two sets of soil vapor screening levels that are recommended for use on projects in the Livermore, California area: the California Environmental Protection Agency's (Cal EPA) Human Health Screening Levels (CHHSLs) and the San Francisco Bay Regional Water Quality Control Board's (SF Bay RWQCB) Environmental Screening Levels (ESLs). In addition, the groundwater concentrations measured at CB-8GW (same location as MIP-8) on March 29, 2006 were compared to the SF Bay

RWQCB's groundwater ESLs to evaluate potential vapor intrusion concerns. The groundwater concentration measured at CB-8GW on March 29, 2006 is considered to be a worst case concentration for current and future groundwater conditions on the Groth Brothers property.

The CHHSLs and ESLs provide concentrations of hazardous chemicals that are considered to be below thresholds of concern based on generally conservative risk-based exposure scenarios and assumptions. For evaluating the potential for soil vapor intrusion, both the CHHSLs and ESLs were developed using Johnson and Ettinger model for vapor intrusion from contaminated soils and groundwater. Table 1, below, summarizes the assumptions used in the development of the CHHSLs and the ESLs for shallow soil gas screening levels and residential land use. Table 2 summarizes the assumptions used in the development of the ESLs for the groundwater–to-indoor air pathway under residential land use. The CHHSLs do not include groundwater screening levels specific to soil vapor intrusion.

TABLE 1: Assumptions used in the Development of CHHSLs and ESLs for Shallow Soil Vapor to Address Vapor Intrusion Concerns

Parameter	**CHHSLs**	**ESLs**
Depth of soil vapor sample	Within 5 feet of building foundation or ground surface.	Within 5 feet of building foundation or ground surface.
Soil Type	Sand (4 inches) underlain by engineered fill (1 ft.)	High permeability sandy fill material.
Building Construction	Slab-on-Grade	Slab-on-Grade
Soil gas-to-indoor air attenuation factor (alpha)	Not provided in text, inferred to be approximately 0.0023 based on soil gas CHHSLs versus indoor air CHHSLs.	0.001
Sources for exposure assumptions and toxicity values	USEPA and Cal/EPA	USEPA, Cal/EPA, and City of Oakland Urban Land Redevelopment Program

Target Cancer Risk	1×10^{-6}	1×10^{-6}
Hazard Quotient (non-carcinogens)	1.0	0.2 (0.5 for TPH)

TABLE 2: Assumptions used in the Development of ESLs s for Groundwater to Address Vapor Intrusion Concerns

Parameter	**ESLs**
Depth to groundwater	10 ft
Soil Type (high permeability soil model)	3.3 feet of dry sandy soil over 6.6 feet of moist clayey loam
Building Construction	Slab-on-Grade
Sources for exposure assumptions and toxicity values	USEPA, Cal/EPA, and City of Oakland Urban Land Redevelopment Program
Target Cancer Risk	1×10^{-6}
Hazard Quotient (non-carcinogens)	0.2
Biodegradation	Assumes 10 times attenuation of BTEX concentrations in the vadose zone prior to migration into the building.

The soil gas-to-indoor air attenuation factor (alpha) used in the development of the CHHSLs are inferred to be based on recommended default attenuation factors provided in the State of California's (2004) "*Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*". In this guidance, a default attenuation factor of 0.002 is recommended for residential slab-on-grade construction of an existing building; a less conservative attenuation factor of 0.0009 is recommended when assessing future residential developments.

The CHHSLs and ESLs were derived using similar assumptions with the exceptions discussed above. The ESLs use a Hazard Quotient of 0.2 to calculate ESLs for noncarcinogens (versus 1.0 for both the CHHSLs). This was done in order to address potential cumulative health effects at sites with multiple contaminants. The ESLs are considered to be adequate for use at sites where no more three carcinogenic chemicals or five chemicals with similar noncarcinogenic ("systemic") health effects are present. The CHHSL's require calculation of a total excess lifetime cancer risk when there a multiple carcinogenic chemicals, and calculation of a hazard index (sum of hazard quotient) when there are multiple non-carcinogenic chemicals. The ESLs were developed using a higher, assumed indoor-air exchange rates in the ESL model, due to the more moderate climate of the San Francisco Bay area (1.0 and 2.0 exchanges per hour for residences and commercial/industrial settings, respectively, versus 0.5 and 1.0 exchanges per hour referenced in the CHHSLs document). There were also slight differences in the soil properties used to calculate the soil vapour attenuation factors.

In addition to providing screening levels for the soil vapour intrusion pathway, the CHHSLs and ESLs both provide soil screening levels for direct exposure pathway. However, this pathway is not considered potentially significant and applicable for screening purposes since contamination is located below 10 feet depth below grade. This deeper soil contamination would not be uncovered as a result of typical site development and maintenance activities and thus would not be accessible to site receptors.

The ESLs also include screening levels for groundwater and soil to address human ingestion of drinking water, migration of groundwater to surface water and impacts to aquatic receptors, and gross contamination issues. These potential exposure pathways are not part of this evaluation.

4.2 Comparison to Screening Levels for Soil Vapor

The results of the soil vapor sampling and analysis program conducted on April 25, 2006 are compared to the CHHSLs and ESLs in Table 3. Duplicate sample results are shown in Table 4. As shown, for the soil vapor samples collected from 5 feet below grade, the concentrations of BTEX and TPH_g were less than the CHHSLs and the ESLs. It is noted that there is no CHHSL for TPH_g. For the CHHSLs, the cumulative risks were also calculated as described in Section 4.1.

While the CHHSLs and the ESLs are based on soil vapor concentrations at 5 feet below a building foundation or from ground surface, the deeper soil vapor samples were also compared to the CHHSLs and ESLs for reference purposes. As shown, the concentration of benzene in the soil vapor sample collected from MIP-8 at 15 feet below

grade had a concentration that was above the CHHSL for benzene, but below the ESL for benzene. The concentrations of all other BTEX parameters, and TPH_g were below the CHHSLs and ESLs.

4.3 Comparison to Screening Levels for Groundwater

The results of the March 29, 2006 groundwater sampling results for CB-8GW are compared to the ESLs for groundwater (for the evaluation of potential vapor intrusion concerns) in Table 5. The concentration of benzene in groundwater (2000 µg/L) was greater than the ESL (540 µg/L). The concentrations of toluene, ethylbenzene, xylenes and MTBE were below the respective ESLs. No ESLs are provided for TPH_g, instead the collection of soil gas samples is recommended by SF Bay RWQCB to evaluate potential vapor intrusion concerns with respect to TPH_g.

5.0 SCREENING LEVEL RISK ASSESSMENT FOR VAPOR INTRUSION PATHWAY

5.1 Approach

This section presents a screening level risk assessment for the soil vapor intrusion pathway. The screening level risk assessment incorporates aspects of both a Tier 2 and Tier 3 assessment, as defined by SF Bay RWQCB (2005). The Tier 2 assessment involves using the same model (Johnson and Ettinger model) as used by Cal EPA and SF Bay RWQCB, except that site specific soil parameters are input into the model. The Tier 3 assessment involves using the modified Johnson and Ettinger model that incorporates bioattenuation over a dominant soil layer and variable soil moisture content within the unsaturated zone.

Risk assessment is the process of estimating the likelihood of adverse effects on human and ecological health resulting from exposure to a contaminant source. There are three conditions that must be present for a potential risk to exist:

- a chemical must be present;
- a receptor must be present; and
- there must be an exposure pathway by which the receptor can come into contact with the chemical.

To determine whether these conditions are present at a given site, a series of steps are carried out, typically involving four stages: hazard identification/problem formulation, exposure assessment, toxicity assessment, and risk characterization.

The first stage in the risk assessment process is the formulation of the problem. This stage is primarily qualitative but also includes quantitative methods, where necessary, to determine: i) the contaminants of potential concern (COPCs); ii) potential human or ecological receptors; and, iii) the pathways by which exposure may occur. The purpose of the problem formulation is to distinguish between issues for which further quantitative analysis is warranted, and those that do not warrant further analysis because of either a low hazard, or the existence of a simple and/or inexpensive solution for mitigating the potential health risks. The information from the problem formulation stage is summarized in a conceptual exposure model(s), which illustrates the pathways of the contaminants from their sources, through the relevant environmental media, and to the receptors of interest.

The next step in the risk assessment is to quantify the exposure of the receptors. The exposure assessment involves estimating the dose of the contaminant received by the human or ecological receptors for each pathway identified in the problem formulation. Site-specific data are used to characterize contaminant source concentrations (*e.g.*, soil concentrations) and exposure media concentrations (*e.g.*, groundwater concentrations), and conservative assumptions are employed to describe potential receptor contact with the contamination.

The toxicity assessment identifies toxicity reference values for each contaminant of concern. A toxicity reference value is an acceptable dose or concentration of a contaminant that can be received by a receptor without causing adverse health effects. Both the type of health effect (*e.g.*, cancer) and the pathway by which a chemical is received (*e.g.*, inhalation) are considered when selecting appropriate toxicity reference values.

The final step in the assessment is the characterization of risks. The information from the exposure and toxicity assessments is combined to produce numerical estimates of human and ecological risks. This step is conducted for all contaminants, receptors and exposure scenarios of concern.

5.2 Problem Formulation

Subsurface gasoline contamination is present on the Groth Brothers site. There is a NAPL smear zone present between approximately 32 and 52 feet below ground surface. A dissolved hydrocarbon plume is associated with the NAPL smear zone. The day prior to soil vapor sampling (i.e., April 25, 2006), the depth to groundwater was approximately 26 feet below grade. Historical data indicates that the groundwater depths at the Site have ranged between approximately 25 and 60 feet below grade. During periods of time

when the groundwater table is lower than the top of the smear zone, higher concentrations of TPH_g and BTEX vapors in the deeper vadose zone would be expected.

The generalized stratigraphic profile at the Groth Brothers site consists of a coarse-grained soil comprised of sandy to silty to clayey gravel, underlain by a discontinuous finer-grained soil consisting primarily of sand, with varying amounts of clay, silt and gravel extending to the water table. With increasing depth, the sand unit becomes coarser closer to the water table and at some locations is gravelly. Based on the grain size gradations, the bulk unsaturated soil texture at the site is approximated as a US SCS Sandy Loam.

The Groth Brothers site is an operating automobile dealership and repair center. The proposed land use is a residential townhouse development. The assumed foundation for the proposed development is slab-at-grade construction. The primary exposure pathways of potential concern for human receptors consists of soil vapor intrusion into future buildings planned at the Groth Brothers site.

Under the current land use, there is the potential for migration of volatiles into outdoor air; however, due to the significant dilution of vapors that will occur, the potential for risk via outdoor air exposure is considered negligible. The development of the site will likely involve excavation of trenches for installation of utilities. During future construction, it is possible that construction workers could be exposed to vapors in utility trenches at the Groth Brothers site. The trenches are expected to be relatively shallow relative to the depth to the water table (approximately 25 ft. below ground); therefore, the potential for significant exposure to vapor concentrations is expected to be relatively low. Quantitative risk assessment of potential exposure of construction workers to vapours in trenches was not specifically performed as part of this investigation. However, the work plan for construction monitoring should include regulator monitoring of hydrocarbon vapor concentrations within trenches or any other confined spaces at the site. Appropriate mitigative measures should be taken if concentrations exceed permissible exposure levels.

The ingestion of groundwater used for drinking water is not considered to be of concern based on water use in the area of the site, which is limited to municipal water supply, and absence of known drinking water wells near to the site. Groundwater is also not used for irrigation or livestock watering in the area of the site. The direct contact with contaminated soil is not considered potentially significant since contamination is located below 10 feet depth below grade. This deeper soil contamination would not be uncovered as a result of typical site development and maintenance activities and thus would not be accessible to site receptors. The migration of groundwater to surface water

receptors is not considered a potential significantly pathway since the nearest surface water body, the Arroyo Mocho, is located approximately 3000 feet from the site.

Utility corridors exist along South L Street in the area of the known release, however, evaluations of potential migration along these pathways has not been specifically evaluated as part of this investigation.

In summary, the conceptual exposure model that was considered as part of this investigation is vapor intrusion into future buildings at the site and inhalation exposure to residential receptors. Vapor migration along utility corridors or into subsurface excavations conducted as part of construction is beyond the scope of this report and was not specifically evaluated for this investigation.

5.3 Quantitative Screening Level Risk Assessment

5.4 Toxicity Assessment

Toxicity assessment involves the classification of the potential toxic effects of chemicals and the estimation of the amounts of chemicals that can be received by human receptors without experiencing adverse effects on their health. Toxicity assessment is conducted for all chemicals of concern and considers possible modes of toxicity associated with different routes and durations of exposure, and sensitive receptors as it applies to the risk scenarios being assessed. The toxicity assessment provides an estimate of how much chemical exposure may occur without unacceptable health effects occurring from a lifetime exposure (or significant portion of lifetime) and provides a basis to interpret predicted exposure rates.

For this assessment, the predicted indoor air concentrations were compared against the CHSSLs and ESLs for indoor air. The CHSSLs were derived using toxicity factors provided in the OEHHA (2005) and are reproduced below.

TABLE 6: OEHHA (2005) Toxicity Factors

Chemicals	OEHHA Toxicity Values		US EPA Toxicity Values	
	URF, $(\mu g/m^3)^{-1}$	Chronic REL, $\mu g/m^3$	URF, $(\mu g/m^3)^{-1}$	RfC, mg/m^3
Benzene	**2.9 E-05**	**6.0 E+01**	7.8 E-06	NA
Carbon Tetrachloride	**4.2 E-05**	**4.0 E+01**	1.5 E-05	NA
1,2-Dichloroethane	**2.1 E-05**	NA	2.6 E-05	NA
cis-1,2-Dichloroethylene	NA	NA	NA	**3.5 E-02**
trans-1,2-Dichloroethylene	NA	NA	NA	**7.0 E-02**
Ethylbenzene	NA	**2.0 E+03**	NA	1.0 E+00
Methyl *tert*-Butyl Ether	**2.6 E-07**	**8.0 E+03**	NA	3.0 E+00
Naphthalene	NA	**9.0 E+00**	NA	3.0 E-03
Tetrachloroethylene	**5.9 E-06**	NA	3.0 E-06	NA
Tetraethyl Lead	NA	NA	NA	**3.5 E-07****
Toluene	NA	**3.0 E+02**	NA	4.0 E-01
1,1,1-Trichloroethane	NA	NA	NA	**2.2 E+00**
Trichloroethylene	**2.0 E-06**	**6.0 E+02**	1.1 E-04	4.0 E-02
Vinyl Chloride	**7.8 E-05**	NA	8.8 E-06	**1.0 E-01**
m-Xylene	NA	**7.0 E+02**	NA	7.0 E+00
o-Xylene	NA	**7.0 E+02**	NA	7.0 E+00
p-Xylene	NA	**7.0 E+02**	NA	7.0 E+00

Notes
* Selected toxicity values shown in bold.
** Extrapolated from RfD.
NA Not Available.
URF Unit Risk Factor

The CHSSLs of indoor air were calculated as follows:

$$CHSSL_{car} = ILCR^T/URF * AT/ED * 365\ days/EF \quad [1]$$

$$CHSSL_{non\text{-}car} = HQ^T * REL * 365\ days/EF \quad [2]$$

Where $ILCR^T$ is the target incremental lifetime cancer risk ($1x10^{-6}$), HQ^T is the target hazard quotient (1), URF is the unit risk factor ($(\mu g/m^3)^{-1}$), REL is the reference exposure level ($\mu g/m^3$), AT is the averaging time (70 years), ED is the exposure duration (30 years for residential) and EF is the exposure frequency (350 days for residential).

5.5 Exposure Assessment

The exposure assessment involved the use of mathematical models to predict indoor vapor concentrations from vapor intrusion into future buildings at the site.

5.5.1 Model Scenarios

The Tier 2 modeling involved use of the Johnson and Ettinger model and site specific input parameters for the following input data and modeling scenarios:

1. Measured shallow (5 ft. below grade) and deep (15 ft. below grade) soil vapor. Vapor transport is assumed to occur through the unsaturated zone only. No biodegradation is included in this scenario.

2. Estimated groundwater concentrations based on recent monitoring data. Transport is assumed to occur both through the capillary fringe and unsaturated zone. The calculated vapor attenuation factor was reduced by a factor of 10X to account for the biodegradation of petroleum hydrocarbons, consistent with the methodology used to derive the SF Bay RWQCB ESLs.

3. Estimated mole fraction for BTEX and MTBE in gasoline non-aqueous phase liquid (NAPL). This scenario assumes that the capillary fringe drops below the top of the NAPL smear zone. No biodegradation is included in this scenario since biodegradation rates are uncertain for higher source strength concentration scenarios.

The Tier 3 modeling involved use of the modified Johnson and Ettinger model that incorporates first-order biodecay over a dominant soil layer and variable soil moisture within the capillary transition zone and unsaturated soil zone.

5.5.2 Modeling Methods

Tier 2 Modeling

The Tier 2 modeling was completed using the US EPA Superfund spreadsheets (V3.1). The SG-ADV spreadsheet was used for the scenarios involving use of soil vapor and NAPL data, where as the GW-ADV spreadsheet was used for the scenario involving groundwater data. For the groundwater-to-indoor air scenario, a two-layer soil moisture profile was assumed (i.e., capillary fringe and unsaturated zone) consistent with the approach taken by USEPA to develop VI Guidance semi site specific vapor attenuation (alpha) values (USEPA, 2002). A 10X empirical reduction factor was applied to the calculated J&E attenuation factor consistent with the approach taken by SF Bay RWQCB in the development of the groundwater ESLs.

For the NAPL case, the soil vapour concentration above NAPL was estimated using the following equation:

$$C_v = MW * X * VP * UCF/ (R * T) \quad [3]$$

where C_v is the soil vapor concentration (mg/m^3), MW is the molecular weight (g/mole), X is the mole fraction (dimensionless), VP is the pure-chemical vapor pressure (atm), R is the Gas constant (m^3-atm/K-mol), UCF is the unit conversion factor (1,000 mg/g) and T is the temperature (^{o}K). The mole fractions used for modeling were the average values for three different gasoline's containing MTBE that are provided in an on-line USEPA database (http://www.epa.gov/athens/learn2model/part-two/onsite/es.htm).

The input parameters for the Tier 2 modeling are provided in Table 7. The water-filled and total porosity for the Sandy Loam are the default values. The building parameters assumed were identical to those used in the development of the SF Bay RWQCB ESLs.

Tier 3 Modeling

The Tier 3 modeling was completed using a spreadsheet model developed by Golder Associates that modifies the Johnson and Ettinger algorithm to include bioattenuation over a dominant (single) soil layer. The model also provides for the capability to simulate a variably saturated soil over seven different soil layers. The Golder model was benchmarked against the RISC 4.02 model[3] and was found to predict indoor air concentrations that were within 5 percent of the RISC model over a wide range of biodecay factors and soil properties. The Tier 3 modeling assumes a dissolved groundwater source and vapor transport through both the capillary fringe and unsaturated soil zone. For the purposes of estimating the soil moisture content, the Sandy Loam was divided into seven layers, as shown in Figure 1 (below). The first-order biodecay rate was 0.018 hr^{-1}. This value is the low end of the range used for model simulations by Abreu and Johnson (2006) and is a conservative value based on published first-order rates in the literature (Hers et al, 2001). The thickness of the bioattenuation layer was 0.8 m. This thickness was chosen since it provided a relatively close match between the measured and predicted soil vapor profile. The Tier 3 building parameters were the same as for the Tier 2 modeling.

[3] The RISC model also includes a dominant layer model for biodecay; however, it only allows for three different soil layers to be simulated.

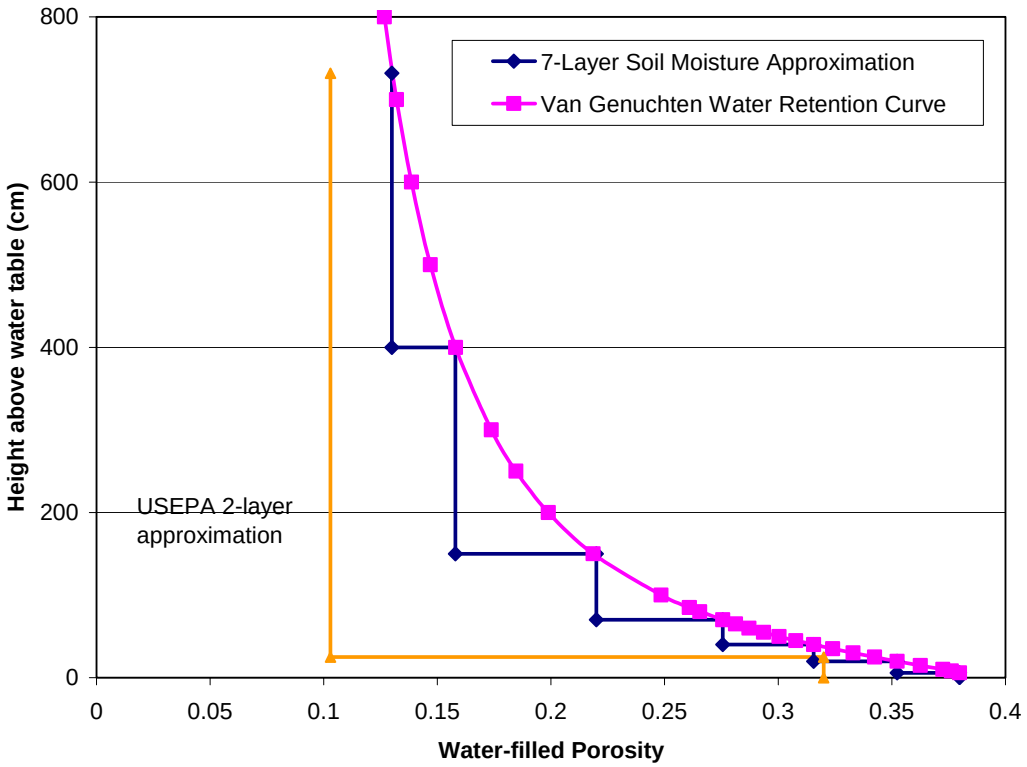

Figure 1. Soil Moisture Profile for 7-Layer J&E Model (Sandy Loam)

5.6 Predicted Indoor Air Concentrations and Risk Characterization

5.6.1 Tier 2 Modeling

The Tier 2 model predictions are provided in Table 8 (soil vapor-to-indoor air), Table 9 (groundwater-to-indoor air) and Table 10 (NAPL-to-indoor air). The predicted indoor air concentrations for soil vapor samples from both 5 ft and 15 ft. below ground were below the ESLs (Table 8) for indoor air. Using the CHSSLs for indoor air, the cumulative excess cancer risk was less than $1x10^{-6}$ and hazard index was less than 1.0, indicating acceptable predicted risks.

For the groundwater-to-indoor air pathway, the predicted indoor air concentrations were less than the ESLs for indoor air with one exception (benzene). The predicted indoor benzene concentration was 0.40 µg/m^3, compared to indoor ESL of 0.084 µg/m^3. Using the CHSSLs for indoor air, the cumulative excess cancer risk was $4.8x10^{-6}$ and the hazard index was $1x10^{-2}$, indicating a predicted excess cancer risk that is slightly above the acceptable level.

For the NAPL-to-indoor pathway, the predicted indoor air concentrations were greater than the CHSSLs and ESLs for BTEX and MTBE. Using the CHSSLs for indoor air, the cumulative excess cancer risk was $5.5x10^{-3}$ and the hazard index was $1x10^{+1}$, indicating a predicted excess cancer risk that is well above the acceptable level.

5.6.2 Tier 3 Modeling

The Tier 3 modeling was completed for benzene and toluene. The predicted vapor attenuation factors (alphas) were:

Benzene: Alpha = 3.7E-09
Toluene: Alpha = 1.6E-08

The predicted soil vapor concentration profile for toluene is compared to the measured toluene vapor concentrations at the multi-level probe (MIP-8) in Figure 2. The above attenuation factors are roughly two orders-of-magnitude less than those calculated using the Johnson and Ettinger model with a two-layer soil moisture model and 10X empirical reduction factor to account for bioattenuation. This means that predicted indoor air concentrations for the Tier 3 modeling would be well below levels of potential concern.

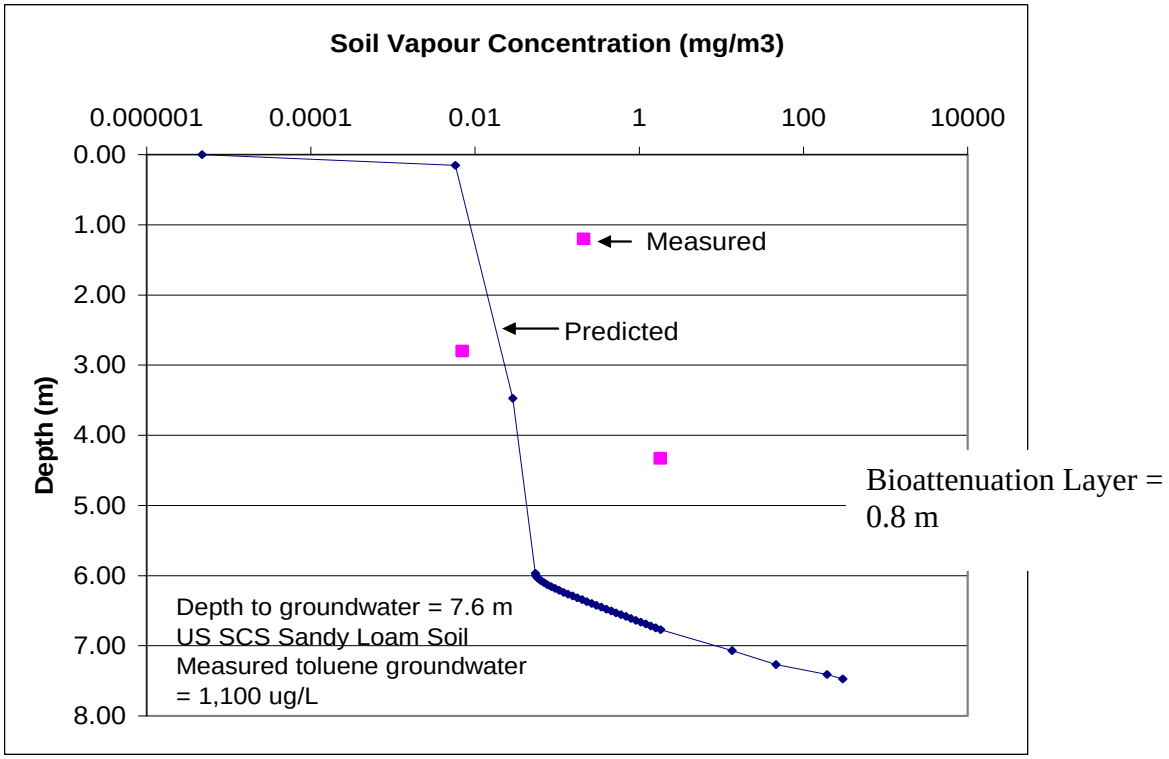

Figure 2. Comparison Measured and Predicted Toluene Soil Vapor Using 7-Layer Soil Moisure Model with First-Order Biodegradation (k = 0.018 hr-1)

5.6.3 Discussion

The predicted indoor air concentrations were less than the ESLs for the soil vapor-to-indoor air scenario modeled using the Johnson and Ettinger model. When a groundwater-to-indoor air scenario is modeled assuming a two-layer soil moisture model and 10X empirical reduction factor, the predicted indoor benzene concentration exceeds the indoor air ESL. Using the predicted groundwater alpha, the concentration of benzene in groundwater that corresponds to an incremental lifetime cancer risk of $1x10^{-6}$ was back calculated to be 418 μg/L. This is slightly less than the groundwater ESL of 540 μg/L for benzene. The site specific benzene concentration is slightly higher than the ESL since a less conservative soil moisture was chosen than that assumed in the development of the ESL.

For the NAPL-to-indoor air scenario much higher indoor air concentrations and health risks were predicted. However, this scenario is conservative in that it is assumed that NAPL is fully exposed to soil vapor (i.e., above the capillary transition zone) and there is no biodegradation. This scenario does, however, illustrate the significant difference in source strength concentrations for a dissolved plume versus a NAPL source.

The Tier 3 modeling was performed to evaluate the influence of variably saturated soil profile and first-order bioattenuation. Although the modeling results are highly approximate, they illustrate the effect the capillary fringe and bioattenuation has on reducing the vapor flux toward a building. The measured and modeled soil vapor concentrations for toluene are similar suggesting that the assumptions for first-order decay rate and dominant biodecay layer thickness are reasonable. Similar results were obtained for benzene.

At the Groth Brothers site there is a relatively thick unsaturated zone and slab-at-grade building construction is proposed. Provided that the NAPL smear zone stays submerged, the measured soil vapor concentrations and modeling results suggest that there is relatively low potential for soil vapor intrusion into buildings that would result in indoor vapor concentrations above acceptable risk levels. If the water table elevation drops to below the top of the NAPL zone, the deep soil vapor concentrations would be expected to increase. While bioattenuation of hydrocarbon vapors would be expected, it is not certain whether significant vapor intrusion (i.e., unacceptable risk levels) can be ruled out for this scenario. Factors that would contribute to significant bioattenuation below buildings are the depth to NAPL (approximately 32 feet) and proposed construction (slab-at-grade). Factors that could hinder bioattenuation would be the building foundation slab, which would tend to hinder oxygen migration to below the building (i.e., compared to vegetated surface cover or asphalt, which is often cracked and relatively permeable). Depending on

the size of the building, an oxygen-limited zone might form below the central portions of the slab.

5.7 Uncertainty Assessment

The soil vapor characterization program consisted of one monitoring round completed in April 2006. There is uncertainty with respect to seasonal or longer-term variability in soil vapor concentrations in response to water table fluctuations. There is also spatial concentration variability due to the relatively complex geology at the site.

There is uncertainty in the exposure modeling completed to predict indoor air concentrations. However, given the climatic conditions at the site, the expected construction and available information on subsurface conditions, the input parameters used for the Johnson and Ettinger modeling are considered reasonable best estimates (i.e. not conservative). The biodegradation modeling is relatively uncertain and does not include consideration of potential oxygen limitations below buildings. However, for a dissolved groundwater scenario and migration through the capillary fringe, the hydrocarbon flux would be expected to be sufficiently low that oxygen would not be limiting. For a NAPL source above the water table, there is greater uncertainty in model predictions. The Tier 2 model predictions for the NAPL case are likely highly conservative since no biodegradation was allowed for.

The assumptions used to develop the indoor air CHSSLs and ESLs are considered conservative. There is uncertainty in the development of toxicity reference factors for humans; safety or uncertainty factors of 100 or more are applied in extrapolating from animal data to humans. Exposures above the reference concentration *may* pose a health risk, but the true threshold for a toxic response in humans may in fact be much higher. For carcinogens, slope factors or unit risk factors are generally derived by assuming no threshold of effect and extrapolating responses observed in animals at high dose to the low doses in the environment received by human receptors. Lastly, the published toxicity values are often the 95 percent upper confidence limit on the mean of the results for various individual toxicity tests. The exposure duration assumed for a residential receptor (350 days per year for 30 years) is considered conservative.

6.0 CONCLUSIONS AND RECOMMENDATIONS

A screening level risk assessment was completed to evaluate potential vapor intrusion for a future residential land use scenario at the Groth Brothers site. To provide data for evaluation of soil vapor intrusion, a soil vapor program was completed in April 2006.

The results of the this program indicated relatively low concentrations (i.e., generally $\mu g/m^3$ levels) of BTEX in the vadose zone.

A modeling study involving several different scenarios was completed to evaluate potential indoor vapor concentrations for a future building. The predicted indoor air concentrations were less than the CHSSLs and ESLs for the soil vapor-to-indoor air scenario modeled using the Johnson and Ettinger model, in conjunction with the soil vapor sampling results. When a groundwater-to-indoor air scenario is modeled assuming a two-layer soil moisture model and 10X empirical reduction factor for biodegradation, the predicted indoor benzene concentration exceeds the indoor air ESL.

For the NAPL-to-indoor air scenario much higher indoor air concentrations and health risks were predicted. However, this scenario is conservative in that it is assumed that NAPL is fully exposed to soil vapor (i.e., above the capillary transition zone) and there is no biodegradation. This scenario does, however, illustrate the significant difference in source strength concentrations for a dissolved and NAPL source.

It is recommended that remedial measures be taken to reduce dissolved groundwater concentrations such that, as a minimum, the back calculated groundwater concentration obtained using the site-specific Johnson and Ettinger model (i.e., benzene equal to 418 μg/L) are met on the Groth Brothers site. Since there is some uncertainty in soil vapor intrusion for a NAPL scenario, it is recommended that NAPL source mitigation be implemented, focusing on shallow NAPL near the water table. Additional soil vapor monitoring is recommended to evaluate temporal variability. This vapor monitoring could be completed during and after remediation to evaluate influence of source treatment on vapor concentrations. An alternate approach may be to rely on soil vapor measurements for development of remediation goals (i.e., as opposed to groundwater).

TABLE 3
Soil Vapor Program Results April 25, 2006
Groth Bothers Assessment,
59 South L Street, Livermore, CA

Location					MW-2	MW-4	MIP-2	MIP-8	MIP-8	MIP-8	MIP-10	MIP-13
SCN	CHHSLs for Shallow Soil Gas[2]	CHHSLs for Shallow Soil Gas[2]	CHHSLs for Shallow Soil Gas[2]	ESLs for Shallow Soil Gas[3]	MW-2	MW-4	MIP-2	MIP-8-5'	MIP-8-10'	MIP-8-15'	MIP-10	MIP-13
Depth (feet)					5	5	5	5	10	15	5	5
Date Sampled					25-Apr-06	25-Apr-06	25-Apr-06	25-Apr-06	25-Apr-06	25-Apr-06	25-Apr-06	25-Apr-06
QA/QC	car/non-car	Carcinogenic	Non-carcinogenic				FDA			FDA		
Non-Halogenated Volatiles												
Methyl Tertbutyl Ether (MTBE)	**4.00E+03**	**4.00E+03**	**3.60E+06**	9.40E+03	ND (4.1)	ND (4.0)	ND (4.2)	ND (4.4)	ND (4.4)	ND (11)	ND (4.3)	ND (8.2)
Benzene	**3.62E+01**	**3.62E+01**	**2.70E+04**	8.50E+01	5.1	12	ND (3.7)	8.6	7.3	**61**	11	12
Toluene	**1.35E+05**	-	**1.35E+05**	6.30E+04	11	580	1000	210	4.9	1600	660	2600
Ethylbenzene	-[4]	-[4]	-[4]	4.20E+05	ND (5.0)	16	32	9.1	ND (5.2)	30	33	49
meta- & para-Xylene	**3.17E+05**[5]	-	**3.17E+055**		9.6	62	120	30	ND (5.2)	97	130	180
ortho-Xylene	**3.15E+05**	-	**3.15E+05**		ND (5.0)	17	38	11	ND (5.2)	25	39	50
total Xylenes	-	-	-	1.50E+05	<14.6	79	158	41	ND (10.4)	122	169	230
$TPH_{(gasolines)}$	-	-	-	2.60E+04	930	3700	3400	2200	1300	18000	3500	9400
Total excess carcinogenic risk (for CHHSLs)[6,7]					1.41E-06	3.31E-06	-	2.38E-06	2.02E-06	1.69E-05	3.04E-06	3.31E-06
Hazard index (for CHHSLs)[6,7]					2.70E-04	4.79E-03	7.53E-03	1.91E-03	3.07E-04	1.42E-02	5.42E-03	1.99E-02
Fixed Gases												
Oxygen (%)					18	20	18	17	17	20	19	21
Methane (%)					0.0011	0.0026	0.001	0.004	0.0045	0.01	0.0022	0.0021
Carbon Dioxide (%)					2.4	1	2.6	3	3.2	0.26	2.5	0.58
Leak Detection Compound												
2-Propanol					ND (11)	52	36	26	ND (12)	44	16	34

Notes:

1) Results are expressed in micrograms per cubic meter (ug/m^3) unless otherwise indicated.

2) California Human Health Screening Levels (CHHSLs) for Soil Gas are based on soil gas concentrations within 5 feet (1.5m) below a building foundation or ground surface. CHHSLs provided are for Residential Land Use.

3) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for Soil Gas are based on soil gas concentrations within 5 feet (1.5m) below a building foundation or ground surface. CHHSLs provided are for Residential Land Use.

4) Calculation of a screening number has been postponed until the toxicity criterion currently being developed by OEHHA is published as a final document.

5) Most conservative screening level (para-Xylene) is shown.

6) No units applicable for this parameter.

7) Cumulative risks were not calculated when soil vapor concentrations were below the detection limit

ND - Not detected at concentrations above laboratory detection limit shown in parentheses.

FDA - Field Duplicate Available

Concentration is greater than CHHSL	**X**
Concentration is greater than ESL	X

TABLE 4

Soil Vapor Program Duplicate Sample Analysis Results April 25, 2006
Groth Bothers Assessment,
59 South L Street, Livermore, CA

Location			MIP-2	MIP-2	RPD	MIP-8	MIP-8	RPD
SCN	CHHSLs for Shallow Soil Gas[2]	ESLs for Shallow Soil Gas[3]	MIP-2	MIP-2 Duplicate		MIP-8-15'	MIP-8-15' Duplicate	
Depth (feet)			5	5		15	15	
Date Sampled			25-Apr-06	25-Apr-06		25-Apr-06	25-Apr-06	
QA/QC			FDA	FD	%	FDA	FD	%
Non-Halogenated Volatiles								
Methyl Tertbutyl Ether (MTBE)	**4.00E+03**	9.40E+03	ND (4.2)	-	-	ND (11)	ND (4.0)	
Benzene	**3.62E+01**	8.50E+01	ND (3.7)	-	-	**61**	**55**	3%
Toluene	**1.35E+05**	6.30E+04	1000	-	-	1600	1800	3%
Ethylbenzene	- [4]	4.20E+05	32	-	-	30	34	3%
meta- & para-Xylene	**3.17E+05**[5]		120	-	-	97	110	3%
ortho-Xylene	**3.15E+05**		38	-	-	25	30	5%
total Xylenes		1.50E+05	158	-	-	122	140	3%
$TPH_{(gasolines)}$		2.60E+04	3400	-	-	18000	16000	3%
Fixed Gases								
Oxygen (%)			18	18	0%	20	-	-
Methane (%)			0.001	0.001	0%	0.01	-	-
Carbon Dioxide (%)			2.6	2.6	0%	0.26	-	-
Leak Detection Compound								
2-Propanol			36	-	-	44	57	6%

Notes:

1) Results are expressed in micrograms per cubic meter (ug/m^3) unless otherwise indicated.

2) California Human Health Screening Levens (CHHSLs) for Soil Gas are based on soil gas concentrations within 5 feet (1.5m) below a building foundation or ground surface. CHHSLs provided are for Residential Land Use.

3) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for Soil Gas are based on soil gas concentrations within 5 feet (1.5m) below a building foundation or ground surface. ESLs provided are for Residential Land Use.

4) Calculation of a screening number has been postponed until the toxicity criterion currently being developed by OEHHA is published as a final document.

5) Most conservative screening level (para-Xylene) is shown.

6) ND - Not detected at concentrations above laboratory detection limit shown in parentheses.

7) RPD - Relative Percent Difference

8) nc - not calculated

TABLE 5
Estimated Groundwater Concentrations,
Groth Brothers Assessment, 59 South L Street, Livermore, CA

Location / Date Sampled	ESLs Groundwater[2]	CB-8GW 29-Mar-06
Non-Halogenated Volatiles		
Methyl Tertbutyl Ether (MTBE)	2.40E+04	830
Benzene	5.40E+02	2,000
Toluene	3.80E+05	1,100
Ethylbenzene	1.70E+05	4,100
total Xylenes	1.60E+05	10,000
$TPH(_{gasolines})$	na	82,000

Notes:

1) Groundwater concentrations are best-estimate of representative groundwater concentrations on Groth Brothers property, based on March 29, 2006 sampling at CB-8GW.

2) Results are expressed in micrograms per L (ug/L).

3) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for evaluation of potential vapor intrusion concerns; residential land use, high permeabiliy soil.

na - not available

Concentration is greater than ESL X

TABLE 7
Site Specific Input Parameters for Johnson and Ettinger model, Groth Brothers Assessment

Parameter		Unit	California Human Health Screening Level and OEHHA (2004) Defaults for Soil Vapor Pathway[1]	Guidance Evaluation & Mitigation of Subsurface Vapor Intrusion to Indoor Air Site-Specific Input Parameters (Table 3)[3]	SF Bay RWQCB Groundwater Screening Levels for Vapor High Permeability Soil	SF Bay RWQCB Soil Vapor Screening Levels for VI High Permeability Soil	Livermore Valley Gas Soil Vapor to Indoor Air	Livermore Valley Gas Groundwater to Indoor Air - 2-Layer	Livermore Valley Gas Groundwater to Indoor Air - 2-Layer
Groundwater or Soil Vapor Concentration			N/A	Maximum (future)	N/A	N/A	Maximum	Footnote 6	Est. mole fraction
Depth to contamination / measurement pt.[7]		m	N/A	N/A			1.5 and 4.5	7.62	9.75
Land use Scenario			Residential building	Residential building	Residential building	Residential building	Future residential building	Future residential building	Future residential building
Soil Parameters									
Capillary Zone					Clay Loam			Sandy Loam	
Thickness			N/A	Site specific	46.8	N/A	N/A	0.25	N/A
Total Porosity			N/A	Site specific	0.43	N/A	N/A	0.387	N/A
Water-filled Porosity			N/A	Site specific	0.375	N/A	N/A	0.32	N/A
Unsaturated Zone									
Layer 1 - Soil Type		-	Engineered fill	Site specific	Clay Loam	Sand	Sandy Loam	Sandy Loam	Sandy Loam
Layer 1 (deepest layer) - Thickness		m	0.3	Site specific	2	0.15	1.5 and 4.5	7.07	9.75
Layer 1 - Total Porosity		-	0.43	Site specific	0.43	0.43	0.387	0.387	0.387
Layer 1 - Water-filled Porosity		-	0.13	Site specific	0.3	0.15	0.103	0.103	0.103
Layer 1 - Soil bulk density		g/cm^3	1.5	Site specific	1.5	1.5	N/A	N/A	N/A
Layer 1 - Soil organic carbon fraction		-	0.002	Site specific	Not used	N/A	N/A	N/A	N/A
Layer 2 - Soil Type		-	Sand	Site specific	Sand	N/A	N/A	N/A	N/A
Layer 2 - Thickness		m	0.1	Site specific	1	N/A	N/A	N/A	N/A
Layer 2 - Total Porosity		-	0.375	Site specific	0.43	N/A	N/A	N/A	N/A
Layer 2 - Water-filled Porosity		-	0.321	Site specific	0.15	N/A	N/A	N/A	N/A
Layer 2 - Soil bulk density		g/cm^3	1.66	Site specific	1.5	N/A	N/A	N/A	N/A
Layer 2 - Soil organic carbon fraction		-	0.002	Site specific	Not used	N/A	N/A	N/A	N/A
Soil temperature		oC	N/A	Site specific	15	15	N/A	N/A	N/A
Soil air permeability		m^2	N/A	Site specific	Not used	N/A	N/A	N/A	N/A
Biodegradation Parameters									
Biodegradation Adjustment			None	None	10X upward[5]	None	None	None, 10X	None, 10X
Building Properties									
Assumed building foundation type			Slab-on-grade	Site specific	Slab-on-grade	Slab-on-grade	Slab-on-grade	Slab-on-grade	Slab-on-grade
Diffusion Path Length	L_d	cm	40	Site specific	300	15? or 0?	N/A	N/A	N/A
Convection Path Length (slab thickness)	L_p	cm	9	Site specific	15	15	N/A	N/A	N/A
Enclosed space floor width (building width)	W_B	cm	1000	Site specific	960	960	1000	1000	1000
Enclosed space floor length (building length	L_B	cm	1000	Site specific	960	960	1000	1000	1000
Building footprint area	A	m^2	100	Site specific	92.16	92.16	100	100	100
Enclosed space (building) height	H	m	2.44	Site specific	2.44	2.44	3.66	3.66	3.66
Depth to base foundation below grade - slab-on-grade	Z_{crack}	cm	9	15	15	15	30	30	30
Depth to base foundation below grade - basement	Z_{crack}	cm	N/A	200	Not used	Not used	N/A	N/A	N/A
Subsurface foundation area for vapour intrusion	A_B	m^2	100	Site specific	Not used	Not used	112	112	112
Floor-wall seam crack width (perimeter crack)	W	cm	0.1	Site specific	0.1	0.1	Not used	Not used	Not used
Crack ratio (perimeter Crack)	η	unitless	Calculated	0.005	Calculated	Calculated	0.005	0.005	0.005
Foundation thickness	T	cm	9	Site specific	15	15	15	15	15
Floor wall seam perimeter length	Xcrack	cm	4000	Site specific	Not used	Not used	N/A	N/A	N/A
Indoor air exchange rate - residential	ACH	1/hr	0.25	0.5	1	1	1	1	1
Indoor air exchange rate - commercial	ACH	1/hr	-	1	2	2	N/A	N/A	N/A
Building ventilation rate	Q_{build}	m^3/min	Calculated	Site specific	Calculated	Calculated	N/A	N/A	N/A
Indoor-outdoor pressure differential	ΔP	g/cm^2-s	40	40[4]	Not used	Not used	N/A	N/A	N/A
Soil gas advection rate	Q_{soil}	L/min	Calculated	5[4]	5	5	5	5	5
Soil sas advection rate/building ventilation	Qs/Qb	unitless	Calculated	Site specific	Calculated	Calculated	0.0016[8]	0.0016[8]	0.0016[8]

Notes:
1. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties January 2005 California Environmental Protection Agency
2. Draft Document Proposed Methodology for Calculating Advisory Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil External Review Draft March 2004, Integrated Risk Assessment Section Office of Environmental Health Hazard Assessment, CA Environmental Protection Agency
3. Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Department of Toxic Substances Control, California Environmental Protection Agency, Dec 15, 2004 (Revised February 7, 2005)
4. For future scenario use Qsoil of 5 L/min
5. 10 X upward adjustment in screening level for BTEX chemicals to account for biodegradation
6. Near-maximum concentration based on recent monitoring
7. From ground surface
8. Calculated

TABLE 8
Soil Vapor-to-Indoor Air Modeling Results, Groth Brothers Assessment

	CHHSLs for Indoor Air car/Non-car (ug/m^3)	CHHSLs for Indoor Air Carcinogenic (ug/m^3)	CHHSLs for Indoor Air non-carcinogenic (ug/m^3)	ESLs for Indoor Air	Soil Vapor to Indoor Air (5 foot data)			Soil Vapor to Indoor Air (15 foot data)		
					Soil Vapor Conc. 5 feet below grade (ug/m^3)[4]	Vapor Attenuation Factor (-)	Indoor Air Conc. (ug/m^3)	Soil Vapor Conc. 15 feet below grade (ug/m^3)[5]	Vapor Attenuation Factor (-)	Indoor Air Conc. (ug/m^3)
Methyl Tertbutyl Ether (MTBE)	**9.53E+00**	**9.53E+00**	**8.35E+03**	9.40E+00	ND	nc	nc	ND	nc	nc
Benzene	**8.40E-02**	**8.40E-02**	**6.26E+01**	8.50E-02	12	4.07E-04	4.91E-03	61	1.79E-04	1.10E-02
Toluene	**3.13E+02**	**-**	**3.13E+02**	6.30E+01	2600	4.07E-04	1.07E+00	1600	1.78E-04	2.84E-01
Ethylbenzene	**-** [3]	**-** [3]	**-** [3]	4.20E+02	49	3.76E-04	1.85E-02	30	1.58E-04	4.74E-05
Total Xylenes	**7.30E+02**	**-**	**7.30E+02**	1.50E+02	230	3.81E-04	8.75E-02	122	1.61E-04	1.97E-02
$TPH_{(gasolines)}$	**na**	**-**	**na**	2.60E+01	9400	4.07E-04	3.83E+00	18000	1.79E-04	3.22E+00
Total excess carcinogenic risk (for CHHSLs)[6]							5.84E-08			1.30E-07
Hazard index (for CHHSLs)[6]							3.60E-03			1.11E-03

Notes:

1) California Human Health Screening Levels (CHHSLs) provided are for Residential Land Use.

2) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for Indoor Air provided are for Residential Land Use.

3) Calculation of a screening number has been postponed until the toxicity criterion currently being developed by OEHHA is published as a final document.

4) Soil vapor concentrations from MIP-13 were used for modelling soil vapor from 5 feet.

5) Soil vapor concentrations from MIP-8 (at 15 feet) were used for modelling soil vapor from 15 feet.

ND - Not detected at concentrations above laboratory detection limit shown in parentheses.

nc - not calculated

na - not available

Concentration is greater than CHHSL	**X**
Concentration is greater than ESL	X

TABLE 9
Groundwater-to-Indoor Air Modeling Results, Groth Brothers Assessment

	CHHSLs for Indoor Air car/Non-car (ug/m^3)	CHHSLs for Indoor Air Carcinogenic (ug/m^3)	CHHSLs for Indoor Air non-carcinogenic (ug/m^3)	ESLs for Indoor Air	Groundwater to Indoor Air (2-layer model)			
					Groundwater Conc. (ug/L)[4]	Soil Vapor Conc. (ug/m^3)	Vapor Attenuation Factor (-)	Indoor Air Conc. (ug/m^3)
Methyl Tertbutyl Ether (MTBE)	**9.53E+00**	**9.53E+00**	**8.35E+03**	9.40E+00	830	1.75E+04	1.85E-06	3.24E-02
Benzene	**8.40E-02**	**8.40E-02**	**6.26E+01**	8.50E-02	2000	3.65E+05	1.10E-06	**4.02E-01**
Toluene	**3.13E+02**	**-**	**3.13E+02**	6.30E+01	1100	2.33E+05	1.07E-06	2.50E-01
Ethylbenzene	**-** [3]	**-** [3]	**-** [3]	4.20E+02	4100	1.00E+06	9.22E-07	9.24E-01
Total Xylenes	**7.30E+02**	**-**	**7.30E+02**	1.50E+02	10,000	2.37E+06	8.94E-07	2.26E+00
$TPH_{(gasolines)}$	**na**	**-**	**na**	2.60E+01	nc	nc	nc	nc
Total excess carcinogenic risk (for CHHSLs)[6]								4.79E-06
Hazard index (for CHHSLs)[6]								1.03E-02

Notes:

1) California Human Health Screening Levels (CHHSLs) provided are for Residential Land Use.
2) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for
3) Calculation of a screening number has been postponed until the toxicity criterion currently being developed by OEHHA is published as a final document.
4) Groundwater concentrations from CB-8GW (same location as MIP-8) on March 29, 2006 were used for modelling groundwater to soil vapor pathway.
nc - not calculated
na - not available

Concentration is greater than CHHSL	**X**
Concentration is greater than ESL	X

TABLE 10
NAPL-to-Indoor Air Modeling Results, Groth Brothers Assessment

	CHHSLs for Indoor Air car/Non-car (ug/m^3)	CHHSLs for Indoor Air Carcinogenic (ug/m^3)	CHHSLs for Indoor Air non-carcinogenic (ug/m^3)	ESLs for Indoor Air	NAPL to Indoor Air: Mole Fraction (-)	Soil Vapor Conc. (ug/m^3)	Vapor Attenuation Factor (-)	Indoor Air Conc. (ug/m^3)
Methyl Tertbutyl Ether (MTBE)	**9.53E+00**	**9.53E+00**	**8.35E+03**	9.40E+00	0.138	1.68E+08	1.05E-04	**1.76E+04**
Benzene	**8.40E-02**	**8.40E-02**	**6.26E+01**	8.50E-02	0.0082	3.32E+06	9.20E-05	**3.06E+02**
Toluene	**3.13E+02**	**-**	**3.13E+02**	6.30E+01	0.068	9.71E+06	9.00E-05	**8.74E+02**
Ethylbenzene	**-** [3]	**-** [3]	**-** [3]	4.20E+02	0.010	5.50E+05	7.95E-05	4.37E+01
Total Xylenes	**7.30E+02**	**-**	**7.30E+02**	1.50E+02	0.089	4.52E+06	8.15E-05	3.68E+02
$TPH_{(gasolines)}$	**na**	**-**	**na**	2.60E+01	nc	nc	nc	nc
Total excess carcinogenic risk (for CHHSLs) [6]								5.49E-03
Hazard index (for CHHSLs) [6]								1.03E+01

Notes:

1) California Human Health Screening Levels (CHHSLs) provided are for Residential Land Use.
2) San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for Indoor
3) Calculation of a screening number has been postponed until the toxicity criterion currently being developed by OEHHA is published as a final document.

ND - Not detected at concentrations above laboratory detection limit shown in parentheses.
nc - not calculated
na - not available

Concentration is greater than CHHSL	**X**
Concentration is greater than ESL	X