

US EPA ARCHIVE DOCUMENT





**Appendix C-2**  
**Performance Evaluation Data - Mass Removal**  
 SVE Pilot Test Report  
 W.G. Krummrich Facility, Sauget, Illinois

Date	Time	LEL	Total VOCs <sup>2</sup>	Flow	Mass Removal Rate <sup>3</sup>	Cumulative Mass Removed <sup>4</sup>	Measurement Location Description <sup>5,6,7</sup>
		(%)	(ppmv)	(scfm)	(lbs/hour)	(lbs)	
02/16/10	SVE Pilot Area Extended Performance Evaluation Start.						
02/16/10	02:00 PM	--	300	562	1.2	3	Combined Effluent
02/16/10	05:30 PM	1%	--	552	0.8	6	Combined Effluent; note 8.
02/17/10	11:00 AM	--	288	517	1.1	23	Combined Effluent
02/17/10	05:10 PM	20%	--	535	15.3	73	Combined Effluent; note 8.
02/18/10	12:00 PM	26%	--	535	19.9	405	Combined Effluent; note 8.
02/22/10	12:00 PM	19%	--	535	14.6	2,062	Combined Effluent; note 8.
02/23/10	12:00 PM	16%	--	602	13.8	2,402	Combined Effluent; note 8.
02/25/10	03:10 PM	16%	--	549	12.6	3,078	Combined Effluent; note 8.
03/01/10	01:30 PM	--	1,460	551	5.8	3,944	Combined Effluent
03/04/10	10:55 AM	--	1,727	606	7.5	4,404	Combined Effluent
03/15/10	01:00 PM	--	1,360	509	5.0	6,063	Combined Effluent
03/19/10	04:00 PM	--	2,684	470	9.0	6,756	Combined Effluent
03/19/10	04:20 PM	--	2,643	446	8.4	6,759	Combined Effluent
03/23/10	03:00 PM	22%	--	446	14.1	7,824	Combined Effluent; note 8.
03/25/10	04:00 PM	14%	--	446	8.9	8,388	Combined Effluent; note 8.
03/26/10	05:30 PM	18%	--	446	11.5	8,648	Combined Effluent; note 8.
03/29/10	01:20 PM	--	1,921	626	8.6	9,331	Combined Effluent
04/14/10	12:45 PM	--	849	564	3.4	11,641	Combined Effluent
04/27/10	11:40 AM	--	2,982	270	5.8	13,072	Post PDB
04/30/10	03:00 PM	--	1,336	477	4.6	13,461	Combined Effluent
05/05/10	09:15 AM	--	71	459	0.2	13,736	Combined Effluent
05/05/10	04:35 PM	--	540	487	1.9	13,743	Combined Effluent
05/11/10	01:15 PM	--	647	551	2.6	14,056	Combined Effluent
05/13/10	10:45 AM	--	521	510	1.9	14,157	Combined Effluent
05/13/10	SVE Sub Area Extended Performance Evaluation Test Start.						
05/13/10	03:30 PM	--	655	487	2.3	10	Combined Effluent
05/14/10	03:40 PM	--	631	500	2.3	65	Combined Effluent
05/18/10	08:30 AM	--	126	584	0.5	189	Combined Effluent
05/19/10	12:45 PM	--	73	437	0.2	199	Combined Effluent
05/21/10	03:45 PM	--	8	528	0.0	206	Combined Effluent
05/21/10	04:35 PM	--	561	547	2.2	207	Combined Effluent
05/25/10	10:30 AM	--	130	414	0.4	323	Combined Effluent
05/25/10	02:00 PM	--	198	548	0.8	325	Combined Effluent
05/26/10	02:10 PM	--	119	482	0.4	340	Combined Effluent
06/01/10	02:40 PM	--	642	102	0.5	403	SVE Line A
06/03/10	12:30 PM	--	513	110	0.4	423	SVE Line A
06/03/10	01:45 PM	--	1,006	110	0.8	424	SVE Line A
06/09/10	12:00 PM	--	70	498	0.3	499	Combined Effluent
06/09/10	02:46 PM	--	278	514	1.0	500	Combined Effluent
06/15/10	12:00 PM	--	390	516	1.4	674	Combined Effluent
06/21/10	02:50 PM	--	443	459	1.5	887	Combined Effluent
06/23/10	04:40 PM	--	488	491	1.7	967	Combined Effluent
06/28/10	01:45 PM	--	414	466	1.4	1,148	Combined Effluent
07/02/10	02:00 PM	--	486	488	1.7	1,331	Combined Effluent
07/06/10	10:00 AM	--	316	513	1.2	1,388	Combined Effluent
07/12/10	11:30 AM	--	829	125	0.7	1,492	SVE Line A
07/16/10	11:20 AM	--	1,586	126	1.4	1,596	SVE Line A
07/16/10	SVE Pilot Test Shutdown						

SVE = soil vapor extraction  
 LEL = lower explosion limit  
 VOCs = volatile organic compounds

% = percent  
 ppmv = parts per million by volume  
 scfm = standard cubic feet per minute

lbs = pounds of benzene  
 -- = not measured/not applicable  
 PDB = positive displacement blower

Notes:

- This table presents the pilot test mass removal rates and cumulative mass removed.
- Total VOCs were screened in the field using a photoionization detector. Results are reported as isobutylene.
- The calculation for the mass removal rate is: total VOCs (ppmv as benzene) x benzene compound-specific conversion factor (1 ppmv = 3.19 mg/M<sup>3</sup>) x 3.74\*10<sup>-6</sup> units conversion factor. For mass removal rate calculations based on the total VOCs measurement, the result is multiplied by 0.60, the benzene reference factor for the PID.
- The calculation for the cumulative mass removed is: (run time\*mass removal rate)+ previous cumulative mass removed.
- Combined effluent flow measurements are based on FIA 301 differential pressure gauge and total VOCs are based on field measurements of samples collected at sample port SP 303 (unless noted).
- Post PDB flow measurement is based on FM 102 direct read flow meter and the total VOCs measurement is based on field measurement of the sample collected sample port SP 104.
- SVE Line A flow measurements are based on FIA 101 differential pressure gauge and total VOCs are based on field measurements of samples collected at sample port SP 101.
- The total VOCs were estimated using the thermal oxidizer unit LEL reading: 12,000 ppmv (benzene LEL)\*% LEL = concentration VOCs (ppmv).

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**Appendix C-3A**  
**Performance Evaluation Data - Pilot Area Wellheads**  
 SVE Pilot Test report  
 W.G. Krummrich Facility, Sauget, Illinois

Location	Monitoring Parameter <sup>1</sup>	Date	2/16/10	2/17/10	2/17/10	2/25/10	3/4/10	3/15/10	4/30/10	4/30/10	5/7/10	5/13/10
		Units										
<b>SVE Wells</b>												
SVE-01A	Vacuum	(in. H <sub>2</sub> O)	60	65	70	65	60	60	60	60	110	60
	ΔP	(in. H <sub>2</sub> O)	0.02	0.02	0.09	0.20	0.06	0.15	0.13	0.13	0.65	0.16
	Flow	(scfm)	7	7	15	23	13	20	19	19	38	21
	VOCs	(ppmv)	--	> 9,999	--	--	58	68	> 9,999	> 9,999	--	--
SVE-02A	Vacuum	(in. H <sub>2</sub> O)	40	40	40	6.0	7.0	6.0	--	--	105	85.0
	ΔP	(in. H <sub>2</sub> O)	0.04	0.04	0.04	0.06	0.05	0.06	--	--	--	0.08
	Flow	(scfm)	11	11	11	14	12	14	--	--	--	14
	VOCs	(ppmv)	--	> 9,999	--	--	> 9,999	> 9,999	--	--	--	--
SVE-03A	Vacuum	(in. H <sub>2</sub> O)	40	65	70	65	65	60	--	--	108	80
	ΔP	(in. H <sub>2</sub> O)	0.05	0.04	0.03	0.10	0.10	0.12	--	--	0.80	0.27
	Flow	(scfm)	12	10	9	16	16	18	--	--	43	26
	VOCs	(ppmv)	--	2,508	--	--	> 9,999	> 9,999	--	--	--	--
SVE-04A	Vacuum	(in. H <sub>2</sub> O)	8.0	7.5	8.0	6.0	5.5	5.7	50	20	110	95
	ΔP	(in. H <sub>2</sub> O)	0.08	0.08	0.07	0.08	0.05	0.09	0.18	1.50	0.49	0.29
	Flow	(scfm)	16	16	15	16	12	17	22	67	33	26
	VOCs	(ppmv)	--	470	--	--	34	37	40	40	--	13
SVE-06A	Vacuum	(in. H <sub>2</sub> O)	35	40	35	60	50	55	50	20	106	80
	ΔP	(in. H <sub>2</sub> O)	0.07	0.10	0.08	note 2.	0.03	0.05	0.17	1.50	--	0.03
	Flow	(scfm)	14	17	15	--	9	12	22	67	--	9
	VOCs	(ppmv)	--	2,852	--	--	1,049	1,204	1,134	1,134	--	411
SVE-08A	Vacuum	(in. H <sub>2</sub> O)	35	35	35.0	8.0	8.0	7.0	--	--	107.0	90.0
	ΔP	(in. H <sub>2</sub> O)	0.08	--	0.10	0.04	0.50	0.41	--	--	0.75	0.21
	Flow	(scfm)	15	note 2.	17	11	39	35	--	--	41	23
	VOCs	(ppmv)	--	> 9,999	--	--	> 9,999	> 9,999	--	--	--	--
SVE-09A	Vacuum	(in. H <sub>2</sub> O)	50	60	28.0	17	25	29	--	--	110	80
	ΔP	(in. H <sub>2</sub> O)	--	0.04	0.10	note 2.	note 2.	note 2.	--	--	0.60	--
	Flow	(scfm)	note 2.	10	17	--	--	--	--	--	37	--
	VOCs	(ppmv)	--	> 9,999	--	--	--	--	--	--	--	--
SVE-10A	Vacuum	(in. H <sub>2</sub> O)	45	20	5.0	3.0	3.2	3.4	--	--	--	--
	ΔP	(in. H <sub>2</sub> O)	0.08	0.08	0.04	0.03	0.05	0.03	--	--	--	--
	Flow	(scfm)	15	15	11	10	12	10	--	--	--	--
	VOCs	(ppmv)	--	2,908	--	--	138	176	--	--	--	--
SVE-11A	Vacuum	(in. H <sub>2</sub> O)	1.5	0.2	50.0	40	45	45	--	--	103	90
	ΔP	(in. H <sub>2</sub> O)	0.15	0.01	0.10	0.04	0.03	0.03	--	--	0.70	0.34
	Flow	(scfm)	22	6	17	11	9	9	--	--	40	29
	VOCs	(ppmv)	--	> 9,999	--	--	> 9,999	> 9,999	--	--	--	--
<b>Air Injection Wells</b>												
AI-SVE-05A	Pressure	(in. H <sub>2</sub> O)	22	13	9.0	1.0	4.1	3.4	--	50.0	--	5.5
	ΔP	(in. H <sub>2</sub> O)	0.23	0.26	0.22	0.27	0.15	0.17	--	2.90	--	0.24
	Flow	(scfm)	26	28	26	29	21	23	--	89	--	27
	VOCs	(ppmv)	--	--	--	--	--	--	--	--	--	--
AI-SVE-07A	Pressure	(in. H <sub>2</sub> O)	5.0	3.5	2.2	3.0	6.4	5.0	--	--	--	6.0
	ΔP	(in. H <sub>2</sub> O)	0.26	0.27	0.22	0.19	0.25	0.33	--	--	--	0.31
	Flow	(scfm)	28	28	26	24	28	32	--	--	--	31
	VOCs	(ppmv)	--	--	--	--	--	--	--	--	--	--

SVE = soil vapor extraction  
 in. H<sub>2</sub>O = inches of water  
 ΔP = differential pressure  
 -- = not measured/not applicable

VOCs = total volatile organic compounds  
 scfm = standard cubic feet per minute  
 ppmv = parts per million by volume

Notes:

- Total VOCs were measured in the field using a photoionization detector (PID).
- Flow rates at the SVE wells were not calculated due to inconsistent flow measurements likely the result of water in the pitot tube.

**Appendix C-3B**  
**Performance Evaluation Data - Sub Area Wellheads**  
 SVE Pilot Test Report  
 W.G. Krummrich Facility, Sauget, Illinois

Location	Monitoring Parameter <sup>1</sup>	Date	5/13/10	5/14/10	5/18/10	5/19/10	5/21/10	5/25/10	6/17/10	6/21/10	6/23/10	7/2/10	7/6/10	7/12/10	7/16/10
		Units													
<b>SVE Well</b>															
SVE-05A	Vacuum	(in. H <sub>2</sub> O)	50	51	80	100	60	75	75	75	70	70	70	65	70
	ΔP	(in. H <sub>2</sub> O)	2.90	--	3.20	3.30	2.40	2.70	1.40	0.41	0.33	0.95	0.41	0.32	0.29
	Flow	(scfm)	89	--	89	88	80	83	60	32	29	49	32	29	27
	VOCs	(ppmv)	880	1,682	351	318	--	439	--	707	--	1,746	684	539	2,394
SVE-07A	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	20	75	85	75	70	70	70	70	70
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	0.42	2.00	1.30	0.20	0.19	0.40	0.27	0.27	0.27
	Flow	(scfm)	--	--	--	--	35	71	57	23	22	32	26	26	26
	VOCs	(ppmv)	--	--	--	--	4,286	207	--	219	--	391	219	219	219
<b>Sub-Area Air Injection Wells</b>															
SVE-02A	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	--	--	85	75	70	60	65	65	65
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	--	--	0.20	0.19	0.13	0.15	0.22	0.22	0.22
	Flow	(scfm)	--	--	--	--	--	--	22	22	18	20	24	24	24
	VOCs	(ppmv)	--	--	--	--	--	--	--	45	--	--	--	--	--
AI-SVE-04A	Pressure	(in. H <sub>2</sub> O)	20.0	22	19	20	20	18	20	--	20	21	20	20	20
	ΔP	(in. H <sub>2</sub> O)	2.90	3.00	1.30	1.20	1.30	1.30	1.20	1.10	1.40	1.10	1.15	1.15	1.15
	Flow	(scfm)	93	94	62	60	62	62	60	--	64	57	58	58	58
	VOCs	(ppmv)	--	--	--	--	--	--	--	--	--	--	--	--	--
AI-SVE-06A	Pressure	(in. H <sub>2</sub> O)	20	20	20	20	20	20	20	--	20	20	20	20	20
	ΔP	(in. H <sub>2</sub> O)	2.80	2.70	1.40	1.40	1.10	1.40	1.40	1.50	1.30	1.20	1.25	1.25	1.25
	Flow	(scfm)	91	89	64	64	57	64	64	--	62	60	61	61	61
	VOCs	(ppmv)	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Additional SVE Wells<sup>2</sup></b>															
SVE-01A	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	--	--	80	75	70	65	70	70	70
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	--	--	0.20	0.13	0.17	0.40	0.18	0.18	0.18
	Flow	(scfm)	--	--	--	--	--	--	22	18	21	32	22	22	22
	VOCs	(ppmv)	--	--	--	--	--	--	--	7	--	--	--	--	--
SVE-09A	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	--	--	80	70	60	70	70	70	70
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	--	--	0.40	0.12	0.14	0.10	0.20	0.20	0.20
	Flow	(scfm)	--	--	--	--	--	--	32	18	19	16	23	23	23
	VOCs	(ppmv)	--	--	--	--	--	--	--	13	--	--	--	--	--
SVE-10A	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	--	--	85	70	60	60	60	60	60
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	--	--	0.90	0.08	0.04	0.10	0.12	0.12	0.12
	Flow	(scfm)	--	--	--	--	--	--	47	14	10	16	18	18	18
	VOCs	(ppmv)	--	--	--	--	--	--	--	19	--	--	--	--	--
SVE-04B	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	100	80	80	--	--	--	--	--	--
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	0.29	0.39	0.40	--	--	--	--	--	--
	Flow	(scfm)	--	--	--	--	26	31	32	--	--	--	--	--	--
SVE-05B	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	100	82	80	--	--	--	--	--	--
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	0.16	0.42	0.3	--	--	--	--	--	--
	Flow	(scfm)	--	--	--	--	19	32	27	--	--	--	--	--	--
SVE-06B	Vacuum	(in. H <sub>2</sub> O)	--	--	--	--	100	80	85	--	--	--	--	--	--
	ΔP	(in. H <sub>2</sub> O)	--	--	--	--	0.18	0.55	0.4	--	--	--	--	--	--
	Flow	(scfm)	--	--	--	--	21	37	31	--	--	--	--	--	--

SVE = soil vapor extraction  
 in. H<sub>2</sub>O = inches of water  
 ΔP = differential pressure

VOCs = total volatile organic compounds  
 scfm = standard cubic feet per minute  
 ppmv = parts per million by volume

- Notes:  
 1. Total VOCs were measured in the field using a photoionization detector (PID).  
 2. SVE Wells SVE-01A, SVE-02A, SVE-04A, SVE-10A, SVE-04B, SVE-05B, and SVE-06B were operated during the sub-area testing to achieve greater groundwater extraction rates from the sub-area

**Appendix C-4A**  
**Performance Evaluation Data - Pilot Area Vapor Probes**  
 SVE Pilot Test Report  
 W.G. Krummrich Facility, Sauget, Illinois

Vapor Probe	Monitoring Parameter <sup>1,2</sup>	Extended Performance Evaluation Testing - Full Pilot Test Area							
		2/16/10	2/17/10	2/25/10	3/4/10	3/15/10	3/29/10	4/30/10	5/13/10
VP-01S	Vacuum/Pressure	+0.01	0.00	+0.01	+0.03	+0.02	+0.01	+0.02	+0.01
	VOCs (ppmv)	--	--	> 9,999	--	note 3.	> 9,999	note 3.	2.4
VP-02S	Vacuum/Pressure	+0.39	+0.09	+0.05	+0.89	+0.08	+0.27	+0.07	+0.03
	VOCs (ppmv)	--	--	213	> 9,999	> 9,999	> 9,999	> 9,999	> 9,999
VP-03S	Vacuum/Pressure	+0.5	+0.01	+0.01	+0.01	+0.01	+0.31	+0.01	+0.01
	VOCs (ppmv)	--	--	84.4	> 9,999	> 9,999	> 9,999	> 9,999	19.7
VP-04S	Vacuum/Pressure	0	+0.01	0	0	0	0	0	0
	VOCs (ppmv)	--	--	75.7	> 9,999	> 9,999	> 9,999	> 9,999	> 9,999
VP-05S	Vacuum/Pressure	0	0	0	0	0	--	0	0
	VOCs (ppmv)	--	--	--	--	note 3.	note 3.	note 3.	186
VP-06S	Vacuum/Pressure	+0.01	0	0	-0.02	-0.01	+0.37	+0.01	-0.01
	VOCs (ppmv)	--	--	--	> 9,999	625	> 9,999	> 9,999	5,207
VP-09S	Vacuum/Pressure	+0.5	0	+0.04	+0.04	+0.03	+0.29	-0.02	-0.02
	VOCs (ppmv)	--	--	--	396	431	368	324	> 9,999
VP-10S	Vacuum/Pressure	0	0	0	+0.08	+0.05	+0.20	-0.07	-0.05
	VOCs (ppmv)	--	--	--	417	> 9,999	302	486	1,102
VP-A01S	Vacuum/Pressure	+0.50	+0.06	+0.06	+0.07	+0.09	0	+0.08	0
	VOCs (ppmv)	--	--	--	14.8	10.6	9.5	13.2	5.1
VP-A02S	Vacuum/Pressure	+1.4	+0.55	+0.04	+0.37	+0.04	0	+0.37	+0.27
	VOCs (ppmv)	--	--	--	9.7	11.9	11.3	7.7	26.8
VP-A03S	Vacuum/Pressure	+0.01	0	0	+0.01	+0.01	--	0	0
	VOCs (ppmv)	--	--	--	--	note 3.	note 3.	note 3.	40.5

SVE = soil vapor extraction

in. H<sub>2</sub>O = inches of water

VOCs = total volatile organic compounds

ppmv = parts per million by volume

-- = not measured/not applicable

Notes:

1. Total VOCs were measured in the field using a photoionization detector (PID).
2. Pressure and vacuum measurements are indicated with a "+" or a "-", respectively.
3. A vapor sample could not be collected at this location most likely due to a submerged screen.

**Appendix C-4B**  
**Performance Evaluation Data - Sub Area Vapor Probes**  
 SVE Pilot Test report  
 W.G. Krummrich Facility, Sauget, Illinois

Vapor Probe	Monitoring Parameter <sup>1,2</sup>	Extended Performance Evaluation Testing - Pilot Test Sub-Area						
		5/13/10	5/14/10	5/18/10	5/25/10	6/7/10	6/21/10	7/6/10
VP-01S	Vacuum/Pressure	+0.02	+0.01	0	+0.01	+0.01	+0.01	+0.02
	VOCs (ppmv)	--	--	24.8	2,214	1,852	1,896	1,644
VP-02S	Vacuum/Pressure	-2.2	-2.1	-0.80	+0.01	+0.01	+0.01	+0.01
	VOCs (ppmv)	--	--	> 9,999	> 9,999	> 9,999	> 9,999	> 9,999
VP-03S	Vacuum/Pressure	+0.01	+0.02	-0.70	-0.22	-0.20	-0.31	-0.25
	VOCs (ppmv)	--	--	95.1	101	109	147	87.8
VP-04S	Vacuum/Pressure	+0.02	+0.02	+0.08	--	-0.04	0	-0.09
	VOCs (ppmv)	--	--	22.7	--	19.7	83.3	21.5
VP-05S	Vacuum/Pressure	+0.01	+0.01	+0.04	0	-0.01	0	-0.03
	VOCs (ppmv)	--	--	218	566	52.1	72.1	83.1
VP-06S	Vacuum/Pressure	--	+0.01	+0.03	+0.01	+0.01	+0.01	0
	VOCs (ppmv)	--	--	74.3	12	14.3	9.2	10.4
VP-09S	Vacuum/Pressure	+0.01	+0.01	-0.90	+0.03	+0.03	+0.03	+0.02
	VOCs (ppmv)	--	--	1142	11.7	10.4	11.1	19.7
VP-10S	Vacuum/Pressure	-2.40	-2.3	-0.70	-0.12	-0.16	-0.24	-0.38
	VOCs (ppmv)	--	--	901	408	311	364	493
VP-A01S	Vacuum/Pressure	+0.01	+0.01	--	0	0	0	0
	VOCs (ppmv)	--	--	note 3.	30.5	22.2	41.5	31.2
VP-A02S	Vacuum/Pressure	+0.01	+0.01	+0.02	--	--	--	--
	VOCs (ppmv)	--	--	note 3.	--	--	--	--
VP-A03S	Vacuum/Pressure	+0.01	+0.01	+0.03	+0.02	+0.03	+0.03	+0.02
	VOCs (ppmv)	--	--	note 3.	1.6	1	0.2	3.6

SVE = soil vapor extraction  
 in. H<sub>2</sub>O = inches of water  
 VOCs = total volatile organic compounds

ppmv = parts per million by volume  
 -- = not measured/not applicable

Notes:

1. Total VOCs were measured in the field using a photoionization detector (PID).
2. Pressure and vacuum measurements are indicated with a "+" or a "-", respectively.
3. A vapor sample could not be collected at this location most likely due to a submerged screen.