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950 Tower Lane. Ste. 1225
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December 16, 2016

Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Attention: Mr. Mark Detterman, PG, CEG, Senior Hazardous Materials Specialist

TRANSMITTAL LETTER
DECEMBER 2016 REMEDIAL PROGRESS REPORT
SOIL VAPOR SYSTEM OPERATIONS FROM NOVEMBER 8 THROUGH 15, 2016
6701, 6705, and 6707 SHELLMOUND STREET
EMERYVILLE, CALIFORNIA
Fuel Leak Case No. RO0000548
Geotracker Global ID T0600100894

Dear Mr. Detterman:

Submitted herewith for your review is the *December 2016 Remedial Progress Report, Soil Vapor System Operations from November 8 Through 15, 2016, 6701, 6705, and 6707 Shellmound Street, Emeryville, California* dated December 16, 2016, prepared by PES Environmental, Inc.

I declare, under penalty of perjury, that the information and/or recommendations contained in the above-referenced document for the subject property are true and correct to the best of my knowledge.

Very truly yours,

ANTON EMERYVILLE, LLC

R. Green

Rachel Green
Development Manager

PES Environmental, Inc.
Engineering & Environmental Services

December 16, 2016

1448.001.02.005

Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Attention: Mr. Mark Detterman, P.G., C.E.G.

Re: December 2016 Remedial Progress Report
Soil Vapor System Operations from November 8 through 15, 2016
6701, 6705, and 6707 Shellmound Street
Emeryville, California
Fuel Leak Case No. RO0000548
Geotracker Global Id T0600100894

Dear Mr. Detterman:

PES Environmental, Inc. (PES) has prepared this December 2016 Remedial Progress Report (RPR) on behalf of Anton Emeryville, LLC (Anton) to fulfill the monthly remedial progress reporting requirements[1] requested by Alameda County Environmental Health (ACEH) for the property at 6701, 6705, and 6707 Shellmound Street in Emeryville, California (collectively, the subject property or site). The subject property is currently listed as an open Spills, Leaks, Investigation and Cleanup (SLIC) case (listed under Mike Roberts Color Production at 6707 Bay Street) with ACEH as the lead environmental regulatory agency.

This RPR has been prepared in accordance with the November 8, 2016 letter from ACEH requesting monthly RPRs during operation of the soil vapor extraction (SVE) system as an interim remediation method (IRM), and includes:

1. Diagram of the SVE system;
2. Operation, Maintenance, Monitoring, and Sampling Plan (O&M Plan);
3. Startup and summary of SVE monitoring activities;

[1] ACEH, 2016. *Request for Interim Remedial Action Monitoring Plan and Schedule; SCP Case RO000548 and Geotracker Global ID T0600100894, Mike Roberts Color Production 6707 Bay Street, Emeryville, CA 94608.* November 8.

4. Summary tables of laboratory analytical data for baseline vapor samples collected prior to startup; and

5. Anticipated field activities for following month.

Operation of the SVE system commenced on November 8, 2016. The reporting period covered by this RPR is inclusive of November 8 through 15, 2016. Future RPR reporting periods will generally cover a 30-day reporting period (e.g., the next RPR will present a summary of the November 15 through December 15, 2016 SVE operation period).

SVE System Diagram

The SVE well network consists of 19 soil vapor extraction wells (wells SVE-1 through SVE-19) connected through schedule 40 polyvinyl chloride (PVC) piping plumbed to the SVE system air inlet. The extracted airstream is conveyed from the air inlet through a water knockout vessel, vacuum blower and through one treatment vessel containing 2,000 lb. of granular activated carbon (GAC) and two vessels containing 4,000 lb. of granular Hydrosil HS-600 potassium permangenate (7%) zeolite to remove volatile organic compounds (VOCs) contained in the extracted vapors. After treatment, the airstream is conveyed through an exhaust stack prior to discharge to the atmosphere above the roof line of the building. Monitoring points near each wellhead, between vessels, as well as at multiple points past the air inlet are monitored. Influent, mid-point, and effluent monitoring is conducted in accordance with the Authority to Construct (ATC) permit obtained from Bay Area Air Monitoring District (BAAQMD), presented in Attachment A of Appendix A.

A schematic diagram of the SVE system is presented in Attachment B of the Standard Operating Procedure (SOP), provided in Appendix A. Photographs of the SVE system components are presented in Appendix B.

O&M Plan

The O&M Plan, presented in Appendix A, presents the methods and procedures for routine operation, maintenance, and monitoring of the SVE system. The procedures were developed in general accordance with the DTSC' *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Vapor Intrusion Guidance), dated October 2011.

Implementation of the O&M Plan is performed by Environmental Engineering, Consulting, and Remediation, Inc. (E2CR).

Summary of SVE Monitoring

SVE field measurements completed during the RPR reporting period includes:

- Daily SVE system monitoring by E2CR, in compliance with conditions of the BAAQMD ATC permit. A summary of SVE operational data is presented in Table 1;

- Weekly field measurements conducted by PES of individual SVE well vacuum[2], flow rates[3], and total VOCs using a photoionization detector (PID)[4]. PID and vacuum measurements at SVE wells are presented in Table 2. Time-concentration plots SVE influent concentration trends will be provided in future RPRs; and

- Baseline (pre-startup) samples were collected by PES on October 31, 2016 from the extraction wells, and analyzed for the full list of VOCs using U.S. Environmental Protection Agency (EPA) Test Method TO-15. Laboratory analytical results for detected VOCs are presented in Table 3. Time-concentration plots of select COCs detected (e.g., vinyl chloride) will be presented in future RPRs.

SVE System Observed Vacuum and Flow Rate

During November 8 through 15, observed operating vacuum ranged from 4.89 to 6.5 inches of mercury.

SVE influent flow rate is estimated utilizing the blower manufacturer curve based on measured vacuum at an influent sample port upstream of the blower. As shown in Table 1, average operating flow rates during the RPR reporting period ranged from 712 to 760 standard cubic feet per minute (scfm).

Vacuum at Vapor Extraction Wells

Table 2 summarizes vacuum observations at each extraction well. In general, observed vacuum pressures from November 9 and 15, 2016, indicate well-distributed vacuum pressure through the SVE well network (i.e., similar vacuum at each well).

[2] Measured with Dwyer Series 477 digital manometer.
[3] Measured with TSI inc., Velocicalc Model 9535 digital anemometer. Due to the presence of turbulent flow at accessible SVE well monitoring points, accurate measurement of individual well flow rates were not obtained.
[4] Measured with a MiniRAE 2000 PID.

VOC Mass Removal

PID readings of total VOCs in influent vapor collected by E2CR during daily SVE system monitoring ranged from 7.0 to 17.7 parts per million by volume (ppmv). The estimated cumulative pounds of vinyl chloride extracted during this reporting period was 0.16 pounds (mass based on vinyl chloride as the primary COC).

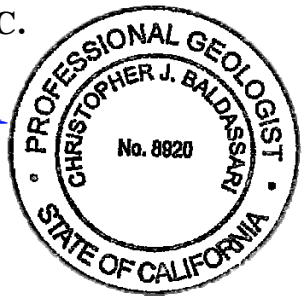
Anticipated Upcoming IRM Field Activities

- Continue daily monitoring of SVE system in accordance with BAAQMD requirements;
- Conduct weekly field measurements of SVE flow, vacuum, and total VOCs; and
- Conduct first 30-day interval vapor sampling of select SVE wells.

If you have any questions regarding this RPR, please call the undersigned at (415) 899-1600.

Very truly yours,

PES ENVIRONMENTAL, INC.



Christopher J. Baldassari, P.G.
Senior Geologist

Kyle S. Flory, P.G.
Principal Geologist

Attachments:

	Table 1	Summary of SVE System Operational Data
	Table 2	Summary of SVE Well Field Measurements
	Table 3	Summary of Laboratory Analytical Results for Vapor Samples
	Appendix A	Standard Operating Procedure (SOP), Soil Vapor Extraction System Operations, Maintenance, Compliance Monitoring, and Vapor Sampling Schedule
	Appendix B	Photographs of SVE System

TABLES

Table 1
Summary of SVE System Operational Data
Soil Vapor Extraction System
6701-6707 Shellmound Street
Emeryville, Cailifornia

Date	System Status on Arrival	Total Operating Hours	System Vacuum Reading (in. of Hg)	Average Flow Rate scfm	PID Influent (ppmv)	Lab Influent (mg/m^3)	VC Extracted (grams)	Cumulative lbs VC Extracted
11/8/16	Started	0	6.5	712	**7.0**	**0.25**	0.00	0.00
11/9/16	ON	18.7	6.2	721	**17.7**		14.6	0.03
11/10/16	ON	42.6	5.3	748	**13.0**		19.4	0.07
11/11/16	ON	63.6	4.89	760	**12.7**		17.3	0.11
11/12/16	OFF	63.6	0.00	0	**NA**		0.0	0.11
11/13/16	OFF	63.6	0.0	0	**NA**		0.0	0.11
11/14/16	ON	65.1	6.0	727	**9.0**		1.2	0.12
11/15/16	ON	90.4	6.0	727	**11.3**		19.9	0.16

Notes:
-- = Data not available
NA = Not Applicable or Not Available
in. = inches
VOC = Volatile Organic Compounds
scfm = Standard cubic feet per minute
ppmv = Parts per million by volume
lbs = Pounds
VC = Vinyl Chloride
Mass extracted are estimated on laboratory analytical data.
mg/m^3 = milligrams per cubic meter air
SVE = Soil vapor extraction

Table 2
SVE Well Field Measurements
6701 - 6707 Shellmound Street
Emeryville, California

	Units	11/9/2016	11/15/2016
SVE-1			
Total VOCs	PPMv	49.3	115.7
Vacuum	in. H2O	67.6	77.8
SVE-2			
Total VOCs	PPMv	44.3	36.5
Vacuum	in. H2O	64.2	72.3
SVE-3			
Total VOCs	PPMv	12.5	17.9
Vacuum	in. H2O	65.9	75.3
SVE-4			
Total VOCs	PPMv	26.8	40.8
Vacuum	in. H2O	66.4	75.7
SVE-5			
Total VOCs	PPMv	35.4	79.4
Vacuum	in. H2O	66.8	76.3
SVE-6			
Total VOCs	PPMv	126.2	93.3
Vacuum	in. H2O	65.2	76.9
SVE-7			
Total VOCs	PPMv	17.1	66.4
Vacuum	in. H2O	64.9	77.0
SVE-8			
Total VOCs	PPMv	5.7	40.2
Vacuum	in. H2O	65.0	77.2
SVE-9			
Total VOCs	PPMv	1.7	13.1
Vacuum	in. H2O	67.6	77.8
SVE-10			
Total VOCs	PPMv	1.7	24.9
Vacuum	in. H2O	67.7	77.9
SVE-11			
Total VOCs	PPMv	12.3	31.1
Vacuum	in. H2O	67.5	77.7
SVE-12			
Total VOCs	PPMv	15.2	46.1
Vacuum	in. H2O	67.6	77.7
SVE-13			
Total VOCs	PPMv	4.2	50.2
Vacuum	in. H2O	67.8	77.6
SVE-14			
Total VOCs	PPMv	4.5	1.2
Vacuum	in. H2O	67.7	77.8
SVE-15			
Total VOCs	PPMv	2.5	34.2
Vacuum	in. H2O	67.6	77.8
SVE-16			
Total VOCs	PPMv	127.1	121.7
Vacuum	in. H2O	67.5	77.8
SVE-17			
Total VOCs	PPMv	15.2	32.1
Vacuum	in. H2O	67.8	77.9
SVE-18			
Total VOCs	PPMv	8.5	60.3
Vacuum	in. H2O	67.7	77.6
SVE-19			
Total VOCs	PPMv	8.3	83.9
Vacuum	in. H2O	67.5	77.6

Note:
SVE = Soil vapor extraction
PID = Photoionization Detector
-- = Not measured
PPMv = parts per million by volume
in. H2O = inches of water

Table 3
Summary of Laboratory Analytical Results for Vapor Samples
Soil Vapor Extraction System
6701, 6705, and 6707 Shellmound Street, Emeryville, California

Sample Location	Sample ID	Date	Sample Depth (feet bgs)	TCE ($\mu g/m^3$)	cis-1,2-DCE ($\mu g/m^3$)	trans-1,2-DCE ($\mu g/m^3$)	Vinyl chloride ($\mu g/m^3$)	1,1,1-TCA ($\mu g/m^3$)	1,1,2,2-PCA ($\mu g/m^3$)	MEK ($\mu g/m^3$)	MIBK ($\mu g/m^3$)	Acetone ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	m,p-Xylene ($\mu g/m^3$)	o-Xylene ($\mu g/m^3$)	1,2,4-TMB ($\mu g/m^3$)	1,3,5-TMB ($\mu g/m^3$)	1,3-DCB ($\mu g/m^3$)	4-Ethyltoluene ($\mu g/m^3$)	Carbon disulfide ($\mu g/m^3$)	Chloroform ($\mu g/m^3$)	Other VOCs ($\mu g/m^3$)
SVE Wells																								
SVE-1	SVE-1	7/13/2016	5 to 10	< 140	< 110	< 110	**3,400**	< 110	< 180	< 160	< 110	< 790	< 85	< 100	< 120	< 230	< 120	< 260	< 130	< 160	< 130	< 170	< 98	
SVE-1	SVE-1	7/14/2016	5 to 10	< 1600	**3,500**	**1,900**	**40,000**	< 1200	< 2000	< 1700	< 1200	< 8600	< 930	< 1100	< 1300	< 2500	< 1300	< 2900	< 1400	< 1800	< 1400	< 1800	< 1100	
SVE-1	SVE-1-103116	10/31/2016	5 to 10	**120**	**670**	**270**	**16,000**	< 74	< 120	**10,000**	< 75	**7,700**	**130**	**66**	< 79	< 160	< 79	< 180	< 89	< 110	< 89	< 110	< 67	**150 (1,1-DCE)**
SVE-2	SVE-2-103116	10/31/2016	5 to 10	< 26	< 19	< 19	**20**	< 20	< 34	**2,400**	< 20	**1,700**	**41**	< 18	< 21	< 42	< 21	< 48	< 24	< 29	< 24	< 30	< 18	
SVE-3	SVE-3-103116	10/31/2016	3.96 to 8.96	< 16	**14**	< 12	**40**	< 13	< 21	**280**	< 13	**190**	**290**	**240**	**92**	**770**	**130**	**110**	**53**	< 18	**27**	**190**	< 11	
SVE-4	SVE-4-103116	10/31/2016	5 to 10	**18**	**51**	**12**	**170**	< 7.1	< 12	**290**	< 7.1	**360**	**67**	**12**	**8.3**	**27**	**10**	< 17	< 8.5	< 10	< 8.5	**240**	< 6.3	**21 (1,2-DCB)**
SVE-5	SVE-5-103116	10/31/2016	5 to 10	**69**	**160**	**23**	**230**	< 7.3	< 12	**320**	< 7.3	**150**	**170**	**33**	**19**	**110**	**23**	**23**	**15**	**24**	< 8.8	< 11	< 6.6	**31 (1,4-DCB)**
SVE-6	SVE-6-103116	10/31/2016	5 to 10	< 29	< 21	< 21	< 14	< 22	< 37	**1,400**	< 22	**600**	**150**	< 20	**27**	**88**	**52**	< 53	< 26	< 32	< 26	< 33	< 20	
SVE-7	SVE-7-103116	10/31/2016	5 to 10	< 7.5	< 5.6	< 5.6	**40**	< 5.7	< 9.6	**140**	< 5.8	**58**	< 4.5	< 5.3	< 6.1	< 12	< 6.1	< 14	< 6.9	< 8.4	< 6.9	< 8.7	< 5.1	
SVE-8	SVE-8-103116	10/31/2016	5 to 10	< 2.1	< 1.6	< 1.6	< 1	< 1.6	< 2.7	**26**	**3.0**	**34**	< 1.3	< 1.5	< 1.7	< 3.5	< 1.7	< 3.9	< 2	< 2.4	< 2	**17**	< 1.5	
SVE-9	SVE-9-103116	10/31/2016	5 to 10	< 22	**38**	< 16	**340**	< 17	< 28	**390**	< 17	**240**	**160**	**68**	**19**	**120**	**32**	< 40	**25**	< 25	< 20	**26**	< 15	
SVE-10	SVE-10-103116	10/31/2016	5 to 10	< 150	< 110	< 110	**3,900**	< 110	< 190	< 160	< 110	< 800	**200**	< 100	< 120	< 240	< 120	< 270	< 130	< 160	< 130	< 170	< 99	
SVE-11	SVE-11-103116	10/31/2016	5 to 10	< 95	**180**	< 70	< 45	< 73	< 120	**2,300**	< 73	**3,300**	**130**	< 67	< 77	< 150	< 77	< 170	< 87	< 110	< 87	< 110	< 65	
SVE-12	SVE-12-103116	10/31/2016	5 to 10	< 1300	**18,000**	**27,000**	**62,000**	< 970	< 1600	< 1400	< 970	< 7000	< 760	< 890	< 1000	< 2100	< 1000	< 2300	< 1200	< 1400	< 1200	< 1500	< 870	**2900 (1,1-DCE)**
SVE-13	SVE-13-103116	10/31/2016	5 to 10	< 54	**160**	< 40	**1,600**	< 41	< 69	**660**	< 41	**330**	**42**	< 38	< 44	< 88	< 44	< 99	< 50	< 61	< 50	< 63	< 37	
SVE-14	SVE-14-103116	10/31/2016	5 to 10	< 20	**49**	< 15	**24**	< 15	< 25	**790**	< 15	**330**	**21**	< 14	< 16	< 32	< 16	< 36	< 18	< 22	< 18	< 23	< 14	
SVE-15	SVE-15-103116	10/31/2016	5 to 10	< 360	< 270	< 270	**11,000**	< 280	< 460	**1,100**	< 280	< 2000	< 210	< 250	< 290	< 580	< 290	< 660	< 330	< 400	< 330	< 420	< 250	
SVE-16	SVE-16-103116	10/31/2016	5 to 10	< 7400	**130,000**	**45,000**	**410,000**	< 5700	< 9500	< 8200	< 5700	< 41000	< 4400	< 5200	< 6000	< 12000	< 6000	< 14000	< 6800	< 8300	< 6800	< 8600	< 5100	
SVE-17	SVE-17-103116	10/31/2016	4.79 to 9.79	< 500	**1,300**	**2,200**	**14,000**	< 380	< 640	**680**	< 380	< 2800	< 300	< 350	< 410	< 810	< 410	< 920	**950**	< 560	< 460	< 580	< 340	
SVE-18	SVE-18-103116	10/31/2016	5 to 10	< 680	< 500	< 500	**52,000**	< 520	< 870	< 750	< 520	< 3800	**880**	< 480	< 550	< 1100	< 550	< 1200	< 620	< 760	< 620	< 790	< 460	
SVE-19	SVE-19-103116	10/31/2016	5 to 10	< 99	< 73	< 73	< 47	< 76	< 130	**4,200**	< 76	**1,400**	< 59	< 70	< 80	< 160	< 80	< 180	< 91	< 110	< 91	< 120	< 68	
Soil Vapor Monitoring Probes																								
SVP-1-7.5	SVP-1-7.5	7/12/2016	7.5	< 250	**250**	< 180	**13,000**	< 190	< 310	< 270	< 190	< 1400	**250**	< 170	< 200	< 400	< 200	< 450	< 220	< 270	< 220	< 280	< 170	
SVP-2-3.5	SVP-2-3.5	7/12/2016	3.5	< 17	< 12	< 12	**920**	< 13	< 21	< 18	< 13	< 92	**28**	**31**	**14**	**55**	**23**	< 31	< 15	< 19	< 15	**83**	**78**	
SVP-2-7.5	SVP-2-7.5	7/12/2016	7.5	< 1300	< 990	< 990	**75,000**	< 1000	< 1700	< 1500	< 1000	< 7400	< 800	< 950	< 1100	< 2200	< 1100	< 2500	< 1200	< 1500	< 1200	< 1600	< 920	
SVP-3-7.5	SVP-3-7.5	7/12/2016	7.5	< 38	< 28	< 28	**2,400**	< 29	< 49	**57**	< 29	**260**	**310**	**170**	< 31	< 61	< 31	< 70	< 35	< 43	< 35	**130**	< 26	
SVP-4-3.5	SVP-4-3.5	7/12/2016	3.5	**6.9**	< 1.6	< 1.6	< 1	**9.5**	**4.8**	**19**	**11**	**44**	**19**	**18**	**23**	**120**	**54**	**17**	**8.7**	< 2.4	**3.9**	**3.1**	**57**	**2.0 (BDCM), 2.4 (Freon 12), 1.5 (MC), 2.6 (Freon 11)**
SVP-4-7.5	SVP-4-7.5	7/12/2016	7.5	**19**	**57**	**9.1**	**180**	< 4.5	< 7.6	**23**	< 4.5	**84**	**230**	**59**	**21**	**210**	**24**	**20**	**10**	**59**	< 5.4	**20**	< 4.1	**72 (1,4-DCB), 23 (NAPH)**

Table 3
Summary of Laboratory Analytical Results for Vapor Samples
Soil Vapor Extraction System
6701, 6705, and 6707 Shellmound Street, Emeryville, California

Sample Location	Sample ID	Date	Sample Depth (feet bgs)	TCE ($\mu g/m^3$)	cis-1,2-DCE ($\mu g/m^3$)	trans-1,2-DCE ($\mu g/m^3$)	Vinyl chloride ($\mu g/m^3$)	1,1,1-TCA ($\mu g/m^3$)	1,1,2,2-PCA ($\mu g/m^3$)	MEK ($\mu g/m^3$)	MIBK ($\mu g/m^3$)	Acetone ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	m,p-Xylene ($\mu g/m^3$)	o-Xylene ($\mu g/m^3$)	1,2,4-TMB ($\mu g/m^3$)	1,3,5-TMB ($\mu g/m^3$)	1,3-DCB ($\mu g/m^3$)	4-Ethyltoluene ($\mu g/m^3$)	Carbon disulfide ($\mu g/m^3$)	Chloroform ($\mu g/m^3$)	Other VOCs ($\mu g/m^3$)
SVP-5-7.5	SVP-5-7.5	7/12/2016	7.5	< 510	< 370	< 370	**22,000**	< 390	< 650	< 560	< 390	< 2800	**490**	< 360	< 410	< 820	< 410	< 930	< 460	< 570	< 460	< 590	< 350	
SVP-6-3.5	SVP-6-3.5	7/12/2016	3.5	< 1700	**14,000**	**6,100**	**100,000**	< 1300	< 2200	< 1900	< 1300	< 9600	< 1000	< 1200	< 1400	< 2800	< 1400	< 3200	< 1600	< 2000	< 1600	< 2000	< 1200	
SVP-6-7.5	SVP-6-7.5	7/12/2016	7.5	< 1800	**16,000**	**6,300**	**98,000**	< 1400	< 2300	< 2000	< 1400	< 10000	< 1100	< 1300	< 1500	< 3000	< 1500	< 3400	< 1700	< 2000	< 1700	< 2100	< 1200	
Residential Land Use ESL[1]				*240*	*4,200*	*31,000*	*4.7*	*520,000*	*24*	*2,600,000*	*1,600,000*	*16,000,000*	*48*	*160,000*	*560*	*52,000*	*52,000*	*NE*	*NE*	*NE*	*NE*	*61*	*NE*	*Varies*
Commercial/Industrial Land Use ESL[2]				*3,000*	*35,000*	*260,000*	*160*	*4,400,000*	*210*	*22,000,000*	*13,000,000*	*140,000,000*	*420*	*1,300,000*	*4,900*	*440,000*	*440,000*	*NE*	*NE*	*NE*	*NE*	*530*	*NE*	*Varies*

Notes:

Detections are shown in bold. Results equal to or exceeding commercial/industrial ESLs are shaded.

Only detected analytes are summarized on table. Refer to Appendix D for laboratory report to access entire list of compounds analyzed.

SVE = Soil vapor extraction

BDCM = Bromodichloromethane

DCB = Dichlorobenzene

DCE = Dichloroethene.

Freon 11 = Trichlorofluoromethane

Freon 12 = Dichlorodifluoromethane

MC = Methylene Chloride

MEK = Methyl Ethyl Ketone

MIBK = Methyl Isobutyl Ketone

NAPH = Naphthalene

PCA = Tetrachloroethane

TCA = Trichloroethane.

TCE = Trichloroethene.

TMB = Trimethylbenzene.

VOCs = Volatile organic compounds.

bgs = Below ground surface.

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

< 2.9 = Not detected at or above the indicated laboratory method reporting limit.

NE = Not established.

-- = Not applicable/not analyzed.

1. February 2016 Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Environmental Screening Levels (ESLs), Table SG-1 Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels. Residential.
2. February 2016 Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Environmental Screening Levels (ESLs), Table SG-1 Subslab/Soil Gas Vapor Intrusion: Human Health Risk Levels. Commercial/Industrial.

APPENDIX A

STANDARD OPERATING PROCEDURE (SOP), SOIL VAPOR EXTRACTION SYSTEM OPERATIONS, MAINTENANCE, COMPLIANCE MONITORING, AND VAPOR SAMPLING SCHEDULE

APPENDIX A

STANDARD OPERATING PROCEDURE (SOP)
SOIL VAPOR EXTRACTION SYSTEM OPERATIONS, MAINTENANCE, COMPLIANCE MONITORING, AND VAPOR SAMPLING SCHEDULE

A1. INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to establish methods and procedures for operation, maintenance, and monitoring of the soil vapor extraction (SVE) system at the 6701-6707 Shellmound Street site in Emeryville, California. The procedures described below have been developed in accordance with the DTSC' *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Vapor Intrusion Guidance), dated October 2011.

An Authority to Construct (ATC) permit was obtained from the Bay Area Air Quality Management District (BAAQMD) prior to construction and installation of the SVE system. A Start-up Notification was also filed with BAAQMD prior to SVE system startup. Copies of these documents are included as Attachment A. Permission for startup operations was granted by BAAQMD and the Alameda County Department of Environmental Health (ACEH) on November 8, 2016. Operation of the SVE system commenced on November 8, 2016. A schematic of the SVE system is included as Attachment B.

A1.1 SVE System Configuration and Monitoring

The SVE well network consists of 19 vapor extraction wells (wells SVE-1 through SVE-19) connected through schedule 40 polyvinyl chloride (PVC) piping to the SVE system air inlet. The extracted airstream is conveyed through a vacuum blower and through one 2,000 lb. granular activated carbon (GAC) and two- 4,000 lb. granular potassium permangenate zeolite to remove volatile organic compounds (VOCs) contained in the extracted vapors. After treatment, the airstream is conveyed through an exhaust stack. In addition to the extraction wells described above, the SVE system includes 10 air inlet wells (wells AI-1 through AI-10) and 6 multi-depth vapor monitoring probes to allow for periodic monitoring of VOC concentrations and vacuum pressure.

Monitoring of flow rates, vacuum pressures, and temperatures at various locations in the SVE system will be conducted in accordance with the ATC permit from BAAQMD presented in Attachment A. The SVE system will be started up and operated in accordance with manufacturer's specification by the SVE subcontractor. In accordance with the BAAQMD ATC permit the soil vapor flow rate shall not exceed 850 standard cubic feet per minute (scfm).

A2. SYSTEM MAINTENANCE

This section presents maintenance activities for the SVE system. All maintenance activities will be conducted in conjunction with the system performance monitoring activities (as described below). The maintenance activities will be conducted by the SVE system subcontractor in accordance with the following schedule:

Vapor extraction wells	Monthly	Inspection for damage and functionality
Piping manifold	Monthly	Inspection for damage and functionality
Valves	Monthly	Inspection for damage and functionality
Portable PID	Annual	Send to manufacturer for calibration
Portable Anemometer	Annual	Send to Manufacturer for calibration
Vacuum/Pressure Gauges	as needed when suspect readings are obtained	Inspection for damage and functionality
Aboveground piping	Monthly	Inspection for damage and integrity.
Air/Water separator (AWS)	Every two months or before rainy replace filter season	Inspect level switch for damage and functionality,
Water transfer pump	Weekly	Inspection for functionality
Vacuum relief valve	Annual	Inspection for functionality
Vacuum blower	Every two weeks	Lube and oil
	Every two months (approx. 1500 hours)	Change oil
	Weekly	Measure motor amperage
	Monthly	Check belt for tension and damage
Inlet/Outlet silencers	Annual	Inspection for integrity
High pressure switch	Annual	Inspection for functionality and adjusting
Vapor Filtration system	Monthly	Inspection for damage and functionality

Maintenance procedures for items listed in the above system maintenance schedule are discussed in the following sections.

A2.1 Soil Vapor Extraction (SVE) System Maintenance

This section details the required maintenance activities for the SVE system. All maintenance activities will be recorded using a General Maintenance Log (or equivalent), located in Attachment C. All form entries should be legible and recorded in permanent ink. Any adjustments or repairs made to the system that are not specifically indicated on the maintenance checklists should also be recorded.

A2.2 Vapor Extraction Wells

No routine servicing is necessary for the vapor extraction wells. A monthly, visual inspection of the PVC casing, well vaults, and instrumentation for functionality or damage is recommended.

A2.1.1 Valves

No maintenance or regular servicing is required. A monthly inspection of valves should be performed to confirm the free operation of valves and to check for any leaks. The valve stem packing on valves should be tightened in the event of valve leakage at the stem; however, excessive tightening of the stem packing will make valve operation sluggish. For gate and globe valves, the operator should ensure that the valve is not at the fully open or fully closed position. If fully open operation is desired, rotate the handle counterclockwise until the stop is encountered. Then rotate the handle one-half turn in the clockwise direction. This will help prevent the valve from sticking against the fully open stop. If fully-closed operation is desired, rotate the handle clockwise until flow is stopped. Threaded fittings should be visually checked for leakage and corrosion at the same time that valves are inspected.

A.2.1.2 Measurement Equipment

Due to the number of wells in the SVE system, system measurement equipment is not permanently mounted to the piping system or manifolds. The system has been designed with sample ports and screwed-on plugs where portable equipment can measure operational parameters. The use of common measuring devices to obtain data from all measurement locations significantly reduces the relative errors usually associated with the use of multiple measurement devices that are not regularly calibrated.

Portable measurement equipment to be used during routine monitoring and maintenance include:

- **Photoionization Detector (PID)**: The PID should be calibrated prior to each daily use. For calibration instructions see the equipment's operation and maintenance manual. In addition, the PID should be sent back to the manufacturer for calibration annually;

- **Portable Anemometer**: The probe tip of the anemometer should be kept clean. To remove dust, gently blow air or run water through the probe. To remove oils, rinse the probe tip with isopropyl alcohol and gently blow air through the probe tip. The humidity sensor (located at the base of the probe window) must be kept dry at all times. The anemometer should be sent back to the manufacturer for calibration annually; and

- **Portable Manometer**: The manometer should be kept clean and dry at all times. The manometer should be sent back to the manufacturer for calibration annually.

A2.2.3 Aboveground Piping

No specific maintenance is required. It is recommended that the operator make monthly visual inspections of all aboveground piping. The inspection should include a check of pipe support integrity, listening for audible vacuum or pressure leaks, and a visual check for pipe integrity (cracks, weathering, etc.). Data collected from the monitoring program should also be monitored for observable trends which may indicate that a pipe leak or obstruction has occurred somewhere in the system.

A2.2.4 Air/Water Separator (AWS)

The air/water separator (AWS) requires no lubrication or periodic maintenance; however, the level switches should be inspected bi-monthly or before the start of the rainy season to assure appropriate operation. The level switches could become inoperable if they accumulate dirt and other foreign matter. Remove and inspect the switches; check for and remove any sediment buildup. In addition, the in-line filter should be replaced every two months to prevent clogging.

Periodically verify that the inlet, level-switch sensor, and bottom drain openings are clear of debris.

A2.2.5 Vacuum Relief Valve

No regular maintenance is required. The operator should manually unseat the valve to ensure that the valve is not frozen shut on an annual basis. Before attempting to unseat the valve, the operator should shut off the power to the vapor extraction unit. The relief valve is set to operate at a vacuum of 10 inches of mercury.

A2.2.6 Vacuum Blower System

The vacuum blower oil level should be checked every two weeks. For specific oil level checking procedures, see the OEM literature. If the oil level is low, add oil as specified in manufacturer's documentation. The oil should be drained, flushed, and replaced in accordance with manufacturer's specifications, of if operating conditions are dusty or hot. Used oil should be stored in appropriate containers and taken to a waste-oil recycling center on a periodic basis.

The blower drive end bearings should be greased with No. 2 non-corrosive bearing grease every two weeks of operation. When regreasing, the old grease will be displaced and forced out the grease wells. For specific grease fitting locations, see OEM literature. To prevent seal damage, the grease wells must be open at all times. Once grease begins venting, stop injecting new grease.

The amperage and voltage at the blower motor should be checked weekly or if modifications or adjustments are made to the blower operation. The motor is rated for a specified range of electrical amperage and voltage. If the measured amperage exceeds the rated amperage, the blower dilution valve should be opened to decrease the work the motor is performing. Amperage exceedance may be due to an increased resistance to flow in the remedial system well and header system. The increased resistance may be caused by a blocked pipe, clogged well screens, or lack or vapor flow yielded from the underlying formation. Appropriate maintenance or remedial measures should be taken if a blockage is encountered. A protective circuit will shut down the motor if amperage exceeds the motors specified range. If this occurs, the SVE system should be restarted and adjusted to prevent repeated shutdowns due to excessive amperage.

All belt drives should be checked monthly for proper belt tension, damage or deterioration, and for proper alignment. The manufacturer's literature should be consulted for detailed alignment and belt replacement instructions.

A2.2.7 Inlet/Discharge Silencers

No regular maintenance is required. The operator should inspect the vessel's connections and the overall vessel integrity on an annual basis.

A2.2.8 High-Pressure Switch

No regular maintenance is required. The pressure switch operation should be verified and readjusted (if necessary) on an annual basis. The pressure switch should be set at 50-inches of water.

A2.2.9 Vapor Phase Carbon And Potassium Permangenate Zeolite Abatement Vessels

The abatement vessels themselves require no regular maintenance other than a monthly visual inspection. The monthly inspection should include:

- **A check of all piping connections.** Rigid 4" ABS piping is used to connect the vessels to the vapor extraction unit, and to the discharge pipe. If a leak is suspected, check connections for leaks using a soap and water solution. Check fittings for damage or signs of wear. Repair as needed; and

- **A check of all sample ports.** Ensure that all sample ports are closed and not leaking. Repair or replace leaking sample ports, as needed.

A check of filter vessel manhole covers. Ensure that manhole covers are not leaking. Each vessel has one top manhole. If a cover is leaking, tighten the lock ring nut. If the cover continues to leak, shut down the vapor extraction unit and replace the manhole cover gasket. Restart the vapor extraction unit and check the cover for leaks.

A2.2.10 Pressure Relief Valve

The pressure relief valve should be inspected and operation verified annually.

A2.3 Compliance Monitoring for Air Emission

This section presents the permit compliance monitoring requirements for the SVE system. The treated vapor discharge from the SVE is regulated by the BAAQMD under the ATC, as well as the permit to operate (PTO) upon issuance.

A2.3.1 Compliance Monitoring with Organic Vapor Meter (PID)

The ATC stipulates how the treatment system is to be operated, when change-outs are to occur, and how to monitor the system. A copy of the ATC is included in Attachment A. Compliance monitoring data will be recorded using General Maintenance Log or equivalent (Attachment C).

The ATC regulates the discharge of total non-methane hydrocarbons in the treated vapor discharge. Because methane occurs naturally, the BAAQMD does not regulate methane discharge from the SVE system. The ATC defines procedures for determining the amount of non-methane hydrocarbons.

The primary requirement of the ATC governs when the carbon and/or potassium permanganate zeolite must be changed-out. According to ATC Conditions 4 and 5, the carbon and/or potassium permanganate zeolite must be changed when either one of the following conditions is detected:

1. 10% of the inlet stream concentration to the second to last carbon vessel; or

2. 10 ppmv or greater (measured as methane).

The above conditions are to be determined by measuring the inlet and outlet vapor concentrations of the abatement vessels as noted on the monitoring log. Other conditions regarding the change-out sequence, storage of records, and determination of methane content are detailed in the ATC. The ATC should be reviewed thoroughly by all personnel responsible for operating and maintaining the SVE system.

In accordance with the BAAQMD ATC, on-Site monitoring of the extracted vapors using a PID will be performed to provide a qualitative means of assessing VOC concentrations in the SVE system influent vapor stream.

Samples analyzed by the PID will be collected in a vacuum sample collection box in dedicated Tedlar bags from the individual extraction wells, and SVE system sample ports at the following locations: influent, effluent from primary carbon vessel, and effluent. The samples will be analyzed using the PID immediately after collection and recorded in the on-Site system operations log book. In accordance with the permit issued by BAAQMD, the PID measurements will be converted to methane equivalent values (C1) using a conversion factor of 2 (the conversion factor for vinyl chloride, the primary VOC of concern) in accordance with the PID manufacturer's specifications.

A2.4 Vapor Sampling for Laboratory Analysis

Samples from SVE wells will be collected and analyzed on a periodic basis to confirm field VOC wellhead measurements and to monitor changes in the relative concentrations of individual VOC constituents in the vapor stream. As such, vapor samples will be periodically collected from select SVE wells using the sample ports at each wellhead. Vapor samples for off-Site laboratory analysis will be collected in batch-certified clean stainless-steel SUMMA canisters.

A2.4.1 Vapor Sampling Schedule

The anticipated schedule for submittal of vapor samples from the SVE wells for laboratory analysis follows:

1. Prior to startup (baseline): All 19 SVE wells (completed on 10/31/16);
2. 30-days after startup: 9 SVE well samples, and one sample of vapor stream (pre-dilution) before blower motor;
3. 60-days after startup: 9 SVE well samples, and one sample of vapor stream (pre-dilution) before blower motor;
4. 90-days after startup: 9 SVE well samples, and one sample of vapor stream (pre-dilution) before blower motor;
5. 120-days after startup: 9 SVE well samples, and one sample of vapor stream (pre-dilution) before blower motor;
6. 150-days after startup: 9 SVE well samples, and one sample of vapor stream (pre-dilution) before blower motor; and
7. 180-days after startup: all 19 SVE wells, 6 vapor monitoring probes, and one sample of vapor stream (pre-dilution) before blower motor.

Samples for laboratory analysis from the SVE wells, probes, and inlet will be obtained using dedicated sample ports. Teflon tubing will be used to connect the sample port to a SUMMA canister. The samples will be transported to the project laboratory under chain-of-custody protocol and analyzed for VOCs using U.S. Environmental Protection Agency (EPA) Test Method TO-15.

Attachments: A – BAAQMD Authority to Construct Permit and Start-up Notification
B – Schematic of SVE System
C – General Maintenance Log

ATTACHMENT A

BAAQMD AUTHORITY TO CONSTRUCT PERMIT AND START-UP NOTIFICATION

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

November 3, 2016

Environmental Engineering,Consulting & Remediation
1020 Winding Creek Rd, Ste 110
Roseville, CA 95678

Attention: Aiguo Xu

Authority to Construct for Permit Application No. 28241, Plant No. 23705

Required Action

Your Authority to Construct is enclosed. This Authority to Construct is not a Permit to Operate. **To receive your Permit to Operate you must:**

1. Complete the Start-up Notification portion of the Authority to Construct.
2. Send the Start-up Notification to the assigned Permit Engineer via e-mail, fax or mail **at least seven days** prior to operating your equipment.

Note: *Operation of equipment without sending the Start-up Notification to the District may result in enforcement action.*

Authorization of Limited Use

The Authority to Construct authorizes operation during the start-up period from the date of initial operation indicated in your Start-up Notification until the Permit to Operate is issued, up to a maximum of 90 days. All conditions (specific or implied) included in this Authority to Construct will be in effect during the start-up period.

Contact Information

If you have any questions, please contact your assigned Permit Engineer:

Stanley Tom, Air Quality Engineer II

Tel: (415) 749-8681 **Fax:** (415) 749-5030 **Email:** stom@baaqmd.gov

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Authority to Construct

(This is not a Permit to Operate)

Plant No. 23705
Application No. 28241

Environmental Engineering,Consulting & Remediation

6701 Shellmound Street, Emeryville, CA 94608
is hereby granted an *Authority to Construct* for the following equipment:

S-1 Soil Vapor Extraction System, 850 scfm max.

abated by

A-1 SVE Abatement System

Adsorption System, 2 potassium permanganate vessels (4000 lbs each), 1 carbon vessel (2000 lbs)

Approved by Carol A Allen for AIC

for JAIME A. WILLIAMS
DIRECTOR OF ENGINEERING

Issue date: November 2, 2016
Expiration date: November 2, 2018

Start-up Notification

Instructions: At least **seven days** before the scheduled initial operation contact your assigned Permit Engineer via email or complete and send this Start-up Notification to the District via fax or mail.

Engineer: Stanley Tom, Air Quality Engineer II
Tel: (415) 749-8681 **Fax:** (415) 749-5030
Email: stom@baaqmd.gov

Plant No. 23705
Source No. S-1
Application No. 28241

The initial operation of this equipment is scheduled for _____ (month/day/year)

Print your first and last name _____

Telephone No. _____

Plant Name: Environm al Engineering,Consulting & Remediation

S-1 Soil Vapor Extraction System, 850 scfm max.

Condition No. 26389 Plant No. 23705 Application No. 28241

1. The owner/operator shall abate the organic emissions from Source S-1 by A-1 SVE Abatement System, consisting of two (4,000 pounds minimum capacity) Potassium Permanganate Vessels and one (2,000 pounds minimum capacity) Activated Carbon Vessels arranged in series during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. The owner/operator shall operate the sources such that the soil vapor flow rate from S-1 shall not exceed 850 scfm. In no event shall POC emissions to the atmosphere exceed 0.07 pounds per day from Source S-1. [Basis: Cumulative Increase, Regulation. 8-47-301, Regulation 2-5]

2. The owner/operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the Air Pollution Control Officer at the following locations:
   a. At the inlet to the second to last Carbon vessel in series.
   b. At the inlet to the last Carbon vessel in series.
   c. At the outlet of the carbon vessel that is last in series prior to venting to the atmosphere. When using an FID to monitor breakthrough, readings may be taken with and without a carbon filter tip fitted on the FID probe. Concentrations measured with the carbon filter tip in place shall be considered methane for the purposes of these permit conditions. [Basis: Cumulative Increase, Regulation 2-5]

3. The owner/operator shall record these monitor readings in a monitoring log at the time they are taken. The owner/operator shall use the monitoring results to estimate the frequency of carbon change-out necessary to maintain compliance with conditions number 4 and 5, and monitoring shall be conducted on a daily basis. The owner/operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the owner/operator prior to a change to the monitoring schedule. [Basis: Cumulative Increase, Regulation 2-5]

4. The owner/operator shall change out the second to last carbon vessel with unspent carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:
   a. 10% of the inlet stream concentration to the Carbon

vessel.
b. 10 ppmv or greater (measured as C1).
[Basis: Cumulative Increase, Regulation 2-5]

5. The owner/operator shall change out the last Carbon vessel with unspent Carbon upon detection at its outlet of 10 ppmv or greater (measured as C1). [Basis: Cumulative Increase, Regulation 2-5]

6. The owner/operator of this source shall maintain the following records for each month of operation of the source:
   a. The hours and times of operation.
   b. Each emission test, monitor reading or analysis result for the day of operation they were taken.
   c. The number of Carbon vessels removed from service.
   d. Total throughput of soil vapor from Source S-1 in Standard Cubic Feet.

   All measurements, records and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least two years following the date the data is recorded. [Basis: Regulation 1-523]

7. The owner/operator shall report any non-compliance with parts 4 and/or 5 to the Director of the Compliance & Enforcement Division at the time that it is discovered. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence. [Basis: Cumulative Increase, Regulation 2-5]

8. Upon final completion of the remediation project, the owner/operator of Source S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5]

End of Conditions

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Authority to Construct

(This is not a Permit to Operate)

Plant No. 23705
Application No. 28241

Environmental Engineering,Consulting & Remediation

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Approved by Carol A Allen for JAC

for JAIME A. WILLIAMS
DIRECTOR OF ENGINEERING

Issue date: November 2, 2016
Expiration date: November 2, 2018

Start-up Notification

Instructions: At least **seven days** before the scheduled initial operation contact your assigned Permit Engineer via email or complete and send this Start-up Notification to the District via fax or mail.

Engineer: Stanley Tom, Air Quality Engineer II
Tel: (415) 749-8681 **Fax:** (415) 749-5030
Email: stom@baaqmd.gov

Plant No. 23705
Source No. S-1
Application No. 28241

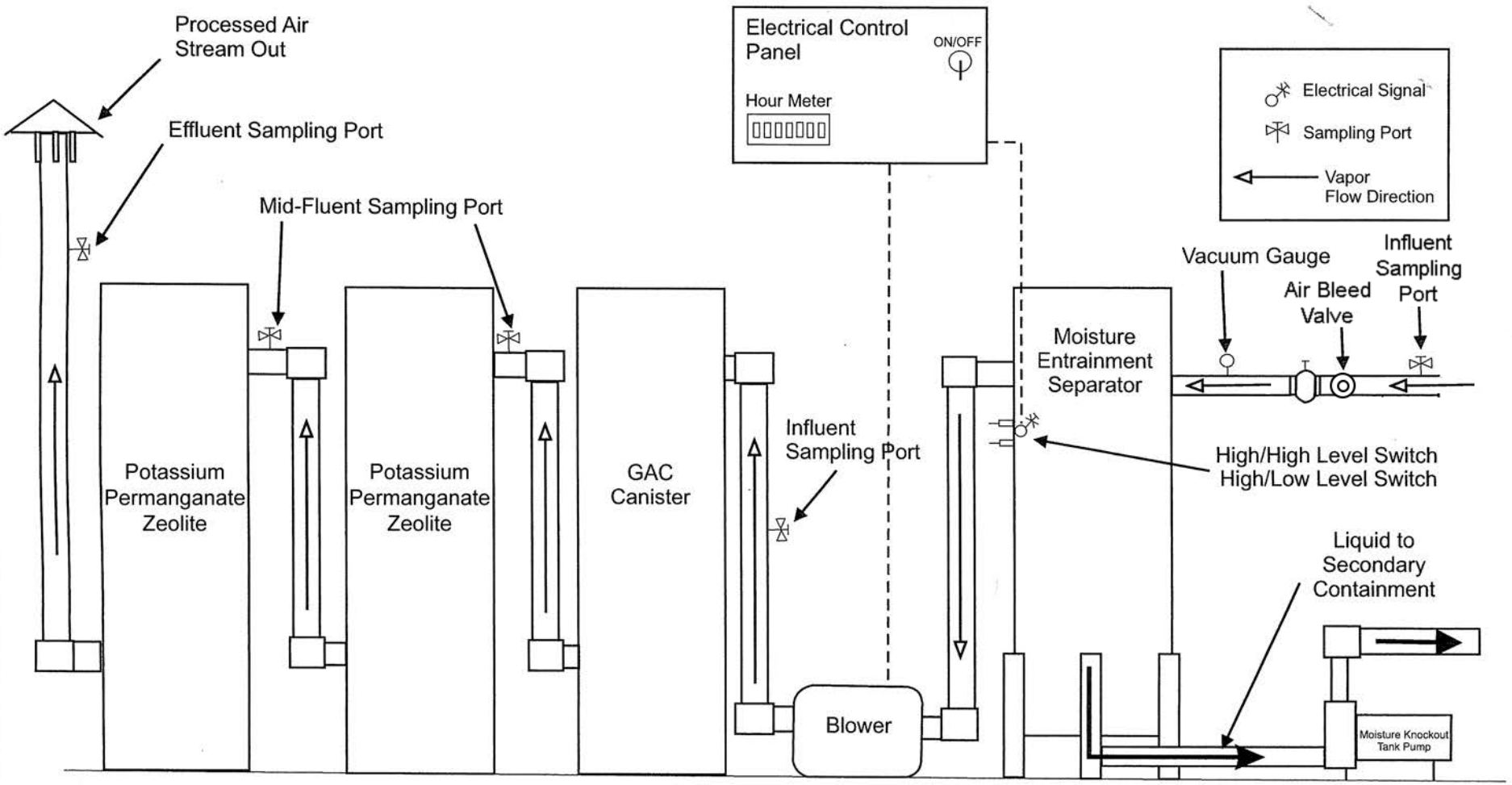
The initial operation of this equipment is scheduled for NOV. 8, 2016 (month/day/year)

Print your first and last name AIGUO XU

Telephone No. (916) 782-8700 OR (916) 580-9113 (cell)

ATTACHMENT B

SCHEMATIC OF SVE SYSTEM



6701 - 6707 SHELLMOUND STREET

EMERYVILLE, CALIFORNIA

PROCESS AND INSTRUMENTATION FLOW DIAGRAM

ATTACHMENT C

GENERAL MAINTENANCE LOG

PES - EMERYVILLE
6701 SHELLMOUND STREET, EMERYVILLE, CA
VAPOR EXTRACTION SYSTEM DATA LOG
GENERAL MAINTENANCE LOG

DATE: _____ **TECHNICIAN:** _____

ARRIVAL TIME: _____ **DEPARTURE TIME:** _____ **PROJECT #:** 2069

SYSTEM RUNNING UPON ARRIVAL? **YES / NO** ***IF NO:*** _____

RUNNING UPON DEPARTURE? **YES / NO** ***IF NO:*** _____

DESCRIPTION	UNITS	UPON ARRIVAL	UPON DEPARTURE
FLOW RATE	(CFM)		
OPERATING TIME	(hr:mm)		(TIME)
ELECTRICAL USAGE	(KWhr)		
WELL FIELD VACUUM	("Hg)		
SYSTEM VACUUM	("Hg)		
AIR COMPRESSOR DUTY CYCLE	(seconds)	ON OFF	ON OFF
AIR COMPRESSOR SETTING	(psi)		
AIR COMPRESSOR HOURS	(hr:mm)		

VAPOR CONCENTRATIONS	OVA Instrument used: PID / FID	Calibrated: YES / NO
INFLUENT (PRE-OXIDIZER)	(ppmv)	
EFLUENT (STACK)	(ppmv)	
VAPOR SAMPLED	INFLUENT : YES / NO	EFFLUENT : YES / NO

WEEKLY SERVICE RENDERED	YES	NO	COMMENTS
CLEAN UP COMPOUND			
AIR COMPRESSOR MOTOR BELT CHECKED			
CLEAN AIR COMPRESSOR FILTER			
INSPECT SPARGE WELLS			
OTHER (specify)			

QUARTERLY SERVICE RENDERED	YES	NO	COMMENTS
AIR COMPRESSOR LUBED			
AIR COMPRESSOR OIL CHANGED			
AIR COMPRESSOR MOTOR LUBED			
CONTROL PANEL INSPECTED/CLEANED			
OTHER (specify)			

Environmental
Engineering,
Consulting &
Remediation, Inc.

FIELD NOTES	
SITE:	DATE:
COMMENTS:	NAME:

1020 Winding Creek Road, Suite 100, Roseville, CA 95678 tel 916.782.8700 fax 916.782.8750 www.e2cr.net

APPENDIX B

PHOTOGRAPHS OF SVE SYSTEM

Photo 1.
View of SVE equipment. Extracted vapor influent collector pipe (at angle) is plumbed through water knockout tank before blower (at center), then through the three treatment vessels (right side of photo).

Photo 2.
View of SVE well piping and central collection piping. SVE system visible in distance.