Sampling and Analysis Plan for Environmental Effects Laboratory RFI Site, Group 5, Santa Susana Field Laboratory

PREPARED FOR: Boeing and DOE

PREPARED BY: CH2M HILL

DATE: February 20, 2008

This technical memorandum presents the sampling and analysis plan (SAP) for the Environmental Effects Laboratory (EEL) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site within Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The purpose of this SAP is to describe the scope and rationale for the field investigation to address the data gaps presented in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008) for the EEL. The I&S Package identified gaps where additional data are needed to support the RFI, risk assessments, and corrective measures studies following a comprehensive review of historical information and reports containing chemical use information, chemical data, and physical data for the RFI site.

The data gaps identified in the I&S Package for the EEL are summarized in Table 1. Data gaps were generally identified for chemical use areas within each RFI site. As presented in Table 1, chemical data gaps were identified for 6 of the 7 chemical use areas identified for the EEL. Data gaps also were identified based on elevated detection limits of previous samples and lack of sediment data and soil data in the 2- to 6-foot-depth interval. In addition, data gaps were identified based on the need for documentation related to regulatory closure of pipelines located at the site.

To address these data gaps, CH2M HILL is proposing to collect 86 soil samples and 12 soil vapor samples. These samples will be collected from a total of 35 locations across the site (Table 1). The specific samples proposed for collection at each chemical use area are summarized in Table 2. For each sample location at each chemical use area, Table 2 describes the matrix to be sampled, the depth from which samples are to be collected, analytical methods to be used, and the rationale for sample collection. As presented in Table 2, more than one sample might be necessary to address the data gaps identified for each chemical use area.

The locations of samples proposed in Table 2 are presented in Figure 1. In addition, Figures 2 through 7 present the locations of the proposed samples relative to the locations of previous samples analyzed for volatile organic compounds (VOCs) in soil and soil vapor, metals in soil, petroleum hydrocarbons in soil, dioxins in soil, and PCBs in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate if the previous sample results (at any depth) were detected, were detected below risk based

screening levels (RBSLs) or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

TABLE 1

Data Gaps

Sampling and Analysis Plan for Environmental Effects Laboratory RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
1	EEL Cryogenic Laboratory and Test Cells – Determine extent of elevated VOC soil gas concentrations, screening for potential VOCs, metals, and hydraulic oil releases in test areas.	X			12
2	EEL Storage – Determine extent of elevated VOC soil gas concentrations, screening for potential VOCs, metals, and hydraulic oil releases.	X			4
3	EEL Mechanics Workshop – Determine extent of elevated VOC soil gas concentrations, screening for potential VOCs, metals, and hydraulic oil releases.	X			4
4	EEL Office Building – No documented chemical use, so will not include in chemical use and data gap summary tables.				No samples collected - no chemical use.
5	Tanks – Screening for hydraulic oil releases and associated constituents of potential concern (COPCs) such as semivolatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs).	X			7
6	Transformers – Determine extent of elevated PCBs detected near substation.	X			2
7	Hazardous Materials Storage Pad – Determine extent of elevated VOC soil gas concentrations, screening for potential VOCs, metals, and hydraulic oil releases in the hazardous materials storage area.	X			6
				Total	**35**

Samples for which the need for laboratory analysis is contingent on the results of other samples are indicated in Table 2 with an "H," signifying they will be place on "Hold." These samples will be collected, but the laboratory will not analyze these samples until CH2M HILL has evaluated the need for lab analysis and provided direction to the lab to analyze the sample. The need for lab analysis will be contingent on the results of samples above or below the proposed sample.

Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (general text). In addition, quality assurance/quality control samples will be collected as described in the general text of the Group 5 SAP.

Schedule

This investigation is scheduled for implementation in March and April 2008. Prior to commencing the fieldwork, a Field Implementation Plan (FIP) will be prepared and submitted for Boeing and DOE review. The contents of the FIP are described in more detail in the Group 5 General Text. The FIP is scheduled to be submitted to Boeing and the Department of Energy (DOE) in February 2008.

References

CH2M HILL. 2008. *Integration & Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California*. January 3.

TABLE 2

Proposed Samples for Environmental Effects Laboratory RFI Site

Sampling and Analysis Plan for Environmental Effects Laboratory RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
1	ELBS1008	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Northwest corner of Bldg. 3271.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	ELBS1009	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Northern corner of Bldg. 3271.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	ELBS1010	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Southeast corner of Bldg 3271.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	ELBS1011	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Southern corner of Bldg 3268. Drill until bedrock is encountered, and hold deeper samples pending shallow results.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
		Soil	20	H	H		H		H		H					H			
1	ELBS1012	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Southeastern corner/front of Bldg 3268.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	ELBS1013	Soil	1	X	X		X		X	X	H					X			Screening for impacts from cryogenics testing operations. Near Bldg. 3108.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	ELSV1001	Soil Vapor	5			X													Screening for VOC impacts - northwest of Bldg. 3271.
		Soil Vapor	10			X													
1	ELSV1002	Soil Vapor	5			X													Screening for VOC impacts - west of Bldg. 3271.
		Soil Vapor	10			X													
1	ELSV1003	Soil Vapor	5			X													Delineate extent of VOC impacts - step out 50 feet south of ELSV03.
		Soil Vapor	10			X													
1	ELSV1004	Soil Vapor	5			X													Delineate extent of VOC impacts - step out 50 feet southeast of ELSV01.
		Soil Vapor	10			X													
1	ELSV1005	Soil Vapor	5			X													Delineate extent of VOC impacts - step out 50 feet north of ELSV04. Also screen for impacts from hazardous materials storage area.
		Soil Vapor	10			X													
1	ELSV1006	Soil Vapor	5			X													Delineate extent of VOC impacts - step out 10 feet northwest of ELSV04. Also screen for impacts north of Bldg. 3271.
		Soil Vapor	10			X													
2	ELBS1014	Soil	1		X				X	X						X			Screening for potential releases from storage areas. West of Bldg 3109.
		Soil	6		X				X							X			
		Soil	10		H				H							H			
2	ELBS1015	Soil	1		X				X	X						X			Screening for potential releases from storage areas. East of Bldg 3109.
		Soil	6		X				X							H			
		Soil	10		H				H							H			
2	ELBS1016	Soil	1		X				X	X						X			Screening for potential releases from storage areas. East of Bldg 3908. Drill until bedrock is encountered, hold deeper samples pending shallow results.
		Soil	6		X				X							H			
			10		H				H							H			
		Soil	20		H				H							H			

TABLE 2

Proposed Samples for Environmental Effects Laboratory RFI Site

Sampling and Analysis Plan for Environmental Effects Laboratory RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
2	ELBS1017	Soil	1		X				X	X						X			Screening for potential releases from storage areas. West of Bldg 3908.
		Soil	6		X				X							H			
		Soil	10		H				H							H			
3	ELBS1018	Soil	1		X				X	X									Screening for potential releases from workshop area. North side of Bldg 3264.
		Soil	6		X				X										
		Soil	10		H				H										
3	ELBS1019	Soil	1		X				X	X									Screening for potential releases from workshop area. North side of Bldg 3227.
		Soil	6		X				X										
		Soil	10		H				H										
3	ELBS1020	Soil	1	X	X		X		X	X	H								Screening for potential releases from workshop area. South side of Bldg 3264.
		Soil	6	X	X		X		X		H								
		Soil	10	H	H		H		H		H								
3	ELBS1021	Soil	1	X	X		X		X	X	H								Screening for potential releases from workshop area. South side of Bldg 3227.
		Soil	6	X	X		X		X		H								
		Soil	10	H	H		H		H		H								
4																			Office - no chemical use/no samples needed.
5	ELBS1001	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks north of Bldg. 3271.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1002	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks north of Bldg. 3271.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1003	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks south of Bldg. 3271.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1004	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks south of Bldg. 3271.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1005	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks between Bldg. 3271 and Bldg. 3268.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1006	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks between Bldg. 3271 and Bldg. 3268.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
5	ELBS1007	Soil	1	X			H			X	H								Screening for releases from hydraulic oil tanks and other tanks - tanks between Bldg. 3108 and Bldg. 3109.
		Soil	6	H			H				H								
		Soil	10	H			H				H								
6	ELBS1022	Soil	1	X				X		X	X								Extent of elevated PCBS northern transformer area.
		Soil	6	H				H			H								
6	ELBS1023	Soil	1	X				X		X	X								Extent of elevated PCBS northern transformer area.
		Soil	6	H				H			H								
7	ELBS1024	Soil	1	X	X		X		X	X	H					X			Screening for potential releases from hazardous materials storage pad area - north of pad. Drill until bedrock is encountered, hold deeper samples pending shallow results.
		Soil	6	X	X		X		X		H					X			

TABLE 2

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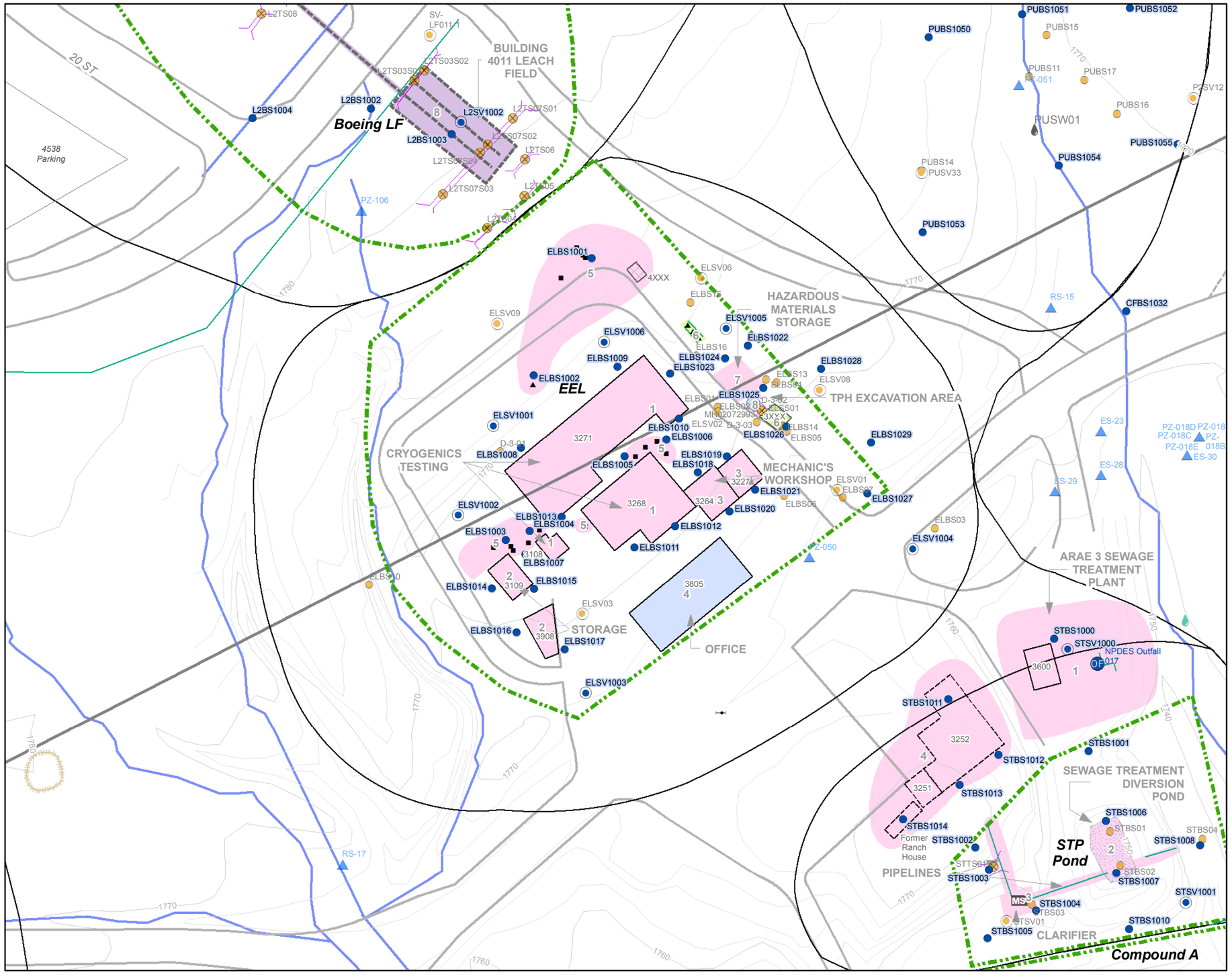
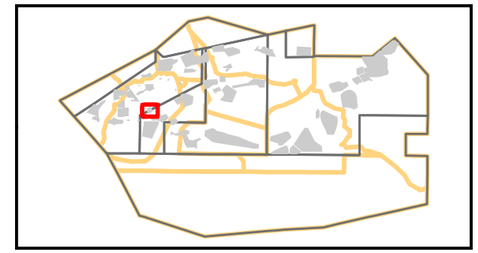
Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	10	H	H		H		H		H					H			
		Soil	20	H	H		H		H		H					H			
7	ELBS1025	Soil	1	X	X		X		X	X	H					X			Screening for potential releases from hazardous materials storage pad area south of pad.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
7	ELBS1026	Soil	1	X	X		X		X	X	H					X			Screening for potential releases from hazardous materials storage pad area, and extent of metals exceedance - step out south of transformer area.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
7	ELBS1027	Soil	1	X	X		X		X	X	H					X			Screening for potential releases from hazardous materials storage pad area- step out 50 feet east. Drill until bedrock is encountered, hold deeper samples pending shallow results.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
		Soil	20	H	H		H		H		H					H			
7	ELBS1028	Soil	1						X	X									Extent of metals exceedance east of storage area, at ELSB04 - step out 50 feet east.
		Soil	6						H										
7	ELBS1029	Soil	1						X	X									Extent of metals exceedance southeast of storage area - step out 50 feet southeast.
		Soil	6						H										
Total Soil Samples for Analysis				33	36		24	2	38	29	2					25			
Total Soil Samples on Hold				31	22		36	2	24		62					21			
Total Soil Vapor Samples for Analysis						12													
Total Soil Samples Collected			86																
Total Number of Locations			35																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

Soil	Groundwater - Spring
Soil - Composite	Water - Artificial
Soil - Sediment	Water - Discharge
Soil - Surface	Water - Surface
Air - Soil Vapor	Water - Surface (Seep)
Air	Biological
Groundwater	Other
Groundwater - Lysimeter	Sump

Basemap Legend

Transformer Poles	Building - Existing	RFI Site - Boeing
Tank - UST	Building - Removed	RFI Site - DOE
Tank - AST	Building - Not Yet Determined	RFI Site - NASA
Tank - Not Yet Determined	Transformer - Existing	RFI Site Buffer
Excavation	Transformer - Removed	RFI Group Boundary
Leachfield	Transformer - Not Yet Determined	Administrative Area
Pipe		Property Boundary
Drainage	Debris	Energetic Constituents
Road - Asphalt	Multiple Use	Propellants
Roads - Dirt	Solvent	Leach Field
Rocks	Petroleum	Non-metal Inorganic Constituents
Streams	Oil/PCBs	Screening for Potential Impacts
Pond	Metals	

Proposed Sampling Locations

EEL

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1 inch equals 60 feet

0 60 120 Feet

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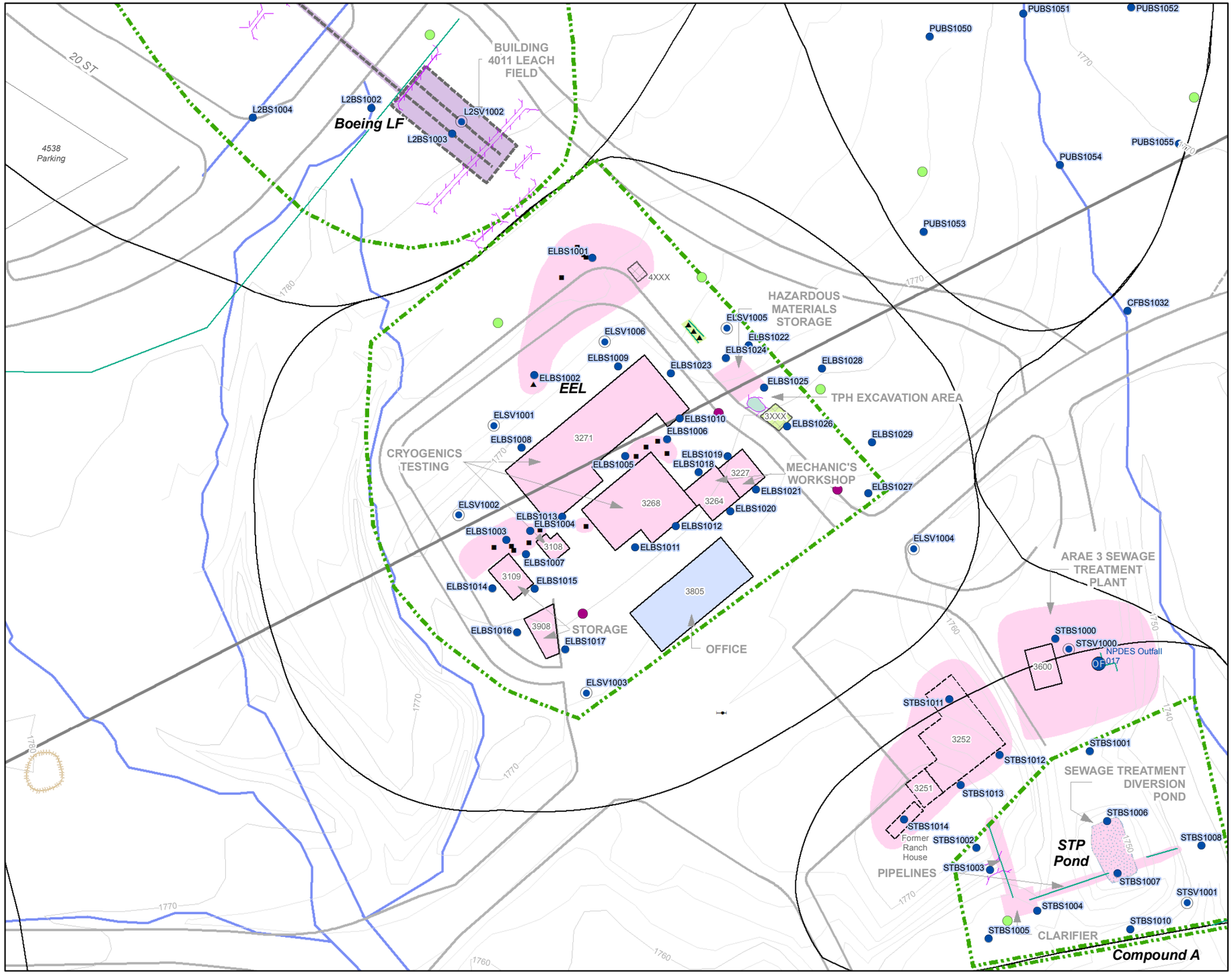
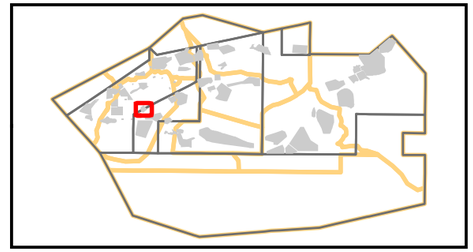
Figure 1





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil Vapor and Proposed Sampling Locations

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1 inch equals 60 feet

0 60 120 Feet

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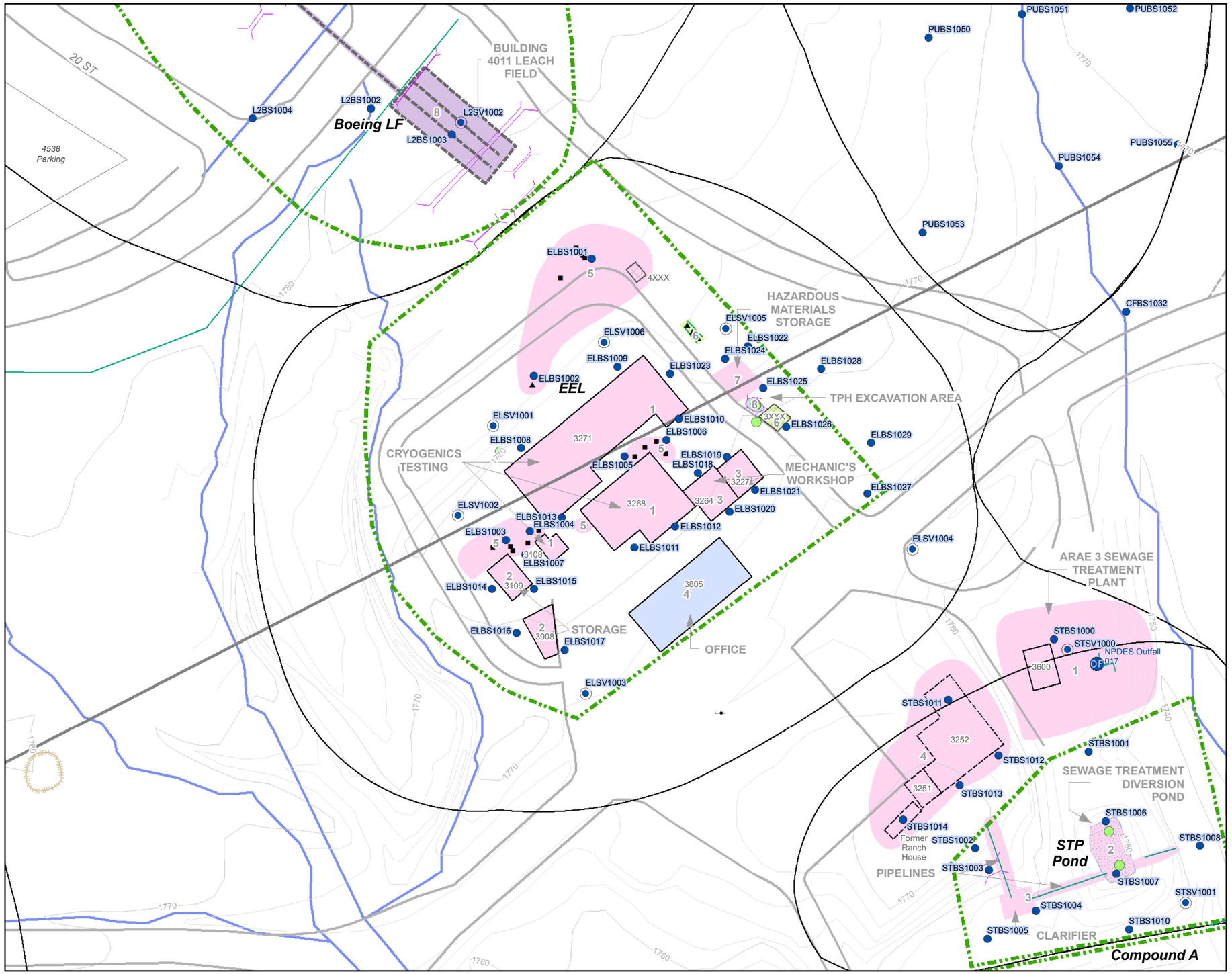
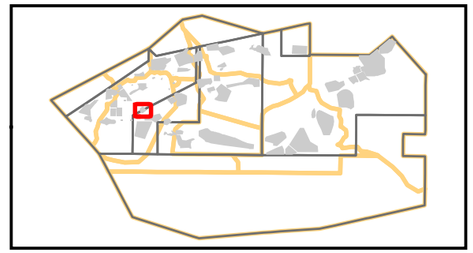
Figure 2





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil and Proposed Sampling Locations

EEL

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1 inch equals 60 feet

0 60 120 Feet

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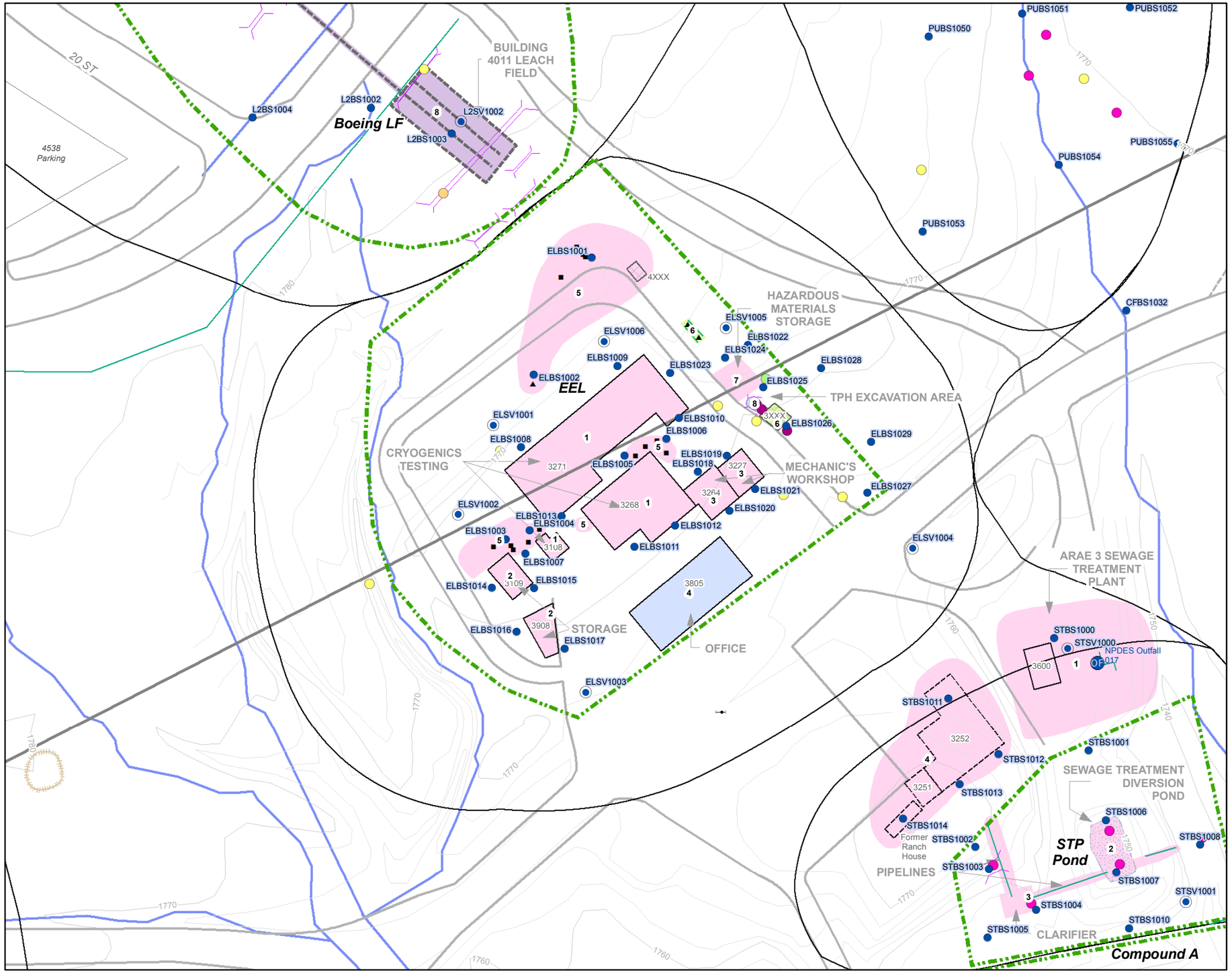
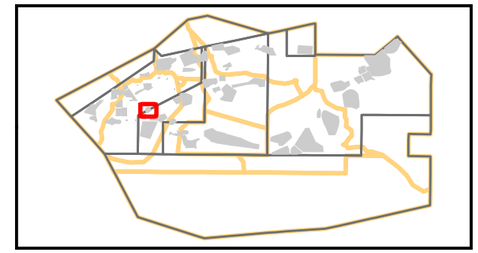
Figure 3





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Metals in Soil

- Exceeds Background + Residential RBLS + Eco RBLS
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Metals in Soil and Proposed Sampling Locations

EEL

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1 inch equals 60 feet

0 60 120 Feet

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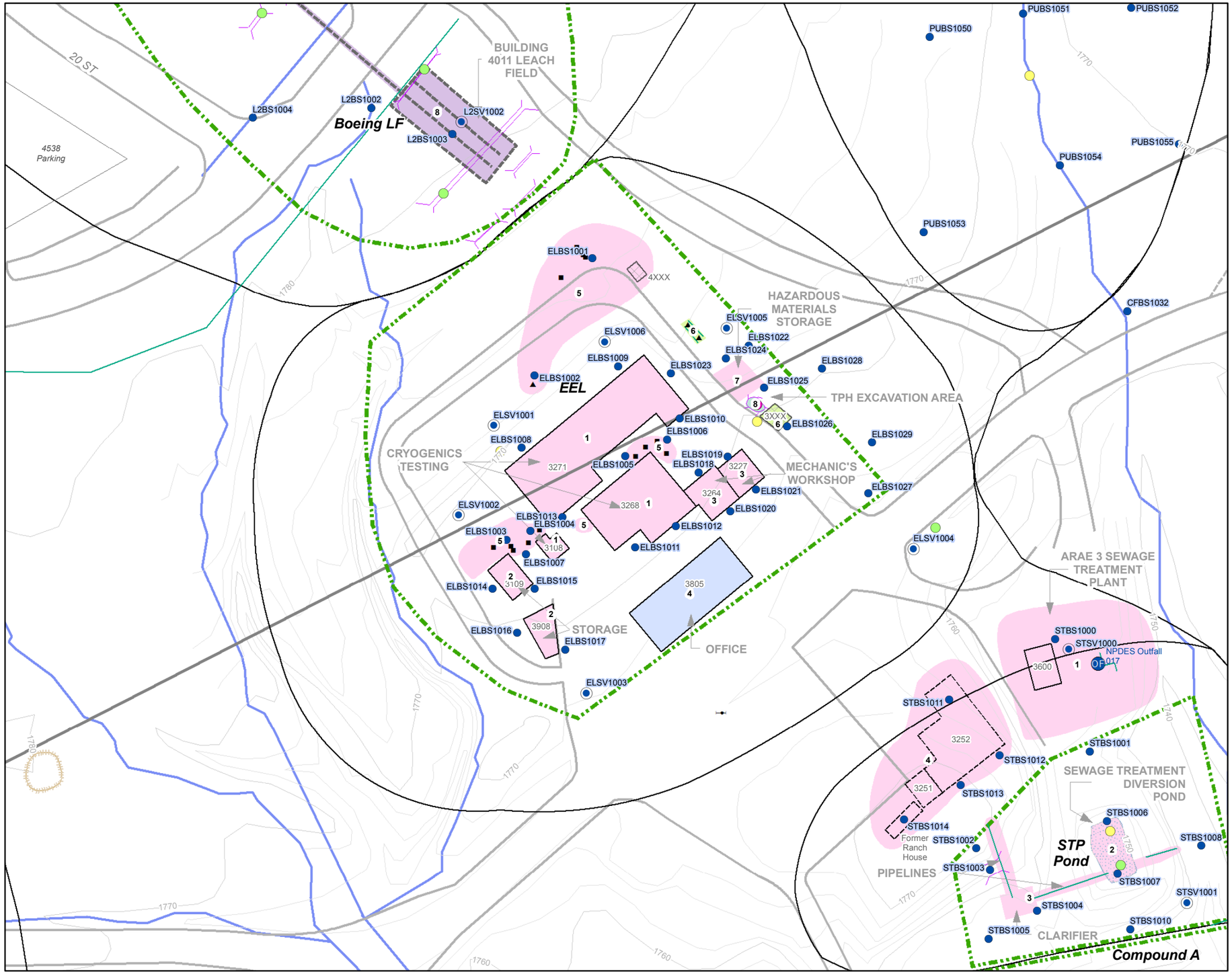
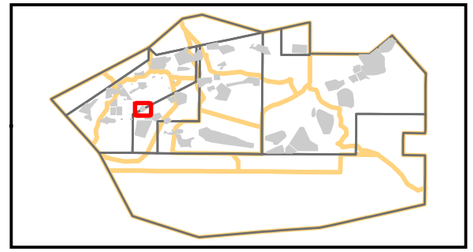
Figure 4





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH in Soil

- Detect > or equal to 100 mg/kg
- Detect < 100 mg/kg
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

TPH in Soil and Proposed Sampling Locations

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1 inch equals 60 feet

0 60 120 Feet

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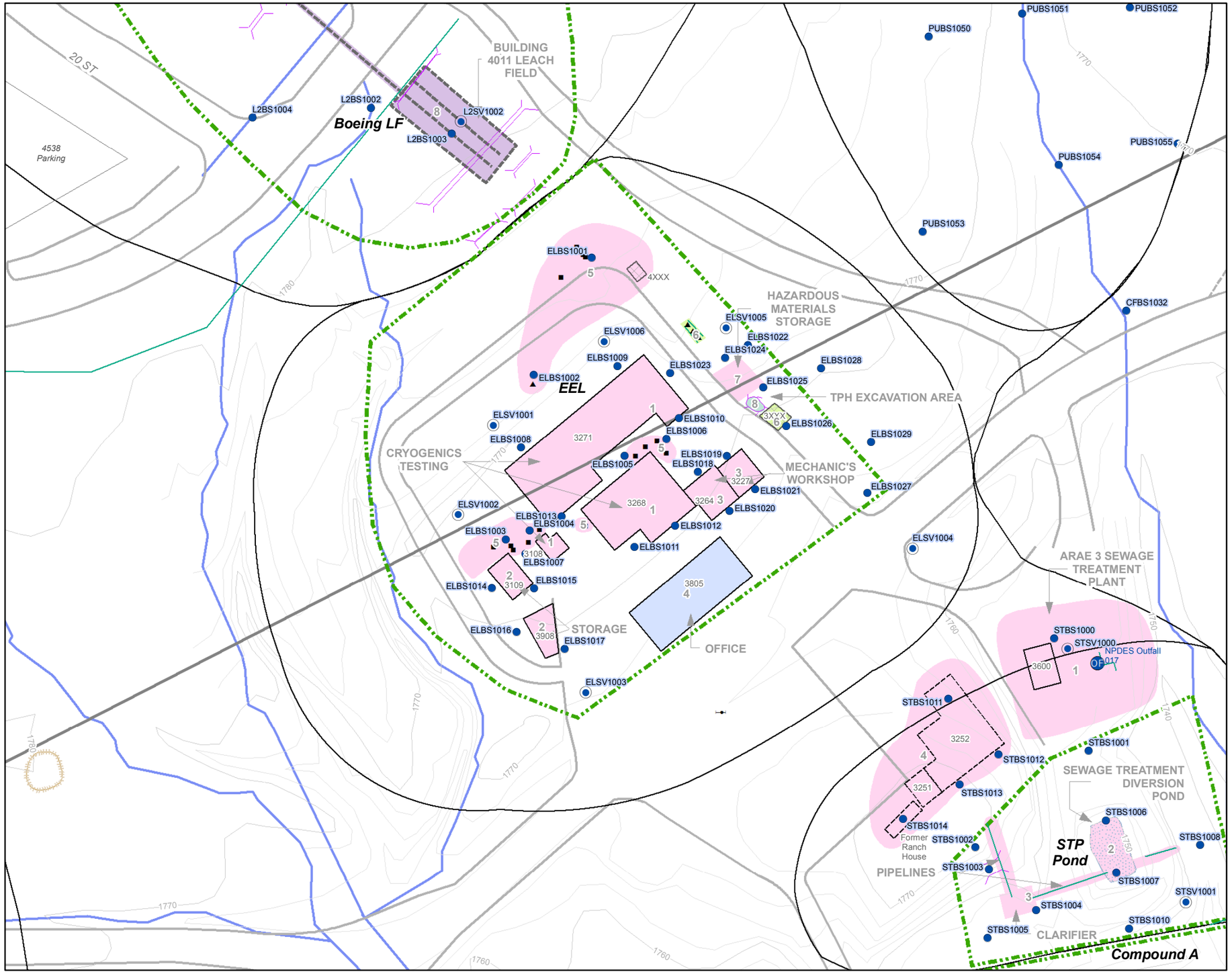
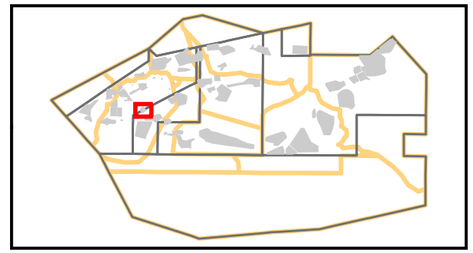
Figure 5





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Dioxins in Soil and Proposed Sampling Locations

EEL

Date: February 20, 2008 **WORKING DRAFT**

1 inch equals 60 feet

0 60 120 Feet

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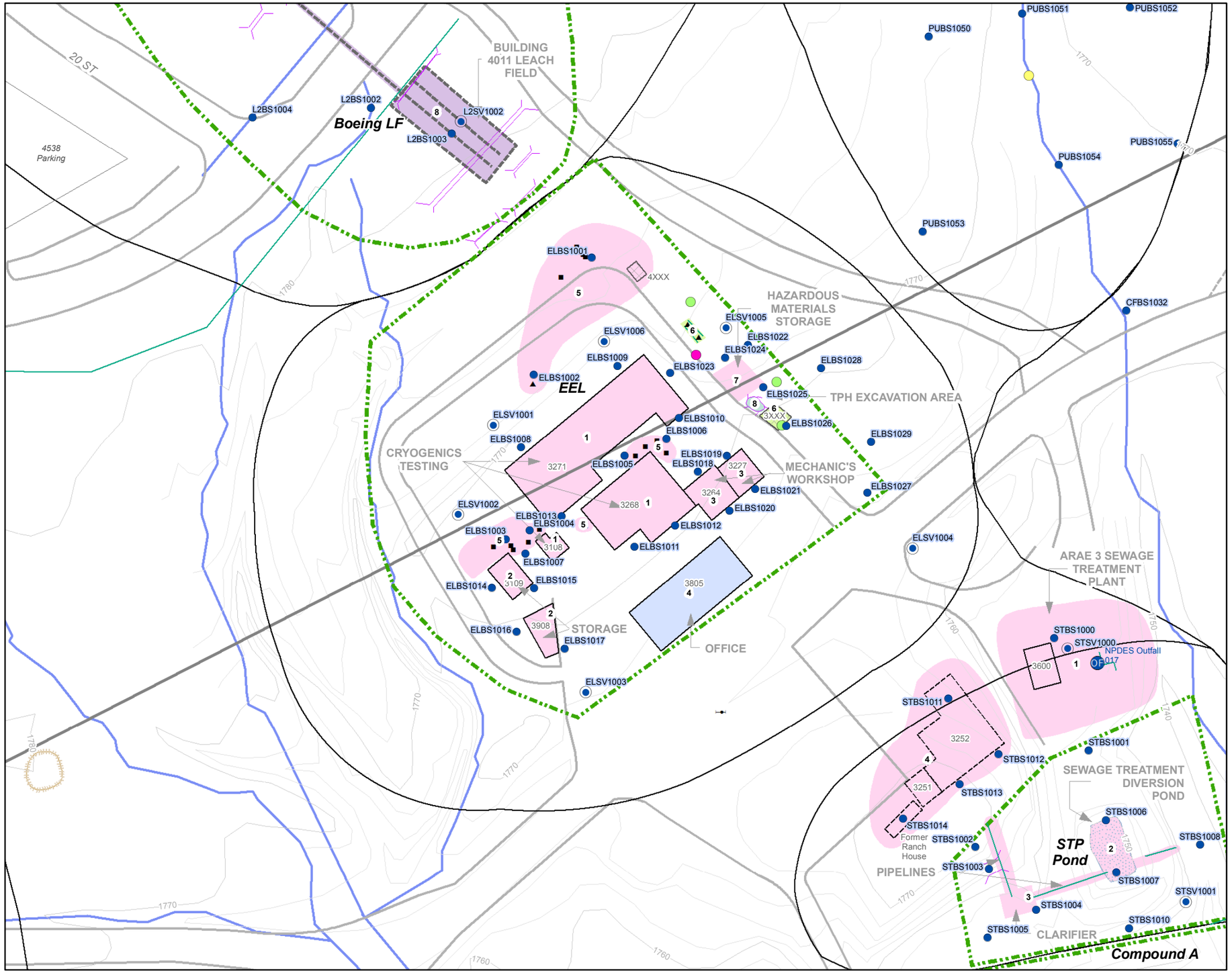
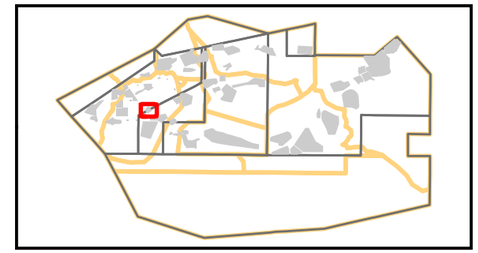
Figure 6





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

PCBs in Soil and Proposed Sampling Locations

EEL

Date: February 20, 2008 **WORKING DRAFT**

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1 inch equals 60 feet

0 60 120 Feet

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CH2MHILL

Figure 7

Sampling and Analysis Plan for Pond Dredge RFI Site, Group 5, Santa Susana Field Laboratory

PREPARED FOR: Boeing and DOE

PREPARED BY: CH2M HILL

DATE: Febraury 20, 2008

This technical memorandum presents the sampling and analysis plan (SAP) for the Pond Dredge at the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site in Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The purpose of this SAP is to describe the scope and rationale for the field investigation to address the data gaps presented in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008) for the Pond Dredge. The I&S Package identified gaps where additional data are needed to support the RFI, risk assessments, and corrective measures studies following a comprehensive review of historical information and reports containing chemical use information, chemical data, and physical data for the RFI site.

The data gaps identified in the I&S Package for the Pond Dredge Area are summarized in Table 1. Data gaps were generally identified for chemical use areas within each RFI site. As presented in Table 1, chemical data gaps were identified for the chemical use area identified for the Pond Dredge Area. Data gaps also were identified based on elevated detection limits of previous samples and lack of soil data in the 2- to 6-foot-depth interval. In addition, data gaps were identified based on the need for documentation of the source and vertical and lateral extents of the pond dredge material. A data gap to verify the need to screen for a depleted uranium slug that could be in the site also was identified.

To address these data gaps, CH2M HILL is proposing to collect 56 soil samples. These samples will be collected from a total of 16 locations across the site (Table 1). The hummocky areas of the site will be trenched to facilitate a better understanding of the nature and extent of dredge materials. Analytical methods proposed in Table 2 are consistent with debris material that has been investigated to date. Other constituents might be analyzed, depending on waste types encountered during trenching. The specific samples proposed for collection in the Pond Dredge are summarized in Table 2. For each sample location at the chemical use area, Table 2 describes the matrix to be sampled, the depth from which samples are to be collected, analytical methods to be used, and the rationale for sample collection. Samples that will be collected from previously trenched areas, near previous samples, by using a drill rig will be denoted with "BS" for soil boring sample. Samples collected in the hummocky areas after trenching will be denoted with "TS" for trench sample. As presented in Table 2, more than one sample might be necessary to address the data gaps identified for each chemical use area.

In addition to the sample locations presented in Table 2, CH2M HILL plans to conduct trenching in disturbed or hummocky areas that have not been previously evaluated. We will evaluate the Pond Dredge area to determine if there are any areas where the extent of debris or suspect dredge material areas has not been delineated. Additional samples may be necessary to assess new areas, if found, but based on discussions with Boeing, we do not anticipate additional areas. The sample locations in these areas are to demonstrate that the RBSL exceedances in these areas are limited to the disturbed areas, and have not impacted surrounding soil or shallow groundwater.

The locations of samples proposed in Table 2 are presented in Figure 1. In addition, Figures 2 through 7 present the locations of the proposed samples relative to the locations of previous samples analyzed for volatile organic compounds (VOCs) in soil and soil vapor, metals in soil, petroleum hydrocarbons in soil, dioxins in soil, and PCBs in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate if the previous sample results (at any depth) were detected, were detected below-risk based screening levels (RBSLs) or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

TABLE 1

Data Gaps

Sampling and Analysis Plan for Pond Dredge RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
1	Confirm material in area is actually pond dredge from Silvernale and R-2 Ponds. Construction debris possible, but no documentation of source or extent.			X	0
1	Screen for other constituents of potential concern (COPCs), including energetics, polychlorinated biphenyls (PCBs), and dioxins. Determine extent of dredge materials/ debris.	X	X		16
1	Verify the need to screen for depleted uranium slug.			X	0
				Total	**16**

Samples for which the need for laboratory analysis is contingent on the results of other samples are indicated in Table 2 with an "H," signifying they will be placed on "Hold." These samples will be collected, but the laboratory will not analyze these samples until CH2M HILL has evaluated the need for lab analysis and provided direction to the lab to analyze the sample. The need for lab analysis will be contingent on the results of samples above or below the proposed sample.

Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (general text). In addition, quality assurance/quality control samples will be collected as described in the general text of the Group 5 SAP.

Schedule

This investigation is scheduled for March and April 2008. Prior to commencing the fieldwork, a Field Implementation Plan (FIP) will be prepared and submitted for Boeing and DOE review. The contents of the FIP are described in more detail in the Group 5 General Text. The FIP is scheduled to be submitted to Boeing and DOE in February 2008.

References

CH2M HILL. 2008. *Integration & Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California*. January 3.

TABLE 2

Proposed Samples for Pond Dredge RFI Site

Sampling and Analysis Plan for Pond Dredge RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
1	PDBS1000	Soil	1	X	X		X		X	X	X	X	X	X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment.
		Soil	6	X	X		X		X		X	X	H	X	X	X			
		Soil	10	H	H		H		H		H	H	H	H	H	H			
1	PDBS1001	Soil	1		X		X			X	H	X		X	X	X			Metals detected at 3.5 feet bgs; vertical delineation of metals. Other COCs not investigated, samples to be collected in undisturbed soil in close proximity to pre-existing sample.
		Soil	6		X		X		X		H	X		X	X	X			
		Soil	10		H		H		H		H	H		H	H	H			
1	PDBS1002	Soil	1		X		X			X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment.
		Soil	6		X		X				H	X		X	X	X			
		Soil	10		H		H		H		H	H		H	H	H			
1	PDBS1003	Soil	1	X	X		X		X	X	H	X		X	X	X			Metals detected at 5 feet bgs; Vertical delineation of metals; Other COCs not investigated, samples to be collected in undisturbed soil in close proximity to pre-existing sample.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1004	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1005	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment. Drill to encounter bedrock - hold deeper samples pending analysis of mobile shallow compounds.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H				H					H		H			
		Soil	20	H	H				H					H		H			
		Soil	30	H	H				H					H		H			
1	PDBS1006	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1007	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment. Drill to encounter bedrock - hold deeper samples pending analysis of mobile shallow compounds.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H				H					H		H			
		Soil	20	H	H				H					H		H			
		Soil	30	H	H				H					H		H			
1	PDBS1008	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated downgradient from the pond dredge site area and in the buffer zone; site assessment.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1009	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment. Drill to encounter bedrock - hold deeper samples pending analysis of mobile shallow compounds.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H				H					H		H			
		Soil	20	H	H				H					H		H			
		Soil	30	H	H				H					H		H			
1	PDBS1010	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated to the north, approximately 60 feet downgradient from previously collected sample with exceedances for metals; site assessment.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1011	Soil	1	X	X		X			X	H	X		X	X	X			Metals detected at 1.5 feet bgs; vertical delineation. Other COCs not investigated, samples to be collected in undisturbed soil in close proximity to pre-existing sample.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDBS1012	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected in undisturbed soil in the close vicinity of pre-existing trench; site assessment. Drill to encounter bedrock - hold deeper samples pending analysis of mobile shallow compounds.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
		Soil	20	H	H		H		H		H	H		H	H	H			
		Soil	30	H	H		H		H		H	H		H	H	H			
1	PDTS1000	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected after trenching for nature extent; site assessment. If new mound found in this area.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDTS1001	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected after trenching for nature extent; site assessment. If new mound found in this area.
		Soil	6	X	X		X		X		H	X		X	X	X			

TABLE 2

Proposed Samples for Pond Dredge RFI Site

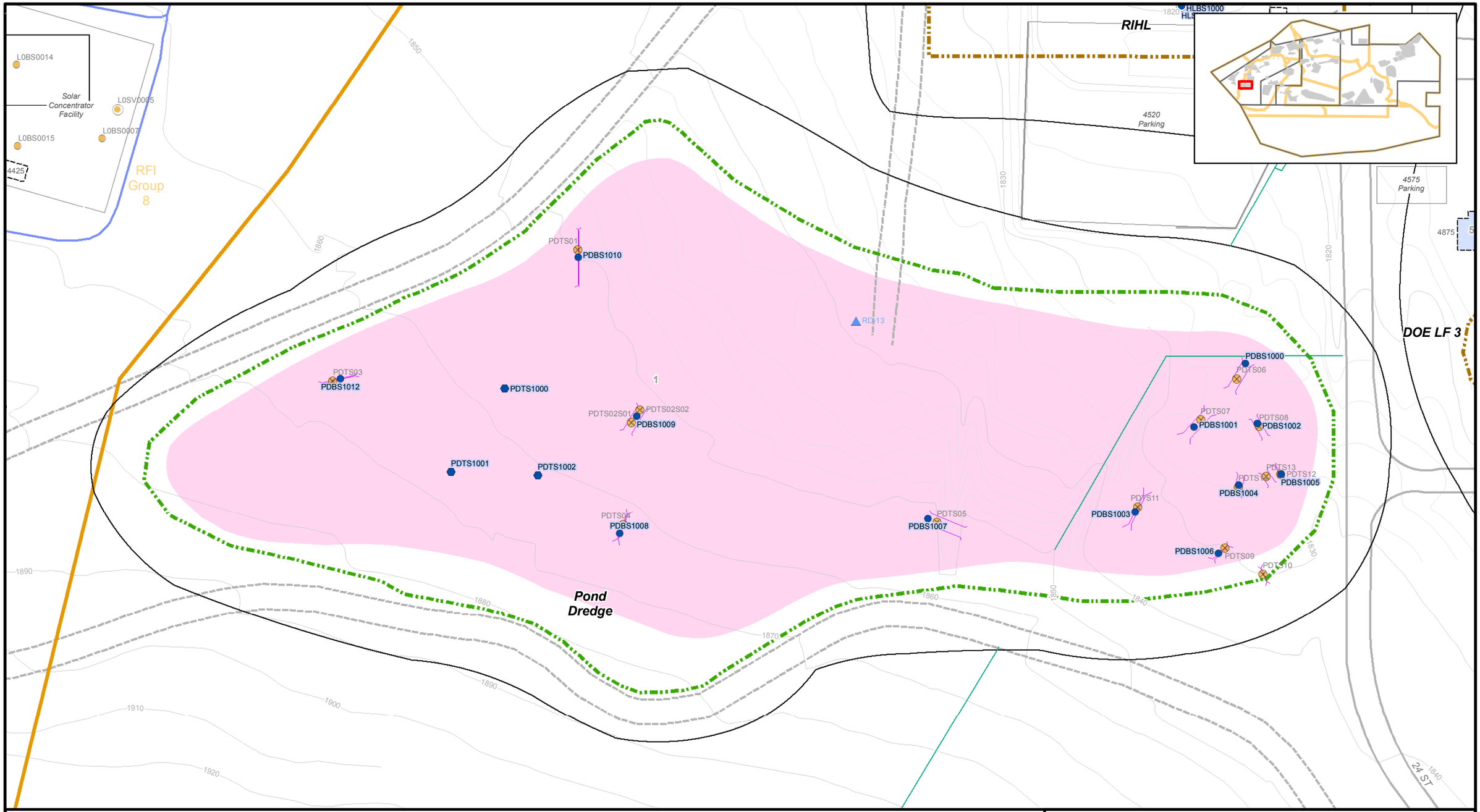
Sampling and Analysis Plan for Pond Dredge RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	Rationale/Objectives
		Soil	10	H	H		H		H		H	H		H	H	H			
1	PDTS1002	Soil	1	X	X		X		X	X	H	X		X	X	X			COCs not investigated, samples to be collected after trenching for nature extent; site assessment. If new mound found in this area.
		Soil	6	X	X		X		X		H	X		X	X	X			
		Soil	10	H	H		H		H		H	H		H	H	H			
Total Soil Samples for Analysis				28	32		32		28	16	2	32	1	32	32	32			
Total Soil Samples on Hold				22	24		15		24		45	15	2	24	15	24			
Total Soil Vapor Samples for Analysis																			
Total Soil Samples Collected			56																
Total Number of Locations			16																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM



Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- B Biological
- MO Other
- MS Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Proposed Sampling Locations

Pond Dredge

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1 inch equals 60 feet

0 60 120 Feet

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FIGURE 1

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

RFI Group 8

RIHL

DOE LF 3

4520 Parking

4575 Parking

Pond Dredge

HLBS1000
HLSV1000

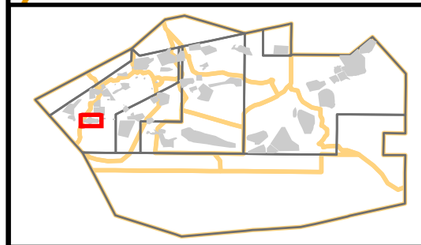
PDBS1010
PDBS1012
PDTS1000
PDBS1009
PDTS1001
PDTS1002
PDBS1008
PDBS1007
PDBS1000
PDBS1001
PDBS1002
PDBS1004
PDBS1005
PDBS1003
PDBS1006

1

4323
4425
4875

1820
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920

24 ST



VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
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- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil Vapor and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

February 21, 2008

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WORKING DRAFT

FIGURE 2

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

RFI Group 8

RIHL

HLBS1000
HLSV1000

4520 Parking

4575 Parking

DOE LF 3

Pond Dredge

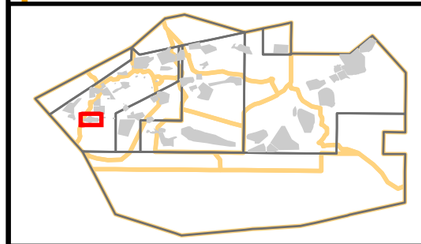
PDBS1010
PDBS1012
PDTS1000
PDBS1009
PDTS1001
PDTS1002
PDBS1008
PDBS1007
PDBS1000
PDBS1001
PDBS1002
PDBS1004
PDBS1005
PDBS1003
PDBS1006

1

4323
4425
4875

1820
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920

24 ST



VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

February 21, 2008

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WORKING DRAFT

FIGURE 3

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

RFI Group 8

RIHL

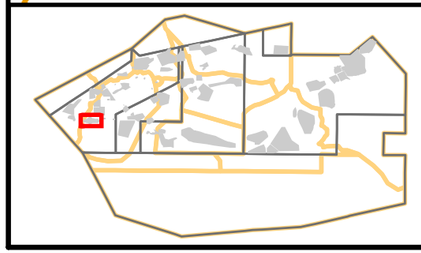
4520 Parking

4575 Parking

DOE LF 3

Pond Dredge

PDBS1010
PDBS1012
PDTS1000
PDBS1009
PDTS1001
PDTS1002
PDBS1008
PDBS1007
PDBS1000
PDBS1001
PDBS1002
PDBS1004
PDBS1005
PDBS1003
PDBS1006
HLBS1000
HLSV1000



Metals in Soil

- Exceeds Background + Residential RBLS + Eco RBLS
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Metals in Soil and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 4

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

RFI Group 8

RIHL

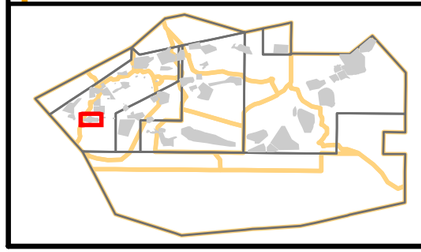
4520 Parking

4575 Parking

DOE LF 3

Pond Dredge

PDBS1010
PDBS1012
PDTS1000
PDBS1009
PDTS1001
PDTS1002
PDBS1008
PDBS1007
PDBS1000
PDBS1001
PDBS1002
PDBS1004
PDBS1005
PDBS1003
PDBS1006
HLBS1000
HLSV1000



TPH in Soil

- Detect > or equal to 100 mg/kg
- Detect < 100 mg/kg
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

TPH in Soil and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 5

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

RFI Group 8

RIHL

4520 Parking

4575 Parking

DOE LF 3

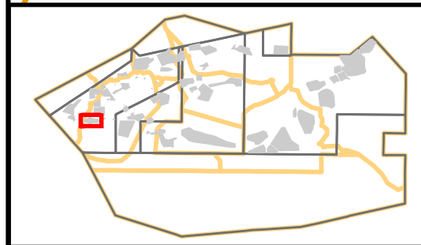
Pond Dredge

HLBS1000
HLSV1000
PDBS1010
PDBS1012
PDTS1000
PDBS1009
PDTS1001
PDTS1002
PDBS1008
PDBS1007
PDBS1000
PDBS1001
PDBS1002
PDBS1004
PDBS1005
PDBS1003
PDBS1006

1820 1830 1840 1850 1860 1870 1880 1890 1900 1910 1920 1630 1640 1650

4323 4425 4875

24 ST



Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Dioxins in Soil and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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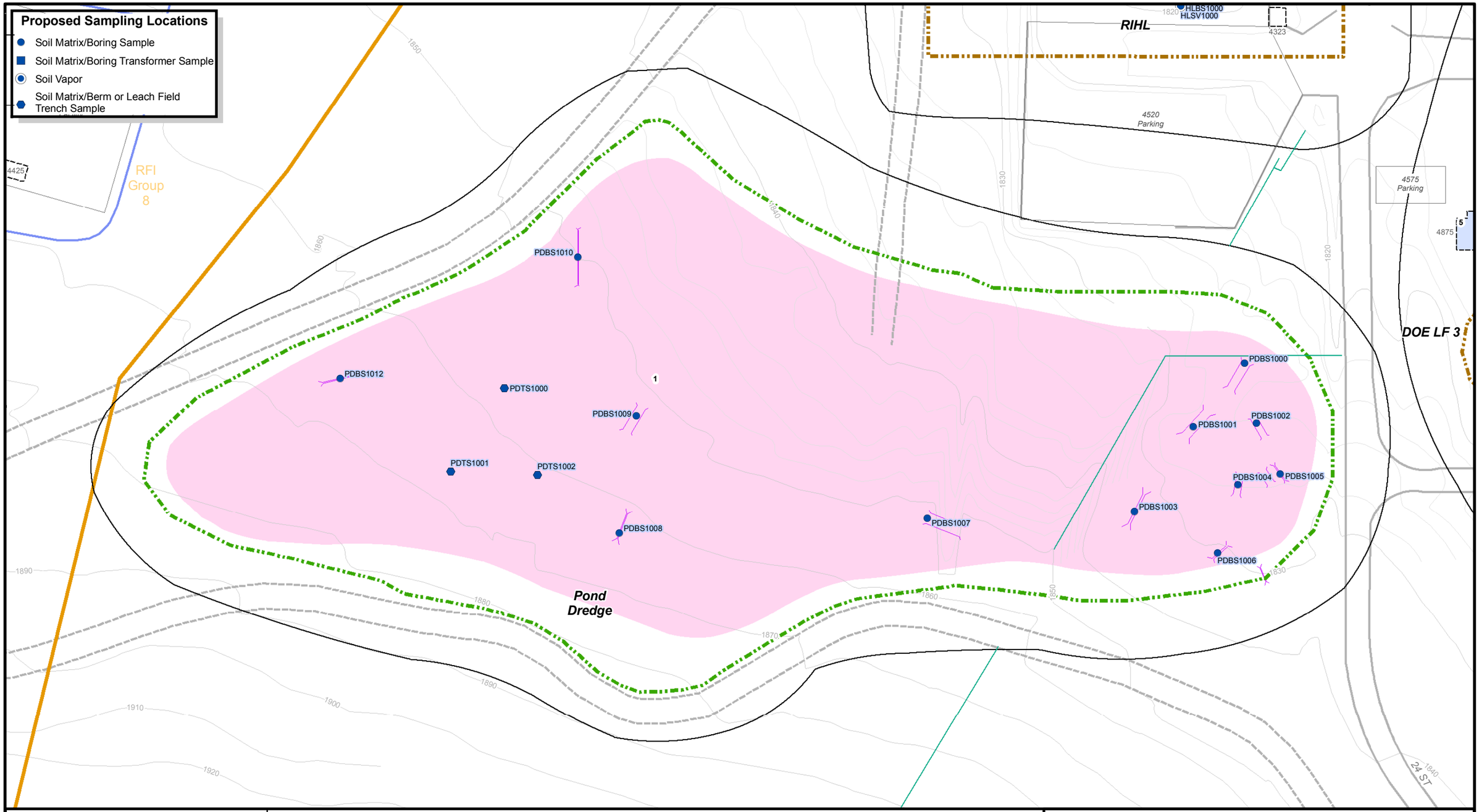
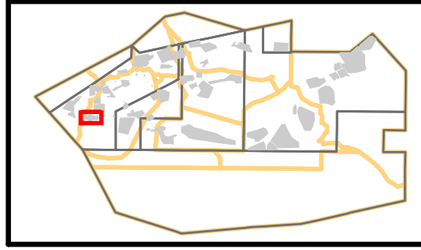
WORKING DRAFT

FIGURE 6





PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

PCBs in Soil and Proposed Sampling Locations

Pond Dredge

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

February 21, 2008

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WORKING DRAFT

FIGURE 7

Sampling and Analysis Plan for the Coal Gasification PDU RFI Site, Group 5, Santa Susana Field Laboratory

PREPARED FOR: Boeing and DOE

PREPARED BY: CH2M HILL

DATE: February 22, 2008

This technical memorandum presents the sampling and analysis plan (SAP) for the Coal Gasification Process Development Unit (PDU) at the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site in Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The PDU area includes Building 4005, Building 4006, the Building 4005/4006 Leach Field, and the PDU process area. Other chemical use areas evaluated with the PDU area include Buildings 4027, 4032, 4402, 4607, 4616, 4042, the 17th Street Drainage Area, the PDU coal storage area, five substations, and multiple above ground storage tanks (ASTs) and underground storage tanks (USTs).

The purpose of this SAP is to describe the scope and rationale for the field investigation to address the data gaps presented in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008) for the PDU. The I&S Package identified gaps where additional data are needed to support the RFI, risk assessments, and corrective measures studies following a comprehensive review of historical information and reports containing chemical use information, chemical data, and physical data for the RFI site.

The data gaps identified in the I&S Package for the PDU are summarized in Table 1. Data gaps were generally identified for chemical use areas within each RFI site. As presented in Table A1, chemical data gaps were identified for 20 of the 24 chemical use areas associated with the PDU. Five of these 20 chemical use areas are associated with the Department of Energy (DOE) Sodium Component Test Installation (SCTI) and Kalina areas and are not included in this SAP. These five chemical use areas are included in the Hazardous Material Storage Area (HMSA) SAP. Data gaps were also identified based on elevated detection limits of previous samples and lack of sediment data and soil data in the depth interval of 2 to 6 feet. In addition, a data gap was identified based on the need for documentation related to regulatory closure of UT-22 and pipelines located at the site.

To address these data gaps, CH2M HILL proposes to collect 195 soil samples and 36 soil vapor samples. These samples will be collected from a total of 88 locations across the site (Table 1). The specific samples proposed for collection at each chemical use area are summarized in Table 2. For each sample location at each chemical use area, Table 2 describes the matrix to be sampled, the depth from which samples are to be collected, analytical methods to be used, and the rationale for sample collection. As presented in Table 2, more than one sample might be necessary to address the data gaps identified for each chemical use area.

The locations of samples proposed in Table 2 are presented in Figure 1. In addition, Figures 2 through 7 present the locations of the proposed samples relative to the locations of previous samples analyzed for VOCs in soil and soil vapor, metals in soil, petroleum hydrocarbons in soil, dioxins in soil, and polychlorinated biphenyls (PCBs) in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate if the previous sample results (at any depth) were detected, were detected below risk-based screening levels (RBSLs) or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

TABLE 1

Data Gaps

Sampling and Analysis Plan PDU Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
1	Building 4005 - Chemical uses include polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPHs), metals, coal dust, coke, cyanide, green liquor (organics, sulfur compounds, and ash, pH =12), silica, and volatile organic compounds (VOCs). Semivolatile organic compounds (SVOCs) and PCBs at Building 4005 have not been investigated. Metals in soil have been detected at concentrations exceeding ecological and human health RBSLs and have not been characterized adequately (the lateral and vertical extents of metals in soil are undefined).	X			13
2	Building 4006 - Chemical uses include tritium titanium foils, mercury, tetralin, and gasoline storage in unidentified underground tanks. SVOCs, TPH, and metals have not been investigated at Building 4006.	X			3
4	Building 4027 - Chemical uses include beryllium, waste oil, contaminated waste solids, debris, batteries, paint waste, wastewater, flammable waste, caustics, and corrosives. VOCs, TPH, SVOCs, oil-related materials, metals, energetics, propellants, PCBs, and nonmetal inorganic compounds have not been investigated at Building 4027.	X			4
5	Building 4032 - Chemical uses include kerosene, PCBs, and asbestos. These chemicals have not been investigated at Building 4032. Investigation is required to evaluate if previous uses of the building have resulted in an impact to environment. Tank UT-22 has been removed and documentation was submitted to the Ventura County Environmental Health Division (VCEHD) to authorize site closure. Boeing considers this site closed, although the permit and final closure letter have not been identified.	X		X	1

TABLE 1

Data Gaps

Sampling and Analysis Plan PDU Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
6	Building 4042 - Chemical uses include lithium, alcohol and storage of unknown chemicals south of Building 4042. VOCs, SVOCs, oil-related materials, metals, and PCBs have not been investigated at Building 4042.	X		X	3
7	Former PDU area - Chemical uses include terphenyl organics, aluminum, caustics, solvents, metals, green liquor, SVOCs, asbestos, Freon, lead paint, and sodium hydroxide. Within the southern portion of the chemical use area, metals in solids have been detected at concentrations exceeding residential and ecological RBSLs. PCBs have been detected in concentrations exceeding ecological RBSLs. These chemicals have not been investigated at Building 4049 nor at the northern portion of the surrounding PDU process area.	X			25
11	Building 4402 - Chemical uses include solvents. These chemicals have not been investigated at Building 4402.	X			2
13	Building 4616 - Chemical uses include sodium nitrate used as a coolant. Metals and nonmetal inorganic compounds have not been characterized at Building 4616.	X			1
14	Coal Storage Yard - Chemical uses include solvents, PCBs, oil, metals, and waste construction debris (including asbestos). These chemicals have not been investigated at the Coal Storage Yard.	X			6
17	Substation 4706 - Chemical uses include PCBs. PCBs have not been investigated at this substation.	X			1 (Composite Sample)
20	Substation 4742 - Chemical uses include PCBs. PCBs have not been investigated at this substation.	X			2 (Composite Samples)
21	Building 4005/4006 Leachfield - Chemical uses include sanitary wastes from Buildings 4005 and 4006. The leach field has been disconnected and was abandoned in 1960-61. The drain lines and tanks were removed in 2001 at the same time the septic tanks were removed. Sampling of soil under drain lines, leach fields, and septic tanks did not detect any contamination of propellants, TPH, metals, SVOCs in soil, and VOCs in soil gas. PCBs and VOCs in soil have not been	X			4

TABLE 1

Data Gaps

Sampling and Analysis Plan PDU Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
	investigated.				
22	PDU Bag House - Chemical uses at the Bag House include PCB, benzene, calcium carbonate, coal, coal dust, coke, cyanide, green liquor (organics, sulfur compounds, and ash, pH =12), silica, chloramine, hexachlorobenzene, sodium carbonate, molten salt carbonate, chromium, toluene, xylene, aromatic hydrocarbons, and heavy metals. These chemicals have not been investigated in soil. VOCs in soil gas indicated concentrations that are above residential and ecological RBSLs.				3
23	PDU Catchment Basin - Chemical uses at the Catchment Basin include PCB, benzene, calcium carbonate, coal, coal dust, coke, cyanide, green liquor (organics, sulfur compounds, and ash, pH =12), silica, chloramine, hexachlorobenzene, sodium carbonate, molten salt carbonate, chromium, toluene, xylene, aromatic hydrocarbons, heavy metals. These chemicals have not been investigated in soil. VOCs in soil gas indicated concentrations that are above residential and ecological RBSLs.	X			2
24	The 17th Street Drainage area received waste runoff from the entire PDU area. Chemical uses include Iron, PCBs, benzene, calcium carbonate, coal, coal dust, coke, cyanide, green liquor (organics, sulfur compounds, and ash, pH =12), silica, chloramine, hexachlorobenzene, sodium carbonate, molten salt carbonate, chromium, toluene, xylene, aromatic hydrocarbons, and heavy metals. Extensive sampling previously has been completed in this area. Concentrations of PCBs, TPH, metals, and SVOCs in soil have been reported in excess of residential and ecological RBSLs.	X			18
Sitewide	Previous samples have detection limits for select VOCs in near surface groundwater, VOCs and metals in soil, and VOCs in soil vapor that exceed risk-based screening levels.	X			Addressed by Other Sample Locations
Sitewide	Metals, VOCs, propellants, and PCBs have not been characterized in soil at the depth interval of 2 to 6 feet, which is used to assess ecological risks.	X			Addressed by Other Sample Locations
				Total	**88**

Notes:

Sitewide = Data Gap applies to the entire Boeing PDU RFI Site
N/A = Not Applicable

Samples for which the need for laboratory analysis is contingent on the results of other samples are indicated in Table 2 with an "H," signifying they will be placed on "Hold." These samples will be collected, but the laboratory will not analyze the samples until CH2M HILL has evaluated the need for lab analysis and provided direction to the lab to analyze the sample. The need for lab analysis might be contingent on the results of samples above or below the proposed sample, or on the results of other analyses in the same sample (for example, polycyclic aromatic hydrocarbons [PAHs] or VOCs might be contingent on the results of laboratory analysis for TPH).

Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (General Text). In addition, quality assurance/quality control samples will be collected as described in the Group 5 SAP (General Text).

Schedule

This SAP is scheduled for implementation in March and April 2008. Prior to commencing the fieldwork, a Field Implementation Plan (FIP) will be prepared and submitted for Boeing and DOE review. The FIP is scheduled to be submitted to Boeing and DOE in February 2008.

References

CH2M HILL. 2008. *Integration & Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California*. January 3.

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
1	PUBS1000	Soil	1	X	X		X		X	X	H					X			No sampling has occurred within the footprint of former Building 4005. Chemical uses include PCBs, metals, non-metal inorganics, fuels, solvents, and SVOCs. Screening sample locations are near the laboratory in the northeast area of the building and on the downgradient (southeast) corner of the building (ID PUBS1056).
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	PUBS1001	Soil	6						X	X									This sample is a step down for sample E-5-03. Sample E-5-03 had elevated concentrations of metals at a previous sample depth of 1 ft bgs.
		Soil	10						H										
1	PUBS1003	Soil	1						X	X									Sample is located approximately 45 feet west of sample E-5-03 (step out). See notes for sample PUBS1001. This sample will also be used as a step down from sample PUBS02. PUBS02 was sampled at a depth of 2 and 5 feet bgs. Exceedances were noted for metals. The boring will be advanced up to 40 feet to define the depth of bedrock.
		Soil	6						X										
		Soil	10						H										
1	PUBS1004	Soil	2						X	X									
		Soil	5						X										
		Soil	10						H										
1	PUBS1005	Soil	1						X	X									This is a step out from sample E-5-03 and is located approximately 35 feet to the north of the previous sample. Previous sample was collected at a depth of 1 ft bgs. Exceedances were reported for metals. PUBS1005 will be used as a step out sample for exceedances of metals identified at previous sample PUBS02. Location is approximately 30 feet north of PUBS02. This location is upgradient of both previous sample locations.
		Soil	2						X										
		Soil	5						X										
		Soil	10						H										
1	PUBS1026	Soil	1		X		X		X	X									This sample will be collected as a cross gradient step out location for E-5-03. This location is approximately 45 feet to the west of the previous sample. This sample will also be used as a screening sample to evaluate the extent of impacts from chemical use area 7 which is to the east of this sample.
		Soil	6		X		X		X										
		Soil	10		H		H		H										
1	PUBS1027	Soil	1		X		X		X	X									This sample will be collected as a down gradient screening sample for Building 4005 and a down/cross gradient screening sample for impacts from chemical use area 7. This sample is located approximately 35 feet southeast of sample PUBS1056.
		Soil	6		X		X		X										
		Soil	10		H		H		H										
1	PUBS1056	Soil	1	X	X		X		X	X	H					X			See rationale for Sample PUBS1000. This sample is being collected at the down gradient side of Building 4005.
		Soil	6	X	X		X		X		H					X			
		Soil	10	H	H		H		H		H					H			
1	PUBS1057	Soil	1	X	X		X		X	X	H					X			PUBS1057 will be collected to investigate impacts from the sump located on the east side of Building 4005.
		Soil	6	X	X		X		X	X	H					X			
		Soil	10	H	H		H		H	H	H					H			
1	PUTS1000	Soil	1						X	X									This is a step out from sample E-5-03 located approximately 30 feet to the south. Previous sample was collected at a depth of 1 ft bgs. Exceedances were reported for metals.
		Soil	6						X										
		Soil	10						H										
1	PUSV1000	Soil Vapor	5			X													

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil Vapor	10			X												No soil vapor sampling has occurred within the previous footprint of Building 4005. These screening soil vapor samples will be located near the laboratory area in the northeast portion of 4005 (PUSV1000), at the southeast (down gradient) corner of the building (PUSV1013), and east of the building near the laboratory and loading areas. Chemical uses include PCBs, metals, non-metal inorganics, fuels, solvents, and SVOCs.
1	PUSV1013	Soil Vapor	5			X												
		Soil Vapor	10			X												
1	PUSV1014	Soil Vapor	5			X												
		Soil Vapor	10			X												
2	PUBS1002	Soil	1	X			X		X	X								
		Soil	6	X			X		X									No previous soil sampling has occurred at Building 4006. Chemical uses include fuel storage, SVOCs, and metals. The
		Soil	10	H			H		H									
2	PUBS1006	Soil	1	X			X		X	X								
		Soil	6	X			X		X									No previous soil sampling has occurred at Building 4006. Chemical uses include fuel storage, SVOCs, and metals. The sample location is at a service entrance on south side of the building.
		Soil	10	H			H		H									
2	PUBS1007	Soil	1	X			X		X	X								
		Soil	6	X			X		X									No previous soil sampling has occurred at Building 4006. Chemical uses include fuel storage, SVOCs, and metals. The sample location is at a service entrance on west side of the
		Soil	10	H			H		H									building.
3																		Chemical data gaps for chemical use area 3 are covered in the HMSA SAP in chemical use area 7.
4	U5BS1105	Soil	1	X	X		X		X	X	H	X	X			X		
		Soil	6	X	X		X		X		H	X	X			X		No previous soil sampling has occurred at Building 4027. Chemical uses/storage include fuel storage, SVOCs, metals, hydrazine, solvents, non-metal inorganics, and energetics. Two soil samples will be collected at Building 4027, one at the centroid of the former building footprint (within laboratory area) and one at the south end of the building (down gradient). Boring U5BS1118 will be advanced up to 40 feet bgs to define the depth of bedrock.
		Soil	10	H	H		H		H		H	H	H			H		
4	U5BS1118	Soil	1	X	X		X		X	X	H	X	X			X		
		Soil	6	X	X		X		X		H	X	X			X		
		Soil	10	H	H		H		H		H	H	H			H		
4	U5SV1103	Soil Vapor	5			X												
		Soil Vapor	10			X												No previous soil vapor sampling has occurred at Building 4027 Chemical uses include fuel storage, SVOCs, metals, PCBs, propellants, solvents, non-metal inorganics, and energetics. Two soil samples will be collected at Building 4027, one at the centroid of the former building footprint (within laboratory area) and one at the south end of the building (down gradient).
4	U5SV1104	Soil Vapor	5			X												
		Soil Vapor	10			X												
5	U5BS1106	Soil	1	X			X		X	X	H							
		Soil	6	X			X		X		H							No sampling has occurred at Building 4032. Chemical uses include fuel, SVOCs, metals, and PCBs. Sample location is the centroid of the former building footprint.
		Soil	10	H			H		H		H							
6	U5BS1107	Soil	1						X	X								No sampling has occurred at Building 4042. Chemical uses

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	6						X										include metals. One sample will be collected at the centroid of the former building footprint and one sample will be collected at the southwest (down gradient) corner of the building.
		Soil	10						H										
6	U5BS1117	Soil	1						X	X									
		Soil	6						X										Same as above.
		Soil	10						H										
6	U5BS1119	Soil	1						X	X									
		Soil	6						X										Same as above. This sample is located approximately 25 feet south of Building 4042.
		Soil	10						H										
7	PUBS1008	Soil	1	X	X		X		X	X	X							X	The northern half of Chemical Use Area 7 has not been sampled. The area is being sampled for all CGOPC. PDU chemical processes occurred throughout the area. Sample locationsPUBS1008 through PUBS1012 will be used to screen the area for impacts from past processes.
		Soil	6	X	X		X		X		X							X	
		Soil	10	H	H		H		H		H							H	
7	PUBS1009	Soil	1	X	X		X		X	X	X							X	
		Soil	6	X	X		X		X		X							X	Same as above.
		Soil	10	H	H		H		H		H							H	
7	PUBS1010	Soil	1	X	X		X		X	X	X							X	
		Soil	6	X	X		X		X		X							X	Same as above.
		Soil	10	H	H		H		H		H							H	
7	PUBS1011	Soil	1	X	X		X		X	X	X							X	
		Soil	6	X	X		X		X		X							X	Same as above.
		Soil	10	H	H		H		H		H							H	
7	PUBS1012	Soil	1	X	X		X		X	X	X							X	
		Soil	6	X	X		X		X		X							X	Same as above.
		Soil	10	H	H		H		H		H							H	
7	PUBS1013	Soil	6		X				X	X								X	This is a step down from previous sample location PUTS07 which was collected at a depth of 1 ft. PUTS07 has exceedances of metals. This sample will also be screened for VOCs. This location has been cleared for SVOCs.
		Soil	10		H				H									H	
7	PUBS1014	Soil	6						X	X	X							X	Step down from previous sample location PUTS04. PUTS04 had exceedances for metals and PCBs at a sample depth of 1 foot.
		Soil	10						H		H							H	
7	PUBS1015	Soil	1						X	X	X							X	This is a step down sample from previous sample SB_FPDU-2 and PDU-2-1. These samples had exceedances of metals at depths of 2 and 1 feet, respectively. This sample will also be used to screen for PCBs.
		Soil	6						X		X							X	
		Soil	10						H		H							H	

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
7	PUBS1016	Soil	1						X	X	X							X	Step down from previous samples SB_FPDU-3, PDU-2-1, and SB-7.10-3. These samples had exceedances of metals at depths of 2 feet, 1 foot, and 1 foot, respectively. This sample will also be used to screen for PCBs.
		Soil	6						X		X							X	
		Soil	10						H		H							H	
7	PUBS1017	Soil	1						X	X	X							X	
		Soil	6						X		X							X	Step down from previous sample PDU-2-1. PDU-2-1 showed exceedances for metals at a depth of 1 foot. This location will also be used to screen for PCBs.
		Soil	10						H		H							H	
7	PUBS1018	Soil	1						X	X	X							X	
		Soil	6						X		X							X	Step down from previous sample SB_FPDU-1. SB-FPDU-1 showed exceedances of metals at a depth of 2 feet. This location will also be used to screen for PCBs.
		Soil	10						H		H							H	
7	PUBS1019	Soil	1						X	X	X							X	Step out from previous samples SB_FPDU-BG and BG-1. These samples were each collected at a depth of 1 foot and showed exceedances above background and eco RBSL for metals. This step out location is approximately 50 feet from the previous samples.
		Soil	6						X		X							X	
		Soil	10						H		H							H	
7	PUBS1020	Soil	1						X	X									
		Soil	6						X										Step down from previous sample SB_FPDU-BG. SB_FPDU-BG showed exceedances of metals at a sample depth of 1 foot.
		Soil	10						H										
7	PUBS1021	Soil	1						X	X									
		Soil	6						X										Step down from previous sample BG-1. BG-1 showed exceedances of metals at a sample depth of 1 foot.
		Soil	10						H										
7	PUBS1022	Soil	1						X	X									
		Soil	2.5						X										Step out for previous samples within Chemical Use Area 7. This sample will be used to evaluate the extent of impacts. This sample is located down gradient from the area 7 samples and upgradient from samples immediately to the west. Exceedances for metals were identified at depths ranging from 1 foot to 5 feet bgs. These samples are located approximately 25 feet to the west (down gradient) of the previous known chemical use area.
		Soil	6						H										
		Soil	10						H										
7	PUBS1023	Soil	1						X	X									
		Soil	6						X										Same as above.
		Soil	10						H										
7	PUBS1024	Soil	1						X	X									
		Soil	6						X										Same as above.
		Soil	10						H										
7	PUBS1025	Soil	1						X	X								X	
		Soil	6						X									X	Same as above.
		Soil	10						H									H	
7	U5BS1120	Soil	1						X	X									Sample is a step out location for metals exceedances at

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	6						H										SB_FPDU-BG. The previous sample was collected at a depth of 1 foot bgs. U5BS1120 is located approximately 40 feet upgradient from the previous sample.
		Soil	10						H										
7	PUSV1001	Soil Vapor	5			X													
		Soil Vapor	10			X													
7	PUSV1002	Soil Vapor	5			X													
		Soil Vapor	10			X													
7	PUSV1003	Soil Vapor	5			X													
		Soil Vapor	10			X													The northern half of Chemical Use Area 7 has not been sampled. The area is being sampled for all CGOPC, including VOCs. Chemical processes occurred throughout the area. Sample locations will provide a PUSV1001 through PUSV1006 will be used to screen the area for impacts from past processes.
7	PUSV1004	Soil Vapor	5			X													
		Soil Vapor	10			X													
7	PUSV1005	Soil Vapor	5			X													
		Soil Vapor	10			X													
7	PUSV1006	Soil Vapor	5			X													
		Soil Vapor	10			X													
8																			Chemical data gaps for chemical use area 8 are covered in the HMSA SAP in chemical use area 7.
10																			Chemical data gaps for chemical use area 10 are covered in the HMSA SAP in chemical use area 10.
11	PUBS1028	Soil	1		X														No sampling has occurred at Building 4402. Chemical uses include VOCs. Sample location is at the centroid of the former building footprint.
		Soil	6		X														
		Soil	10		H														
11	PUSV1007	Soil Vapor	5			X													No sampling has occurred at Building 4402. Chemical uses include VOCs. Sample location is at the centroid of the former building footprint.
		Soil Vapor	10			X													
13	PUBS1029	Soil	1						X	X						X			No sampling has occurred at Building 4616. Chemical uses include metals and non-metal inorganics. Sample location is at the centroid of the former building footprint.
		Soil	6						X							X			
		Soil	10						H							H			
14	PUBS1030	Soil	1	X	X		X		X	X	X					X			
		Soil	6	X	X		X		X		X					X			
		Soil	10	H	H		H		H		H					H			
14	PUBS1031	Soil	1	X	X		X		X	X	X					X			No sampling has occurred at the Coal Storage Area. Two samples are being collected to screen for potential impacts to the environment from the coal storage and chemical storage at the site. Sample locations are on the eastern and western side of the Yard. Boring PUBS1031 will be advanced up to 40 feet bgs to define the depth of bedrock. Sample PUBS1058 will also be used to investigate impacts from the drainage and catchment along 17th Street.
		Soil	6	X	X		X		X		X					X			
		Soil	10	H	H		H		H		H					H			
14	PUBS1058	Soil	1	X	X		X		X	X	X					X			
		Soil	6	X	X		X		X		X					X			

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

Sampling and Analysis Plan for Coal Gasification Process Development Unit RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	10	H	H		H		H		H					H			
14	PUSV1008	Soil Vapor	5			X													
		Soil Vapor	10			X													
14	PUSV1009	Soil Vapor	5			X													
		Soil Vapor	10			X													Same as above. PUSV1015 will also be used to investigate impacts from the drainage and catchment along 17th street.
14	PUSV1015	Soil Vapor	5			X													
		Soil Vapor	10			X													
17	PUBX1000	Soil	1								X								No sampling has occurred at Substation 4706. Four samples will be collected approximately 5 feet away from each corner of the substation and composited into one sample for analysis.
19																			
20	U5BX1101	Soil	1								X								No sampling has occurred at Substations 4742. Four samples will be collected approximately 5 feet away from each corner of each substation and composited into one sample for analysis. Two substations are located here.
20	U5BX1102	Soil	1								X								
21	PUBS1032	Soil	10		X						X								No previous sampling for VOCs or PCBs has occurred at the Leach field. VOCs and PCBs were used in the Building 4005 and PDU area. Sampling locations are at each corner of the former leach field. The boring will be advanced up to 40 feet bgs to define the depth of bedrock.
21	PUBS1033	Soil	10		X						X								
21	PUBS1034	Soil	10		X						X								
21	PUBS1035	Soil	10		X						X								
22	PUBS1036	Soil	1	X	X		X		X	X	X					X			No previous soil sampling has occurred at this chemical use area. Chemical uses include TPH, VOCs, SVOCs, metals, and PCBs. Sampling location is near the center of the chemical use area.
		Soil	6	X	X		X		X		X					X			
		Soil	10	H	H		H		H		H					H			
22	PUSV1010	Soil Vapor	5			X													
		Soil Vapor	10			X													These samples are step down and step out locations for previous sample PUSV04. The step down location is PUSV1010. The step out location is PUSV1011 and is located approximately 20 feet to the west. PUSV04 was collected at a depth of 4 feet bgs and exceeded residential RBSLs for VOCs.
22	PUSV1011	Soil Vapor	5			X													
		Soil Vapor	10			X													
23	PUBS1037	Soil	1	X	X		X		X	X	X					X			No previous soil sampling has occurred at this chemical use area. Chemical uses include TPH, VOCs, SVOCs, metals, and PCBs. Sampling location is near the center of the chemical use area.
		Soil	6	X	X		X		X		X					X			
		Soil	10	H	H		H		H		H					H			
23	PUSV1012	Soil Vapor	5			X													Step out for PUSV04. This soil vapor sampling location is approximately 30 feet east of PUSV04.
		Soil Vapor	10			X													
24	PUBS1038	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Sample location is step out location for the 17th Street Drainage area. Previous sampling results showed non-detects for VOCs in soil and soil vapor. Previous sampling did not include pH, and inorganics. Previous sampling results indicated exceedances for metals, SVOCs, PCBs, and TPH in soil

TABLE 2

Proposed Samples for Coal Gasification Process Development Unit RFI Site

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Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	10	H			H	H	H		H					H			metals, SVOCs, PCBs, and TPH in soil.
24	PUBS1039	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1040	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1041	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1042	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1043	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1044	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1045	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above. The boring will be advanced to a depth of up to 40 feet bgs to define the depth of bedrock.
		Soil	10	H			H	H	H		H					H			
24	PUBS1046	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1047	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1048	Soil	1	X			X	X	X	X	X					X			

TABLE 2

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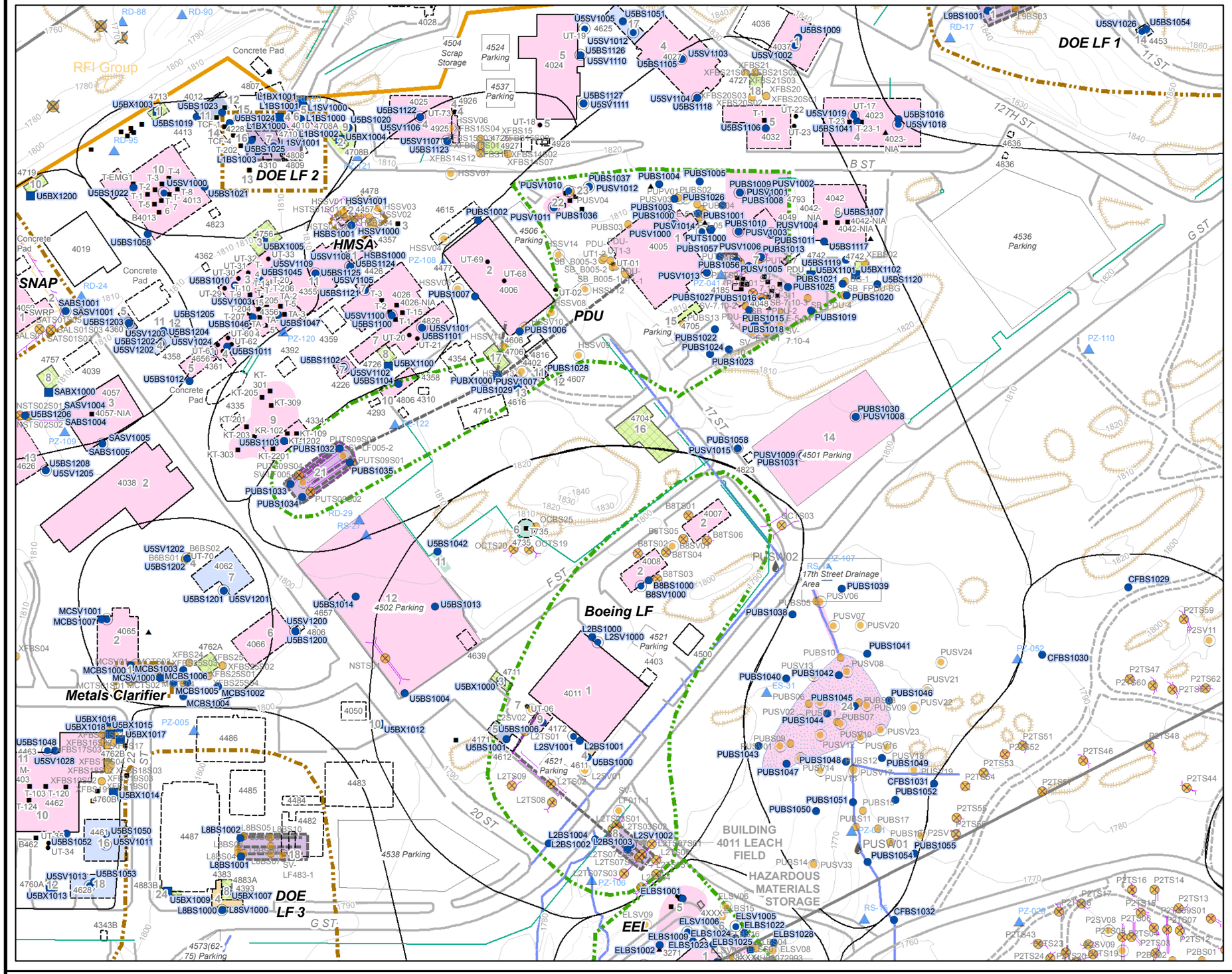
Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1049	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1050	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1051	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1052	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1053	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1054	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
24	PUBS1055	Soil	1	X			X	X	X	X	X					X			
		Soil	6	X			X	X	X		X					X			Same as above
		Soil	10	H			H	H	H		H					H			
Total Soil Samples for Analysis				74	41		78	36	121	63	74	4	4			58		24	
Total Soil Samples on Hold				37	19		39	18	64	1	52	2	2			29		13	
Total Soil Vapor Samples for Analysis						36													
Total Soil Samples Collected			195																
Total Number of Locations			88																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM



Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

Soil	Groundwater - Spring
Soil - Composite	Water - Artificial
Soil - Sediment	Water - Discharge
Soil - Surface	Water - Surface
Air - Soil Vapor	Water - Surface (Seep)
Air	Biological
Groundwater	Other
Groundwater - Lysimeter	Sump

Basemap Legend

Transformer Poles	Building - Existing	RFI Site - Boeing
Tank - UST	Building - Removed	RFI Site - DOE
Tank - AST	Building - Not Yet Determined	RFI Site - NASA
Tank - Not Yet Determined	Transformer - Existing	RFI Site Buffer
Excavation	Transformer - Removed	RFI Group Boundary
Leachfield	Transformer - Not Yet Determined	Administrative Area
Pipe		Property Boundary
Drainage	Debris	Energetic Constituents
Road - Asphalt	Multiple Use	Propellants
Roads - Dirt	Solvent	Leach Field
Rocks	Petroleum	Non-metal Inorganic Constituents
Streams	Oil/PCBs	Screening for Potential Impacts
Pond	Metals	

Proposed Sampling Locations

PDU

Date: February 21, 2008

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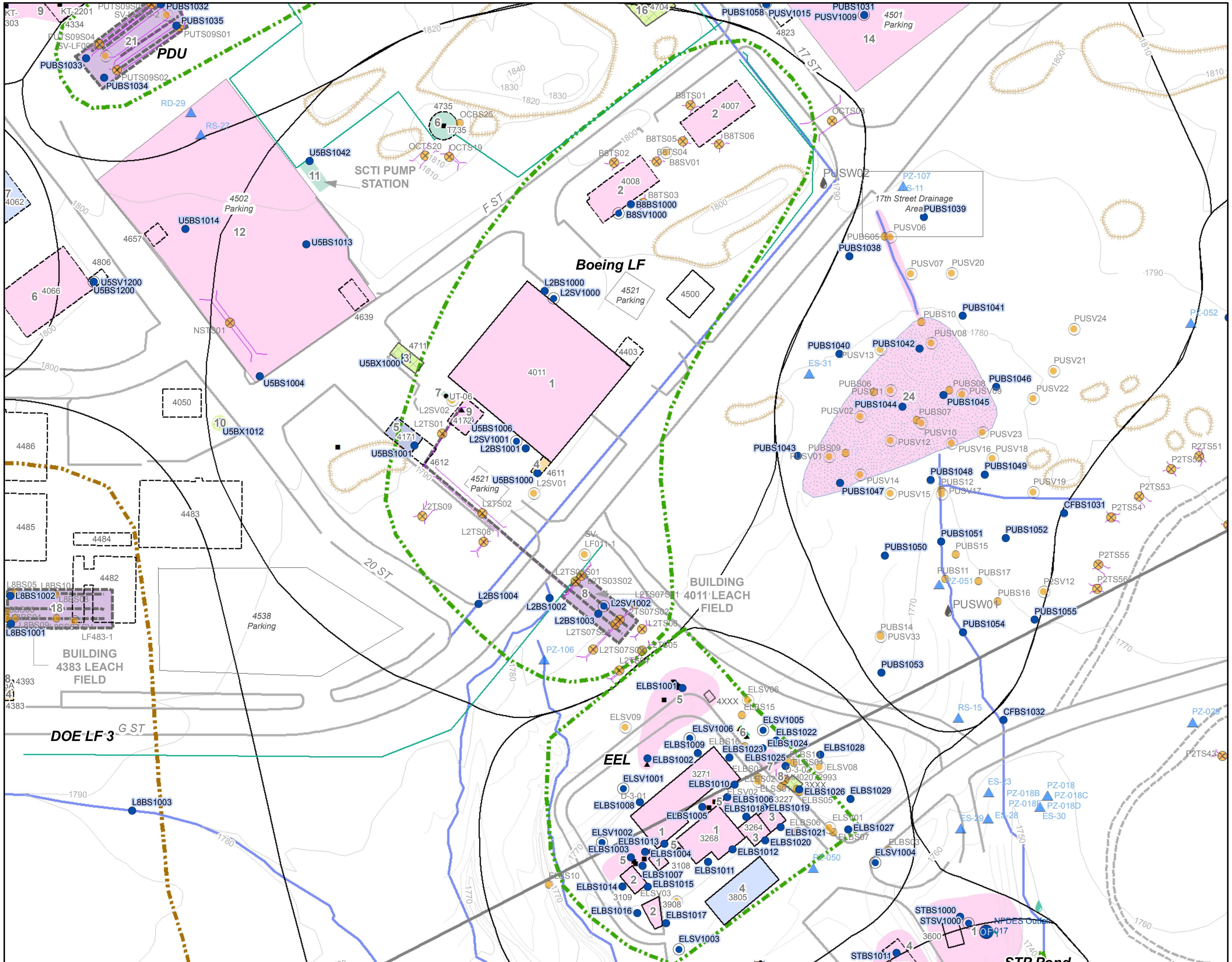
1 inch equals 150 feet

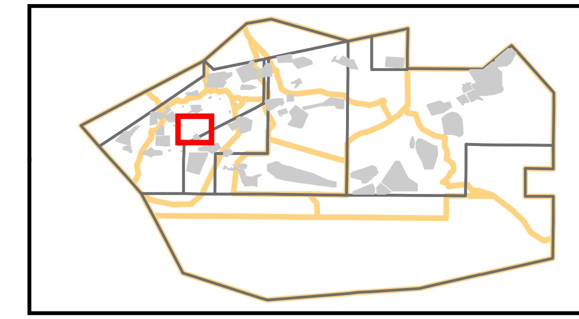
0 150 300 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure 1





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

Soil	Groundwater - Spring
Soil - Composite	Water - Artificial
Soil - Sediment	Water - Discharge
Soil - Surface	Water - Surface
Air - Soil Vapor	Water - Surface (Seep)
Air	Biological
Groundwater	Other
Groundwater - Lysimeter	Sump

Basemap Legend

Transformer Poles	Building - Existing	RFI Site - Boeing
Tank - UST	Building - Removed	RFI Site - DOE
Tank - AST	Building - Not Yet Determined	RFI Site - NASA
Tank - Not Yet Determined	Transformer - Existing	RFI Site Buffer
Excavation	Transformer - Removed	RFI Group Boundary
Leachfield	Transformer - Not Yet Determined	Administrative Area
Pipe		Property Boundary
Drainage	Debris	Energetic Constituents
Road - Asphalt	Multiple Use	Propellants
Roads - Dirt	Solvent	Leach Field
Rocks	Petroleum	Non-metal Inorganic Constituents
Streams	Oil/PCBs	Screening for Potential Impacts
Pond	Metals	

Proposed Sampling Locations

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Figure 1

Date: February 20, 2008

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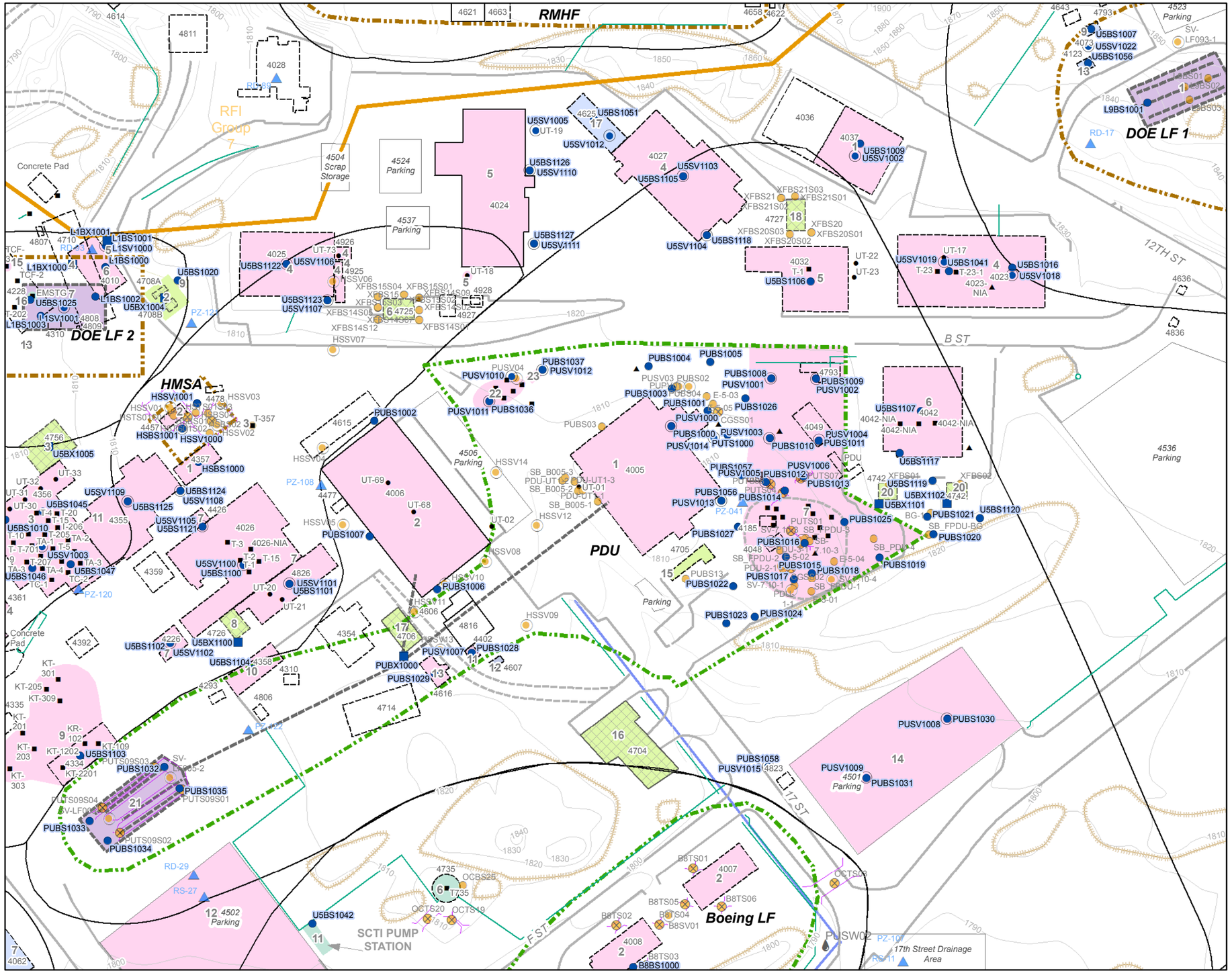
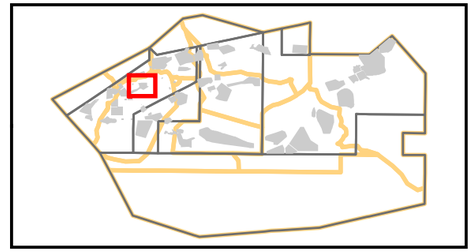
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

Soil	Groundwater - Spring
Soil - Composite	Water - Artificial
Soil - Sediment	Water - Discharge
Soil - Surface	Water - Surface
Air - Soil Vapor	Water - Surface (Seep)
Air	Biological
Groundwater	Other
Groundwater - Lysimeter	Sump

Basemap Legend

Transformer Poles	Building - Existing	RFI Site - Boeing
Tank - UST	Building - Removed	RFI Site - DOE
Tank - AST	Building - Not Yet Determined	RFI Site - NASA
Tank - Not Yet Determined	Transformer - Existing	RFI Site Buffer
Excavation	Transformer - Removed	RFI Group Boundary
Leachfield	Transformer - Not Yet Determined	Administrative Area
Pipe		Property Boundary
Drainage	Debris	Energetic Constituents
Road - Asphalt	Multiple Use	Propellants
Roads - Dirt	Solvent	Leach Field
Rocks	Petroleum	Non-metal Inorganic Constituents
Streams	Oil/PCBs	Screening for Potential Impacts
Pond	Metals	

Proposed Sampling Locations

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1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

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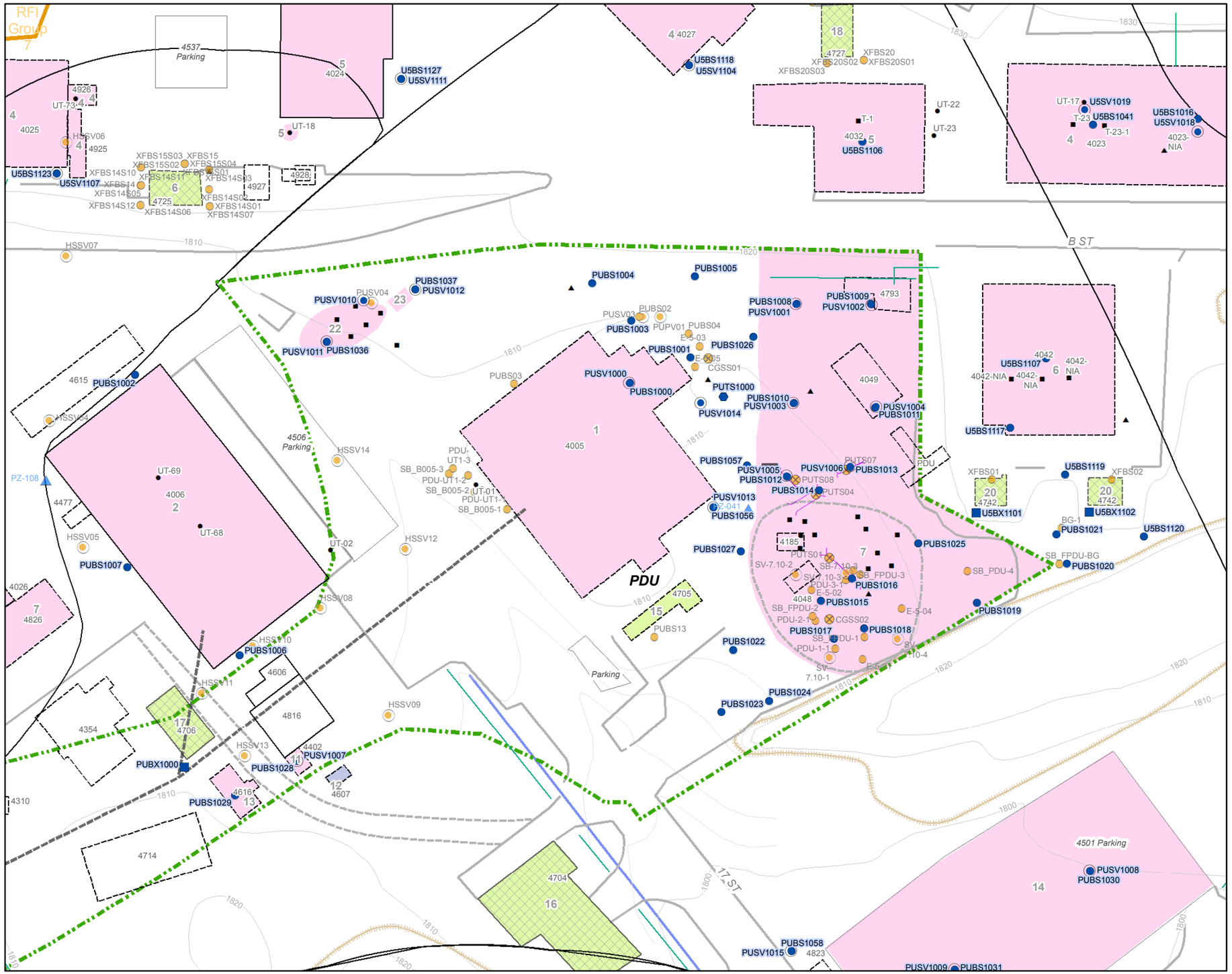
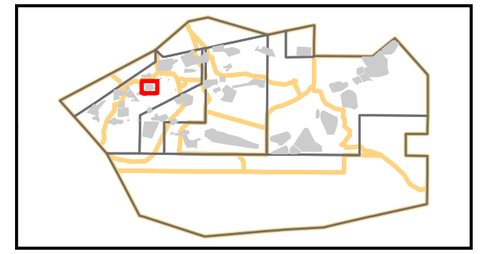
Figure 1





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- Biological
- Other
- Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Proposed Sampling Locations

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1 inch equals 60 feet

0 60 120 Feet

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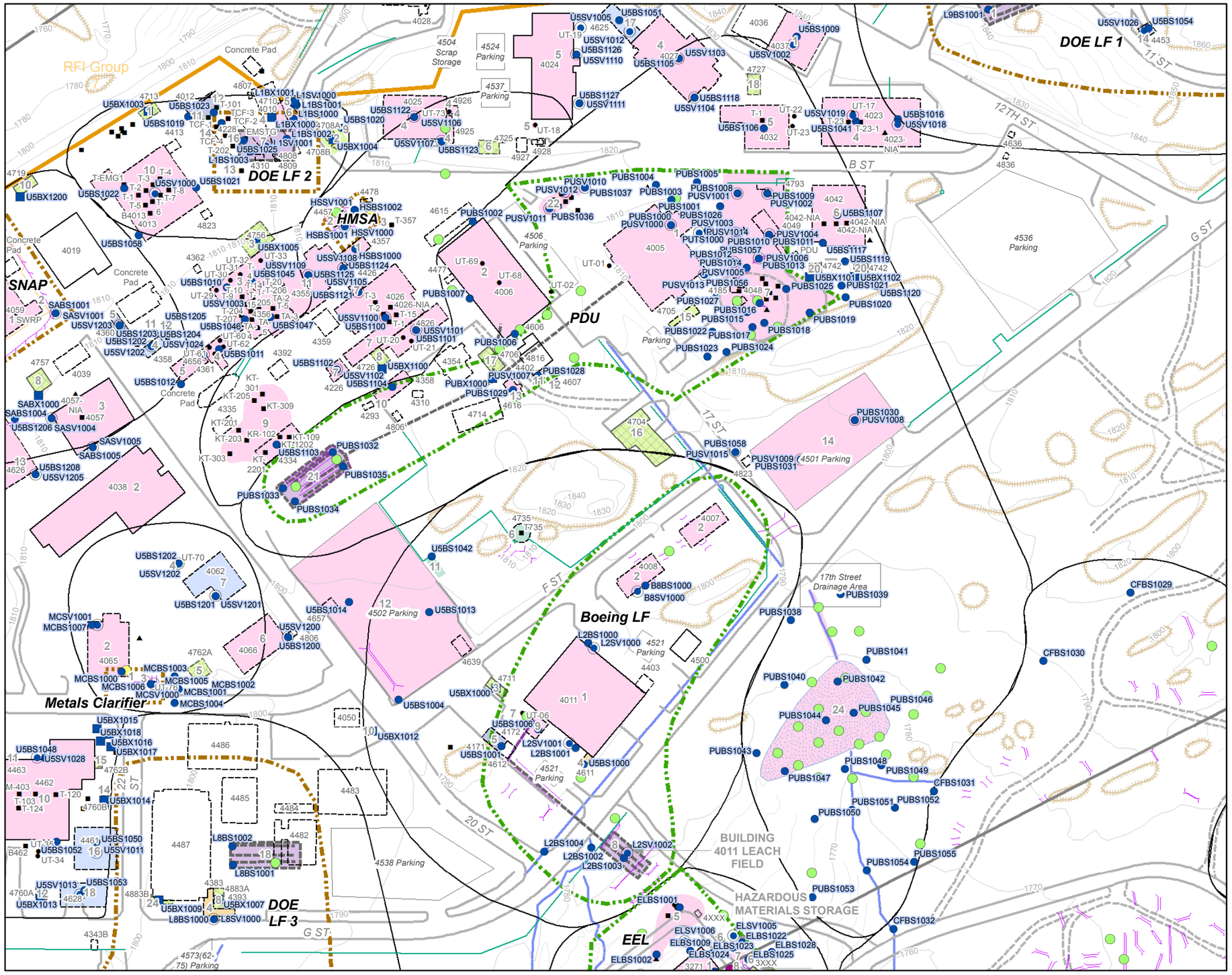
Figure 1



Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil Vapor and Proposed Sampling Locations

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Date: February 21, 2008

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1 inch equals 150 feet

0 150 300 Feet

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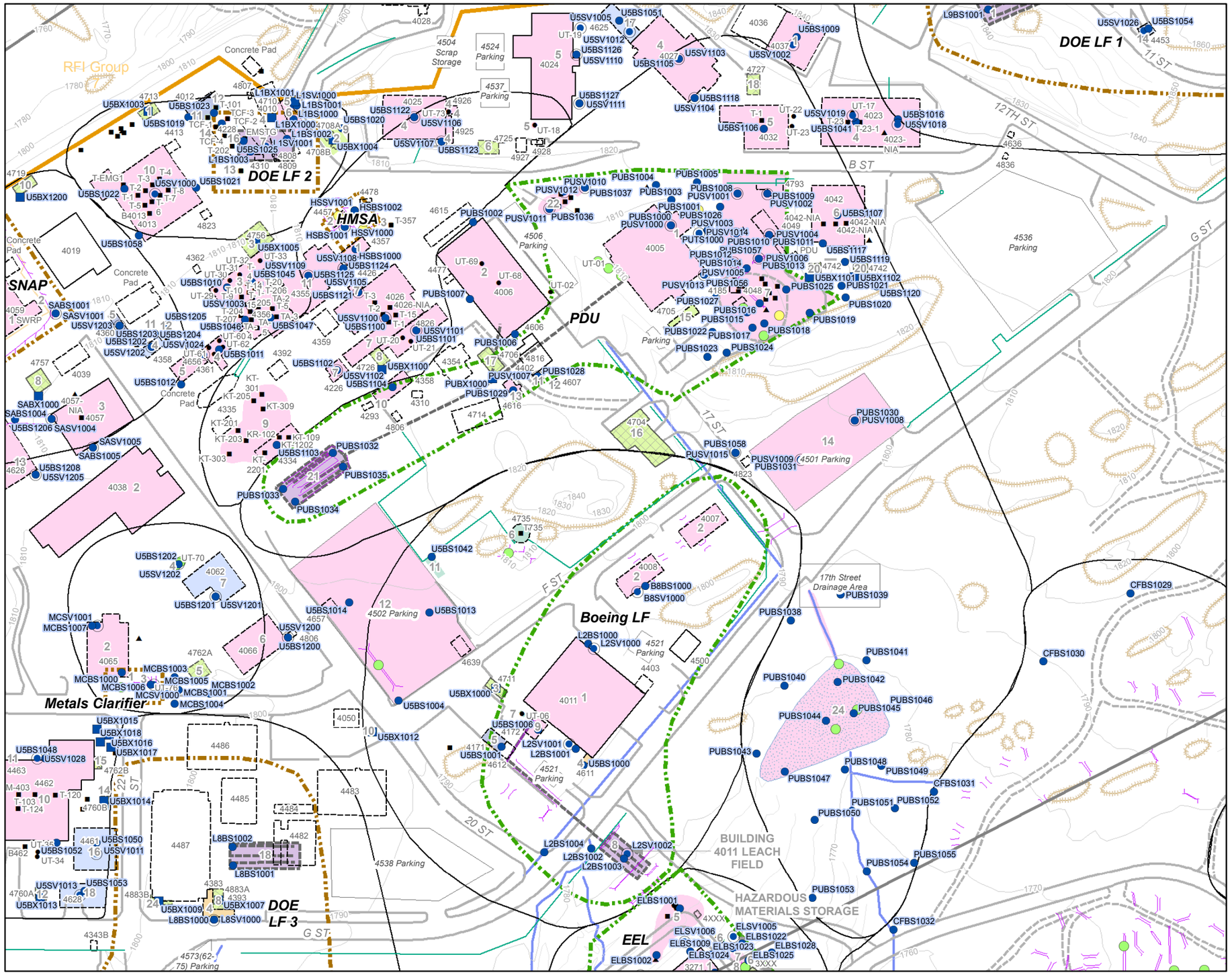
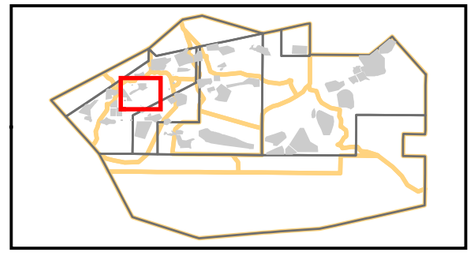
Figure 2





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil and Proposed Sampling Locations

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Date: February 21, 2008

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1 inch equals 150 feet

0 150 300 Feet

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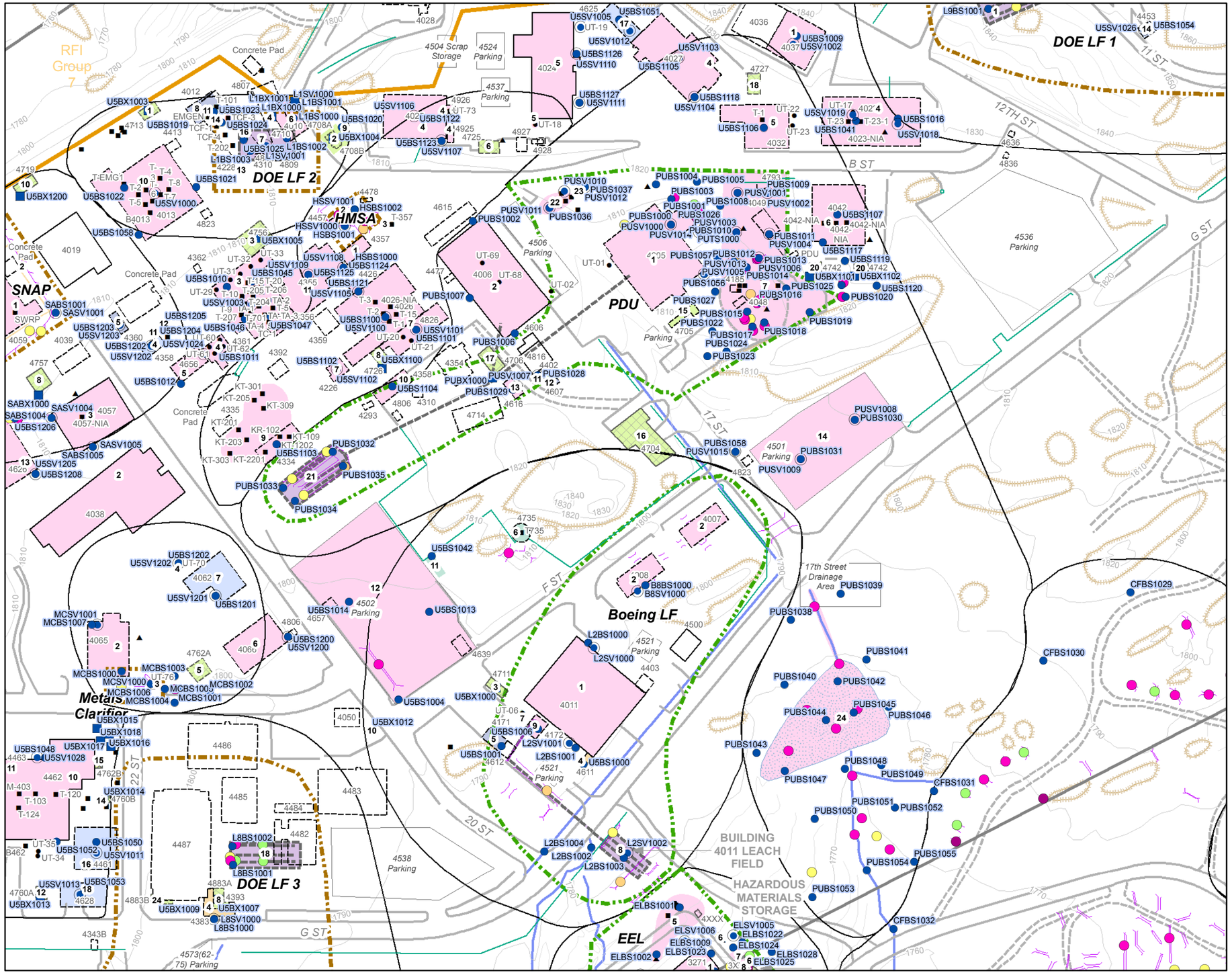
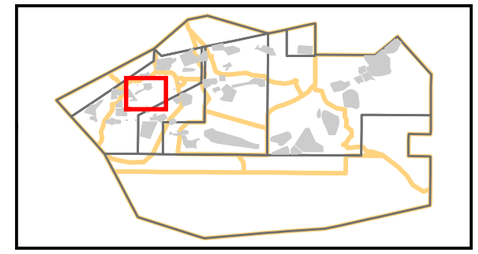
Figure 3





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Metals in Soil

- Exceeds Background + Residential RBLS + Eco RBLS
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Metals in Soil and Proposed Sampling Locations

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1 inch equals 150 feet

0 150 300 Feet

SANTA SUSANA FIELD LABORATORY

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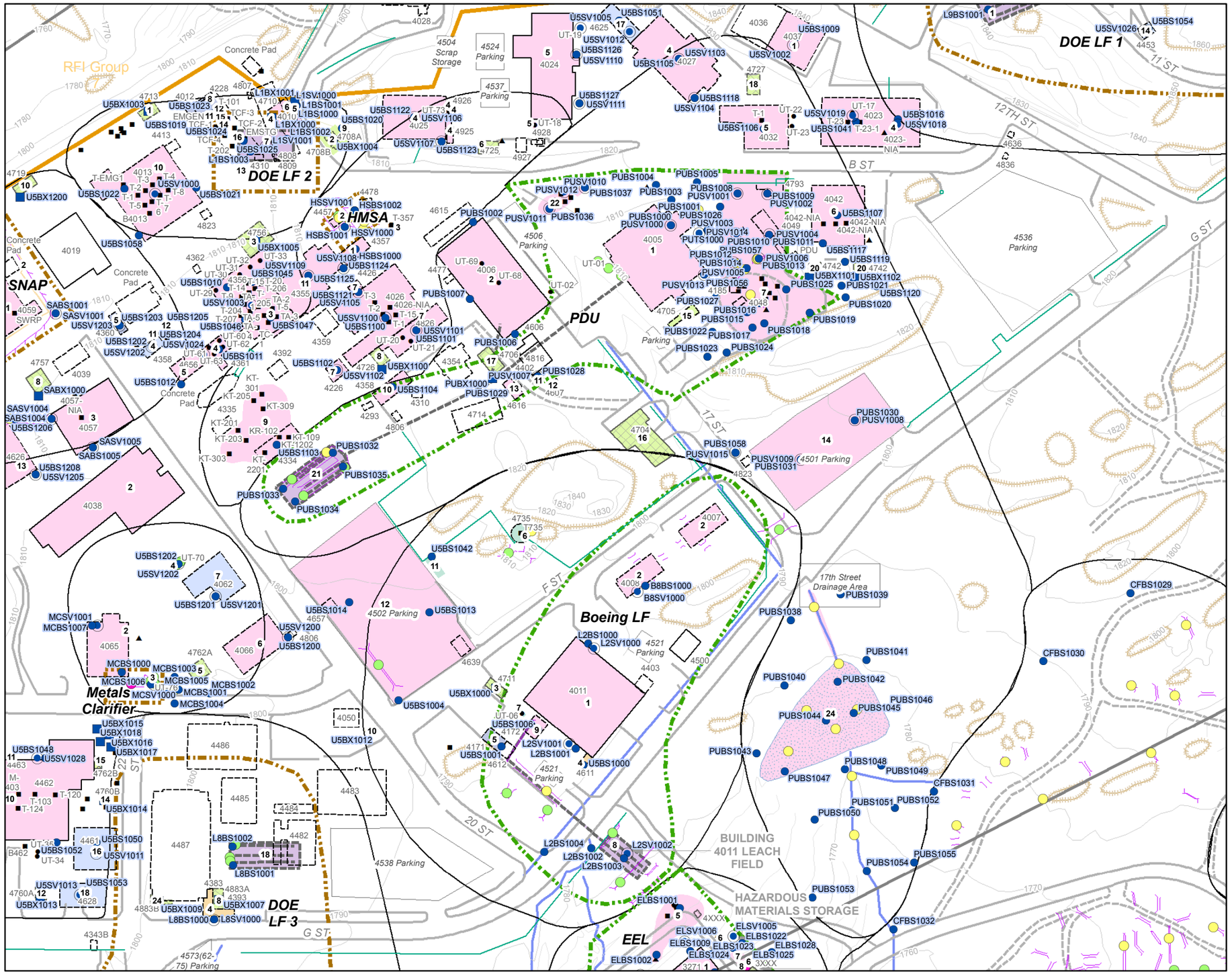
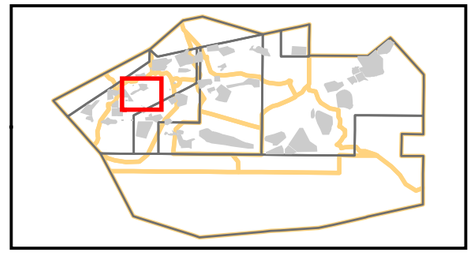
Figure 4





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH in Soil

- Detect > or equal to 100 mg/kg
- Detect < 100 mg/kg
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

TPH in Soil and Proposed Sampling Locations

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Date: February 21, 2008 **WORKING DRAFT**

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1 inch equals 150 feet

0 150 300 Feet

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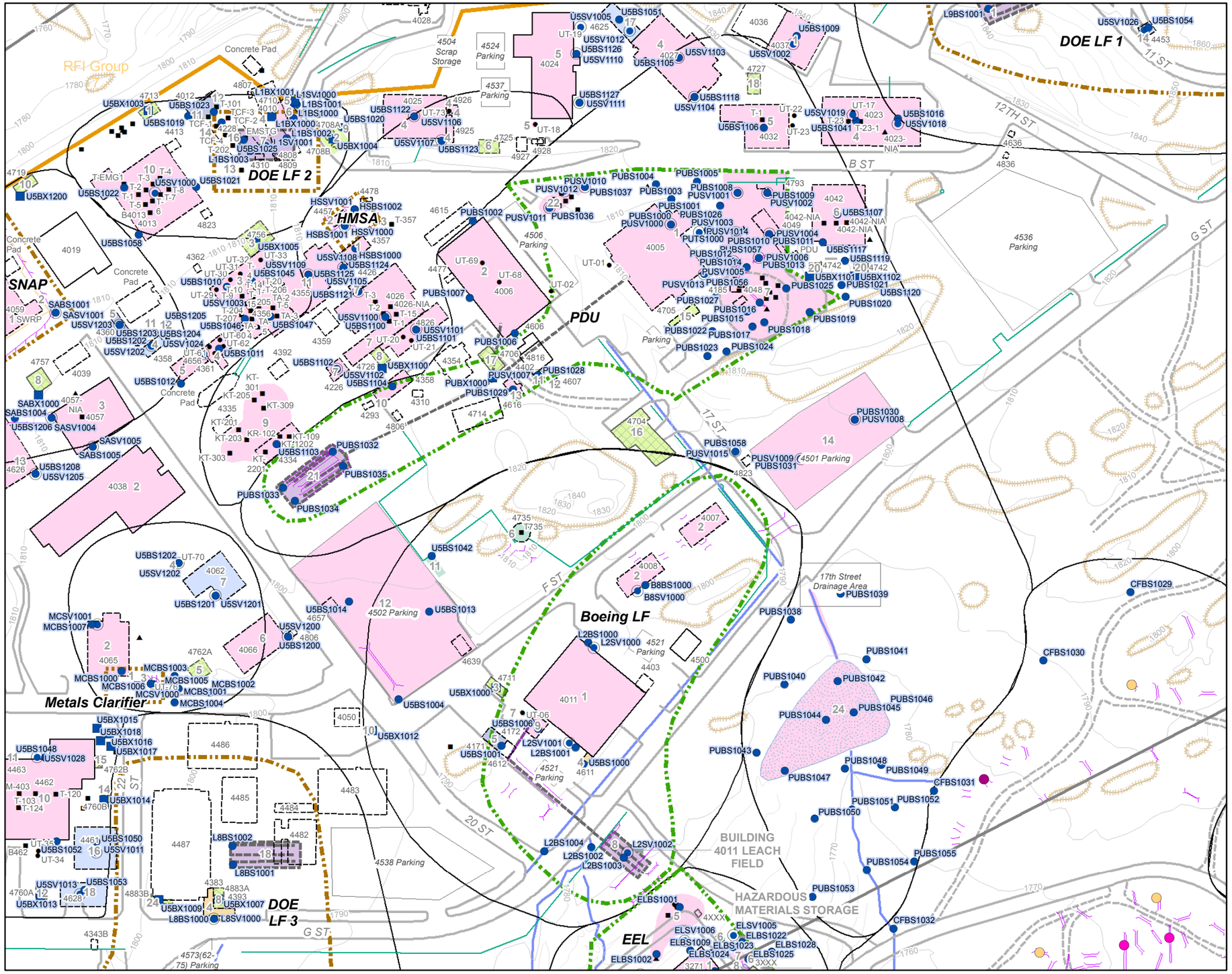
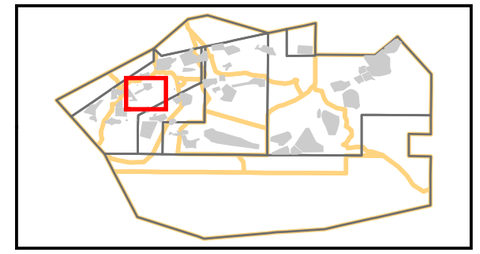
Figure 5





Proposed Sample Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Dioxins in Soil and Proposed Sampling Locations

PDU

Date: February 20, 2008

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1 inch equals 150 feet

0 150 300 Feet

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SANTA SUSANA FIELD LABORATORY

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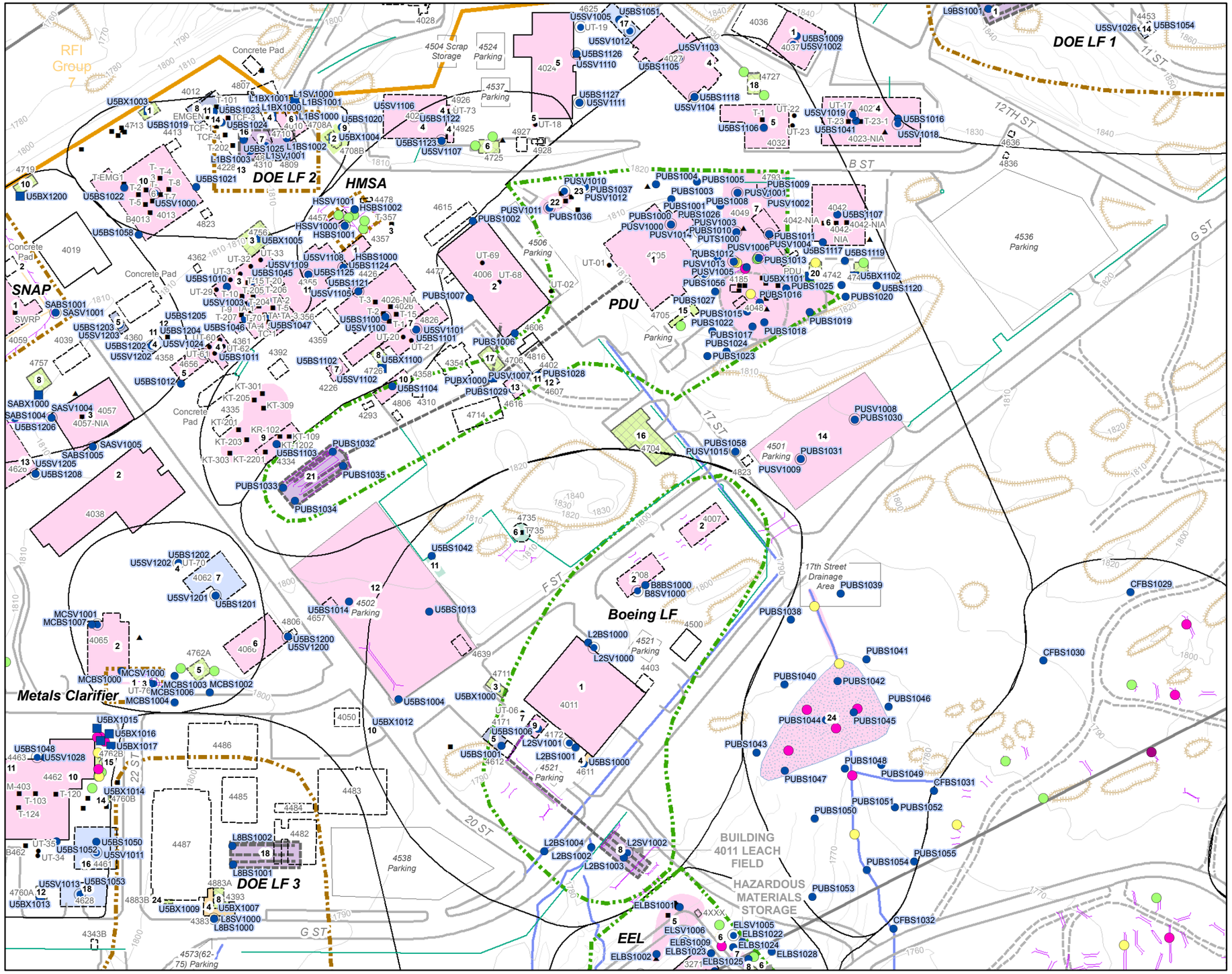
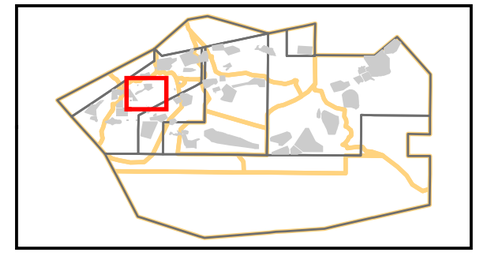
Figure 6





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

PCBs in Soil and Proposed Sampling Locations

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1 inch equals 150 feet

0 150 300 Feet

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Figure 7

Sampling and Analysis Plan for Area 3 Sewage Treatment Plant RFI Site, Group 5, Santa Susana Field Laboratory

PREPARED FOR: Boeing and DOE

PREPARED BY: CH2M HILL

DATE: February 20, 2008

This technical memorandum presents the sampling and analysis plan (SAP) for the Area 3 Sewage Treatment Plant (STP) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site within Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The purpose of this SAP is to describe the scope and rationale for the field investigation to address the data gaps presented in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008) for the Area 3 Sewage Treatment Plant. The I&S Package identified gaps where additional data are needed to support the RFI, risk assessments, and corrective measures studies following a comprehensive review of historical information and reports containing chemical use information, chemical data, and physical data for the RFI site.

The data gaps identified in the I&S Package for the Area 3 Sewage Treatment Plant are summarized in Table 1. Data gaps were generally identified for chemical use areas within each RFI site. As presented in Table 1, chemical data gaps were identified for the three chemical use areas identified for Area 3 Sewage Treatment Plant. Data gaps also were identified based on elevated detection limits of previous samples and lack of sediment data and soil data in the 2- to 6-foot-depth interval. In addition, data gaps were identified based on the need for documentation related to regulatory site closure and to confirm status of pipelines located at the site.

To address these data gaps, CH2M HILL is proposing to collect 48 soil samples and 4 soil vapor samples. These samples will be collected from a total of 17 locations across the site (Table 1). The specific samples proposed for collection at each chemical use area are summarized in Table 2. For each sample location at each chemical use area, Table 2 describes the matrix to be sampled, the depth from which samples are to be collected, analytical methods to be used, and the rationale for sample collection. As presented in Table 2, more than one sample might be necessary to address the data gaps identified for each chemical use area.

The locations of samples proposed in Table 2 are presented in Figure 1. In addition, Figures 2 through 7 present the locations of the proposed samples relative to the locations of previous samples analyzed for volatile organic compounds (VOCs) in soil and soil vapor, metals in soil, petroleum hydrocarbons in soil, dioxins in soil, and PCBs in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate if the previous sample results (at any depth) were detected, were detected below risk based

screening levels (RBSLs) or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

TABLE 1

Data Gaps

Sampling and Analysis Plan for Area 3 Sewage Treatment Plant RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
1	Area 3 STP – No sampling done at the STP. Will need to include sampling at STP for site closure. Verify the need to investigate STP in conjunction with site closure and decommissioning. Locate extent and confirm status of piping.	X	X	X	3
2	STP Pond – Delineate lateral extent of metals exceeding human health and ecological RBSLs.	X			6
3	STP Clarifier – Verify location and status of clarifier. Delineate lateral extent of metals exceeding human health and ecological RBSLs.	X	X	X	4
4	Former Ranch House – Document review indicates metallurgical laboratory, materials storage area, and workshops – conduct screening sampling in the former building footprints to check for possible releases	X			4
				Total	**17**

Samples for which the need for laboratory analysis is contingent on the results of other samples are indicated in Table 2 with an "H," signifying they will be place on "Hold." These samples will be collected, but the laboratory will not analyze these samples until CH2M HILL has evaluated the need for lab analysis and provided direction to the lab to analyze the sample. The need for lab analysis will be contingent on the results of samples above or below the proposed sample.

Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (general text). In addition, quality assurance/quality control samples will be collected as described in the general text of the Group 5 SAP.

Schedule

This investigation is scheduled for March and April 2008. Prior to commencing the field work, a Field Implementation Plan (FIP) will be prepared and submitted for Boeing and the Department of Energy (DOE) review. The contents of the FIP are described in more detail in the general text of the Group 5 SAP. The FIP is scheduled to be submitted to Boeing and DOE in February 2008.

References

CH2M HILL. 2008. *Integration & Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California*. January 3.

TABLE 2

Proposed Samples for Sewage Treatment Pond RFI Site

Sampling and Analysis Plan for Sewage Treatment Pond RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method															Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
1	STBS1000	Soil	1	X	X		X		X	X		X	X	X		X			Upgradient side of Bldg. 3600, COCs not investigated; lateral and vertical delineation in Area 1. Possible hand auger at this location due to existent above ground piping and other equipment; rig accessibility issues. Drill until bedrock is encountered, and hold deeper samples pending shallow results.
		Soil	6	X	X		X		X			X	H	X		X			
		Soil	10	H	H		H		H			H	H	H		H			
		Soil	20	H	H		H		H			H	H	H		H			
		Soil	30	H	H		H		H			H	H	H		H			
		Soil	40	H	H		H		H			H	H	H		H			
1	STBS1001	Soil	1	X	X		H		X	X		X		X		X			COCs not investigated; lateral and vertical delineation in Area 1. Contingent upon discovery of pipeline leading from STP to diversion pond or to clarifier, possibly hand auger as location on steep slope.
		Soil	6	X	X		H		X			X		X		X			
		Soil	10	H	H		H		H			H		H		H			
1	STSV1000	Soil Vapor	5			X													VOCs in Soil Vapor not investigated
		Soil Vapor	10			X													
2	STBS1006	Soil	1							X									Metals detected at 0.5 feet bgs in STBS01; vertical delineation. Possible hand auger at this location as drilling rig accessibility might be a concern.
		Soil	6						X										
		Soil	10						H										
2	STBS1007	Soil	1							X									Metals detected at 5.0 feet bgs in STBS02; vertical delineation. Possible hand auger at this location as drilling rig accessibility might be a concern.
		Soil	6																
		Soil	10						H										
2	STBS1008	Soil	1							X									Metals detected at 0.5 feet bgs in STBS04; vertical delineation. Possible hand auger at this location as drilling rig accessibility might be a concern.
		Soil	6						X										
		Soil	10						H										
2	STBS1009	Soil	1	X	X		H		X	X		X		X		X			Lateral delineation of metals to the south, approximately 40 feet downgradient from metals detected at 0.5 feet bgs in sample STBS04 and approximately 60 feet downgradient from metals detected in STBS02 as general surficial flow is in the southeast direction; other COCs not investigated. Possible hand auger at this location due to steep slope as drilling rig accessibility might be a concern.
		Soil	6	X	X		H		X			X		X		X			
		Soil	10	H	H		H		H			H		H		H			
2	STBS1010	Soil	1	X	X		H		X	X		X		X		X			Lateral delineation of metals to the south, approximately 30 feet downgradient from metals detected in samples STBS02 and approximately 50 feet downgradient from metals detected in STBS03, respectively; other COCs not investigated. Possible hand auger at this location due to steep slope, as drilling rig accessibility might be a concern.
		Soil	6	X	X		H		X			X		X		X			
		Soil	10	H	H		H		H			H		H		H			
2	STSV1001	Soil Vapor	5			X													VOCs in Soil Vapor not investigated
		Soil Vapor	10			X													
3	STBS1002	Soil	1	X	X		H		X	X		X		X		X			Lateral delineation of metals to the north, approximately 15 feet upgradient from metals detected in sample STTS01; other COCs not investigated. Possible hand auger at this location due to steep slope, as drilling rig accessibility might be a concern.
		Soil	6	X	X		H		X			X		X		X			
		Soil	10	H	H		H		H			H		H		H			

TABLE 2

Proposed Samples for Sewage Treatment Pond RFI Site

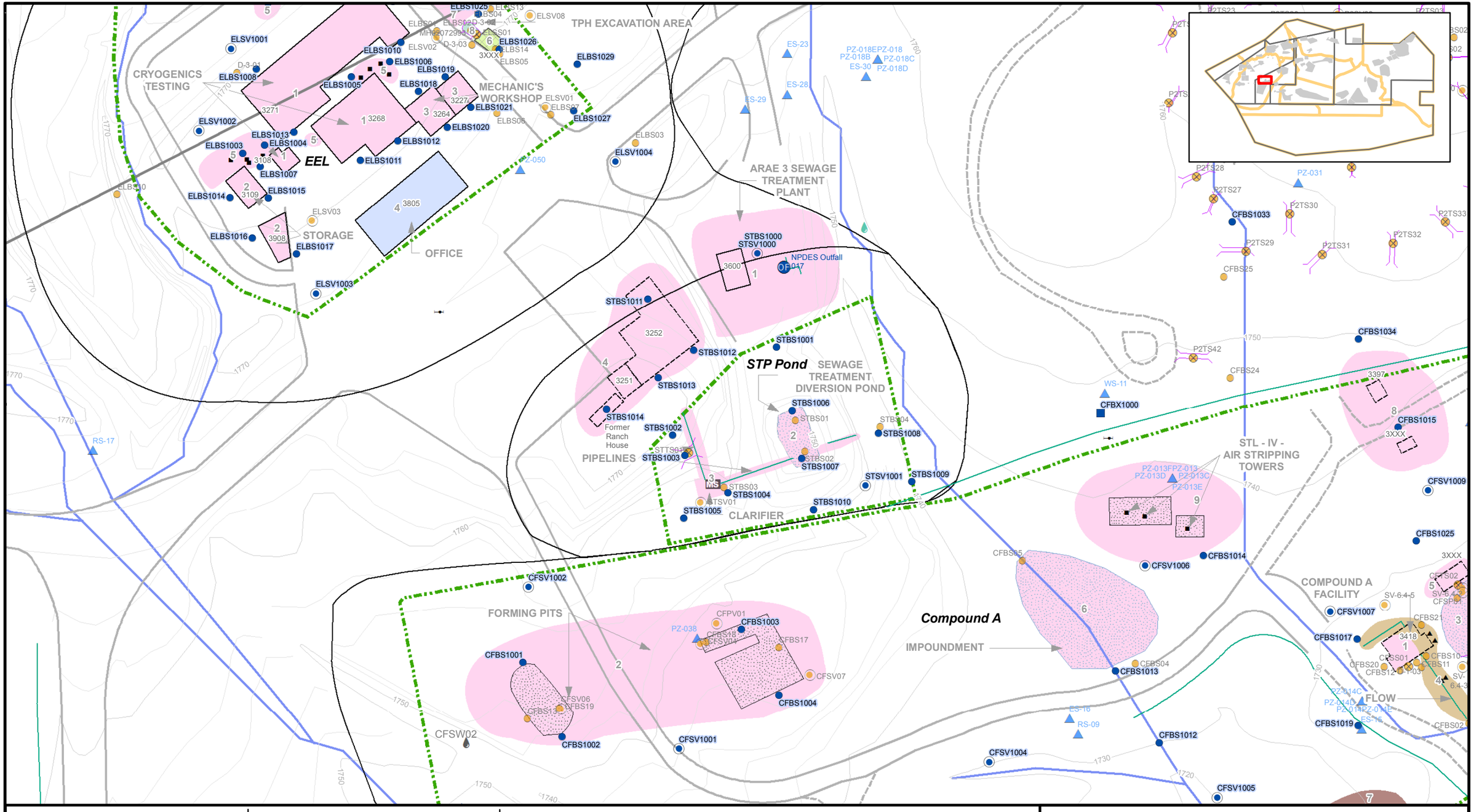
Sampling and Analysis Plan for Sewage Treatment Pond RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
3	STBS1003	Soil	1							X									Metals detected at 1.0 feet bgs in STTS01; vertical delineation. Possible hand auger at this location due to steep slope, as drilling rig accessibility might be a concern.
		Soil	6						X										
		Soil	10						H										
3	STBS1004	Soil	1							X									Metals detected at 4.0 feet bgs in STBS03; vertical delineation. Possible hand auger at this location due to steep slope, as drilling rig accessibility might be a concern.
		Soil	6						X										
		Soil	40						H										
3	STBS1005	Soil	1	X	X		H		X	X		X		X		X			Lateral delineation of metals to the southwest, approximately 30 feet for metals detected in STBS03; other COCs not investigated. Possible hand auger at this location due to steep slope, as drilling rig accessibility might be a concern.
		Soil	6	X	X		H		X			X		X		X			
		Soil	10	H	H		H		H			H		H		H			
4	STBS1011	Soil	1	X	X		H		X	X						X			COCs not investigated; site assessment in Chem Use Area 4. Sample in the footprint of former machine tool workshop or possible hand auger at this location very close to the Bldg if it exists, as steep drop off to the south.
		Soil	6	X	X		H		X							X			
		Soil	10	H	H		H		H							H			
4	STBS1012	Soil	1	X	X		H		X	X						X			Downgradient side of former metallurgical lab, COCs not investigated. Possible hand auger at this location very close to lab footprint as steep drop off to the south.
		Soil	6	X	X		H		X							X			
		Soil	10	H	H		H		H							H			
4	STBS1013	Soil	1	X	X		H		X	X						X			Downgradient side of former misc. storage area, COCs not investigated. Possible hand auger at this location very close to former misc. storage area as steep drop off to the south.
		Soil	6	X	X		H		X							X			
		Soil	10	H	H		H		H							H			
4	STBS1014	Soil	1	X	X		H		X	X						X			Downgradient side of former workshop area, COCs not investigated. Possible hand auger at this location very close to former workshop area as steep drop off to the south.
		Soil	6	X	X		H		X							X			
		Soil	10	H	H		H		H							H			
Total Soil Samples for Analysis				20	20		2		24	15		12	1	12		20			
Total Soil Samples on Hold				13	13		31		18			9	5	9		13			
Total Soil Vapor Samples for Analysis						4													
Total Soil Samples Collected			48																
Total Number of Locations			17																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM



Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- B Biological
- MO Other
- MS Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

Feet

0 60 120

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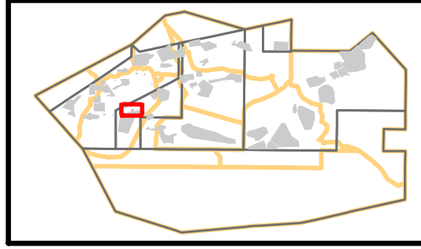
WORKING DRAFT

FIGURE 1

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH EXCAVATION AREA
MECHANIC'S WORKSHOP
EEL
STORAGE
OFFICE
ARAE 3 SEWAGE TREATMENT PLANT
NPDES Outfall
SEWAGE TREATMENT DIVERSION POND
STP Pond
PIPELINES
Former Ranch House
CLARIFIER
STL - IV - AIR STRIPPING TOWERS
FORMING PITS
Compound A
IMPOUNDMENT
COMPOUND A FACILITY
FLOW



VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil Vapor and Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 2

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

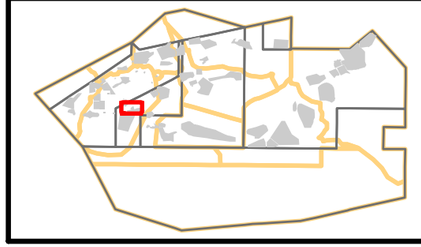
TPH EXCAVATION AREA
MECHANIC'S WORKSHOP
EEL
STORAGE
OFFICE
ARAE 3 SEWAGE TREATMENT PLANT
NPDES Outfall
SEWAGE TREATMENT DIVERSION POND
STP Pond
PIPELINES
Former Ranch House
CLARIFIER
STL - IV - AIR STRIPPING TOWERS
FORMING PITS
Compound A
IMPOUNDMENT
COMPOUND A FACILITY
FLOW

ELBS1025 ELBS1010 ELBS1006 ELBS1026 ELBS1029 ELBS1019 ELBS1018 ELBS1005 ELBS1021 ELBS1027 ELBS1020 ELBS1013 ELBS1004 ELBS1003 ELBS1012 ELBS1011 ELBS1007 ELBS1015 ELBS1014 ELBS1016 ELBS1017 ELSV1003 ELSV1004 LSV1001 LBS1008

STBS1000 STSV1000 STBS1011 STBS1001 STBS1012 STBS1013 STBS1014 STBS1002 STBS1003 STBS1006 STBS1008 STBS1007 STSV1001 STBS1009 STBS1004 STBS1005 STBS1010

CFBS1033 CFBS1034 CFBX1000 CFBS1015 CFSV1009 CFBS1025 CFBS1014 CFSV1006 CFSV1007 CFBS1017 CFBS1013 CFBS1012 CFSV1004 CFSV1005

CFSV1002 CFBS1003 CFBS1001 CFBS1004 CFBS1002 CFSV1001



VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil and Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 3

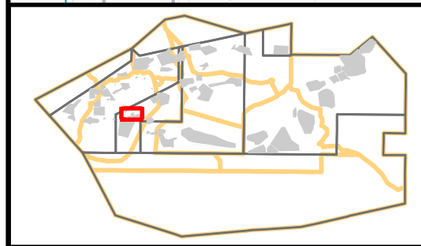
Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH EXCAVATION AREA
MECHANIC'S WORKSHOP
EEL
STORAGE
OFFICE
ARAE 3 SEWAGE TREATMENT PLANT
NPDES Outfall
SEWAGE TREATMENT DIVERSION POND
STP Pond
PIPELINES
Former Ranch House
CLARIFIER
STL - IV - AIR STRIPPING TOWERS
FORMING PITS
Compound A
IMPOUNDMENT
COMPOUND A FACILITY
FLOW

ELSV1001 ELSV1002 ELSV1003 ELSV1004
ELBS1001 ELBS1003 ELBS1004 ELBS1005 ELBS1006 ELBS1007 ELBS1008 ELBS1010 ELBS1011 ELBS1012 ELBS1013 ELBS1014 ELBS1015 ELBS1016 ELBS1017 ELBS1018 ELBS1019 ELBS1020 ELBS1021 ELBS1025 ELBS1026 ELBS1027 ELBS1029
STBS1000 STSV1000 STBS1001 STBS1002 STBS1003 STBS1004 STBS1005 STBS1006 STBS1007 STBS1008 STBS1009 STBS1010 STBS1011 STBS1012 STBS1013 STBS1014 STSV1001
CFBS1001 CFBS1002 CFBS1003 CFBS1004 CFBS1012 CFBS1013 CFBS1014 CFBS1015 CFBS1017 CFBS1019 CFBS1025 CFBS1033 CFBS1034
CFBX1000
CFSV1001 CFSV1002 CFSV1004 CFSV1005 CFSV1006 CFSV1007 CFSV1009

3271 3268 3227 3264 3805 3908 3109 3108 3252 3251 3600 3397 3418 3XXX



Metals in Soil

- Exceeds Background + Residential RBLS + Eco RBLS
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Metals in Soil and Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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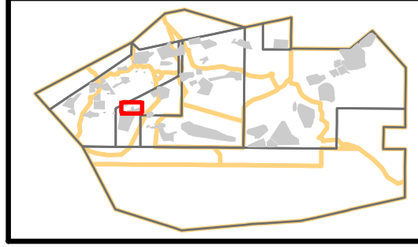
WORKING DRAFT

FIGURE 4

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH EXCAVATION AREA
MECHANIC'S WORKSHOP
EEL
STORAGE
OFFICE
ARAE 3 SEWAGE TREATMENT PLANT
NPDES Outfall
SEWAGE TREATMENT DIVERSION POND
STP Pond
PIPELINES
Former Ranch House
CLARIFIER
STL - IV - AIR STRIPPING TOWERS
FORMING PITS
Compound A
IMPOUNDMENT
COMPOUND A FACILITY
FLOW



TPH in Soil

- Detect > or equal to 100 mg/kg
- Detect < 100 mg/kg
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

TPH in Soil and Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 5

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH EXCAVATION AREA
MECHANIC'S WORKSHOP
EEL
STORAGE
OFFICE
ARAE 3 SEWAGE TREATMENT PLANT
NPDES Outfall
SEWAGE TREATMENT DIVERSION POND
STP Pond
PIPELINES
Former Ranch House
CLARIFIER
STL - IV - AIR STRIPPING TOWERS
FORMING PITS
Compound A
IMPOUNDMENT
COMPOUND A FACILITY
FLOW

ELBS1025 ELBS1010 ELBS1006 ELBS1026 ELBS1029 ELBS1019 ELBS1018 ELBS1005 ELBS1021 ELBS1027 ELBS1020 ELBS1012 ELBS1013 ELBS1004 ELBS1003 ELBS1007 ELBS1011 ELBS1014 ELBS1015 ELBS1016 ELBS1017 ELSV1003 ELSV1004

STBS1000 STSV1000 STBS1011 STBS1012 STBS1001 STBS1013 STBS1014 STBS1002 STBS1003 STBS1007 STBS1006 STBS1008 STSV1001 STBS1009 STBS1004 STBS1005 STBS1010

CFBS1033 CFBS1034 CFBX1000 CFBS1015 CFSV1009 CFBS1025 CFBS1014 CFSV1006 CFSV1007 CFBS1017 CFBS1013 CFBS1019 CFBS1012 CFSV1004 CFSV1005

CFSV1002 CFBS1003 CFBS1001 CFBS1004 CFBS1002 CFSV1001

Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Dioxins in Soil and Proposed Sampling Locations

STP Pond

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

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WORKING DRAFT

FIGURE 6

Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

ELSV1001 ELSB1008 ELSB1010 ELSB1006 ELSB1005 ELSB1019 ELSB1018 ELSB1025 TPH EXCAVATION AREA 3XXX ELSB1026 ELSB1029 MECHANIC'S WORKSHOP ELSB1027 ELSB1021 ELSB1020 ELSV1002 ELSB1013 ELSB1003 ELSB1004 ELSB1012 ELSB1011 EEL ELSB1007 ELSB1014 ELSB1015 ELSB1016 STORAGE ELSB1017 OFFICE ELSV1003 ELSV1004 ARAE 3 SEWAGE TREATMENT PLANT STBS1000 STSV1000 NPDES Outfall OF 017 STBS1011 STBS1012 STBS1001 SEWAGE TREATMENT DIVERSION POND STBS1006 STP Pond STBS1008 STBS1013 STBS1014 Former Ranch House PIPELINES STBS1002 STBS1003 STBS1007 STSV1001 STBS1009 STBS1004 STBS1005 CLARIFIER STBS1010 CFBX1000 CFBS1033 CFBS1034 CFBS1015 STL - IV - AIR STRIPPING TOWERS CFSV1009 CFBS1025 CFBS1014 CFSV1006 COMPOUND A FACILITY CFSV1007 CFBS1017 CFBS1019 FLOW CFBS1012 CFSV1004 CFSV1005 CFSV1002 FORMING PITS CFBS1003 CFBS1001 CFBS1004 CFBS1002 CFSV1001 Compound A IMPOUNDMENT CFBS1013

PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

PCBs in Soil and Proposed Sampling Locations

STP Pond

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1 inch equals 60 feet

0 60 120 Feet

February 21, 2008

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FIGURE 7

Sampling and Analysis Plan for the Southeast Drum Storage Yard RFI Site, Group 5, Santa Susana Field Laboratory

PREPARED FOR: Boeing and DOE

PREPARED BY: CH2M HILL

DATE: February 22, 2008

This technical memorandum presents the sampling and analysis plan (SAP) for the Southeast Drum Storage Yard (SE Drum) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site within Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The Area of Concern (AOC) SE Drum Storage Yard previously was used for storage of drums of unknown contents in the early 1960s.

The purpose of this SAP is to describe the scope and rationale for the field investigation to address the data gaps presented in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008) for the SE Drum. The I&S Package identified gaps where additional data are needed to support the RFI, risk assessments, and corrective measures studies following a comprehensive review of historical information and reports containing chemical use information, chemical data, and physical data for the RFI site.

The data gaps identified in the I&S Package for the SE Drum are summarized in Table 1. As presented in Table 1, chemical data gaps were identified for the single chemical use area identified for the Southeast Drum Storage Yard. In addition, documentation data gaps were identified related to the contents of the drums stored at this site. To address these data gaps, CH2M HILL is proposing to collect nine soil samples and two soil vapor samples. These samples will be collected from a total of four locations across the site (Table 1).

The specific samples proposed for collection are summarized in Table 2. For each sample location, Table 2 describes the matrix to be sampled, the depth from which samples are to be collected, analytical methods to be used, and the rationale for sample collection. As presented in Table 2, more than one sample might be necessary to address the data gaps identified for the chemical use area.

The locations of samples proposed in Table 2 are presented in Figure 1. In addition, Figures 2 through 7 present the locations of the proposed samples relative to the locations of previous samples analyzed for volatile organic compounds (VOCs) in soil and soil vapor, metals in soil, petroleum hydrocarbons in soil, dioxins in soil, and polychlorinated biphenyls in soil. The previous sample location symbols on Figures 2 through 7 are color coded to indicate whether the previous sample results (at any depth) were detected, were detected below risk-based screening levels (RBSLs) or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

TABLE 1

Data Gaps

Sampling and Analysis Plan for the Southeast Drum Storage Yard RFI Site, Group 5, Santa Susana Field Laboratory

Chemical Use Area Number	Data Gap	Chemical Data Gap	Physical Data Gap	Documentation Data Gap	Number Sample Locations to Address Data Gaps
1	SE Drum Storage Yard - The contents of the drums stored at the site are unknown. Soil at the site has not been investigated adequately for metals, VOCs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbon (TPH), propellants, and energetics. Also, previous soil samples had detection limits that exceed RBSLs for select VOCs, SVOCs, and propellants. While soil vapor has been analyzed for VOCs, previous samples had detection limits that exceed RBSLs for select VOCs.	X		X	4
				Total	**4**

Samples for which the need for laboratory analysis is contingent on the results of other samples are indicated in Table 2 with an "H," signifying the sample will be placed on "Hold." These samples will be collected, but the laboratory will not analyze these samples until CH2M HILL has evaluated the need for lab analysis and provided direction to the lab to analyze the sample. The need for lab analysis will be contingent on the results of samples above or below the proposed sample.

Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (General Text). In addition, quality assurance/quality control samples will be collected as described in the Group 5 SAP (General Text).

Schedule

This investigation is scheduled for March and April 2008. In preparation for commencing the fieldwork, a Field Implementation Plan (FIP) was prepared and submitted for Boeing and DOE review on February 22, 2008.

References

CH2M HILL. 2008. *Integration & Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California*. January 3.

TABLE 2

Proposed Samples for the Southeast Drum Storage Yard RFI Site

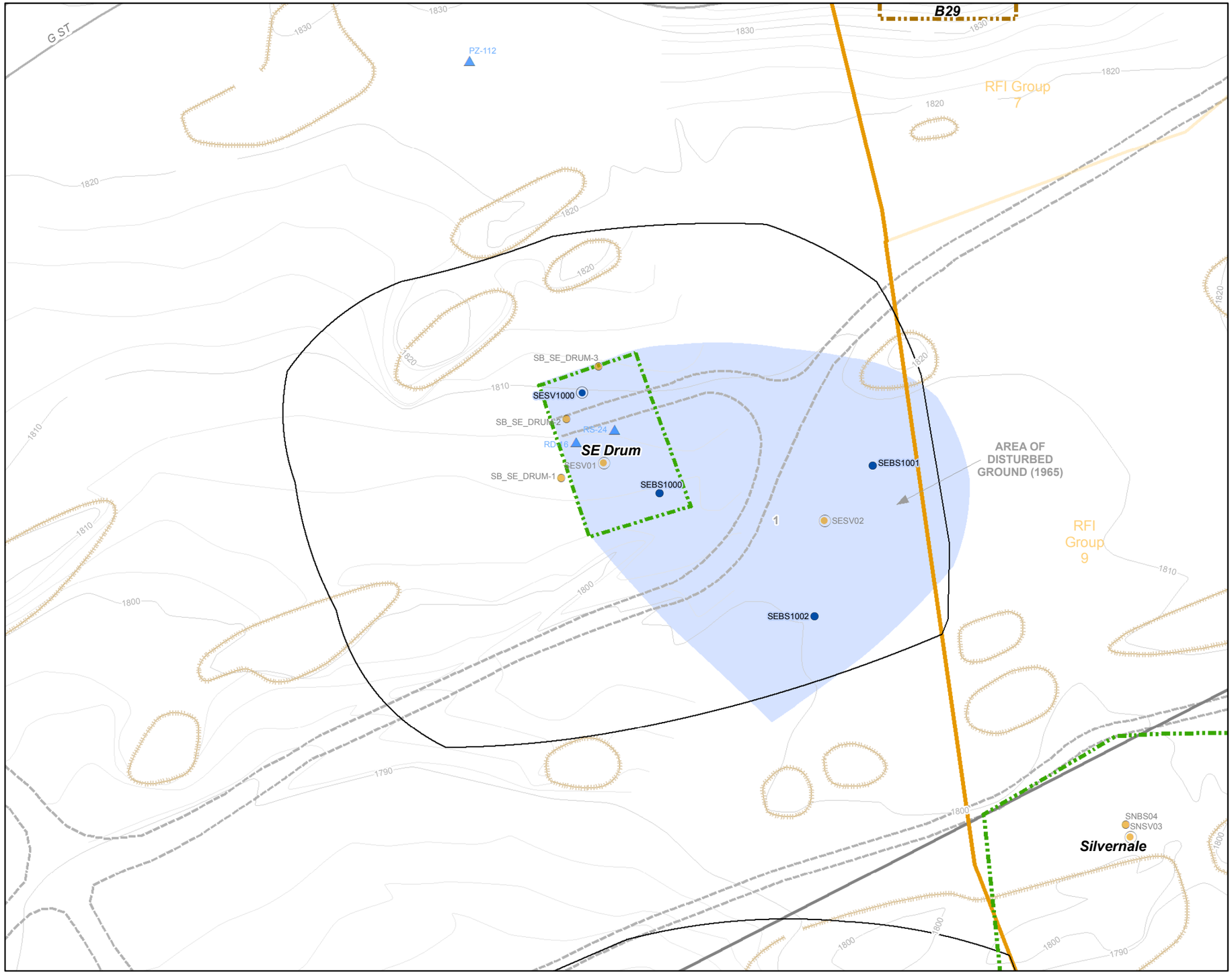
Sampling and Analysis Plan for Southeast Drum Storage Yard RFI Site, Group 5, Santa Susana Field Laboratory

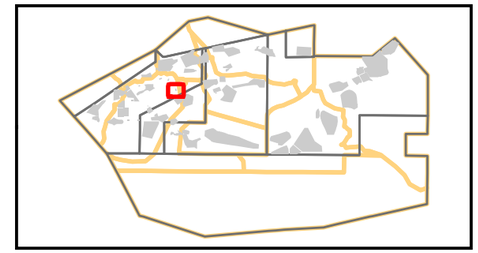
Chemical Use Area No.	Location ID	Matrix	Sample Depth (feet bgs)	Analytical Method														Rationale/Objectives
				TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)	
1	SEBS1000	Soil	1	X	X		X		X	X	H								Screening for the potential contents of the drums in areas that have not been previously investigated.
		Soil	6	X	X		X		X		H								
		Soil	10	H	X		H		H		H								Analysis of this sample will be contingent on the results for more shallow samples.
1	SEBS1001	Soil	1	X	X		X		X	X	H								Screening for the potential contents of the drums in areas that have not been previously investigated. The propsed sample is located in an area of disturbed ground shown on a 1965 aerial photograph.
		Soil	6	X	X		X		X		H								
		Soil	10	H	X		H		H		H								Analysis of this sample will be contingent on the results for more shallow samples.
1	SEBS1002	Soil	1	X	X		X		X	X	H								Screening for the potential contents of the drums in areas that have not been previously investigated. The propsed sample is located in an area of disturbed ground shown on a 1965 aerial photograph.
		Soil	6	X	X		X		X		H								
		Soil	10	H	X		H		H		H								Analysis of this sample will be contingent on the results for more shallow samples.
1	SESV1000	Soil Vapor	5			X													The detection limits for previous soil vapor samples exceeded the RBSLs for many VOCs. Additional soil vapor sampling is proposed to address this data gap.
		Soil Vapor	10			X													
Total Soil Samples for Analysis				6	9		6		6	3									
Total Soil Samples on Hold				3			3		3		9								
Total Soil Vapor Samples for Analysis						2													
Total Soil Samples Collected			9																
Total Number of Locations			4																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Existing Sampling Locations

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- Biological
- Other
- Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Proposed Sampling Locations

SE Drum

Date: February 20, 2008 **WORKING DRAFT**

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1 inch equals 60 feet

0 60 120 Feet

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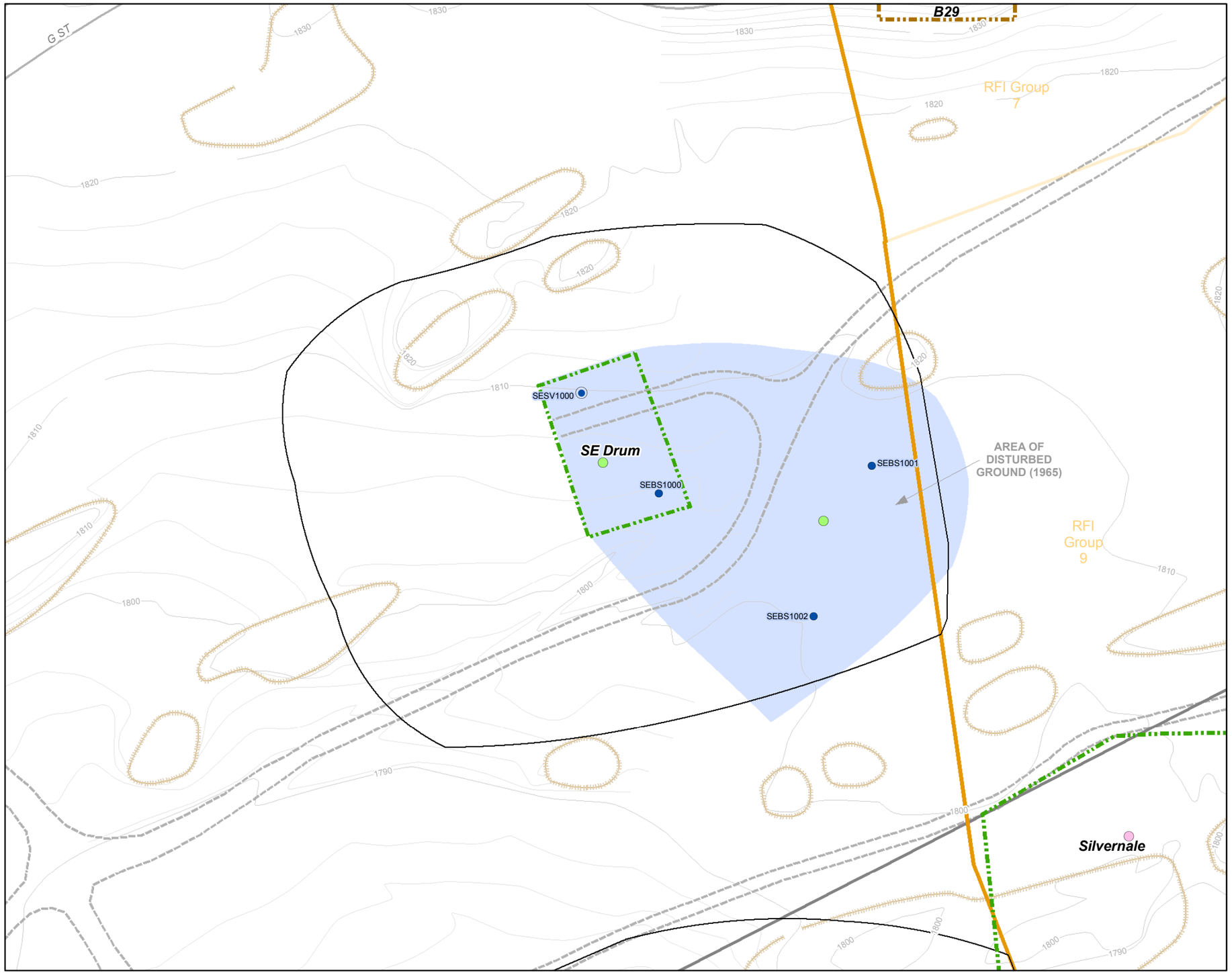
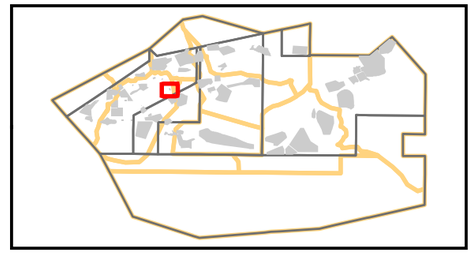
Figure 1





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil Vapor and Proposed Sampling Locations

SE Drum

Date: February 21, 2008 **WORKING DRAFT**

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1 inch equals 60 feet

0 60 120 Feet

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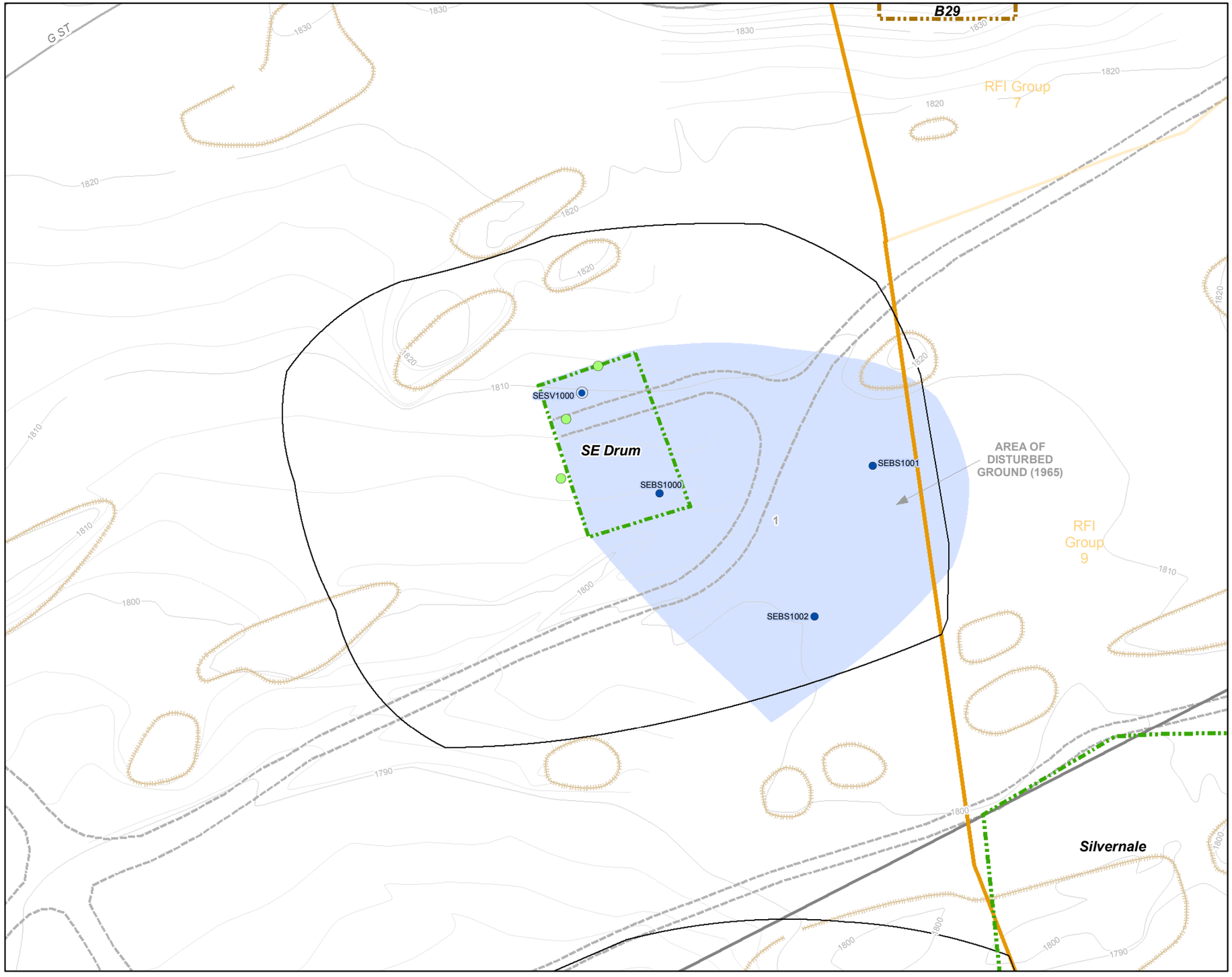
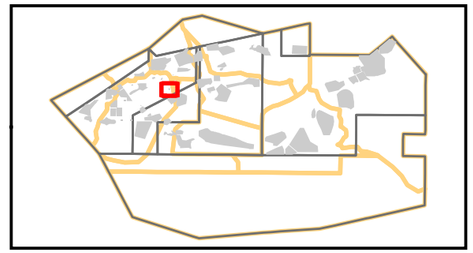
Figure 2





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

VOCs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

VOCs in Soil and Proposed Sampling Locations

SE Drum

Date: February 20, 2008 **WORKING DRAFT**

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1 inch equals 60 feet

0 60 120 Feet

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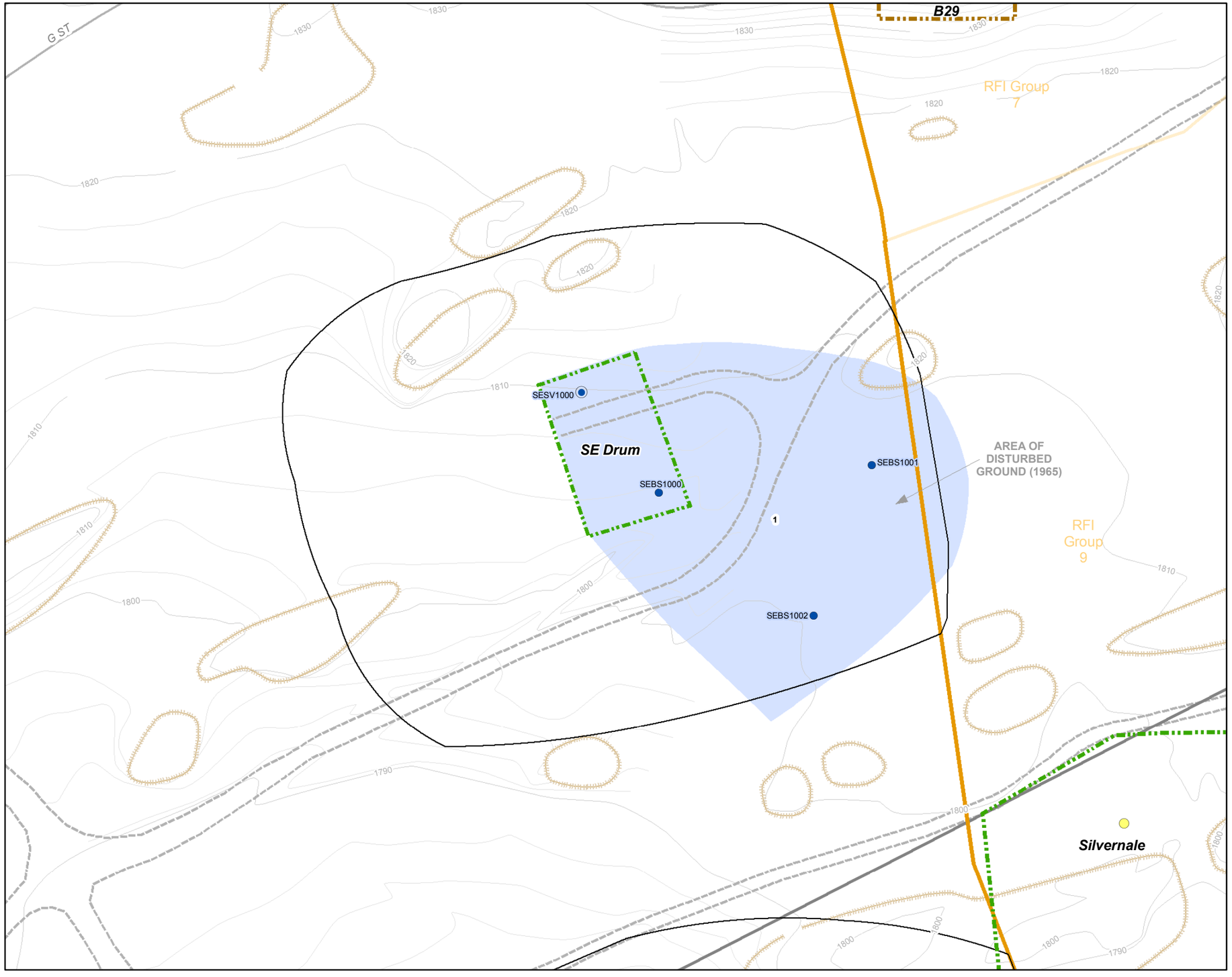
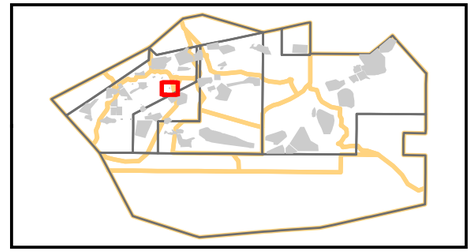
Figure 3





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Metals in Soil

- Exceeds Background + Residential RBLS + Eco RBLS
- Exceeds Background + Eco RBSL
- Exceeds Background
- Dectect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Metals in Soil and Proposed Sampling Locations

SE Drum

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1 inch equals 60 feet

0 60 120 Feet

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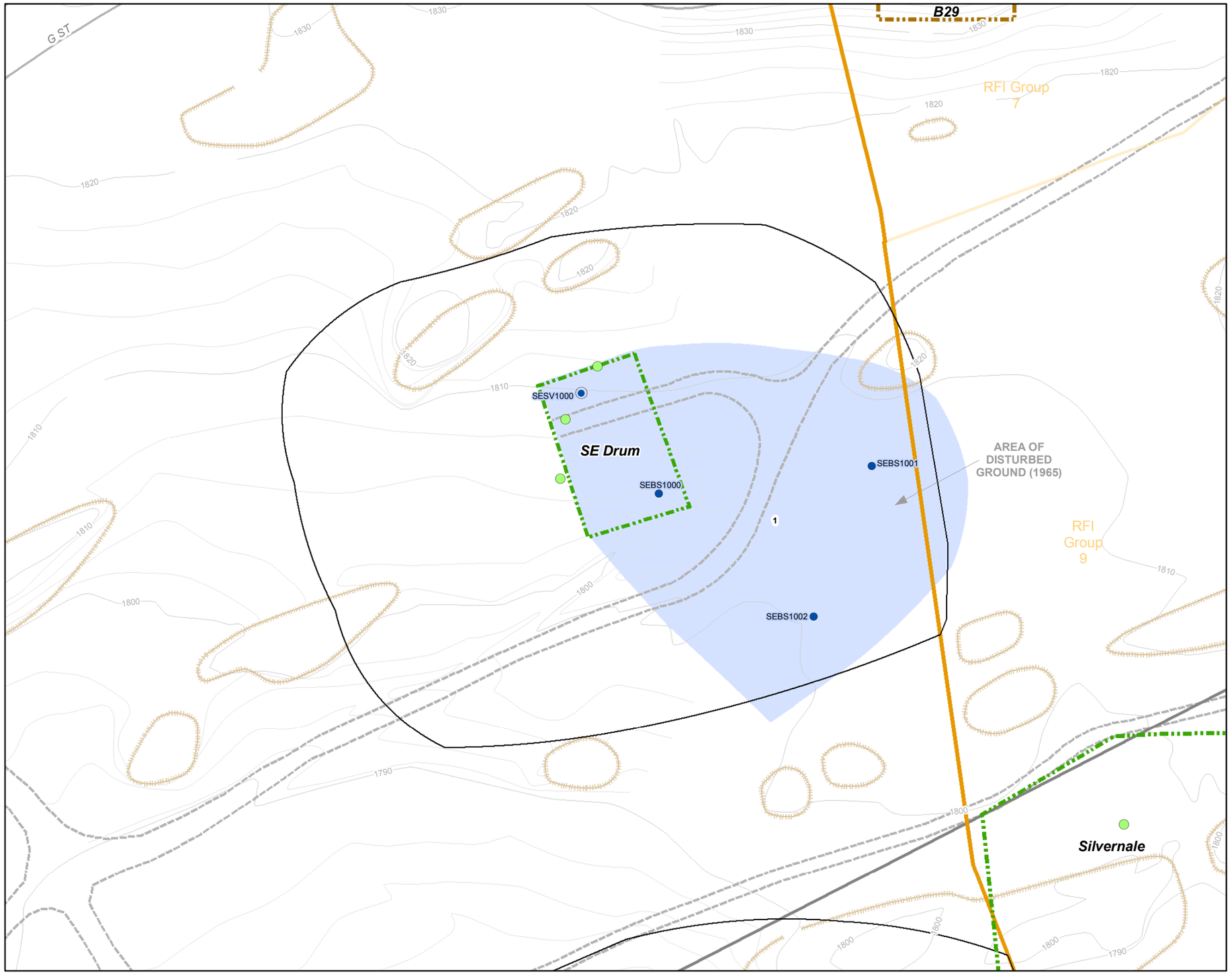
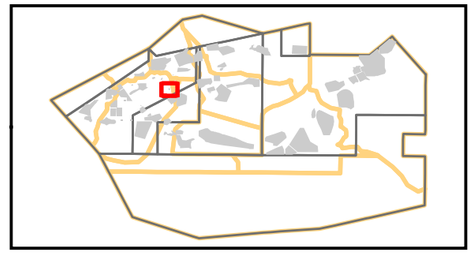
Figure 4





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

TPH in Soil

- Detect > or equal to 100 mg/kg
- Detect < 100 mg/kg
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

TPH in Soil and Proposed Sampling Locations

SE Drum

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1 inch equals 60 feet

0 60 120 Feet

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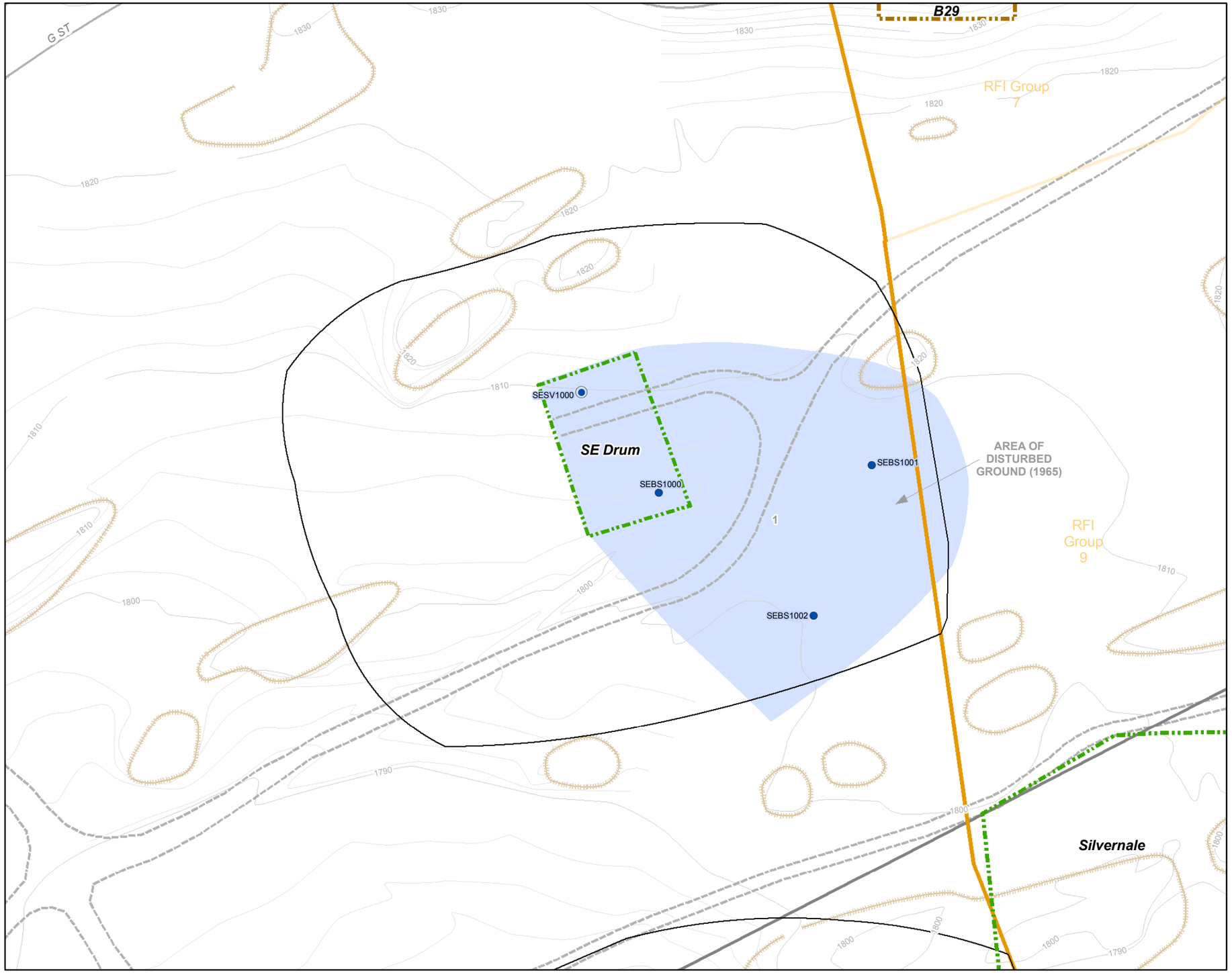
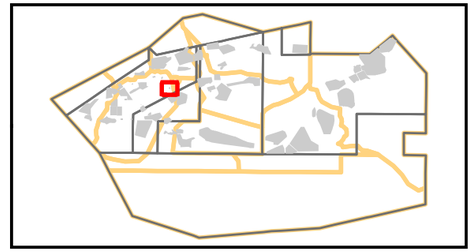
Figure 5





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

Dioxins in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- Exceeds Background + Eco RBSL
- Exceeds Background + Residential RBSL
- Exceeds Background
- Detect, Below Background Concentration
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
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- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Dioxins in Soil and Proposed Sampling Locations

SE Drum

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1 inch equals 60 feet

0 60 120 Feet

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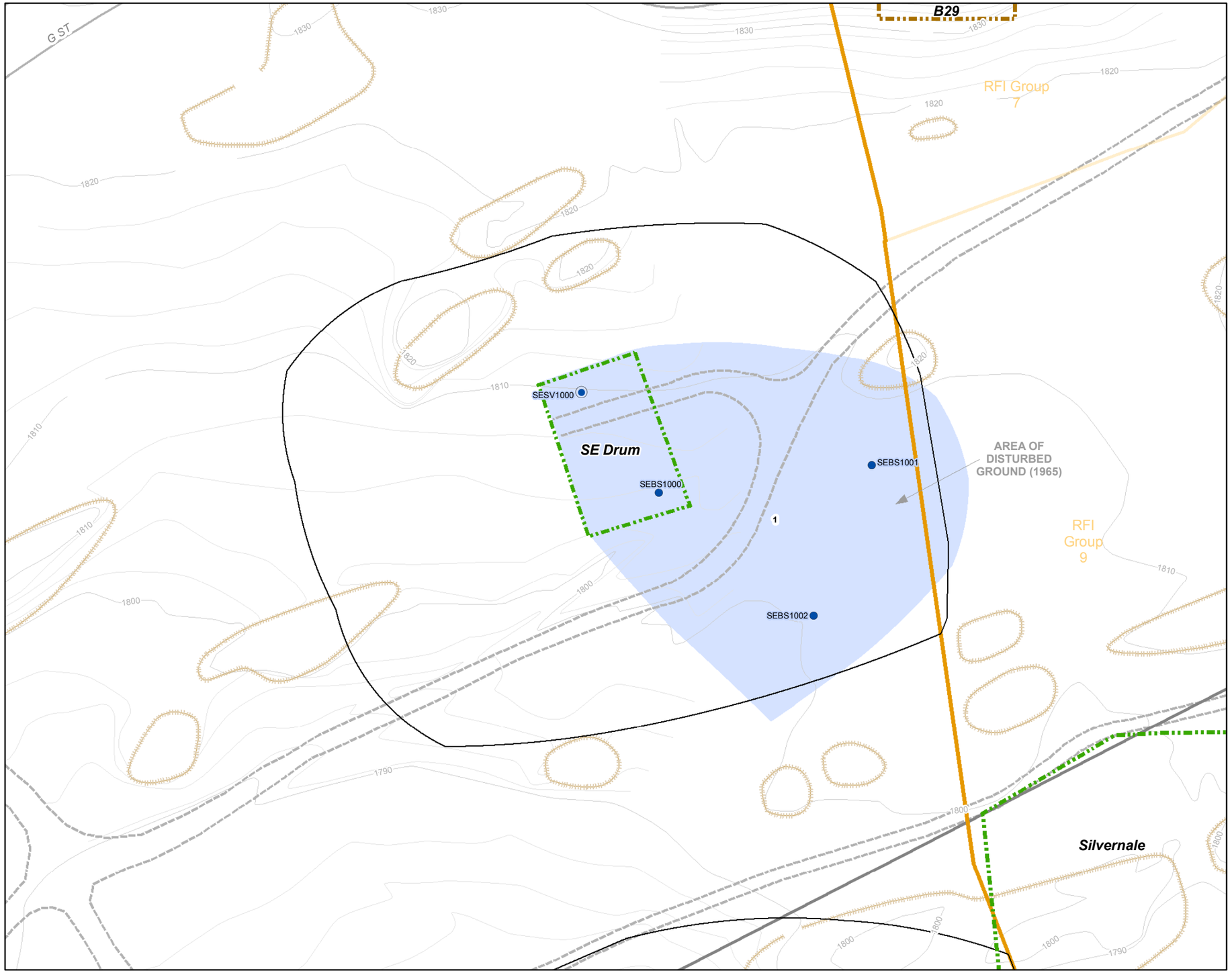
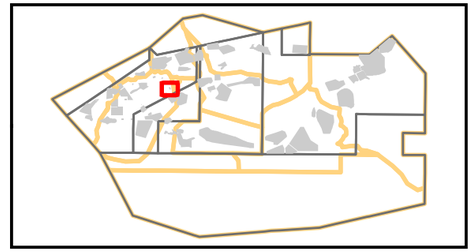
Figure 6





Proposed Sampling Locations

- Soil Matrix/Boring Sample
- Soil Matrix/Boring Transformer Sample
- Soil Vapor
- Soil Matrix/Berm or Leach Field Trench Sample

PCBs in Soil

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
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- RFI Group Boundary
- Administrative Area
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- Streams
- Pond
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

PCBs in Soil and Proposed Sampling Locations

SE Drum

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1 inch equals 60 feet

0 60 120 Feet

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Figure 7