N

North Tank Farm Area

Former Steamer Overhead Tank Area

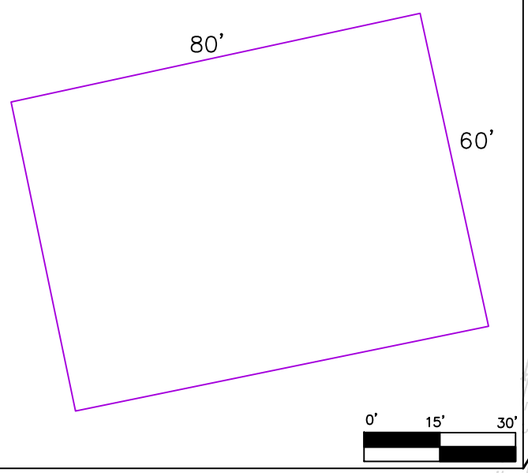
Former Benzene Pipeline Area

Near Little Mo Area

Former Benzene and
Chlorobenzene Storage Area

STATE ROUTE

Big Mo SVE Pilot Test Area



125’ 0’ 125’ 250’

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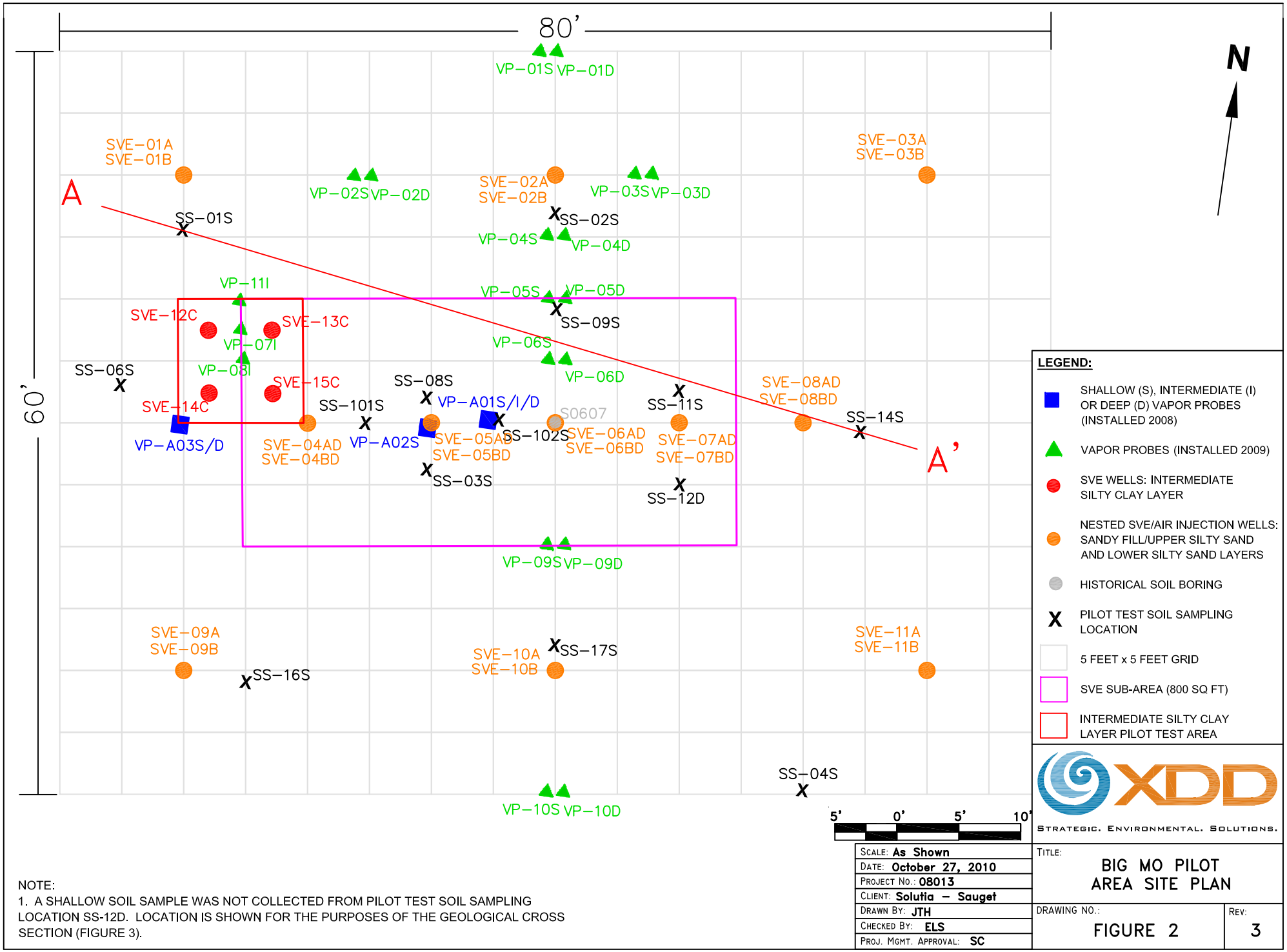
SCALE: AS Shown	TITLE: W.G. KRUMMRICH FACILITY SVE TREATMENT AREAS
DATE: October 13, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 1
CHECKED BY: ELS	REV: 1
PROJ. MGMT. APPROVAL: SC	



LEGEND:

- SHALLOW (S), INTERMEDIATE (I) OR DEEP (D) VAPOR PROBES (INSTALLED 2008)
- VAPOR PROBES (INSTALLED 2009)
- SVE WELLS: INTERMEDIATE SILTY CLAY LAYER
- NESTED SVE/AIR INJECTION WELLS: SANDY FILL/UPPER SILTY SAND AND LOWER SILTY SAND LAYERS
- HISTORICAL SOIL BORING
- X PILOT TEST SOIL SAMPLING LOCATION
- 5 FEET x 5 FEET GRID
- SVE SUB-AREA (800 SQ FT)
- INTERMEDIATE SILTY CLAY LAYER PILOT TEST AREA

NOTE:
1. A SHALLOW SOIL SAMPLE WAS NOT COLLECTED FROM PILOT TEST SOIL SAMPLING LOCATION SS-12D. LOCATION IS SHOWN FOR THE PURPOSES OF THE GEOLOGICAL CROSS SECTION (FIGURE 3).

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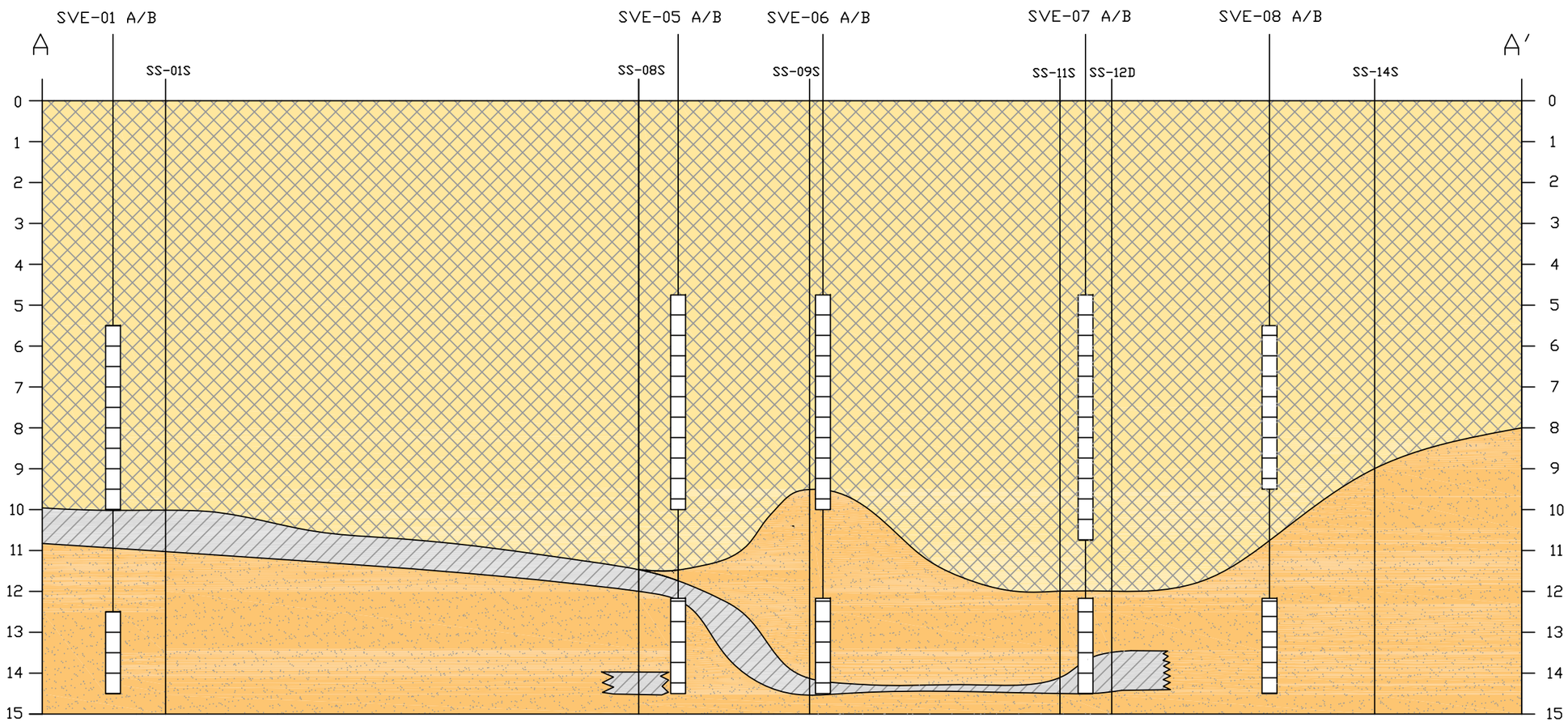
SCALE:	As Shown
DATE:	October 27, 2010
PROJECT NO.:	08013
CLIENT:	Solutia – Sauget
DRAWN BY:	JTH
CHECKED BY:	ELS
PROJ. MGMT. APPROVAL:	SC

TITLE: BIG MO PILOT AREA SITE PLAN

DRAWING NO.: FIGURE 2

REV: 3



3' 0' 3' 6'

HORIZONTAL SCALE

1.5' 0' 1.5' 3'

VERTICAL SCALE

LEGEND:

- SANDY FILL/UPPER SILTY SAND LAYER
- INTERMEDIATE SILTY CLAY LAYER
- LOWER SILTY SAND LAYER
- SHALLOW (A) AND DEEP (B) SVE WELL SCREEN INTERVAL

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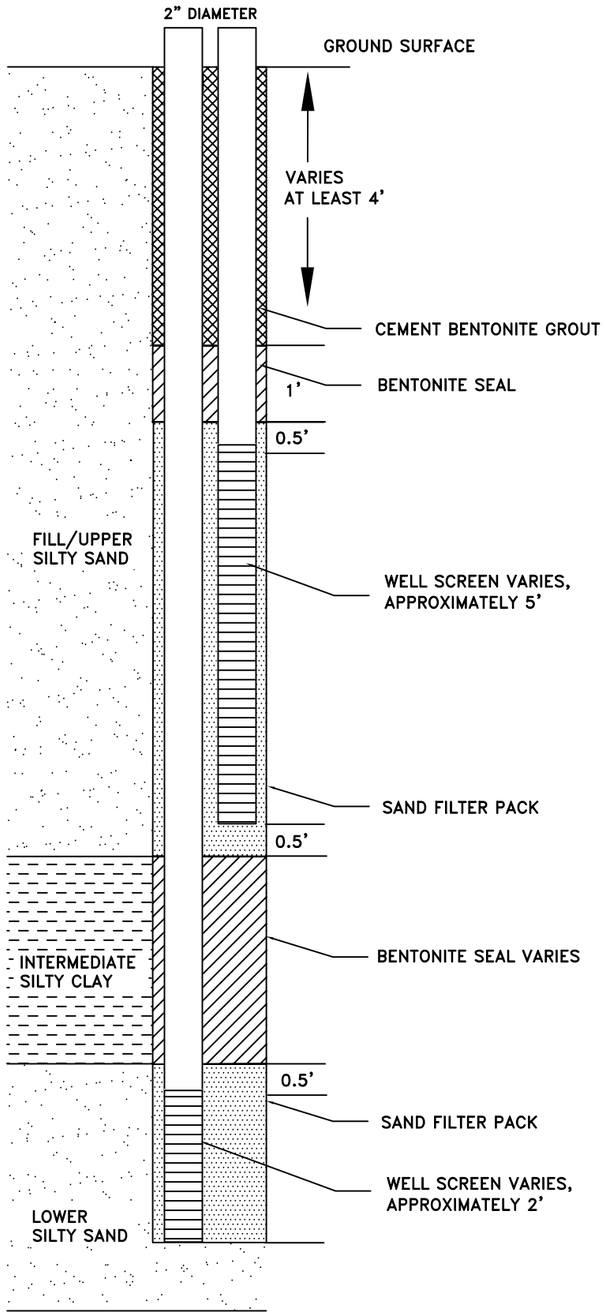
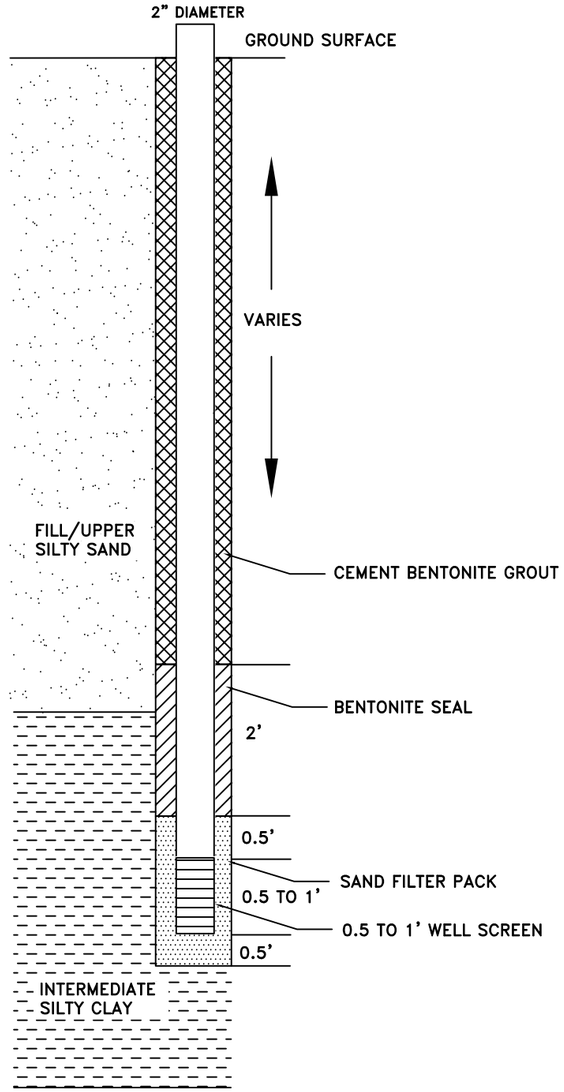
SCALE: **As Shown**	TITLE: BIG MO GEOLOGICAL CROSS SECTION
DATE: **October 13, 2010**	
PROJECT No.: **08013.01**	
CLIENT: **Solutia – Sauget**	
DRAWN BY: **PC**	DRAWING NO.: FIGURE 3
CHECKED BY: **ELS**	REV: 2
PROJ. MGMT. APPROVAL: **JMP**	

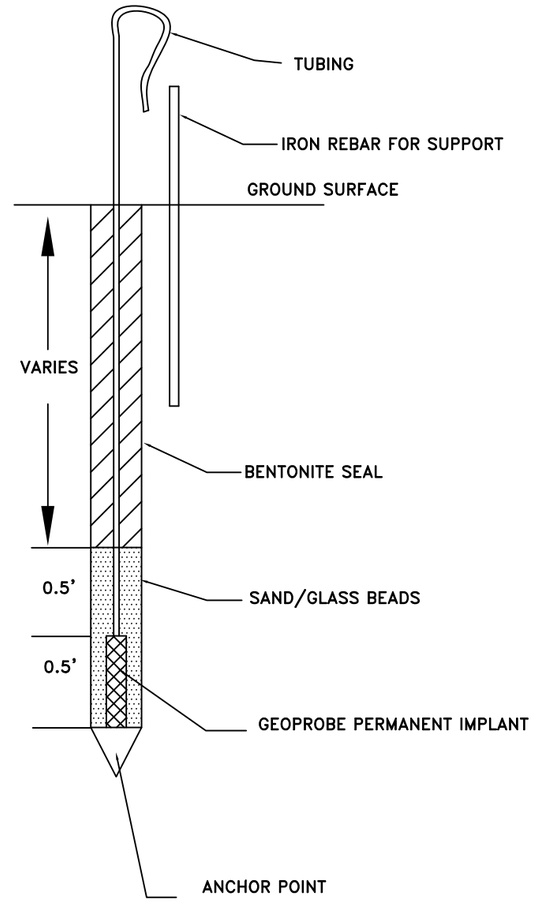
TYPICAL SVE WELL
FILL/UPPER SILTY SAND
AND LOWER SILTY SAND



TYPICAL SVE WELL
INTERMEDIATE SILTY CLAY



TYPICAL VAPOR PROBE



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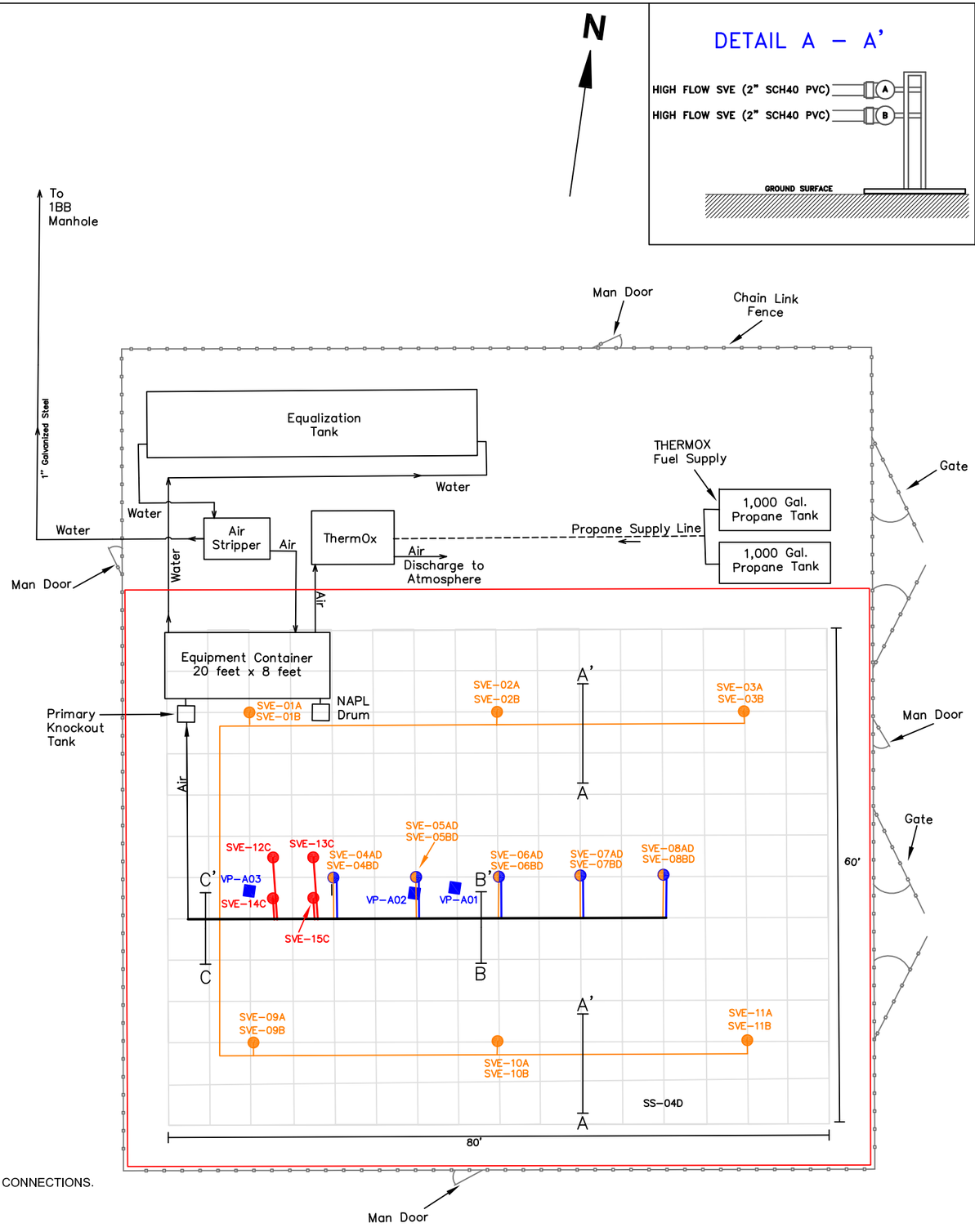
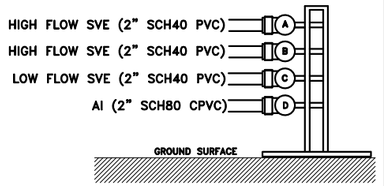
SCALE: Not to Scale	TITLE: TYPICAL SVE WELL AND VAPOR PROBE DESIGN
DATE: October 14, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 4
CHECKED BY: ELS	REV: 1
PROJ. MGMT. APPROVAL: SC	

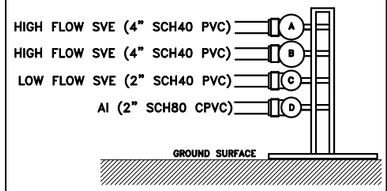


DETAIL A – A'

DETAIL B – B'



DETAIL C – C'



Main Manifold Lines	Description	Target geologic layer	Corresponding wells	No of wells
A	High Flow SVE	Sandy fill/upper silty sand layer	SVE–01A, SVE–02A, SVE–03A, SVE–04A, SVE–05A, SVE–06A, SVE–07A, SVE–08A, SVE–09A, SVE–10A, SVE–11A	11
B	High Flow SVE	Lower silty sand layer	SVE–01B, SVE–02B, SVE–03B, SVE–04B, SVE–05B, SVE–06B, SVE–07B, SVE–08B, SVE–09B, SVE–10B, SVE–11B	11
C	Low Flow SVE	Intermediate silty clay layer	SVE–12C, SVE–13C, SVE–14C, SVE–15C,	4
D	AI	Sandy fill/upper silty sand and lower silty sand layers	SVE–04AD, SVE–04BD, SVE–05AD, SVE–05BD, SVE–06AD, SVE–06BD, SVE–07AD,SVE–07BD, SVE–08AD, SVE–08BD,	10

LEGEND:

- SVE WELLS CONNECTED TO THE "C" MANIFOLD (INDIVIDUAL SVE WELLS WITH ONE WELL SCREEN)
- SVE WELLS CONNECTED TO THE "A" & "B" MANIFOLDS (NESTED SVE WELLS WITH TWO WELL SCREENS)
- AIR INJECTION & SVE WELLS CONNECTED TO EITHER "A&D" OR "B&D" MANIFOLDS (NESTED SVE WELLS WITH TWO WELL SCREENS) THESE WELLS WILL BE FITTED TO OPERATE AS EITHER SVE OR AI WELLS)
- 5 FEET x 5 FEET GRID
- SVE / AI MANIFOLDING LINES A,B,C AND D
- SVE MANIFOLDING LINES A & B
- AI BRANCH LINE D
- SVE MANIFOLDING LINE C
- EXTENT OF LOW PERMEABILITY RAIN COVER

7.5' 0' 7.5' 15'

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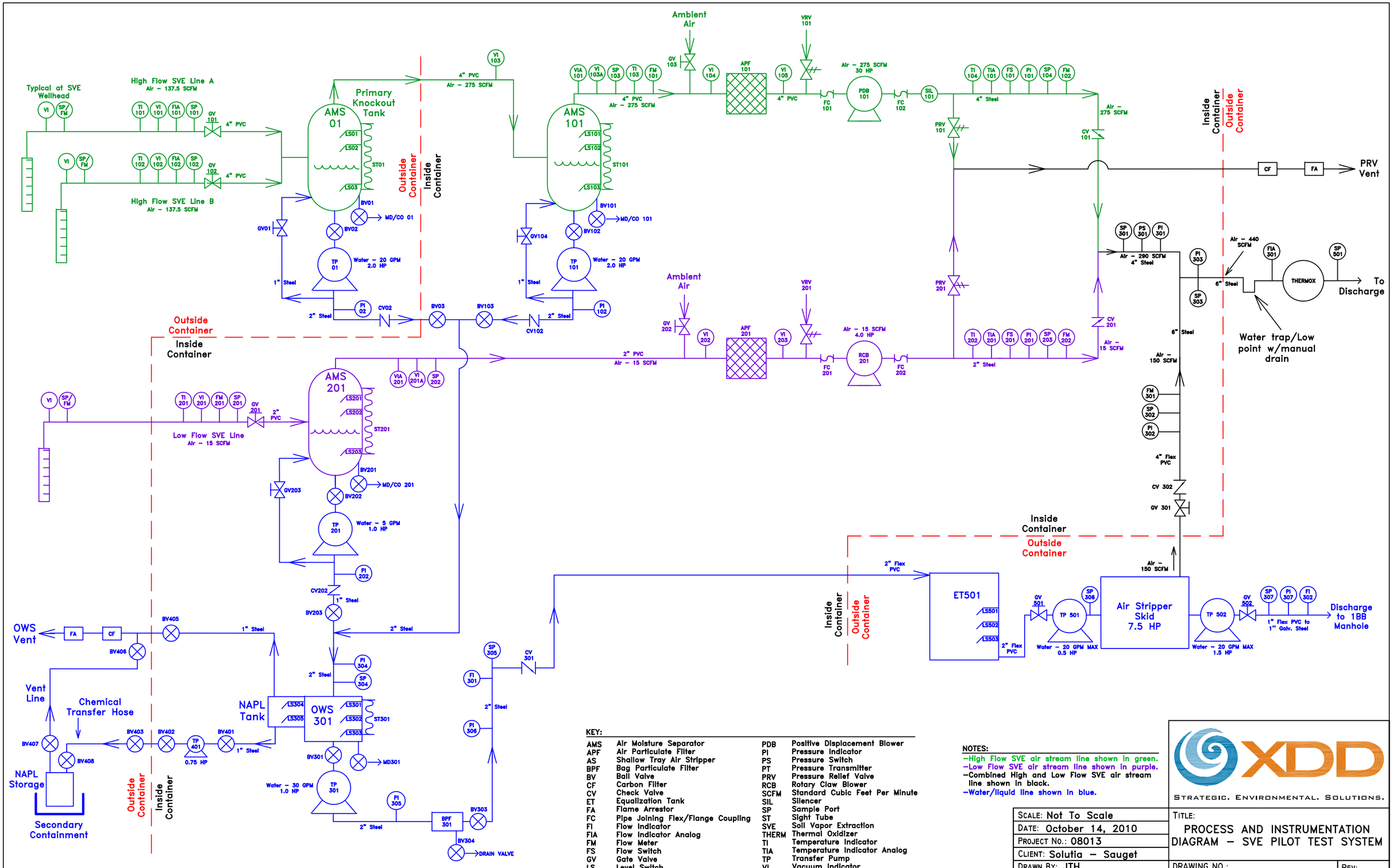
NOTES:
1. SUFFIX ON WELL IDENTIFICATIONS INDICATES MANIFOLD CONNECTIONS.
2. AI - AIR INJECTION
3. CPVC - CHLORINATED POLYVINYL CHLORIDE
4. PVC - POLYVINYLCHLORIDE
5. SVE - SOIL VAPOR EXTRACTION
6. ThermOx - THERMAL OXIDIZER
7. SCH = SCHEDULE

SCALE: As Shown	TITLE: SVE/AI WELL FIELD AND PILOT EQUIPMENT LAYOUT
DATE: October 14, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 5
CHECKED BY: ELS	REV: 5
PROJ. MGMT. APPROVAL: SC	



KEY:

AMS	Air Moisture Separator	PDB	Positive Displacement Blower
APF	Air Particulate Filter	PI	Pressure Indicator
AS	Shallow Tray Air Stripper	PS	Pressure Switch
BPF	Bag Particulate Filter	PT	Pressure Transmitter
BV	Ball Valve	PRV	Pressure Relief Valve
CF	Carbon Filter	RCB	Rotary Claw Blower
CV	Check Valve	SCFM	Standard Cubic Feet Per Minute
ET	Equalization Tank	SIL	Silencer
FA	Flame Arrestor	SP	Sample Port
FC	Pipe Joining Flex/Flange Coupling	ST	Sight Tube
FI	Flow Indicator	SVE	Soil Vapor Extraction
FIA	Flow Indicator Analog	THERM	Thermal Oxidizer
FM	Flow Meter	TI	Temperature Indicator
FS	Flow Switch	TIA	Temperature Indicator Analog
GV	Gate Valve	TP	Transfer Pump
LS	Level Switch	VI	Vacuum Indicator
MD	Manual Drain	VIA	Vacuum Indicator Analog
CO	Clean Out	VRV	Vacuum Relief Valve
OWS	Oil Water Separator	PS/PT	Pressure Switch/Pressure Transmitter

NOTES:
- High Flow SVE air stream line shown in green.
- Low Flow SVE air stream line shown in purple.
- Combined High and Low Flow SVE air stream line shown in black.
- Water/liquid line shown in blue.

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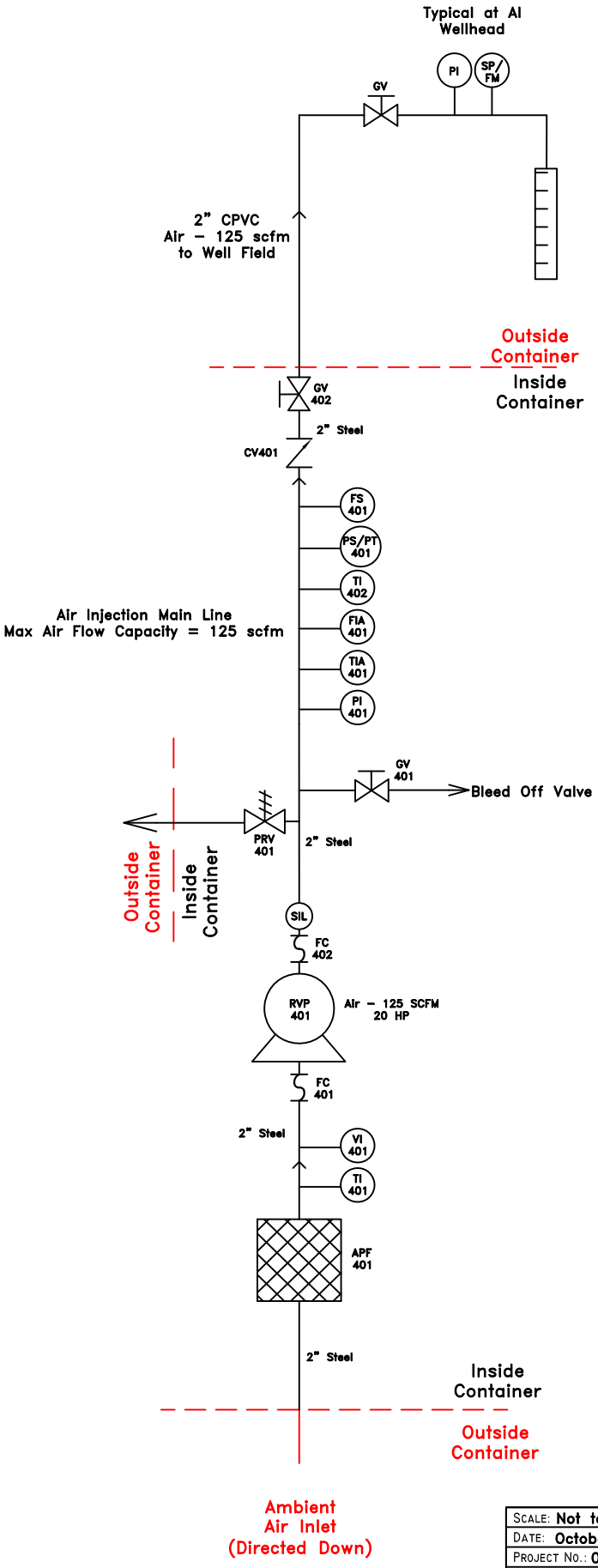
SCALE: Not To Scale	TITLE: PROCESS AND INSTRUMENTATION DIAGRAM – SVE PILOT TEST SYSTEM
DATE: October 14, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 6A
CHECKED BY: ELS	REV: 3
PROJ. MGMT. APPROVAL: SC	



KEY:

APF	Air Particulate Filter
CV	Check Valve
FC	Pipe Joining Flex/Flange Coupling
FM	Flow Meter
FIA	Flow Indicator Analog
FS	Flow Switch
GV	Gate Valve
PI	Pressure Indicator
PRV	Pressure Relief Valve
PS	Pressure Switch
PT	Pressure Transmitter
PSI	Pounds per Square Inch
RVP	Rotary Vane Pump
SCFM	Standard Cubic Feet Per Minute
SIL	Silencer
TI	Temperature Indicator
TIA	Temperature Indicator Analog
VI	Vacuum Indicator

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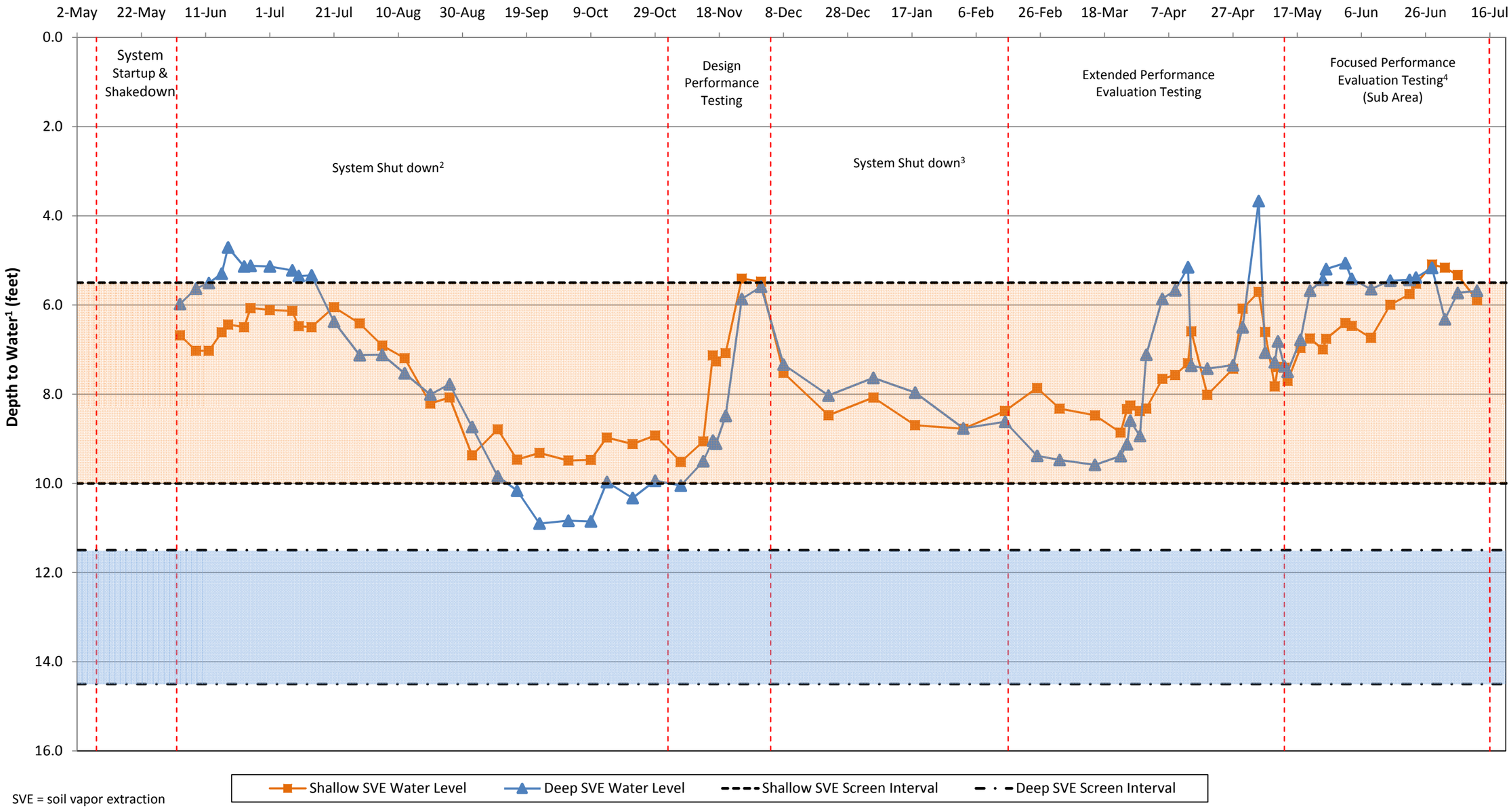
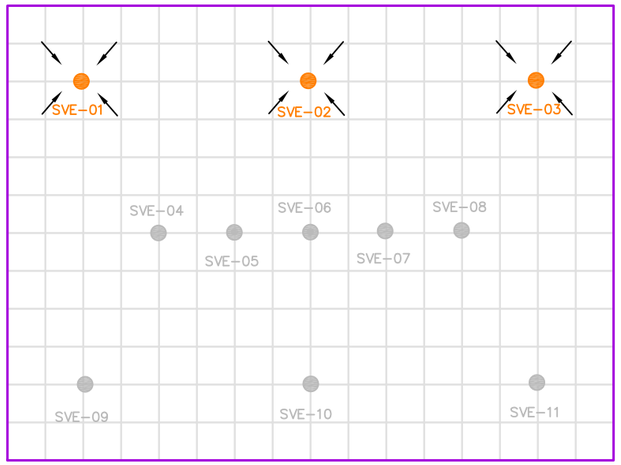
SCALE: Not to Scale	TITLE: PROCESS AND INSTRUMENTATION DIAGRAM – AI PILOT TEST SYSTEM
DATE: October 27, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 6B
CHECKED BY: ELS	REV: 2
PROJ. MGMT. APPROVAL: SC	

Figure 7
Average Groundwater Levels at Select Soil Vapor Extraction Wells
SVE Pilot Test Report
W.G. Krummrich Facility, Sauget, Illinois

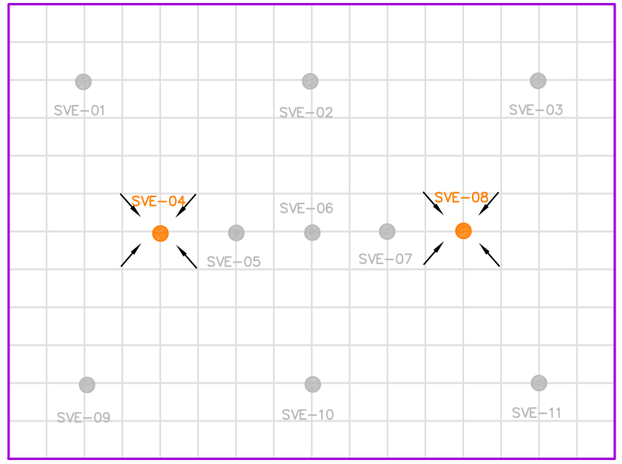


SVE = soil vapor extraction

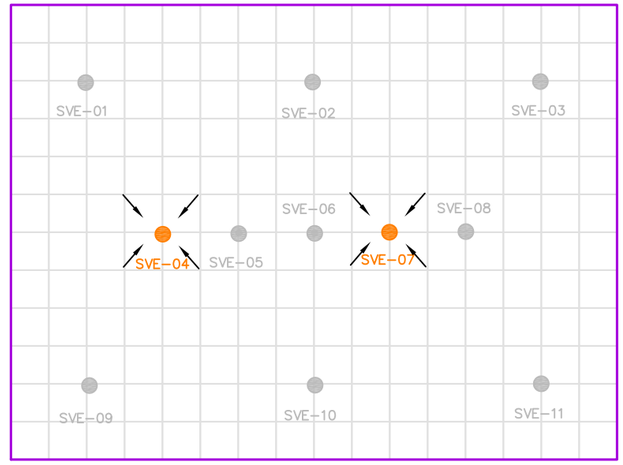
Notes:
1. The average water levels presented are based on measurements collected at shallow (A) and deep (B) SVE wells SVE-01A/B, SVE-02A/B, SVE-03A/B, SVE-04A/B, SVE-05A/B, SVE-06A/B, SVE-07A/B, SVE-08A/B, SVE-09A/B. SVE-10A/B, and SVE-11A/B. Generally, all available groundwater level data was included in the average calculation unless field observations indicated significant mounding or the presence of product in the well, or the well was operating as an air injection well.
2. The system was shut down on June 4, 2009 due to high groundwater levels. By late October 2009, groundwater levels had receded sufficiently to expose the shallow well screens.
3. The system was shut down on December 4, 2009 due to a rapidly rising groundwater level. By February 2010 the groundwater levels had receded sufficiently to restart the Extended Performance Evaluation Testing.
4. The system was permanently shut down on July 16, 2010 due to sustained high groundwater levels.



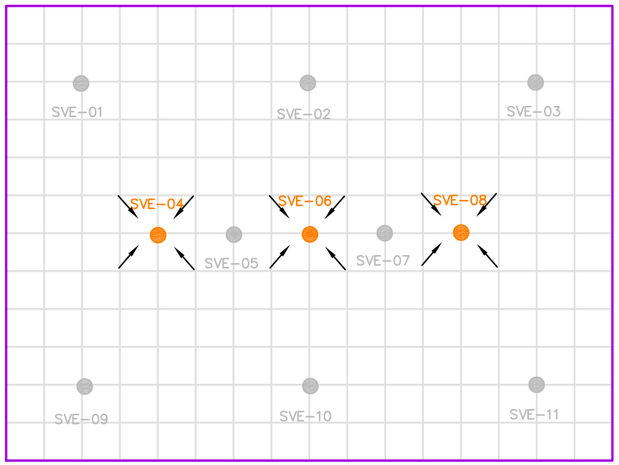
Configuration 1



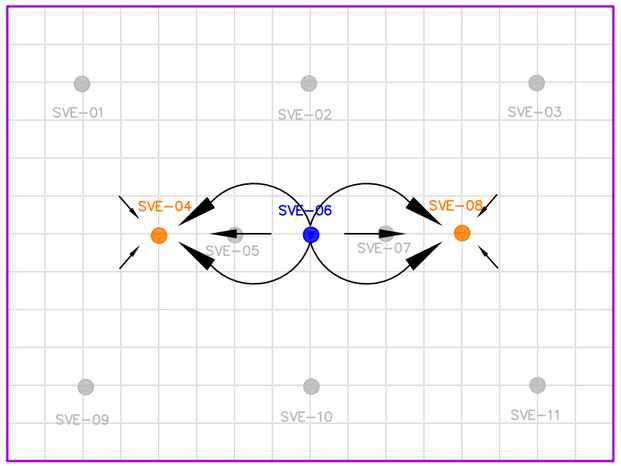
Configuration 2



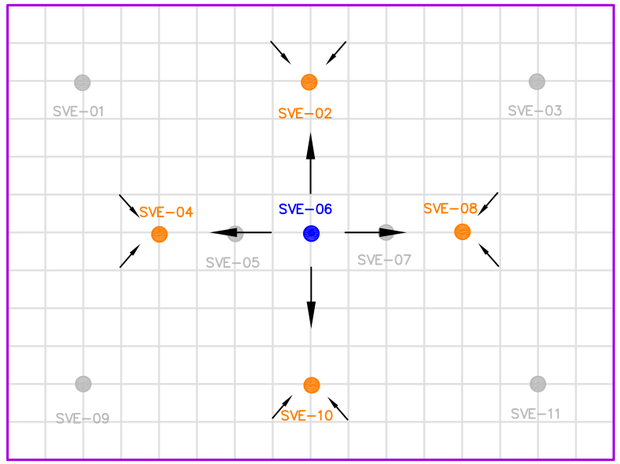
Configuration 3



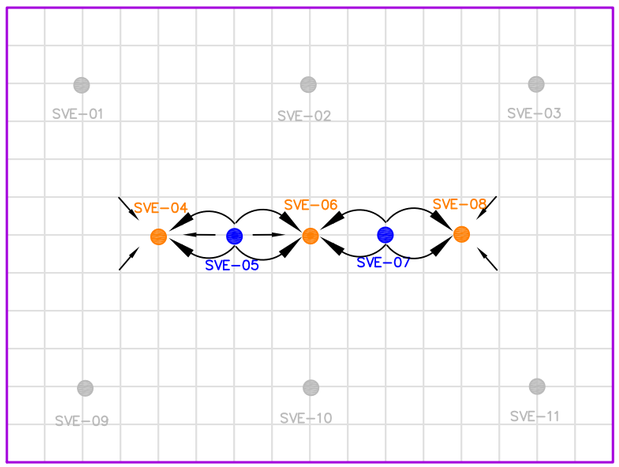
Configuration 4



Configuration 5



Configuration 6



Configuration 7

Note: Multi-well configurations 1 though 7 were tested in the fill and upper silty sand layers.

Legend

- SVE WELLS IN OPERATION AS VACUUM WELLS
- SVE WELLS IN OPERATION AS PRESSURE WELLS
- SVE WELLS NOT IN OPERATION
- FENCED PILOT TEST AREA: FILL AND UPPER AND LOWER SILTY SAND LAYERS
- 5 FEET X 5 FEET AREA
- AIR FLOW DIRECTION

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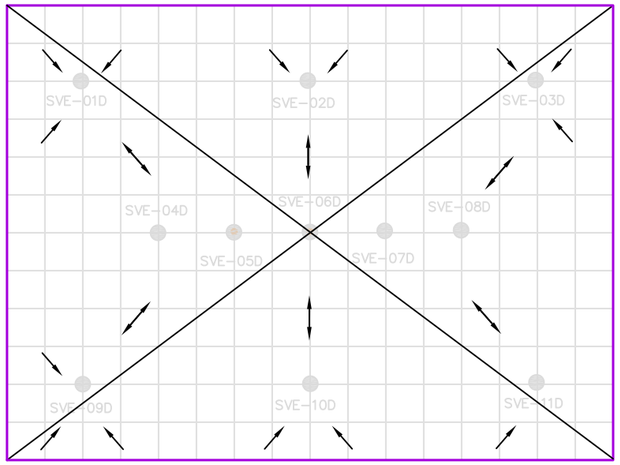
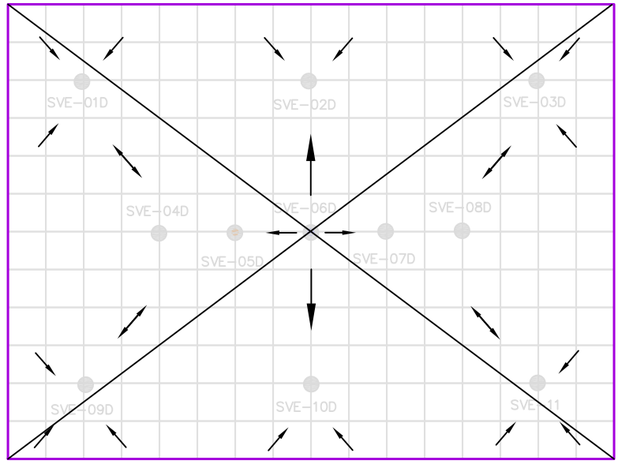
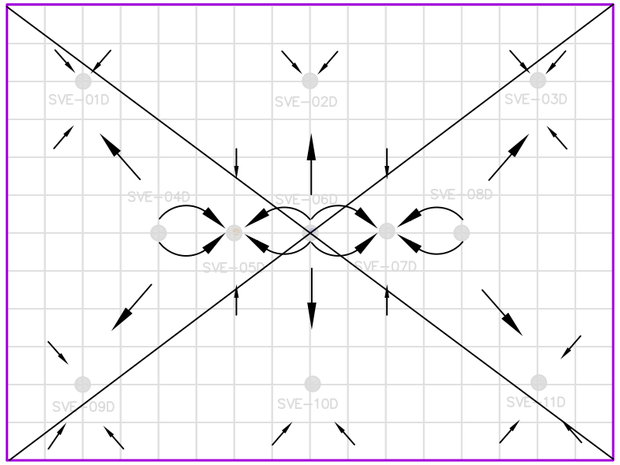
SCALE: As Shown	TITLE: PARAMETER EVALUATION TESTING – MULTI-WELL CONFIGURATIONS
DATE: October 13, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 8A
CHECKED BY: ELS	REV: 3
PROJ. MGMT. APPROVAL: SC	



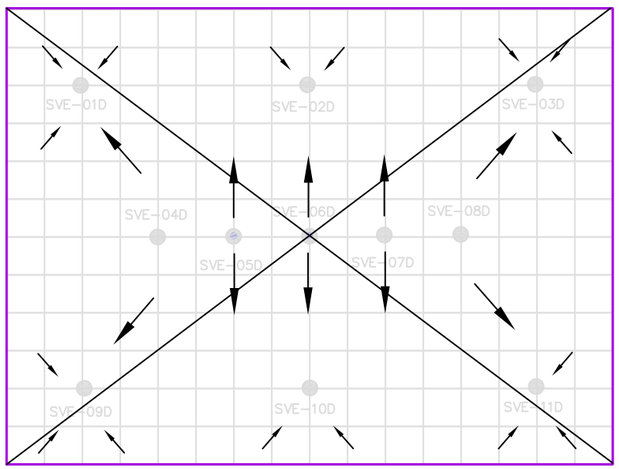
Configuration 8



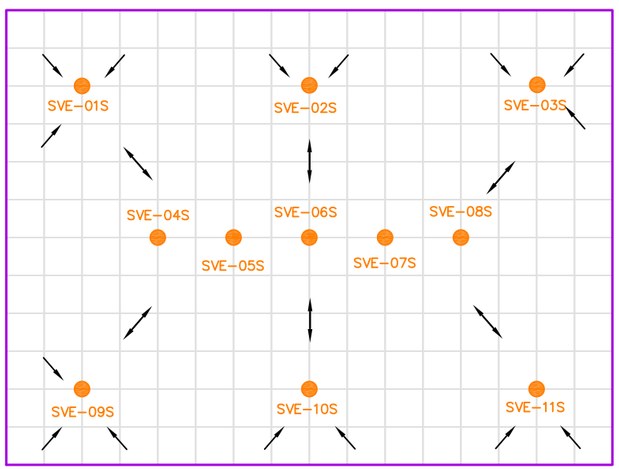
Configuration 9



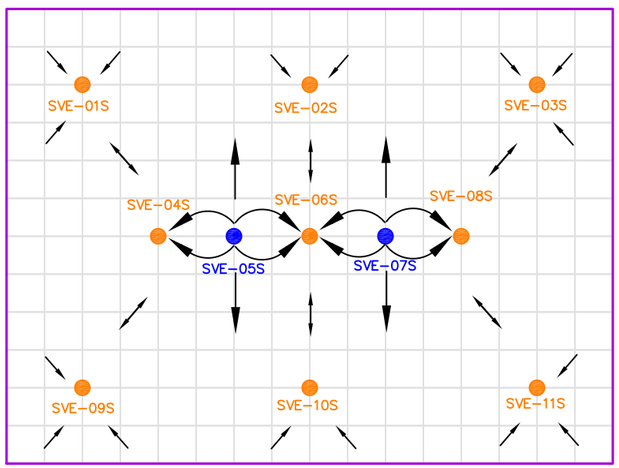
Configuration 10



Configuration 11



Configuration 12



Configuration 13

Legend

- SVE WELLS IN OPERATION AS VACUUM WELLS
- SVE WELLS IN OPERATION AS PRESSURE WELLS
- SVE WELLS NOT IN OPERATION
- FENCED PILOT TEST AREA: FILL AND UPPER AND LOWER SILTY SAND LAYERS
- 5 FEET X 5 FEET AREA
- AIR FLOW DIRECTION

Note:
1.Multi-well configurations 8 through 11 were the additional well-field configurations for the lower silty sand layer. Due to saturated lower silty sand well screens, these configurations were not tested.

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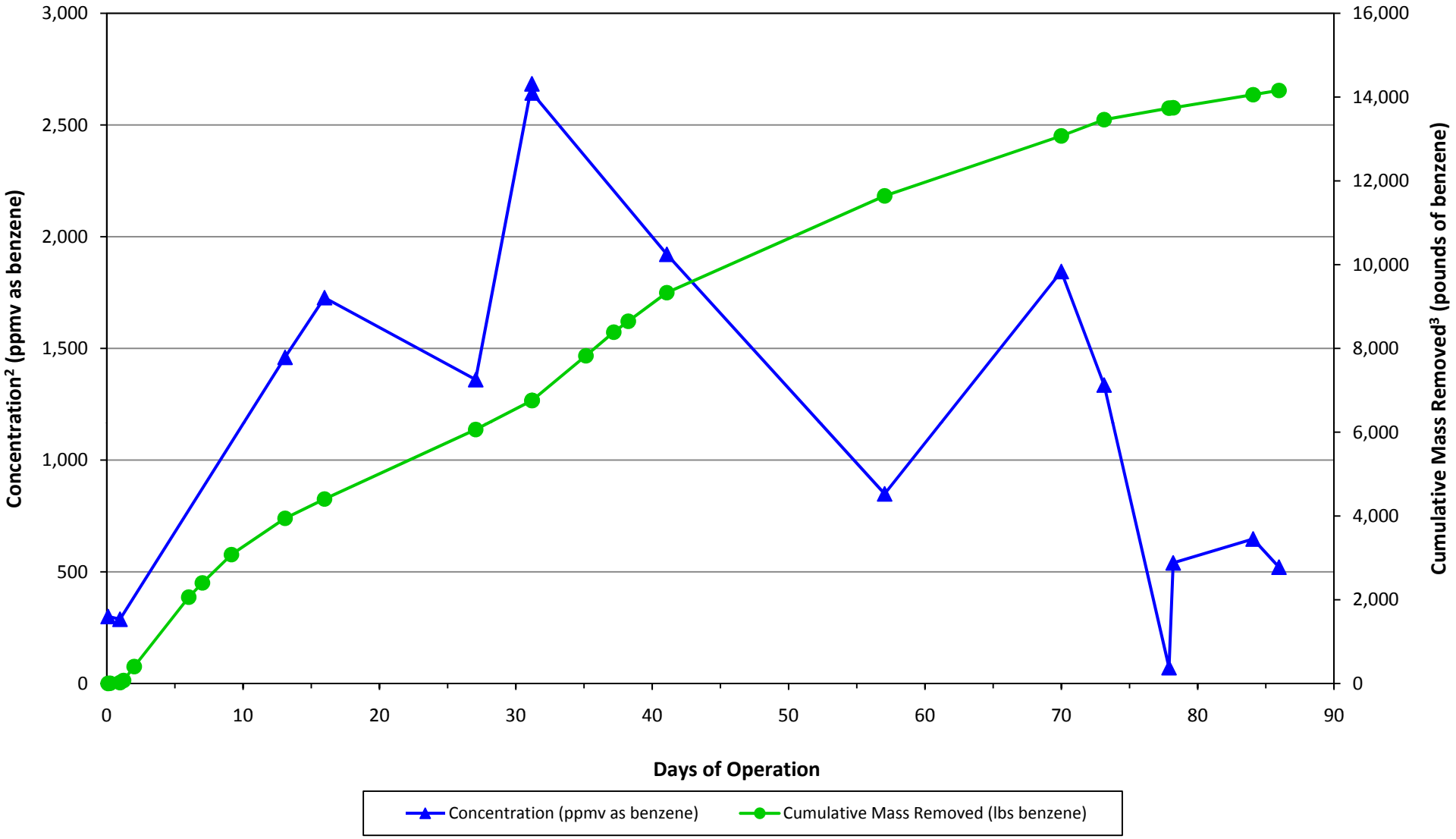
SCALE: As Shown	TITLE: PARAMETER EVALUATION TESTING – FLOW FIELD CONFIGURATIONS
DATE: October 11, 2010	
PROJECT NO.: 08013	
CLIENT: Solutia – Sauget	
DRAWN BY: JTH	DRAWING NO.: FIGURE 8B
CHECKED BY: ELS	REV: 3
PROJ. MGMT. APPROVAL: SC	

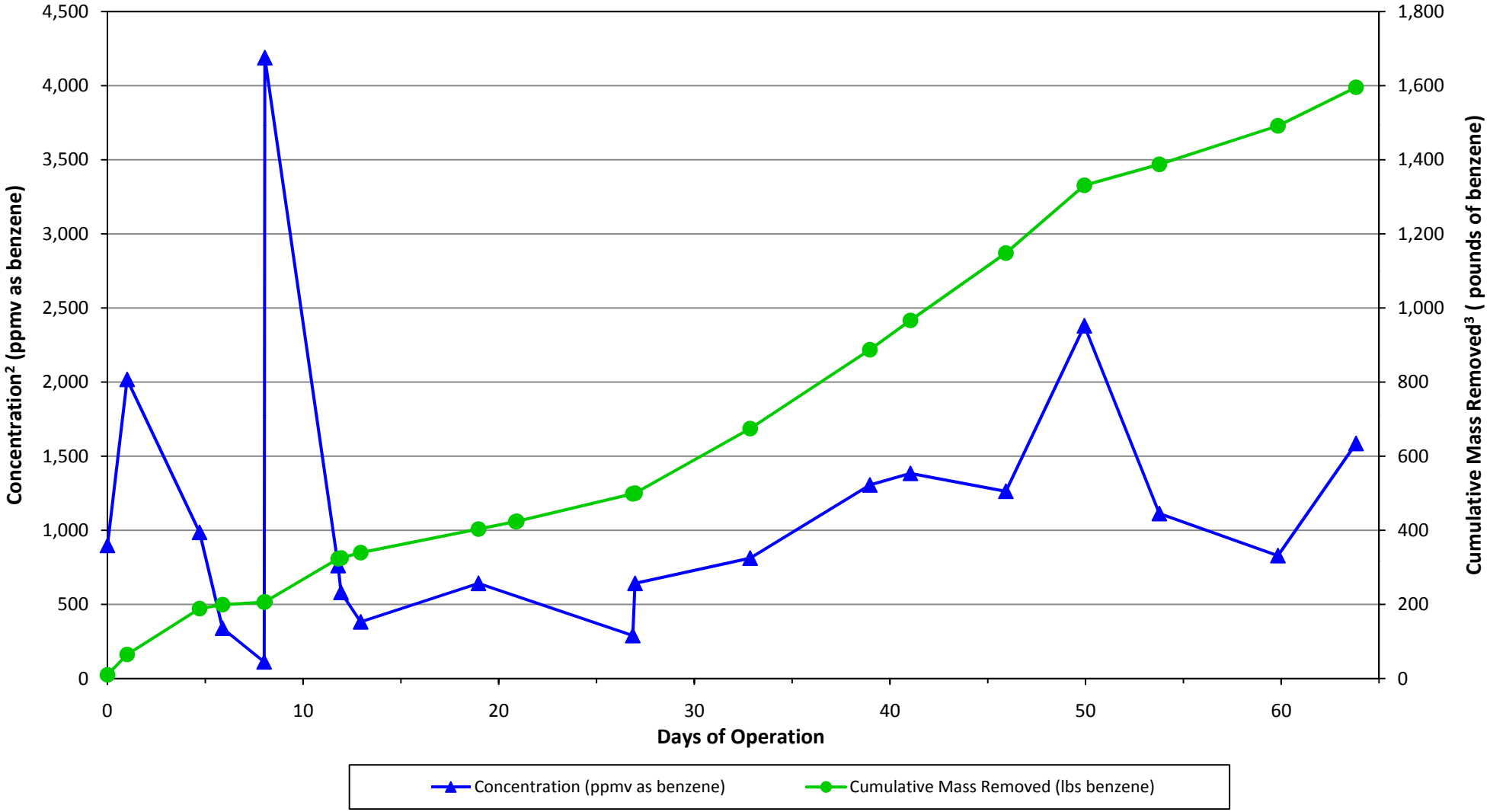
Figure 9A
Pilot Area Benzene Concentration and Cumulative Mass Removed[1]
SVE Pilot Test Report
W.G Krummrich Facility, Sauget, Illinois



Notes:
1. The Soil Vapor Extraction (SVE) Pilot Test was operated from February 16, 2010 to May 13, 2010. This chart represents the cumulative mass removed and the change in benzene concentration.
2. Soil vapor samples were collected from the combined total system and screened in the field for total volatile organic compounds using a photoionization detector. Results were reported as parts per million by volume (ppmv) as benzene.
3. The cumulative mass removed calculation is based the combined total system vapor concentration.

XDD, LLC

Figure 9B
Sub Area Benzene Concentration and Cumulative Mass Removed[1]
SVE Pilot Test Report
W.G. Krummrich Facility, Sauget Illinois



Notes:
1. The Soil Vapor Extraction (SVE) Pilot Test was reconfigured on May 13, 2010 to focus treatment on a less impacted area and operated through July 16, 2010. This chart represents the cumulative mass removed and the change in benzene concentration since the reconfiguration.
2. Soil vapor samples were collected from Line A and screened in the field for total volatile organic compounds using a photoionization detector. Results were reported as parts per million by volume (ppmv) as benzene.
3. The cumulative mass removed calculation is based on either Line A (well field only) or combined total system vapor concentration.

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