Report

Sampling and Analysis Plan for RFI Group 5 Santa Susana Field Laboratory, Ventura County, California

Prepared for:

The Boeing Company

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Acronyms and Abbreviations

AOC	Area of Concern
AST	aboveground storage tank
CMS	Corrective Measures Study
COPC	constituent of potential concern
DOE	United States Department of Energy
DQO	data quality objective
DTSC	Department of Toxic Substances Control
ECL	Engineering Chemistry Laboratory
EDTA	ethylene diamine tetra-acetic acid
EEL	Environmental Effects Laboratory
ERA	ecological risk assessment
FIP	field implementation plan
HHRA	Human Health Risk Assessment
HMSA	Hazardous Material Storage Area
I&S Package	Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory (CH2M HILL, 2008)
KEWB	Kinetic Experiments Water Boiler
MS/DS	matrix spike/matrix spike duplicate
mg/kg	milligram/kilogram
NDMA	n-nitrosodimethylamine
NTO	nitrogen tetroxide
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PDU	Process Development Unit
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan

RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act Facility Investigation
SAP	Sampling and Analysis Plan
SCTI	Sodium Component Test Installation
SE Drum	Southeast Drum Storage Yard
SNAP	Systems for Nuclear Auxiliary Power
SRAM	Standardized Risk Assessment Methodology
SSFL	Santa Susana Field Laboratory
STL-IV	Systems Test Laboratory-IV
STP	Sewage Treatment Plant
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCE	trichloroethylene
TPH	total petroleum hydrocarbon
UST	underground storage tank

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

This document presents the Sampling and Analysis Plan (SAP) for the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) sites and other unaffiliated features 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 identified and described in the *Integration and Synthesis Package for RFI Group 5, Santa Susana Field Laboratory, California* (I&S Package) (CH2M HILL, 2008). That document identified gaps where additional data are needed for each RFI site in Group 5 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. Similarly, gaps where additional data are needed to confirm or dismiss the potential for release at unaffiliated features in Group 5 were identified in the I&S Package.

The SAP presented herein will describe how and where data will be collected to address the data gaps identified for the RFI sites and unaffiliated features in Group 5. Additional information regarding the fieldwork proposed in this SAP will be included in a field implementation plan (FIP). The FIP will include additional detail on how the planned scope of work will be implemented and the schedule and costs for implementing the SAP. The FIP will include information on the types and dimensions of all field vehicles, names of all personnel conducting field work, a Field Information Card, a Pre-field checklist, and standard operating procedures. The FIP will be submitted prior to commencing any fieldwork in Group 5.

1.0 RFI Site-Specific SAPs

Based on the data gaps presented for each RFI site in the I&S Package, site-specific SAPs were developed for each RFI site in Group 5. The locations of the RFI sites in Group 5 are presented in Figure 1. The site-specific SAPs propose investigation for the chemical use areas[1] that were identified as having data gaps. The site-specific SAPs for the following Boeing-owned RFI sites are presented in the following attachments included in Appendix A:

- Attachment A-1: Boeing Area IV Leach Fields
- Attachment A-2: Compound A
- Attachment A-3: Engineering Chemistry Laboratory (ECL)
- Attachment A-4: Environmental Effects Laboratory (EEL)
- Attachment A-5: Pond Dredge Area

[1] Chemical uses areas are areas where chemicals of potential concern were used, stored, or released, as identified during the historical document review.

- Attachment A-6: Process Development Unit (PDU)
- Attachment A-7: Sewage Treatment Plant (STP)
- Attachment A-8: Southeast Drum Storage Yard (SE Drum)
- Attachment A-9: Systems Test Laboratory IV (STL-IV)

The site-specific SAPs address all features that are located within the RFI site buffers (shown as black lines in Figure 1) that were identified as having chemical uses during the document review. Unaffiliated features (for example, buildings, tanks, and transformers) that are located outside these RFI site buffers and were identified as having chemical uses in Group 5 are addressed in separate SAPs. Attachment A-10 presents the SAP for the only Boeing-owned unaffiliated feature that is located outside the RFI site buffers that has chemical uses (the STL-IV Explosive Bunkers).

The site-specific SAPs for the following Department of Energy (DOE)-owned RFI sites are presented in the following attachments included in Appendix B:

- Attachment B-1: Building 65 Metals Clarifier
- Attachment B-2: Building 100 Trench
- Attachment B-3: DOE Leach Fields 1
- Attachment B-4: DOE Leach Fields 2
- Attachment B-5: DOE Leach Fields 3
- Attachment B-6: Hazardous Materials Storage Area
- Attachment B-7: Rockwell International Hot Laboratory
- Attachment B-8: Systems for Nuclear Auxiliary Power (SNAP)

Attachment B-9 presents the SAP for the DOE-owned unaffiliated features that are located outside the RFI site buffers in Group 5.

2.0 Sampling Approach and Rationale

The Data Quality Objectives (DQOs) for Group 5 are presented in Table 1. The key DQOs include:

- Identify potential source areas
- Characterize the nature and extent of contamination
- Collect data sufficient for performing risk assessments
- Collect data sufficient for making corrective measures study (CMS) recommendations;
- Collect data sufficient for assessing the threat to the Chatsworth formation groundwater

The strategy for identifying and investigating potential source areas at a site or feature not previously investigated ("screening assessment") is different than that for characterizing the lateral and vertical extents of contamination at areas where releases have been confirmed ("extent characterization"). The following sections describe the strategies for collecting data to address these two types of data needs. In addition, information regarding the need for data to support the human health and ecological risk assessments, CMS, and threat to groundwater assessment is provided in the following sections.

2.1 Screening Assessment

Judgmental sampling will be performed to confirm or dismiss the potential for releases to the environment at locations that have not been investigated previously. Table 2 presents the sampling and analysis strategies that were generally followed in developing the site-specific SAPs for features that have not been previously investigated. As presented in Table 2, the sampling and analysis strategies vary by the type of feature being investigated.

In general, samples at previously uninvestigated buildings will be collected based on the following protocol:

1) Sample at specific areas of the building where processes with chemical uses were performed and/or where staining was observed.

2) If information on (1) is not available, sample at the locations of entrances/exits of the building.

3) If information on (1) and (2) is not available, sample at the downslope ends of a building or in downstream surface water drainage pathways.

4) If information on (1), (2), and (3) is not available, sample at the center of the building footprint.

Following this screening assessment, no further investigation will be recommended for features where analytical data indicate that constituents of potential concern (COPCs) are present at concentrations below risk-based screening levels (RBSLs) or below background concentrations for metals and dioxins, when greater than the RBSLs. For features where analytical data indicate that COPCs are present at concentrations above RBSLs, or above background concentrations for metals and dioxins when they are greater than the RBSLs, further investigation will be performed to define the lateral and vertical extents of contamination. This characterization will be performed as described in the following section.

2.2 Extent Characterization

For RFI sites and unaffiliated features where a release to the environment has been confirmed, but the extent of contamination has not been defined, characterization is required to evaluate the extent of impacts. Step-out and step-down samples will be collected to define the lateral and vertical extents of contamination, as described in Table 3. As presented in Table 3, step-out and step-down samples will generally be collected from the upper 10 feet of the site if COPCs are detected at concentrations exceeding RBSLs (or background concentrations for metals and dioxins when they are greater than the RBSLs) in soil or soil vapor samples. After the lateral extent of contamination in the upper 10 feet of soil and soil vapor has been defined, step-down samples might be collected from depths greater than 10 feet if analytical data for more mobile constituents (for example, volatile organic compounds [VOCs] and total petroleum hydrocarbon [TPH]-gasoline) indicate that concentrations are increasing with depth or if staining or other indications of contamination are observed in the upper 10 feet. Samples may also be collected from depths greater than 10 feet below ground surface (bgs) for subsurface sources of contamination. Data for samples below 10 feet bgs will be used to assess the potential threat to groundwater (Section 2.5). Additional information on the step-out/step-down strategy will be provided in the FIP.

In addition to drilling to depths greater than 10 feet bgs for purposes of evaluating potential threats to groundwater, select borings will be advanced to depths greater than 10 feet bgs to identify the depth of competent bedrock. The number of borings advanced to bedrock will depend on the size of a site, but will typically range from 1 to 5 borings per site.

To address the potential for cross-site impacts, surface soil samples will be collected from surface water drainage channels extending downstream of most RFI sites. Figure 2 presents the surface water flow drainage patterns for Group 5. In general, surface soil samples will not be collected from drainage channels upstream of the RFI sites unless information suggests that impacts to an RFI site from upstream sources exist.

2.3 Data to Support Risk Assessments

Data collected during implementation of this SAP will be used in the human health and ecological risk assessments for RFI sites in Group 5 where COPCs are detected at concentrations exceeding RBSLs. Risk assessments will be performed in accordance with the *Standardized Risk Assessment Methodology (SRAM) Work Plan, Santa Susana Field Laboratory, Ventura County, California, Revision 2* (MWH, 2005). Human health risk assessments (HHRAs) will be performed using data collected from depth intervals of 0 to 2 feet bgs and 0 to 10 feet bgs. The receptors included in the HHRAs will be the current worker and potential trespasser and the future resident, worker, and recreator. Ecological risk assessments (ERAs) will be performed using data from the depth intervals of 0 to 2 feet bgs and 0 to 6 feet bgs as applicable to different ecological receptors. The ecological receptors representing the site are the deer mouse, the thrush, the hawk, the bobcat, the mule deer, the heron, and a generic aquatic receptor.

Sediment and surface water samples will not be collected to support the risk assessments because no standing surface water bodies exist in Group 5. Groundwater also will be excluded from evaluation in the ERA for Group 5 because near-surface groundwater does not discharge to the ground surface in Group 5. In addition, biological samples will not be collected during implementation of this SAP. If determined to be necessary, biological samples will be collected to support the ERA as part of additional data collection efforts during the CMS.

2.4 Data to Support Corrective Measures Studies

For sites where corrective measures are likely based on the analytical data collected to date, additional data may be required to support the CMS. Potential presumptive measures were described in the I&S Package. This Group 5 SAP proposes collection of data to support the CMS for select RFI sites.

2.5 Data to Support Threat to Groundwater Assessment

While data collected from the upper 10 feet of soil will be used in the risk assessments for each RFI site, additional data might be necessary for soil below 10 feet bgs to assess the potential threat to Chatsworth groundwater. The need for data below 10 feet bgs will be determined based on analytical data collected in the upper 10 feet of the site and based on observations made in the field (using the criteria provided in Table 3).

3.0 Analytical Approach

Tables 2 and 3 provide descriptions of the strategy for performing laboratory analysis of samples to be collected during implementation of this SAP. In general, samples will be analyzed for the chemical groups identified as having been used, stored, or released at the building, tank, or other feature based on the review of historical documentation. In addition to chemicals that were specifically identified during the historical document review, additional chemical groups were identified using the list of processes and associated chemical uses presented in Table 4.

Additional analytical guidelines that were followed during preparation of this SAP include:

- For features that have known TPH uses, semivolatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs) will be analyzed in or near samples where higher carbon-range TPH (for example, diesel and oil) is detected at elevated concentrations.
- Due to the bioavailability of metals at low pH, pH will be analyzed at features that have known metal uses (in surface soil samples only).
- Dioxins and SVOCs will be analyzed in areas where burned materials are observed.

For features where the historical uses are not known (and therefore the chemical uses are also unknown), a screening for TPH, VOCs, SVOCs, and metals will be performed. Soil at these features also might be analyzed for other chemical groups based on the chemical uses of adjacent features/RFI sites.

3.1 Quality Assurance Project Plan

Laboratory analysis will be performed in accordance with the Surficial Media Operable Media Quality Assurance Project Plan (QAPP) (MECX, 2008). The QAPPs describe the quality assurance/quality control (QA/QC) requirements for SSFL and identify the analytical methods, method detection limits, and analyte lists for the constituents used at SSFL. The QA/QC requirements are also summarized below.

QA/QC Sampling Requirements

In accordance with the QAPP, QA/QC samples will be collected and analyzed at the following frequency:

- Field Duplicate: Collected on a 10 percent frequency for each matrix and for each type of analysis.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD): Collected on a 5 percent frequency for each matrix and for each type of analysis.
- Equipment Blanks: One sample collected per day for each equipment type that is decontaminated.
- Trip Blank: One sample per cooler containing samples for analysis of VOCs.

3.2 Criteria for Contingent Analyses

In some cases, the need for performing select analytical methods is contingent on the results of performing other analytical methods on a particular sample. In these cases, the laboratory will be notified to hold the sample for analysis of select constituents until CH2M HILL, Boeing, and/or DOE have the opportunity to review the results of other analyses performed on the sample. CH2M HILL will notify the laboratory if analysis for the held constituents is necessary based on these results (based on a comparison of the analytical results to RBSLs or other screening level). For example, the need for analysis of SVOCs is contingent on the results of analysis for TPH in many samples. SVOCs will be analyzed in these samples if TPH is detected at a concentration exceeding the RBSL (1,400 milligram/kilogram [mg/kg]). Similarly, the need for analysis of PCBs is sometimes contingent on the results of analysis for TPH. PCBs will be analyzed in these samples if TPH is detected at a concentration above 500 mg/kg. The site-specific SAPs identify the constituents that will be held for analysis by the laboratory pending the results of other analytical methods.

The need for laboratory analysis of VOCs in soil will be contingent on the results of laboratory analysis of VOCs in soil vapor. Soil vapor samples will be collected prior to collecting soil samples. If VOCs are not detected in soil vapor samples at a particular location or feature, soil samples collected from that location or feature will not be analyzed for VOCs. In addition, the locations of soil samples to be submitted for laboratory analysis of VOCs may shift based on the results of laboratory analysis of VOCs in soil vapor.

As presented in Table 2, three to four discrete samples will be mixed into a single composite sample at pole-mounted transformers and electrical substations. The composite sample will be analyzed for PCBs. CH2M HILL will compare the results for the composite sample against the RBSLs for PCBs and will provide the analytical laboratory with direction to analyze the discrete samples only if the composite sample exceeds RBSLs.

4.0 Summary of Proposed Samples for Group 5

The site-specific SAPs attached in Appendixes A and B present the sample media, sample depths, analytical methods, and sample rationale for samples proposed for each RFI site (and the unaffiliated feature). Sample location identifications were developed using the two-digit code that indicates the RFI site associated with the sample (for example, "U5" was used for unaffiliated features in Group 5), followed by the two-digit code that indicates the sample/matrix type (for example, BS was used for soil boring samples, SV was used for soil vapor samples, and BX was used for soil boring transformer samples), followed by four numerical digits (starting with "1000" at each site). For example, a sample numbered SEBS1002 would be from the Southeast (SE) Drum Storage Yard RFI site. It is a soil boring sample (BS) and is the third consecutively numbered sample (1002) for this RFI site.

Based on the information presented in the site-specific SAPs, Tables 5 and 6 present summaries of all the samples proposed for the Boeing-owned and DOE-owned RFI sites in Group 5, respectively. As shown in the tables, 998 samples are proposed for the Boeing-owned sites in Group 5, and 578 samples are proposed for the DOE-owned RFI sites in Group 5. A summary of the number of samples by analytical method is presented in Tables 7 and 8 for the Boeing-owned and DOE-owned RFI sites, respectively. These tables

exclude samples that are contingent on the results of laboratory analysis for other samples and exclude samples that will be collected for purposes of QA/QC.

5.0 Health and Safety Plan

Fieldwork will be performed in accordance with the *Draft Health and Safety Plan, RCRA Facility Investigation Reporting, Santa Susana Field Laboratory* (CH2M HILL, 2007).

6.0 References

CH2M HILL. 2007. *Draft Health and Safety Plan, RCRA Facility Investigation Reporting, Santa Susana Field Laboratory*. August 1.

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

DTSC. 2007. DTSC responses to Boeing's comments on the Group 6 RFI Report. May 16.

MECX. 2008. *Draft Quality Assurance Project Plan, SSFL RCRA Facility Investigation, Surficial Medial Operable Unit*. February.

MWH. 2005. *Standardized Risk Assessment Methodology (SRAM) Work Plan, Santa Susana Field Laboratory, Ventura County, California, Revision 2*. September.

_____. 2007. *Group 8 RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*.

TABLE 1
Data Quality Objectives
Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

Problem statement:	Comply with regulatory requirements by characterizing the nature and extent of contamination in surficial media (soil matrix, sediment, soil vapor, surface water, near-surface groundwater, air, biota and weathered bedrock).					
Decision Questions	1. Has historical information on chemical use areas and chemical releases been reviewed to identify potential source areas?	2. Have source area characterization plans been developed to characterize nature and extent of contamination?	3. Is the nature and extent of contamination at potential source areas within RFI sites characterized sufficiently for risk assessment?	4. Have potential human health and ecological impacts been assessed?	5. Have threats to Chatsworth Formation Groundwater been adequately assessed?	6. Have characterization and risk assessment results been used to make site action recommendations for CMS?
Data Inputs needed to resolve decision questions	1. RFA 2. CCR 3. Historical Photos 4. Site Walks 5. Interviews 6. Facility Maps 7. Historical Sampling Data	1. Risk-based Screening Levels (RBSLs) 2. Soil Background Levels 3. Previous chemical concentrations (all media) 4. Conceptual Exposure Model (CEM) for human and ecological risks 5. QAPP, HSP, Field SOPs	1. Ten characterization plans (DTSC approved Work Plans and DTSC approved sampling scope) 2. Collected data (all media) and associated QC data 3. Upstream/downstream migration patterns	1. SRAM (exposure assumptions, toxicity data, etc) 2. Characterization data 3. Site specific BAFs 4. TPH/BTEX/PAH correlation data 5. PCB/congener correlation data	1. Surficial OU characterization data 2. Chatsworth Formation OU characterization data	1. RFI site assessment and risk assessments 2. Current and future land use
Study Boundaries	1. Administrative areas at SSFL, adjacent open spaces and drainages.	1. The grouping of related source areas into RFI sites (SWMUs/AOCs) based on historical operations.	1. RFI sites and associated drainages 2. Above the weathered-unweathered bedrock interface	1. RFI sites and associated drainages 2. Data from upper 10 feet of soil (soil matrix and soil vapor) 3. Near-surface groundwater; surface water and sediment	1. RFI Sites and downgradient areas.	1. Potential source areas within RFI sites and associated drainages
Decision Rules	1. If available documentation has been reviewed, then identify source areas requiring further investigation. 2. If new information becomes available, then incorporate into evaluation and add source areas if needed.	1. If potential source areas can be located, then targeted (biased) sampling will be conducted around that location. 2. If potential source area locations cannot be determined, multiple investigation sampling methods will be employed (GPR/EM, trenching, grid sampling [soil matrix or soil vapor]) 3. If chemical use in potential source areas is well defined, then use targeted analytical suites 4. If chemical use in potential source areas is not well defined, then use broader analytical program based on potential chemical releases	1. If site data meet QA requirements and step-out criteria, and source areas are delineated, then nature and extent of contamination are sufficiently characterized for risk assessment. Note: QA requirements are specified in the QAPP and programmatic findings are described in Appendix A. Programmatic step-out criteria and sampling/analysis decisions are described in Sections 5 through 8 for each sampling media. Individual site RFI reports address site-specific QA, step-out criteria, and sampling/analysis decisions.	1. If appropriate receptors and chemicals are evaluated in the risk assessment, then impacts have been described.	1. If the vertical extent of Surficial OU contamination is demonstrated to have an acceptably low potential threat to groundwater, impacts to the CFOU are unlikely and further characterization of the Chatsworth Formation groundwater is not necessary. 2. If COPCs extend from alluvium/weathered bedrock into unweathered bedrock, assess the presence of COPCs in the CFOU.	1. If there are no unacceptable human health or ecological impacts based on current and futuresite use, then the recommendation is “no further action” for RFI site. 2. If there are unacceptable human health or ecological impacts, then the RFI site would be recommended for CMS evaluation of source areas contributing to risk. 3. If there are uncertainties in either the characterization data or risk assessment that affect site decisions, then the RFI site would be recommended for CMS evaluation of uncertainties.
Limits on Decision Errors (Uncertainties)	1. The largest uncertainty is associated with completeness of available documentation (i.e., some historical sources may not be documented).	1. The largest uncertainty is associated with unidentified source areas.	1. The largest uncertainty is the spatial or temporal variability of the samples.	1. The largest uncertainty is carrying forward the uncertainties and conservatism inherent in the risk assessment process into the conclusions and recommendations.	1. The presence of COPCs in the CFOU may be a result of upgradient sources and not related to site sources.	1. The largest uncertainty is future land use assumptions and resulting recommendations.
Optimize Investigation Design	1. Conduct additional historical review when new site use or sampling information becomes known.	1. Modify characterization plans as new information becomes known.	1. Conduct additional sampling or analysis to reduce uncertainty or as new information becomes known.	1. Consider multiple exposure scenarios when evaluating potential risks to receptors.	1. Conduct additional sampling if the impacts to the CFOU from Surficial OU sources have not been adequately assessed.	1. Conduct additional sampling or risk evaluation to reduce uncertainty or when new information becomes known.

TABLE 2
Proposed Sampling and Analysis Strategy
Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

Feature Type	Sampling Strategy	Analysis Strategy	Sampling Density/Depths	Reference
Buildings with no known chemical use based on documentation (that is, documentation shows that the building did not use chemicals (for example, office building, guard shack, lunch room). A visual inspection of building vicinity is recommended to screen and verify that there are no environmental impacts in this area.	Sampling is NOT required If documentation exists that indicates that the building did not use chemicals (for example, office building, guard shack, lunch room). A visual inspection of building vicinity is recommended to screen and verify that there are no environmental impacts in this area.	No sampling is proposed in these areas. However, if visual impacts are observed, then analyze the samples for the "screening suite": VOCs, SVOCs, Metals, TPH. Add any adjacent RFI -site/group specific analytical methods to the list, as appropriate.	No sampling is proposed. However, if visible impacts are observed, then collect one sample at ~ 1 foot bgs.	
Buildings with no documented usage information (that is, we do not know what the building was used for)	1) Inspect buildings and vicinity for visible impacts/soil staining. If impacts are observed, perform targeted sampling in this area. 2) If no impacts are observed, identify low points and drainage pathways around the building and collect soil samples.	Analyze the samples for the "screening suite": VOCs, SVOCs, Metals, TPH. Add any adjacent RFI - site/group specific analytical methods to the list, as appropriate.	Lateral: If no visibly impacted area or low points, collect samples from 1) Existing Buildings: One to 2 locations per building (in front and back near entrance/exits) or 2) Former Buildings: one location per building at the centroid of former building footprint. Vertical: Collect samples at 1 and 6 feet bgs.	Department of Toxic Substances Control (DTSC), 2007
Buildings with known chemical uses	1) For existing buildings, inspect buildings and vicinity for visible impacts/soil staining. If visibly impacted, perform targeted sampling in this area. 2) For former buildings, inspect historical photographs to identify visible impacts if any. If impacts are observed, perform targeted sampling in this area. 3) For existing and former buildings, if no visible impacts, identify low points and drainage pathways in the area and collect soil samples.	Analyze the soil samples for the analytical methods corresponding to the chemicals used in the building.	Lateral: The locations, the number, and the analytical results of former sampling locations will guide sampling density. If no former samples exist, collect samples from a minimum of one location per building. If no visibly impacted area or low points are observed, collect samples near entrance/exits at existing buildings and at the centroid of the building footprint for former buildings. If known chemical is a VOC, then perform soil vapor sampling. Vertical: If using a hand auger, collect samples at 1 and 6 feet bgs. If using a direct push rig, also collect samples at 10 feet bgs. Analyze samples from 1 and 6 feet bgs and place the rest on HOLD. Collect soil vapor samples at 5 and 10 feet bgs.	
Transformer Poles	The soil beneath onsite Boeing pole mounted transformers (installed prior to 1980) will be visually inspected for staining. At locations where there is a single pole-mounted transformer (installed prior to 1980) and no staining or leakage is identified, soil sampling would not be conducted. If, however, staining of the soil is identified, then soil sampling will be conducted. Where two or more transformers (installed prior to 1980) are or have been mounted on a pole above an unpaved surface, then soil sampling will be conducted regardless of staining conditions on the poles or transformers. This approach is suggested due to the combined volume of multiple transformers. If the ground surface beneath the two or more mounted transformers (installed prior to 1980) is covered with asphalt or concrete and staining is not identified, then soil sampling will not be conducted. If, however, staining is identified on the paved surface, then soil sampling will be conducted. If PCBs are detected at nearby sites, samples will also be collected beneath pole mounted transformers adjacent to or within the site.	Analyze composite samples for PCBs. The discrete samples will be held by the laboratory. Analysis of the discrete samples will be performed if the composite sample exceeds RBSLs.	Lateral: Collect soil samples from 3 to 4 locations (~5 feet around pole location). Composite discrete samples into one sample. Vertical: Collect samples at ~0.5 feet bgs.	DTSC-approved protocol
Substations	The soil beneath/around onsite Boeing-owned substations will be visually inspected for staining. Soil sampling will be conducted regardless of staining conditions. If the ground surface beneath the substation (installed pre-1980) is covered with asphalt or concrete and staining is not identified, then soil sampling will not be conducted. If, however, staining is identified on the paved surface, then soil sampling will be conducted. If PCBs are detected at nearby sites, samples will also be collected beneath pole mounted transformers adjacent to or within the site.	Analyze composite samples for PCBs. The discrete samples will be held by the laboratory. Analysis of the discrete samples will be performed if the composite sample exceeds RBSLs.	Lateral: Collect soil from 3 to 4 locations (~5 feet around substation location). Composite discrete samples into 1 sample. Vertical: Collect samples at ~0.5 feet bgs.	Modified from above
Tank Areas	1) Inspect the tank and vicinity for visible impacts/soil staining. 2) For underground storage tanks (USTs), collect soil samples from both ends of the tank. For aboveground storage tanks (ASTs), collect soil sample from beneath the tank. 3) If tank may have contained volatile constituents or there is no known chemical use, collect soil vapor samples approximately 20 feet from tank locations.	Analyze soil samples for the tank contents (if known) or for the screening suite of chemicals (if unknown). Analyze the soil vapor samples for VOCs.	Lateral: For USTs, collect soil samples from one to two locations at the ends of the tank. For ASTs, collect soil samples from 1 location beneath the tank. For groups of tanks located next to one another, samples may represent multiple tanks. Collect soil vapor samples from one to two locations. Vertical: Collect soil samples at 1, 6, and 10 feet below tank bottom. Analyze samples from 1 and 6 feet bgs and place the rest on HOLD. Collect soil vapor samples at 5 and 10 feet bgs.	MWH, 2007

TABLE 2
Proposed Sampling and Analysis Strategy
Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

Feature Type	Sampling Strategy	Analysis Strategy	Sampling Density/Depths	Reference
Concrete Pads with no documented usage information (that is, we do not know what the building was used for)	1) Inspect the pad area for visible impacts/soil staining. If visibly impacted, perform targeted sampling in this area. 2) If no visible impacts, identify low points and drainage pathways in the area and collect soil samples.	Analyze the samples for the "screening suite": VOCs, SVOCs, Metals, TPH. Add any adjacent RFI – site/group specific analytical methods to the list, as appropriate.	Lateral: If no visibly impacted area or low points, then soil samples from one location per concrete pad. Vertical: Collect samples at 1 and 6 feet bgs.	
Pipelines	1) Inspect the pipelines and vicinity for visible impacts/soil staining and the conditions of the pipeline (rusting, cracks etc.) 2) Collect soil samples along the length of the pipe. Depending on the length of the pipeline, space the soil samples at 50, 100, or 200 feet. Focus soil sampling near pipeline joints and bends. 3) If the pipeline may have contained volatile constituents or there is no known chemical use, collect soil vapor samples along the pipeline.	Analyze the soil samples for the pipeline contents (if known) or for the screening suite of chemicals. Analyze the soil vapor samples for VOCs.	Lateral: Collect soil samples from locations 50, 100, or 200 feet along the pipeline. Collect 2 soil vapor samples from 2 locations along the pipeline. Vertical: Collect samples at 0.5 feet below pipeline bottom. Collect soil vapor samples at 5 feet bgs.	
Spray Field Areas	Perform grid soil sampling. If chemicals used include volatile constituents, then perform soil vapor sampling.	Analyze the samples for the analytical methods corresponding to the chemicals used in the area. Add any adjacent RFI –site/group specific analytical methods to the list, as appropriate. Analyze the soil vapor samples for VOCs, if applicable.	Lateral: Collect soil samples along the grid. Grid size determined based on the square footage of the area. If known chemical uses include VOCs, collect a minimum of two soil vapor samples. Vertical: If using a hand auger, collect samples at 1 and 6 feet bgs. If using a direct push rig, also collect samples at 10 feet bgs. Analyze samples from 1 and 6 feet bgs and place the rest on HOLD. Collect soil vapor samples at 5 and 10 feet bgs.	
Leach Fields	1) Inspect the leach field area for visible impacts/soil staining. If visibly impacted, perform targeted sampling in this area. 2) If no visible impacts, identify the influent and downslope ends of the leach field and collect soil samples. 3) If volatile constituents were used in the building associated with the leach field, collect soil vapor samples.	Analyze the samples for the analytical methods corresponding to the chemicals used in the area. Add any adjacent RFI –site/group specific analytical methods to the list, as appropriate. Analyze the soil vapor samples for VOCs.	Lateral: If no visibly impacted area and influent/downslope ends cannot be identified, collect soil samples at two random locations per leach field. Vertical: If using a hand auger, collect samples at 1 and 6 feet bgs. If using a direct-push rig, also collect samples at 10 feet bgs. Analyze samples from 1 and 6 feet bgs and place the rest on HOLD. Collect soil vapor samples at 5 and 10 feet bgs.	
Debris Area	1) Clearly delineate debris areas and display on maps, 2) Collect one or two samples from the debris area.	Analyze the samples for known COPCs if debris source is known. If the debris source is unknown, then analyze the sample for the "screening suite": VOCs, SVOCs, Metals, TPH. If burned debris is observed, analyzed for dioxins and SVOCs.	Lateral: Randomly collect two samples in each debris area. Vertical: If using a hand auger, collect samples at 1 and 6 feet bgs. If using a direct push rig, also collect samples at 10 feet bgs. Analyze samples from 1 and 6 feet bgs and place the rest on HOLD.	
Surface Water Drainage Pathway (Unlined)	1) Inspect the drainage pathway and vicinity for visible impacts/soil staining. 2) Collect soil/sediment samples along the length of the drainage with the site. Depending on the length of the drainage, space the soil samples at ~100 to ~200 feet. Focus soil samples near mouth of the drainage and at other low points.	Analyze the samples for the analytical methods corresponding to the chemicals used in the area. Add any adjacent RFI –site/group specific analytical methods to the list, as appropriate.	Lateral: Collect soil/sediment samples at intervals of approximately 100 to 200 feet along the drainage, depending on its length. Vertical: Collect samples at 1 foot bgs.	

Notes:
bgs: below ground surface
PCB: Polychlorinated Biphenyls
RBSL: Risk Based Screening Level
RCRA: Resource Conservation and Recovery Act
RFI: RCRA Facility Investigation
SVOC: Semi-volatile Organic Compound
TPH: Total Petroleum Hydrocarbons
VOC: Volatile Organic Compound

TABLE 3
Proposed Sampling and Analysis Strategy for Characterizing the Extent of Impacts
Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

Media	Criteria	Step-Out and Step-Down Sampling and Analysis Strategy	
		0 to 10 feet bgs	**Greater than 10 feet bgs**
Soil Vapor	Step-out samples are collected if VOC concentrations exceed RBSLs for soil vapor.	Lateral Extent: Advance three or four soil vapor points around the original sample location with concentrations above RBSLs, approximately 50 feet apart or as appropriate for field conditions. Collect the step-out samples at the same depth as the original sample. Analyze for VOCs. Vertical Extent: Collect samples 5 feet deeper than the depth of the original sample at or near the location of the original sample with concentrations above RBSLs. Analyze for VOCs.	After defining the lateral extent of contamination within the upper 10 feet, soil vapor samples will be collected from depths greater than 10 feet at locations where the elevated concentrations of VOCs (for example, more than an order of magnitude above RBSLs) were detected in the upper 10 feet at a site. Samples will be collected at 10 foot depth intervals to bedrock at these locations. Analyze for VOCs.
Soil	Step-out samples are collected if COPC concentrations in a soil matrix sample exceed the RBSLs. For metals and dioxins, step-out samples are not collected if COPC concentrations slightly exceed RBSLs or background concentrations over a wide area with no apparent trend in concentrations.	Lateral Extent: Advance a step-out location boring approximately 20 to 50 feet (or more) from the original sample location with concentrations above RBSLs, as appropriate for field conditions. The step-out distance will be on the lower end of this range for smaller sites, for constituents that are less mobile (for example, PCBs, metals, and heavy carbon-range hydrocarbons), and for concentrations that were slightly above RBSLs or background concentrations in the original sample. The step-out distance will be on the higher end of this range for larger sites, more mobile constituents (for example, VOCs), and for concentrations that were greatly above the RBSLs or background concentrations in the original sample. Collect the step-out samples at the same depth as the original sample, and collect additional samples 3 to 5 feet below the depth of the original sample at the step-out locations (HOLD the deeper samples). Analyze only for the COPCs that were detected above RBSLs/background concentrations in the original sample. Vertical Extent: Collect a sample approximately 3 to 5 feet below the depth of the original sample in which the RBSL or background concentration was exceeded. (At transformer locations, collect a sample 0.5 to 1 foot below the depth of the original sample in which the RBSL was exceeded.) The step-down distance will vary based on chemical type, depth of bedrock, and concentrations in the original sample (relative to RBSLs/background concentrations). Analyze only for the COPCs that were detected above RBSLs/background concentrations in the original sample.	After defining the lateral extent of contamination within the upper 10 feet, soil samples will be collected at locations where: 1) Concentrations of mobile constituents (for example, VOCs, TPH-gasoline) are elevated and/or increasing with depth in the upper 10 feet of soil. 2) Staining or other indications of contamination are observed in the upper 10 feet bgs. 3) Constituents are present in soil as a result of subsurface releases. Samples will be collected at 10-foot depth intervals to bedrock at these locations. In addition, groundwater samples may be collected to evaluate potential groundwater impacts. COPCs suspected of being a threat to groundwater will be analyzed based on the criteria presented above.

TABLE 4

Type of Chemical Use Areas and Typical Target Analytical Suites

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

Chemical Use Area Type	Chemical use description	Typical Analytical Methods Used for RFI Characterization										
		VOCs	SVOCs	TPH	PCBs	Metals	Dioxins	Energetics	Perchlorate	NDMA	Formaldehyde	pH
Solvents	Engine/component testing areas, laboratories, storage areas, clarifiers, sumps/pits, degreasers, and storage tanks and associate pipelines	X										
Petroleum fuels	Gasoline, jet or rocket fuel, diesel storage tanks and associated pipelines, and engine/component testing areas	X[(a)]		X								
Oil-related Materials	Hydraulic and lubricant oils, sumps/pits, waste oils and transformers		X	X	X	X						
Metal wastes (*not associated with debris disposal*)	Corrosive activities/area, sumps/pits, and storage tanks					X						X
Debris Areas	Landfills and debris and burn areas (incinerators)	X[(b)]	X[(b)]	X	X[(b)]	X	X[(b)]					
Perchlorate and Energetic Constituents	Storage, testing and handling					X		X	X			
Hydrazine Fuels	Small engine or system testing areas									X	X	
Other areas screened for potential chemical use/impacts	Leach fields, general storage areas, disturbed terrain	X		X		X						

(a) VOCs were analyzed in areas of gasoline use

(b) VOCs were typically screened for in these areas, and dioxins/SVOcs analyzed if visible burned materials were present. PCBs were typically analyzed if elevated concentrations of lubricant oil-range TPH were detected.

Source: Group 6 RFI Report

TABLE 5

Summary of Samples by Matrix for Boeing RFI Sites

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

RFI Site	No. of Soil Samples	No. of Soil Vapor Samples	No. of Groundwater Samples	No. of Sediment Samples	No. of Surface Water Samples	Total
Boeing Area IV LF	39	8				**47**
Compound A	110	20				**130**
ECL	91	35				**126**
EEL	86	12				**98**
STP	48	4				**52**
SE Drum Yard	9	2				**11**
STL-IV	190	48				**238**
Pond Dredge	56					**56**
PDU	195	36				**231**
Unaffiliated	9					**9**
Total for All RFI Sites	**833**	**165**				**998**

TABLE 6

Summary of Samples by Matrix for DOE RFI Sites

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

RFI Site	No. of Soil Samples	No. of Soil Vapor Samples	No. of Groundwater Samples	No. of Sediment Samples	No. of Surface Water Samples	Total
Building 100 Trench	35	4				**39**
Building 65 Metals Clarifier	30	10				**40**
DOE Leach Fields 1	47	16				**63**
DOE Leach Fields 2	41	6				**47**
DOE Leach Fields 3	84	26				**110**
HMSA	46	24				**70**
SNAP	39	20				**59**
RIHL	55	20				**75**
Unaffiliated	55	20				**75**
Total for All RFI Sites	**432**	**146**				**578**

TABLE 7

Summary of Samples by Analytical Method for Boeing RFI Sites

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

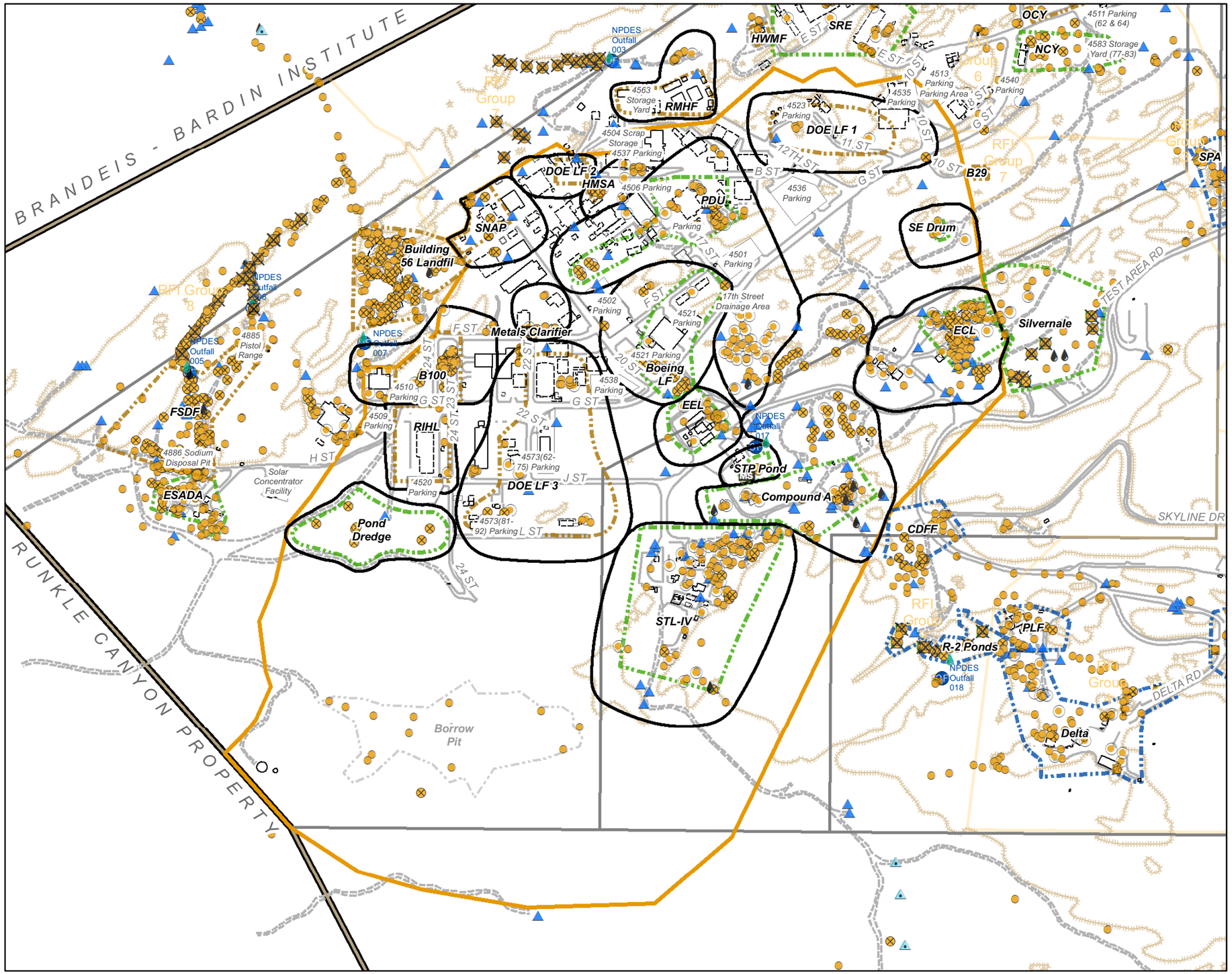
RFI Site	No. of Locations	Analytical Method														
		TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM-Short)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine & Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Soil Grain Size Analysis (ASTM D422)	Chromium VI (EPA 7196A)
Boeing Area IV LF	19	16	19	8	25		20	7	6		3					
Compound A	46	82	55	20		82	106	35	57	46		13	57	33		
ECL	50	19	36	35	16	21	65	25	3	6	24	18		12	3	
EEL	35	64	58	12	60	4	62	29	64					46		
STP	17	33	33	4	33		42	15		21	6	21		33		
SE Drum Yard	4	9	9	2	9		9	3	9							
STL-IV	88	111	161	48	112	8	146	51	5	3	39	3	3	79		
Pond Dredge	16	50	56		47		52	16	47	47	3	56	47	56		
PDU	88	111	60	36	117	54	185	64	126	6	6			87		37
Unaffiliated	3									9		9				
Total for All RFI Sites	**366**	**495**	**487**	**165**	**419**	**169**	**687**	**245**	**317**	**138**	**81**	**120**	**107**	**346**	**3**	**37**

TABLE 8

Summary of Samples by Analytical Method for DOE RFI Sites

Sampling and Analysis Plan for RFI Group 5, Santa Susana Field Laboratory, Ventura County, California

RFI Site	No. of Locations	Analytical Method														
		TPH (ext.) (EPA 8015B)	VOCs (Full) (EPA 8260B)	VOCs (Soil Vapor) (EPA 8260B)	PAHs (EPA 8270C SIM-Short)	SVOCs (EPA 8270C +TICS)	Metals (EPA 6010B/ EPA 6020)	pH (EPA 9045)	PCBs (EPA 8082)	Energetics (EPA 8330)	Hydrazine and Formaldehyde (EPA 8315A)	Perchlorate (EPA 6850)	Dioxins (EPA 1613B)	Inorganics (EPA 300.0)	Mercury (EPA 7471A)	Chromium VI (EPA 7196A)
Building 100 Trench	17	9	3	4	9		29	9					10	3		
Building 65 Metals Clarifier	16	12	16	10	16		12	4							14	
DOE Leach Fields 1	25	36	33	16	36		36	12	2					12	6	9
DOE Leach Fields 2	20	18	15	6	15	12	27	9	14		12					
DOE Leach Fields 3	51	43	44	26	37		62	20	8	12		18			10	
HMSA	28	36	30	24	39		42	14	40			3		6		
SNAP	25	30	30	20	21		33	15	23							
RIHL	30	12	33	20	12		33	14	13							
Unaffiliated	31	39	24	20	39	3	39	14	34		12			3		
Total for All RFI Sites	**243**	**235**	**228**	**146**	**224**	**15**	**313**	**111**	**134**	**12**	**24**	**21**	**10**	**24**	**30**	**9**



RFI Site Buffer

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Water - Surface (Seep)
- B Biological
- MO Other
- MS Sump
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- Air
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface

Buffer Zones Group 5

Date: December 31, 2007

WORKING DRAFT

1 inch equals 500 feet

0 500 1,000 Feet

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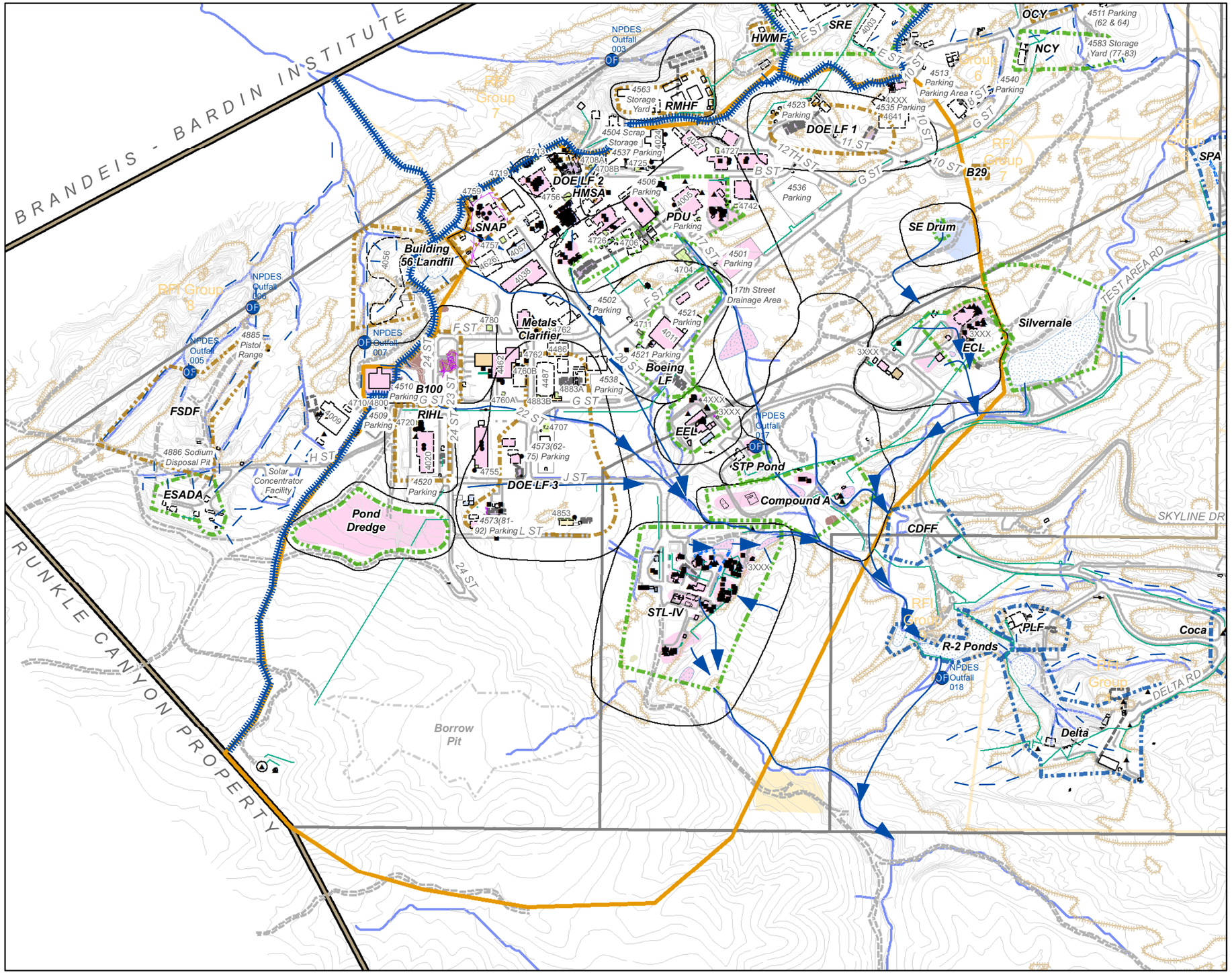
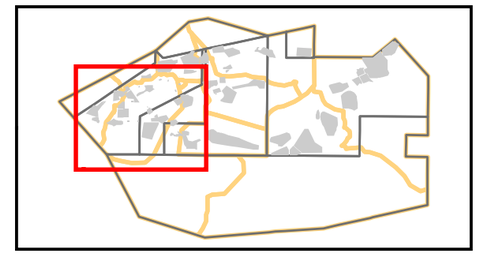
Figure 1





Surface Water Flow

Surface Water Divide

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

Surface Water Flow Direction Group 5

Date: December 31, 2007

WORKING DRAFT

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1 inch equals 500 feet

0 500 1,000 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure 2

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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 Boeing Area IV Leach Fields 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 Boeing Area IV Leach Fields includes Area of Concern (AOC) Building 4011 Leach Field and AOC Building 4008 Warehouse. Other chemical use areas evaluated with the Boeing Area IV Leach Fields include Buildings 4007, 4008, 4011, 4171, 4172, 4611, three aboveground storage tanks (ASTs), one underground storage tank (UST) , one transformer, one transformer pole, one electrical substation, a pump station, and a parking lot.

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 Boeing Area IV Leach Fields. 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 Boeing Area IV Leach Fields 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 10 of the 12 chemical use areas identified for the Boeing Area IV Leach Fields. 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 and in the downstream surface water drainage pathway.

To address these data gaps, CH2M HILL proposes to collect 39 soil samples and 8 soil vapor samples from a total of 19 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.

TABLE 2

Proposed Samples for Boeing Area IV Leach Fields RFI Site

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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	L2BS1000	Soil	1	X	H		X		X	X									Building 4011 was used as a machine shop. Chemical uses at Building 4011 include VOCs, metals, and TPH. No sampling has been performed to date. This proposed sample is located at the Building 4011 loading dock. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro L2SV1000.
		Soil	6	X	H		X		X										
		Soil	10	H	H		H		H										Analysis of this sample will be contingent on the results for more shallow samples.
1	L2SV1000	Soil Vapor	5			X													VOCs in soil vapor have not been investigated at Building 4011. This proposed sample is located at the Building 4011 loading dock.
		Soil Vapor	10			X													
1	L2BS1001	Soil	1	X	H		X		X	X									See above. This proposed sample is located at the entrance to Building 4011 on the southwestern side of the building. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro L2SV1001.
		Soil	6	X	H		X		X										
		Soil	10	H	H		H		H										Analysis of this sample will be contingent on the results for more shallow samples.
1	L2SV1001	Soil Vapor	5			X													VOCs in soil vapor have not been investigated at Building 4011. This proposed sample is located at the entrance to Building 4011 on the southwestern side of the building.
		Soil Vapor	10			X													
1	L2BS1002	Soil	1	X	X		X		X	X									The proposed sample is located at the inlet of surface water drainage from Building 4011 towards the R-2 Ponds. Samples will be collected to evaluate potential impacts from Building 4011 to downslope areas.
		Soil	6	X	X		X		X										
		Soil	10	H	H		H		H										Analysis of this sample will be contingent on the results for more shallow samples.
1	L2BS1004	Soil	1	X	X		X		X	X	X								Investigate sediment/surface soil in surface water flow drainage pathway for site COPCs. This proposed sample is located at the downstream end of the surface water drainage pathway (near the intersection of G and 20th Streets).
2	B8BS1000	Soil	1	X	H		X		X	X	H		X						Building 4008 was used as a machine shop and for chemical and equipment storage. Chemical uses include metals, hydrazine, VOCs, and oils and lubricants. This proposed sample is located at the downgradient/downslope side of former Building 4008. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro B8SV1000.
		Soil	6	X	H		X		X		H		X						
		Soil	10	H	H		H		H		H		H						Analysis of this sample will be contingent on the results for more shallow samples.
2	B8SV1000	Soil Vapor	5			X													This proposed sample is located at the downgradient/downslope side of former Building 4008.
		Soil Vapor	10			X													
3	U5BX1000	Soil	1								X								Building 4711 is an electrical substation. PCBs have not been investigated at this substation Discrete samples will be collected at 4 locations around the substation (approximately 5 feet from each side of the substation) and will be composited into 1 sample for laboratory analysis. The discrete samples will be held by the lab. Analysis of the discrete samples will be contingent on the results of the composite sample.
4	U5BS1000	Soil	1		H														Building 4611 was used for spray painting. Chemical uses include VOCs. The proposed sample is located within the former building footprint. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro L2SV1001.
		Soil	6		H														

TABLE 2

Proposed Samples for Boeing Area IV Leach Fields RFI Site

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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														Analysis of this sample will be contingent on the results for more shallow samples.
5	U5BS1001	Soil	1						X	X									Building 4171 was used as an X-ray room. Chemical uses include silver[2] and aluminum. No sampling has occurred at Building 4171. The proposed sample is located at a low spot on the southeastern side of the former building footprint.
		Soil	6						X										
		Soil	10						H										Analysis of this sample will be contingent on the results for more shallow samples.
6																			No data gaps at AST 4735.
7																			No data gaps. UT-06 has been closed by Ventura County.
8	L2BS1003	Soil	4		H														Chemical uses of the Building 4011 Leach Field are assumed to be the same as those for Building 4011 (TPH, metals, and VOCs). While TPH and metals have been investigated in soil, VOCs have not been investigated in soil or soil vapor within the foot print of the leach field. This proposed sample is located near the middle of the leach field. The leach field pipelines were at a depth of approximately 4 feet near the middle of the leach field. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro L2SV1002.
		Soil	7		H														
		Soil	10		H														
8	L2SV1002	Soil Vapor	5			X													VOCs in soil vapor have not been investigated at the Building 4011 Leach Field. This proposed sample is located near the downslope end of the leach field.
		Soil Vapor	10			X													
9	U5BS1006	Soil	1						X	X									Building 4172 was used as an X-ray room. Chemical uses include hydroquinone, silver[2], and aluminum. No sampling has occurred at Building 4172. The proposed sample is located near the centroid of the former building footprint.
		Soil	6						X										
		Soil	10						H										Analysis of this sample will be contingent on the results for more shallow samples.
10	U5BX1012	Soil	0.5								X								Transformer Pole D-5 contained 3 transformers. PCBs have not been investigated at this pole. Discrete samples will be collected at 3 locations around the substation (approximately 5 feet away from the pole) and will be composited into 1 sample for laboratory analysis. The discrete samples will be held by the lab. Analysis of the discrete samples will be contingent on the results of the composite sample.
11	U5BS1042	Soil	1	X				H											Pump station was used to pump fuel-oil from AST 4735. TPH and PAHs have not been investigated. The proposed sample location is located where the distribution piping connected to the pump station. PAHs will be analyzed if TPH detected above 1,400 mg/kg.
		Soil	6	X				H											
		Soil	10	H				H											Analysis of this sample will be contingent on the results for more shallow samples.
12	U5BS1004	Soil	1					X	X										The parking lot (4502) between the Building 4005/4006 leach field and Building 4011 was used for temporary storage of coal (allowed to dry here). Chemical uses include PAHs. The proposed sample is located at the downslope end of the parking lot (southern corner).
		Soil	6					X											
		Soil	10					H											Analysis of this sample will be contingent on the results for more shallow samples.
12	U5BS1013	Soil	1					X											See above. The proposed sample is located on the southeastern side of the parking lot.
		Soil	6					X											
		Soil	10					H											Analysis of this sample will be contingent on the results for more shallow samples.

TABLE 2

Proposed Samples for Boeing Area IV Leach Fields RFI Site

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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)	
12	U5BS1014	Soil	1				X												See above. The proposed sample is located on the northwestern side of the parking lot.
		Soil	6				X												
		Soil	10				H												Analysis of this sample will be contingent on the results for more shallow samples.
Total Soil Samples for Analysis				11	3		15		14	7	3		2						
Total Soil Samples on Hold				5	16		10		6		3		1						
Total Soil Vapor Samples for Analysis						8													
Total Soil Samples Collected			39																
Total Number of Locations			19																

Note:

X = Analyze sample

H = Hold sample analysis until instructed by PM

TABLE 1

Data Gaps

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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	Building 4011 - Chemical uses include volatile organic compounds (VOCs), metals, and total petroleum hydrocarbon (TPH). These chemicals have not been investigated in soil (or soil vapor for VOCs). This chemical use area includes AT-05 and AT-06, which contained propane and fuel-oil, respectively. The locations of these tanks are unknown.	X		X	5
2	Buildings 4007 and 4008 - Chemical uses include metals, hydrazine, VOCs, oils and lubricants, and polychlorinated biphenyls (PCBs). These chemicals have not been investigated in soil (or soil vapor for VOCs).	X			2
3	Building 4711 - Chemical uses include PCBs. PCBs have not been investigated in soil.	X			1 (Composite Sample)
4	Building 4611 - Chemical uses include VOCs. VOCs have not been investigated adequately in soil or soil vapor.	X			1
5	Building 4171 - Chemical uses include metals. Metals have not been investigated in soil.	X			1
6	AST 4735 - Chemical uses include fuel oil. TPH constituents have been detected in soil at this location at low concentrations.				N/A
7	UT-06 - Chemical uses include diesel/fuel-oil. This site has been closed by Ventura County Environmental Health Division. No investigation is required.				N/A
8	Building 4011 Leach Field - Chemical uses are assumed to be the same as those for Building 4011 (TPH, metals, and VOCs). While TPH and metals have been investigated in soil, VOCs have not been investigated in soil or soil vapor at the Building 4011 Leach Field.	X			2
9	Building 4172 - Chemical uses include metals and VOCs. Metals and VOCs have not been investigated in soil (or soil vapor for VOCs). In addition, a tank is located at Building 4172. The contents of this tank are unknown.	X		X	1
10	Transformer Pole D-5 – PCBs have not been investigated at the location of this transformer pole containing three transformers.	X			1
11	Sodium Component Test Installation (SCTI) Pump Station – Fuel oil was pumped from AST 4735. TPH and PAHs have not been in soil.	X			1
12	Parking Lot 4502 – Used for temporary	X			3

TABLE 1

Data Gaps

Sampling and Analysis Plan for Boeing Area IV Leach Fields 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
	storage/drying of coal. Chemical uses include PAHs. PAHs have not been investigated in soil.				
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 the RBSLs.	X			Addressed by Other Sample Locations
Sitewide	Metals, VOCs, propellants, and PCBs have not been characterized in soil at the 2-to-6-foot-depth interval used to assess ecological risks.	X			Addressed by Other Sample Locations
Sitewide	Sediment and surface water runoff in drainage channels extending from the site have not been analyzed for site constituents of potential concern (COPCs).	X			1
N/A	Limited information is available on the pipelines that are shown in site figures. Additional information is needed to evaluate the pipelines as potential sources of contamination and to verify the locations and depths of these pipelines.			X	N/A
				Total	**19**

Notes:
Sitewide = Data Gap applies to the entire Boeing Area IV Leach Fields RFI Site
N/A = Not Applicable

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 PCBs in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate whether the previous sample results (at any depth) were detected, were detected below RBSLs or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

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.

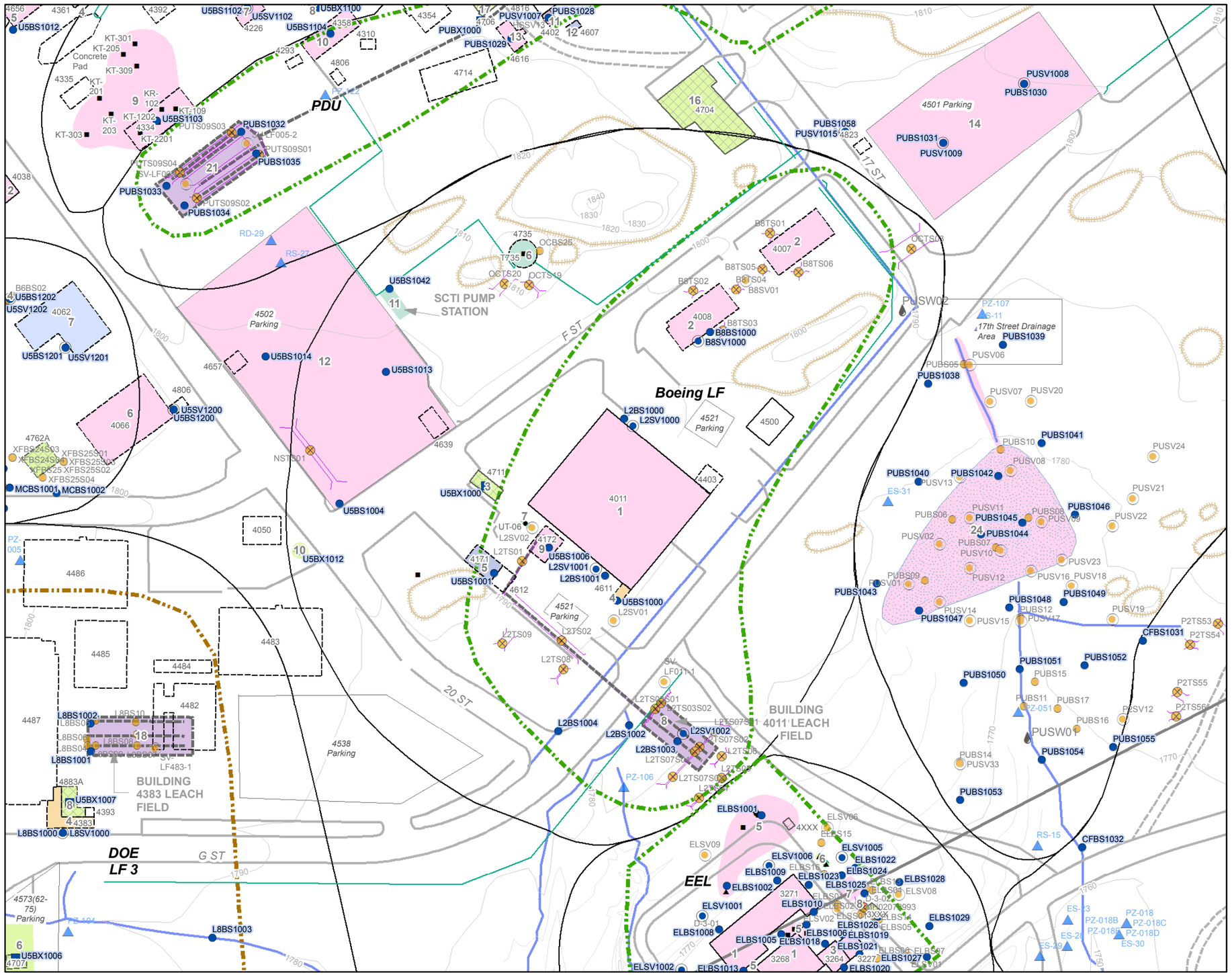
Additional samples will be collected, if necessary, based on the results of the samples proposed in Table 2. Step-out and step-down samples will be collected, if necessary, as described in the Group 5 SAP (General Text). In addition, quality assurance/quality control samples will be collected as described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

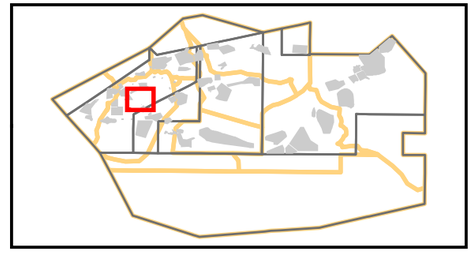
Schedule

This investigation is scheduled for March and April 2008. 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.





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

Boeing LF

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

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1 inch equals 100 feet

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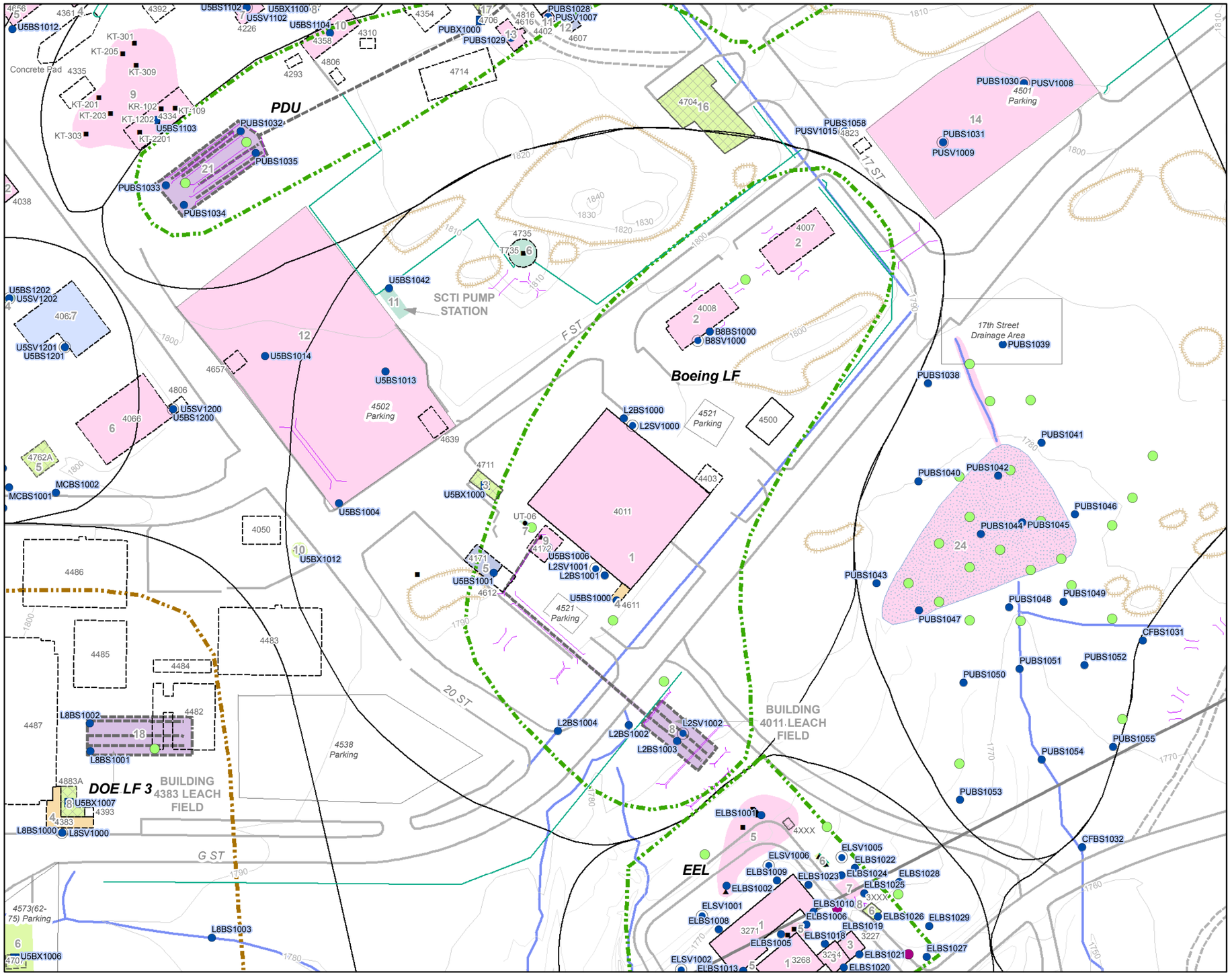
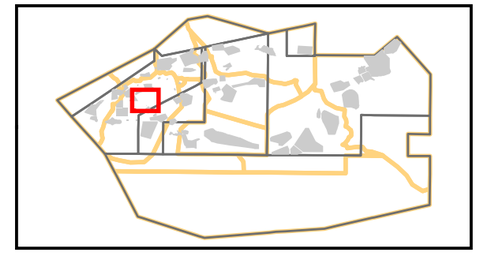
Figure 1





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

Boeing LF

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1 inch equals 100 feet

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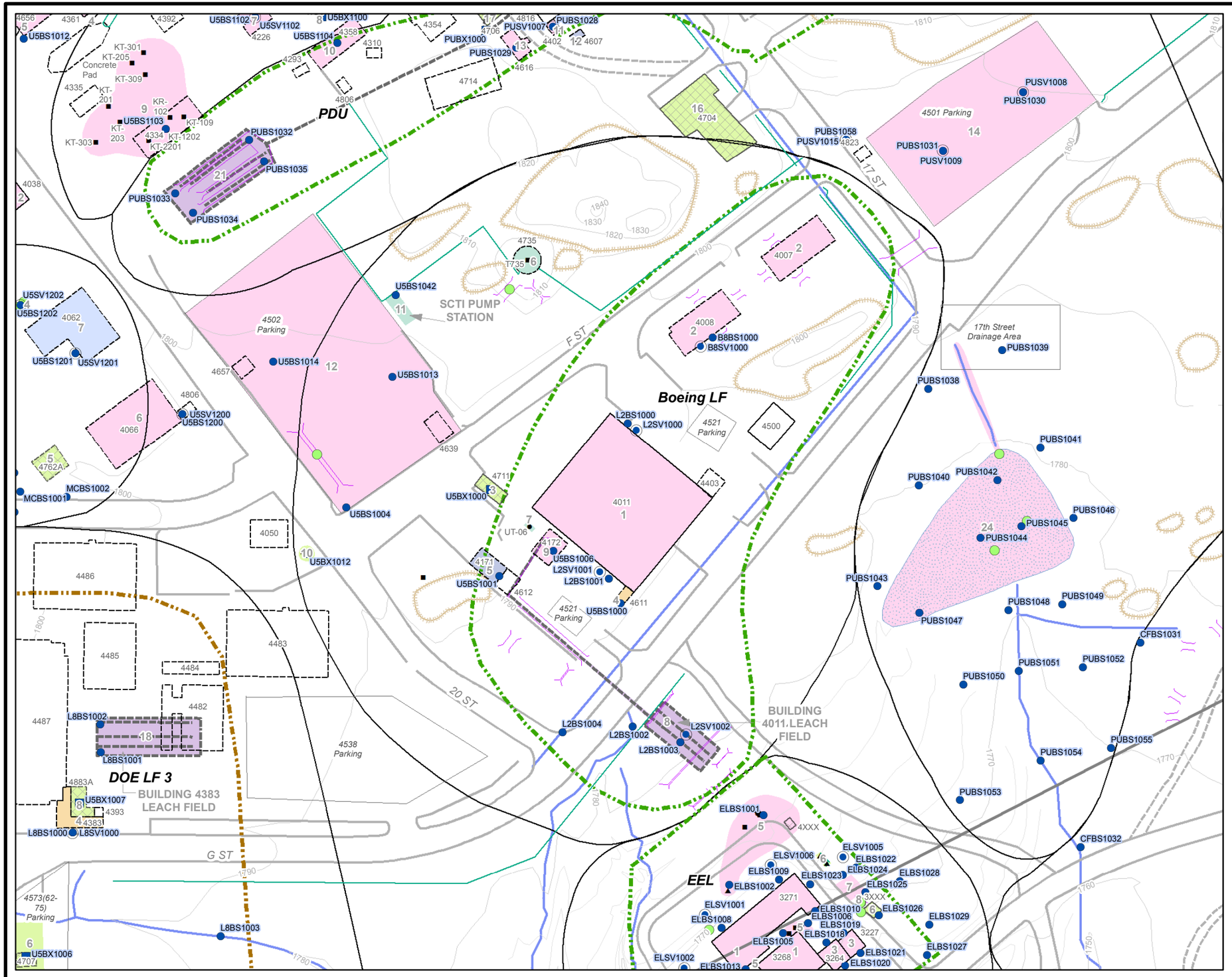
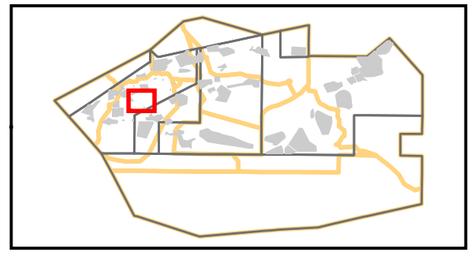
Figure 2





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

Boeing LF

Date: February 20, 2008

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1 inch equals 100 feet

0 100 200 Feet

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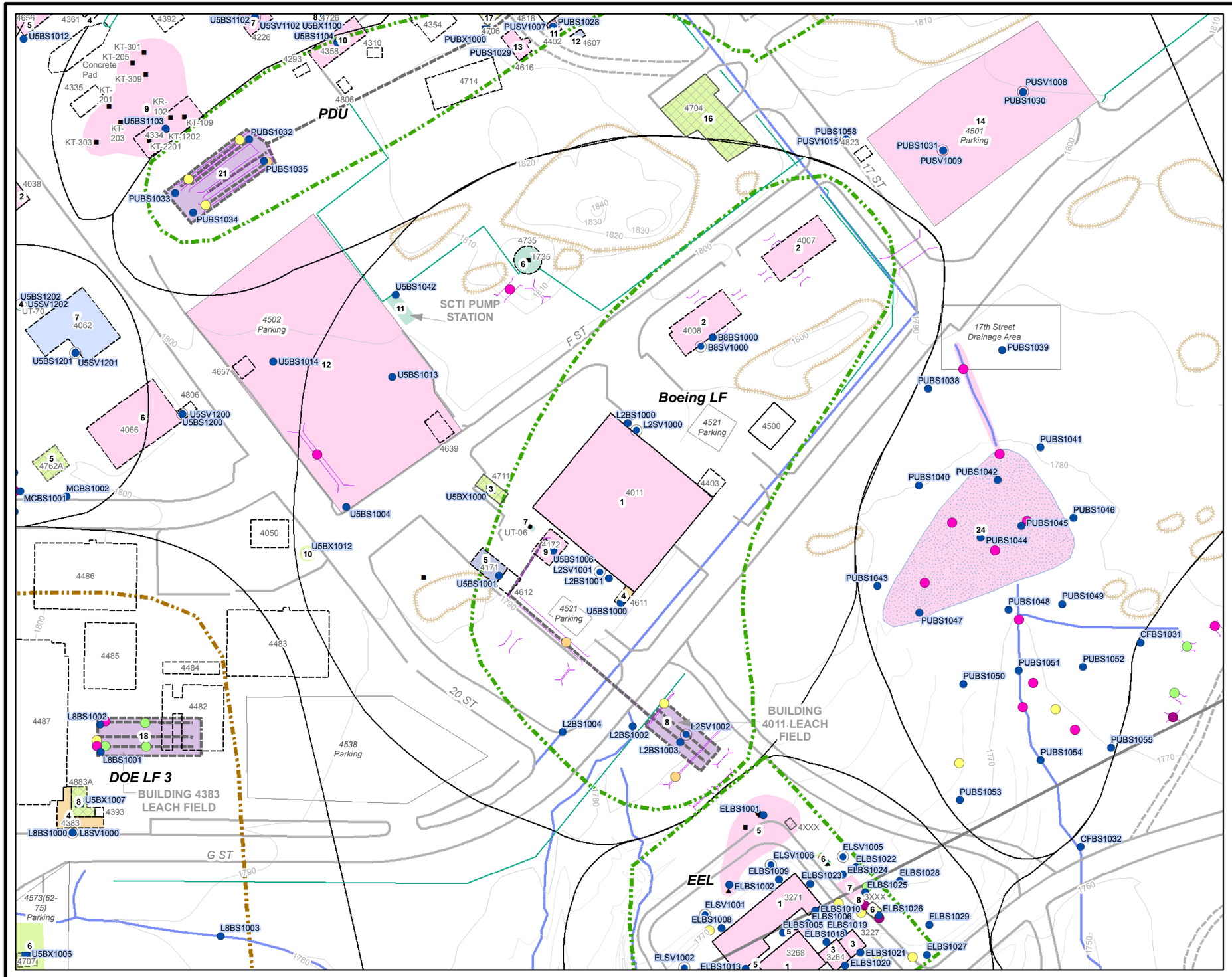
Figure 3



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 100 feet

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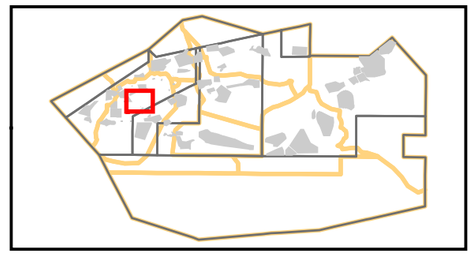
Figure 4



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 100 feet

0 100 200 Feet

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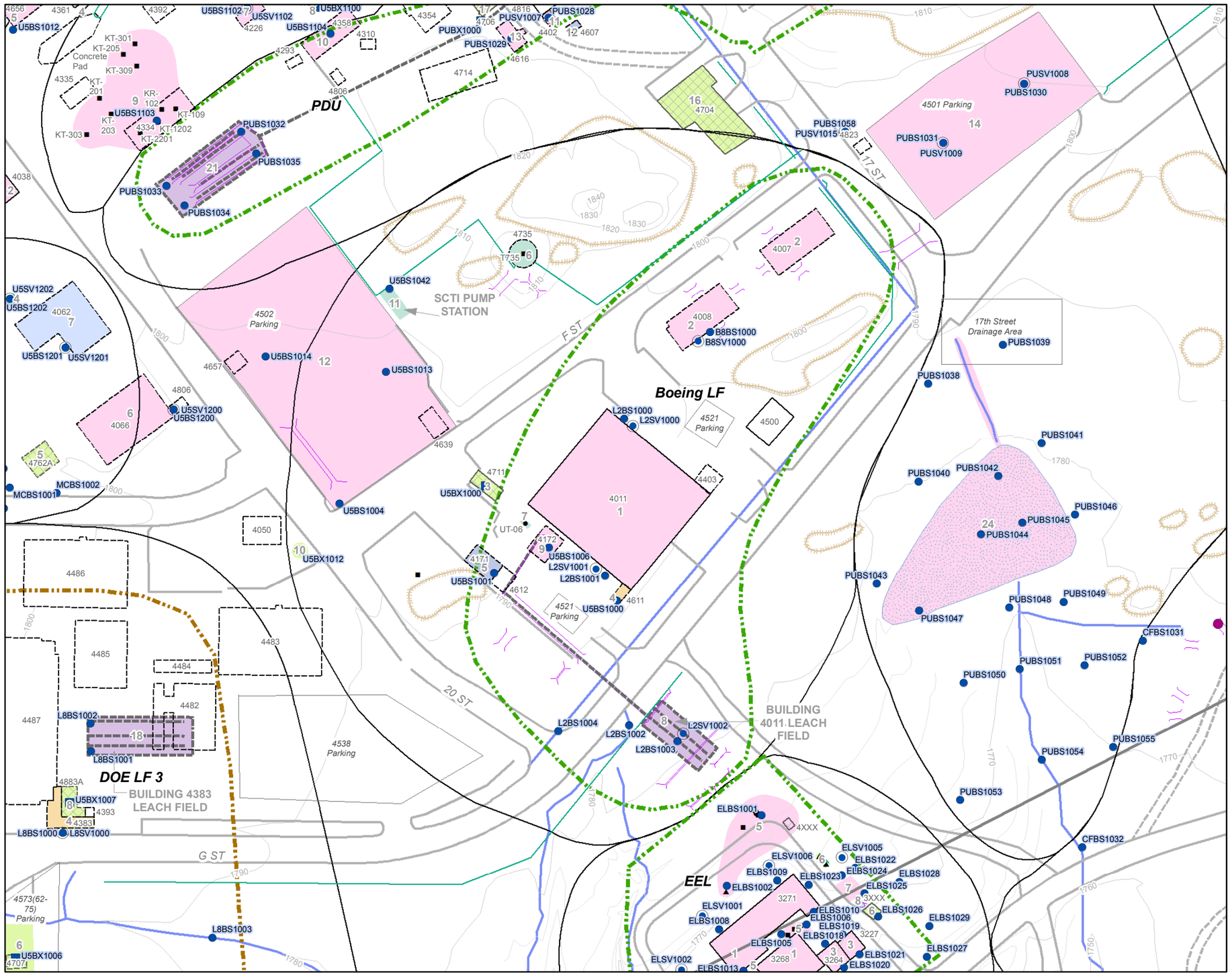
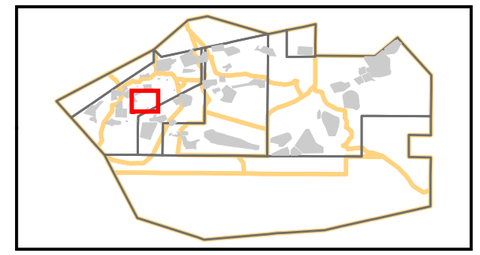
Figure 5





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

Boeing LF

Date: February 20, 2008

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1 inch equals 100 feet

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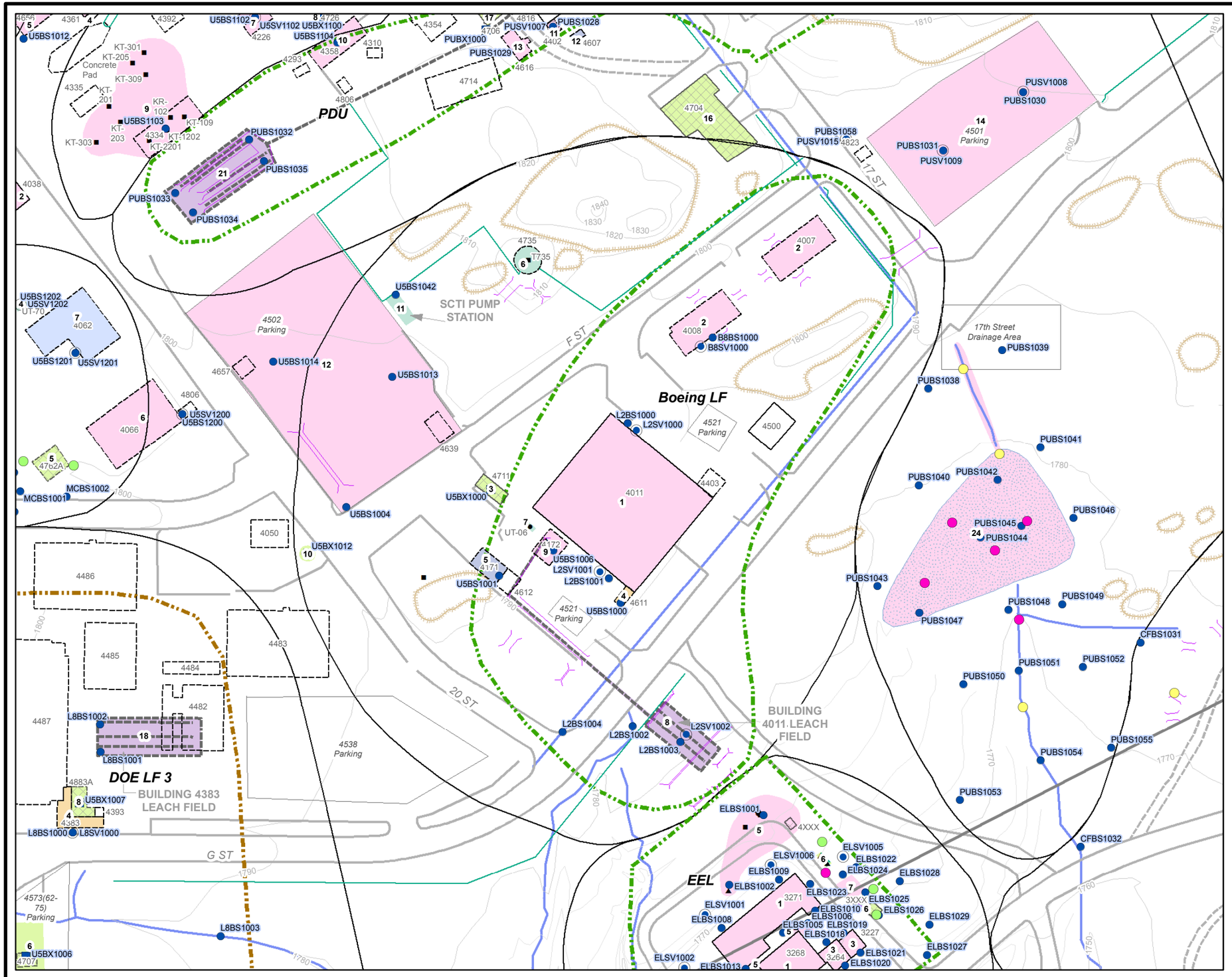
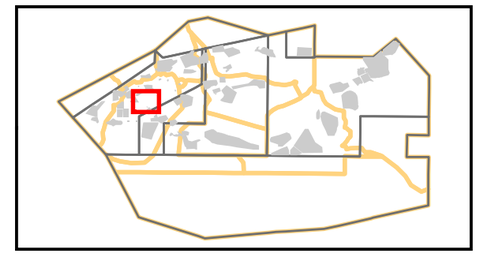
Figure 6





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

Boeing LF

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

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1 inch equals 100 feet

0 100 200 Feet

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Figure 7

Sampling and Analysis Plan for Compound A Facility 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 Compound A Facility 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 Compound A Facility. 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 Compound A Facility 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 8 of the 10 chemical use areas identified for Compound A Facility. 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 110 soil samples and 20 soil vapor samples. These samples will be collected from a total of 46 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.

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 P2 suspect dredge are north of Compound A, and the debris area to the south of Compound A to determine if there are any areas where the extent of debris or fill 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.

TABLE 1

Data Gaps

Sampling and Analysis Plan for Compound A Facility 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	Building 3418 – Determine the lateral and vertical extents of elevated VOCs in soil and soil gas, and elevated metals in soil to the east of Building 3418.	X			12
2	Forming Pits – Confirm location of forming pits, and sample for metals at forming pit locations. Also, there is an RBSL exceedance for VOCs in soil vapor near the pits, but no documented use of VOCs. Determine source and extent of VOCs exceedance.	X		X	6
3	Compound A Facility Pond – Determine the lateral and vertical extents of elevated VOCs in soil and soil gas, and elevated metals in soil. Characterize debris, and determine extent of debris in former pond. Determine source and extent of perchlorate exceedance.	X	X	X	Samples included in SAP for Bldg 3418.
4	Fluorine Pipeline – Determine status of pipeline, and sample for related contaminants.	X		X	2
5	Storage Shed – Determine the lateral and vertical extent of elevated VOCs in soil and soil gas, and elevated metals in soil.	X			Samples included in SAP for Bldg 3418.
6	Suspect Pond – Downstream of Area 3 STP – check for possible releases from STP Area.	X	X		1
7	Dump Site – Confirm location of dump site/debris area. Conduct screening samples.	X		X	11
8	Explosive Magazines (Bldgs. 3397 and 3398) – Confirm location of explosive magazines and sample for energetics.	X		X	2
9	Systems Test Laboratory IV (STL-IV) Air Stripping Towers – Check for releases downgradient of air strippers, and sample transformer north of the towers.	X		X	3
10	Suspect Dredge Materials (P2) North of Compound A Facility Site	X	X	X	9
				Total	**46**

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.

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 Group 5 SAP (general text).

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 the Department of Energy (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 Compound A Facility RFI Site

Sampling and Analysis Plan for Compound A Facility 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	CFSV1007	Soil Vapor	5			X													Soil vapor samples CFSV1007 through CFSV1010 are to delineate extent of soil vapor exceedance in pond area. CFSV1007 is the step out to the west.
		Soil Vapor	10			X													
1	CFSV1008	Soil Vapor	5			X													Extent of soil vapor exceedance in pond area - step out to the east.
		Soil Vapor	10			X													
1	CFSV1009	Soil Vapor	5			X													Extent of soil vapor exceedance in pond area - step out to the north.
		Soil Vapor	10			X													
1	CFSV1010	Soil Vapor	5			X													Extent of soil vapor exceedance in pond area - step out to the south.
		Soil Vapor	10			X													
1	CFBS1019	Soil	1	X	X			X	X	X		X				X			Soil samples CFBS1019 through CFBS1026 are to delineate extent of impacts from Compound A Facility, pond and storage area.
		Soil	6	X	X			X	X			X				X			
		Soil	10	H	H			H	H			H				H			
1	CFBS1020	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			
1	CFBS1021	Soil	1	X	X			X	X	X		X				X			Sample downstream of sample CFBS1022.
		Soil	6	X	X			X	X			X				X			
		Soil	10	H	H			H	H			H				H			
1	CFBS1022	Soil	1	X	X			X	X	X		X		X	X	X			Extent of impacts from Compound A Facility, pond and storage area., check for releases to drainage leaving CMP A RFI site boundary to the southeast. Check for dioxins release from upgradient/upstream sources/exceedances.
		Soil	6	X	X			X	X			X		X		X			
		Soil	10	H	H			H	H			H		H		H			
1	CFBS1023	Soil	1	X	X			X	X	X		X				X			Drill until bedrock is reached - hold deeper samples pending shallow results.
		Soil	6	X	X			X	X			X				X			
		Soil	10	H	H			H	H			H				H			
1	CFBS1024	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			
1	CFBS1025	Soil	1	X	X			X	X	X		X		X		X			
		Soil	6	X	X			X	X			X		X		X			
		Soil	10	H	H			H	H			H		H		H			
1	CFBS1026	Soil	1	X	X			X	X	X		X		X		X			Drill until bedrock is reached - hold deeper samples pending shallow results.
		Soil	6	X	X			X	X			X		X		X			
		Soil	10	H	H			H	H			H		H		H			
		Soil	20	H	H			H	H			H		H		H			
		Soil	30	H	H			H	H			H		H		H			
2	CFBS1001	Soil	1						X	X		X		X					Metals analyses not performed on previous samples near forming pits. Samples CFBS1001 through CFBS1004 primarily to check for metals releases, include energetics to complement previous samples.
		Soil	6						X			X							
		Soil	10						H			H							
2	CFBS1002	Soil	1						X	X		X							Drill to encounter bedrock - hold deeper samples pending shallow results.
		Soil	6						X			X							
		Soil	10						H			H							
		Soil	20						H			H							
		Soil	30						H			H							
2	CFBS1003	Soil	1						X	X		X		X					
		Soil	6						X			X							
		Soil	10						H			H							

TABLE 2

Proposed Samples for Compound A Facility RFI Site

Sampling and Analysis Plan for Compound A Facility 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	CFBS1004	Soil	1						X	X		X							
		Soil	6						X			X							
		Soil	10						H			H							
2	CFSV1001	Soil Vapor	5			X													Delineate extent of soil gas exceedance near forming pit (sample CFSV04). approximately 50 feet to the south. Another exceedance observed further to the south, north of STL-IV Impoundment 1.
		Soil Vapor	10			X													
2	CFSV1002	Soil Vapor	5			X													Delineate extent of soil gas exceedance near forming pit (sample CFSV04), approximately 100 feet to the northwest. Previous soil gas samples have detection limit issues, so this location needed to delineate exceedance to the north and west of the forming pit exceedance.
		Soil Vapor	10			X													
3																			Chem Use Area 3 (Bldg. 314A Pond) sampling covered with sampling for Chemical Use Area 1 (Bldg. 314A)
4	CFBS1017	Soil	1						X	X						X			Fluorine pipeline, check for potential releases at points entering and leaving Bldg. 3418.
		Soil	6						H							H			
4	CFBS1018	Soil	1						X	X						X			Fluorine pipeline - see above.
		Soil	6						H							H			
5																			
6	CFBS1013	Soil	1	X				X	X	X	H				X	X			Screening for potential releases to suspect pond, which is downgradient of Area 3 STP. Check for releases from upgradient/adjacent sources - fluoride (CMP A), inorganics (STP/EEL).
		Soil	6	X				X	X		H				X	X			
		Soil	10	H				H	H		H				H	H			
7	CFBS1005	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6. Determine lateral extent of metals and dioxins exceedances southeast of sample location.
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1006	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6. Step out 50 feet west of exceedance CFBS06 (dioxins).
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1007	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6. Step out 50 feet west of exceedances at CGSB09 (metals) and south of CFBS06 (dioxins).
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1008	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6. Sample location in drainage south of Compound A, checking for releases to drainage, and delineating extent of exceedances observed near debris area.
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1009	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6. Eastern extent of possible debris impacts, and also due south of Bldg 418.
		Soil	6	X	X			X	X		H				X				

TABLE 2

Proposed Samples for Compound A Facility RFI Site

Sampling and Analysis Plan for Compound A Facility 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				
7	CFBS1010	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, step out 50 feet east of CFTS01.
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1011	Soil	1	X	X			X	X	X	H				X				Screening for impacts in drainage downgradient of debris area, and also downgradient and lateral extent from chem use areas 1, 3, and 6.
		Soil	6	X	X			X	X		H				X				
		Soil	10	H	H			H	H		H				H				
7	CFBS1012	Soil	1	X	X			X	X	X	H				X				Screening for impacts in debris area, upgradient from debris and also downgradient and lateral from chem use areas 1, 3, and 6. Drill to encounter bedrock - 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				
		Soil	30	H	H			H	H		H				H				
7	CFSV1003	Soil Vapor	5			X													Soil vapor samples CFSV1003, CFSV1004, and CFSV1005 to delineate soil vapor exceedance at SVSV05 to the south, east and north. STL-IV soil vapor samples will bound exceedance to the west.
		Soil Vapor	10			X													
7	CFSV1004	Soil Vapor	5			X													
		Soil Vapor	10			X													
7	CFSV1005	Soil Vapor	5			X													
		Soil Vapor	10			X													
8	CFBS1015	Soil	1						X	X		X							Screening for potential releases from explosive magazine (Bldg. 3397).
		Soil	6						X			X							
		Soil	10						H			H							
8	CFBS1016	Soil	1						X	X		X							Screening for potential releases from explosive magazine (Bldg. 3398).
		Soil	6						X			X							
		Soil	10						H			H							
9	CFBS1014	Soil	1		X					X									Screening for potential releases from STL-IV air strippers
		Soil	6		X														
		Soil	10		H														
9	CFBX1000	Soil	1									X							Sample near pole-mounted transformer north of stripping towers.
9	CFSV1006	Soil Vapor	5			X													Screening for potential releases from STL-IV air strippers
		Soil Vapor	10			X													
10	CFBS1027	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1028	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1029	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1030	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				

TABLE 2

Proposed Samples for Compound A Facility RFI Site

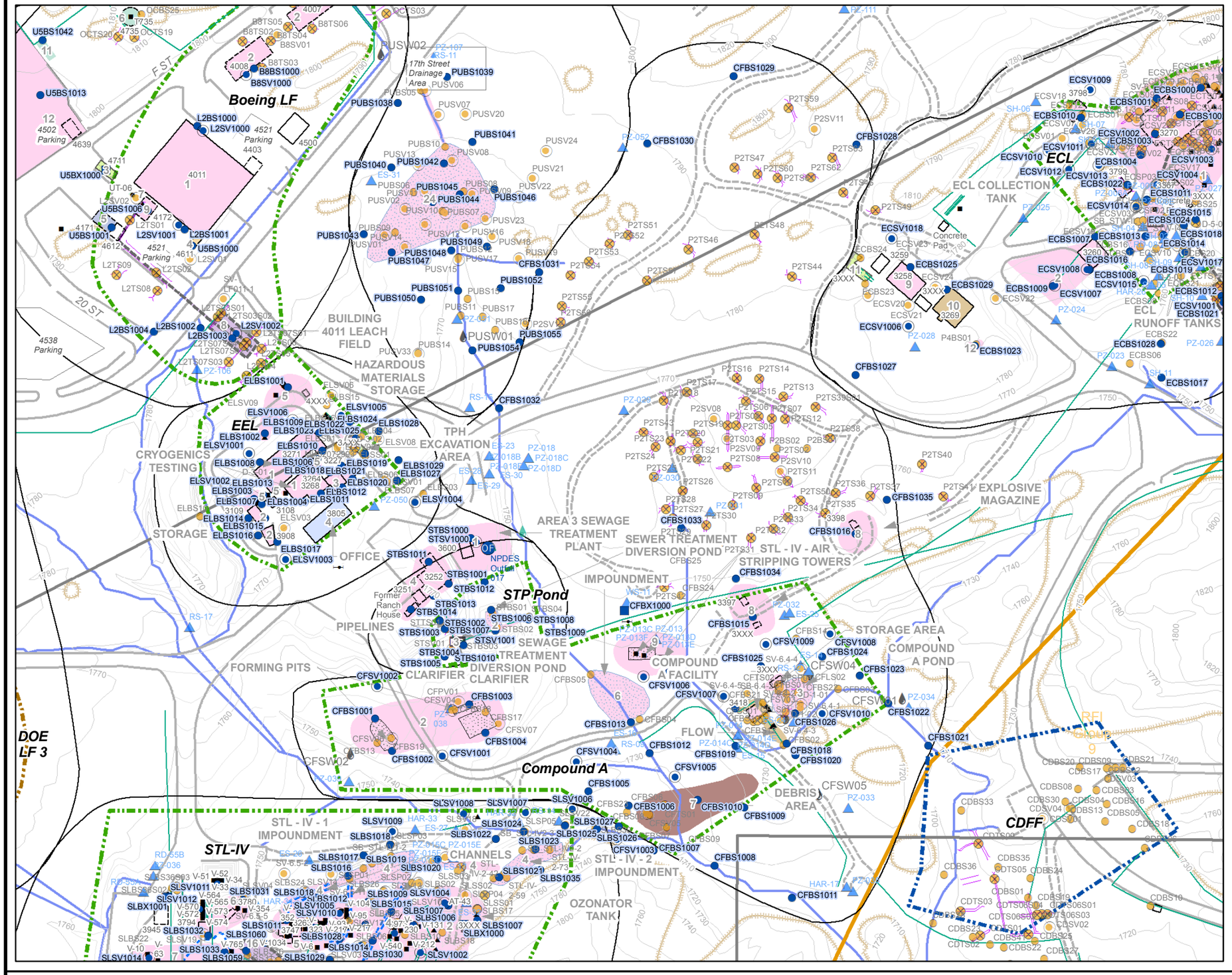
Sampling and Analysis Plan for Compound A Facility RFI Site, Group 5, Santa Susana Field Laboratory

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)	
10	CFBS1031	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1032	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1033	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1034	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
10	CFBS1035	Soil	1	X				X	X	X	X				X				Extent of elevated metals, dioxins, PCBs, etc. P2 suspect materials area.
		Soil	6	X				X	X		X				X				
		Soil	10	H				H	H		H				H				
Total Soil Samples for Analysis				52	34			52	66	35	19	28		8	37	20			
Total Soil Samples on Hold				30	21			30	40		38	18		5	20	13			
Total Soil Vapor Samples for Analysis						20													
Total Soil Samples Collected			110																
Total Number of Locations			46																

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

Compound A

Date: February 21, 2008

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1 inch equals 150 feet

0 150 300 Feet

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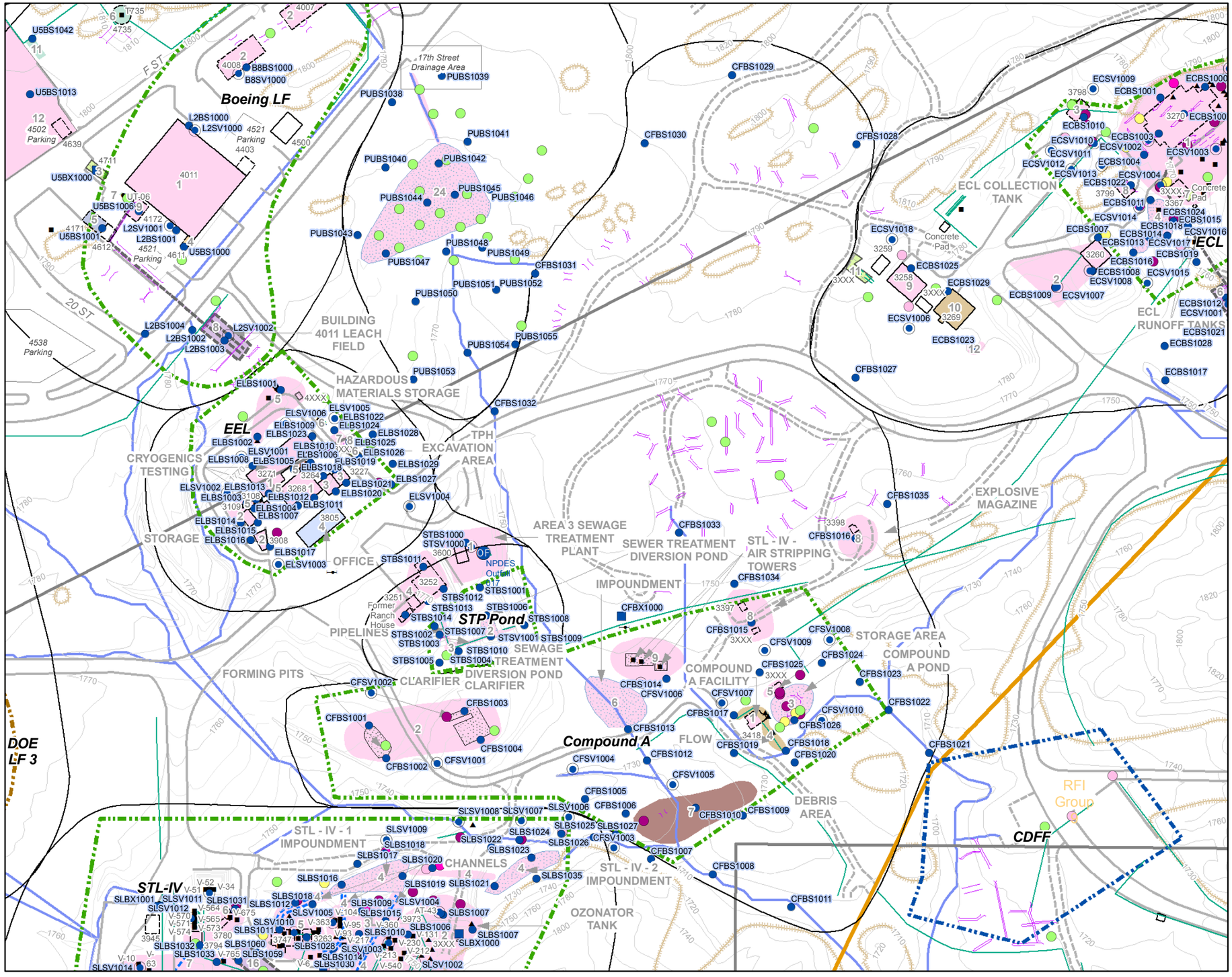
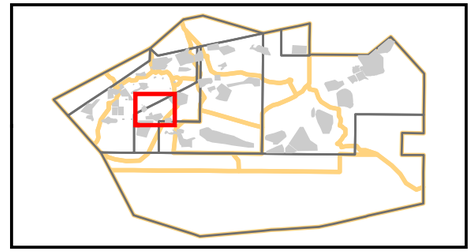
Figure 1





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

Compound A

Date: February 21, 2008

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1 inch equals 150 feet

0 150 300 Feet

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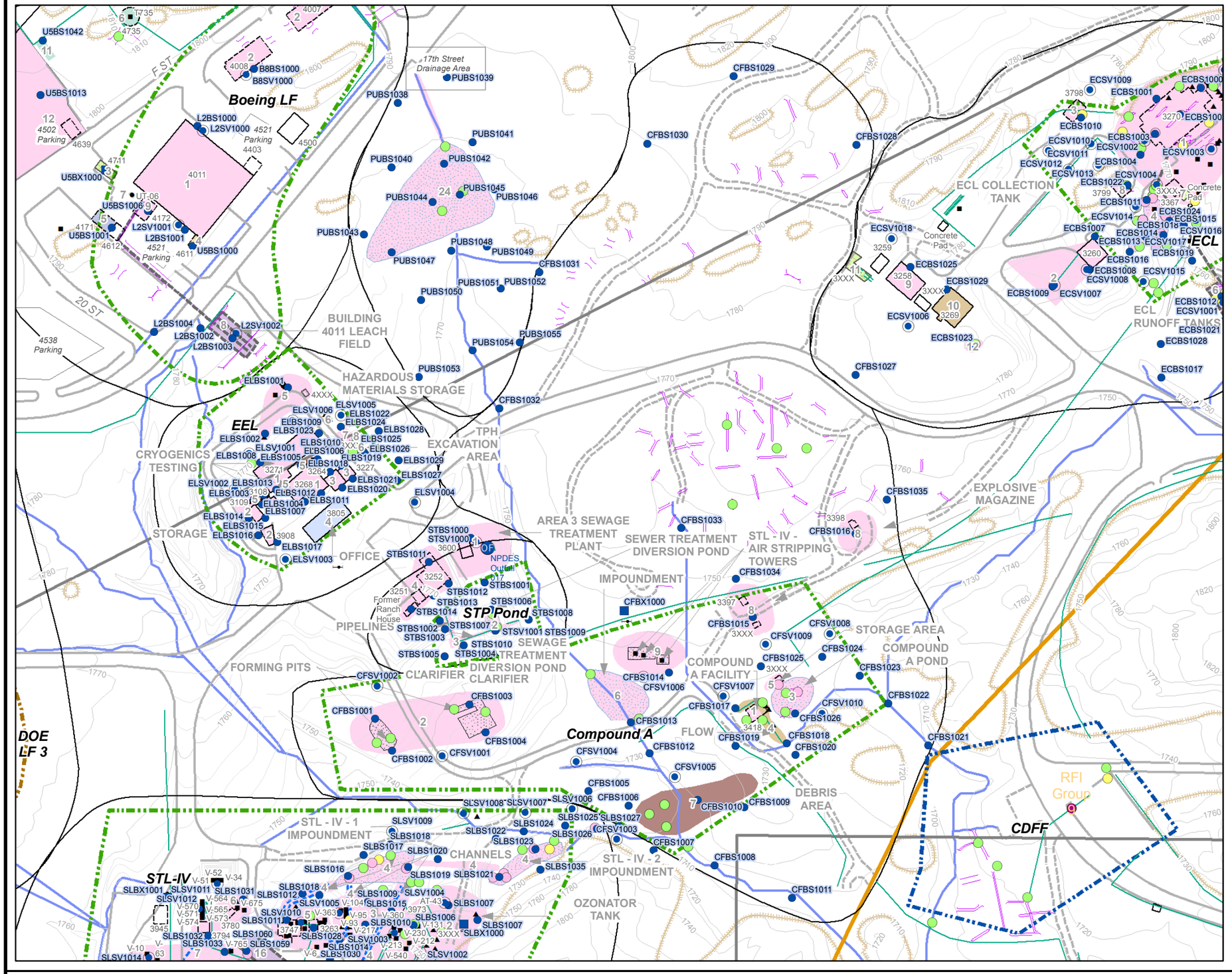
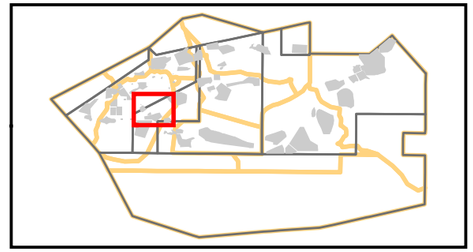
Figure 2





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

Compound A

Date: February 21, 2008

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1 inch equals 150 feet

0 150 300 Feet

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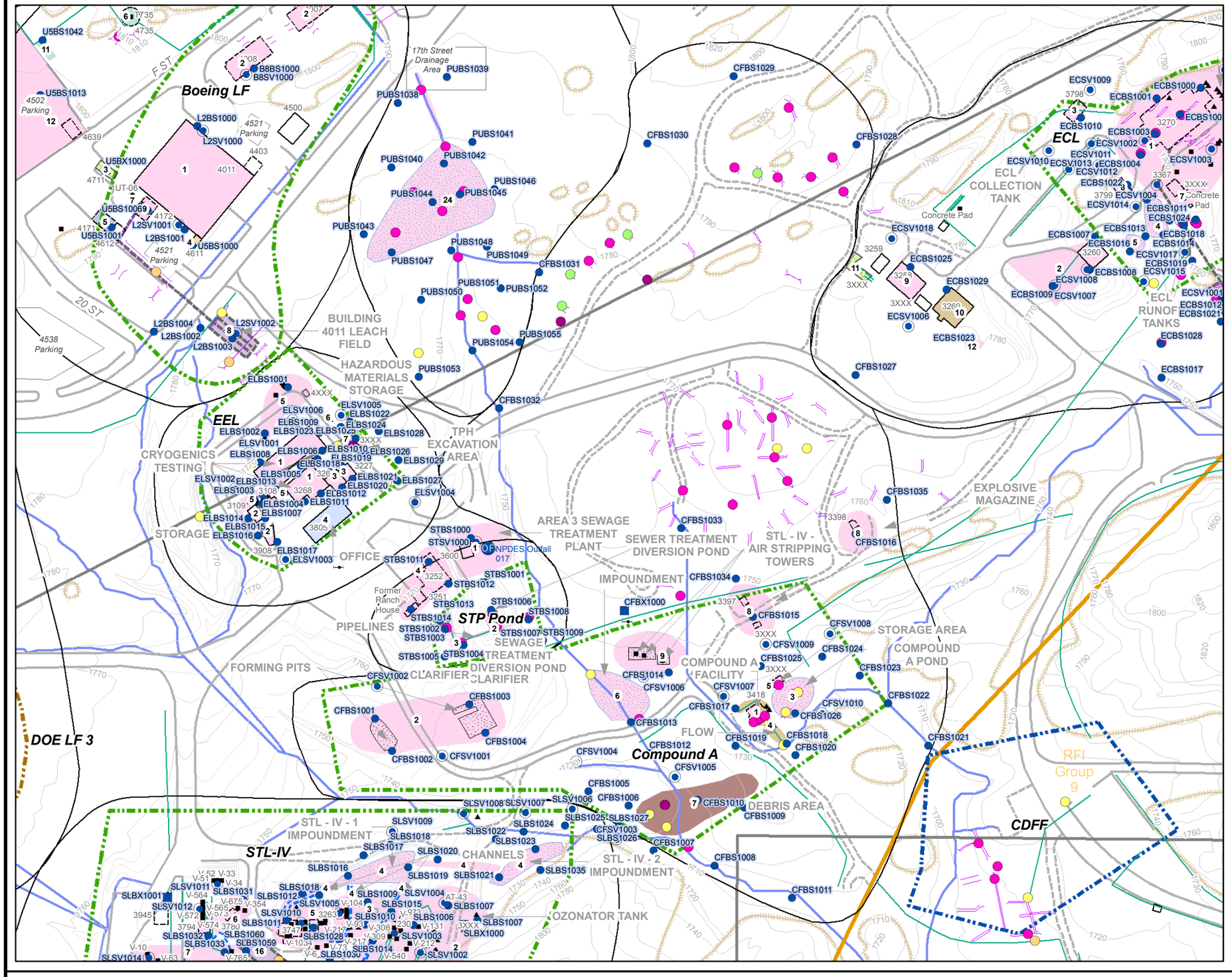
Figure 3



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

Compound A

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

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1 inch equals 150 feet

0 150 300 Feet

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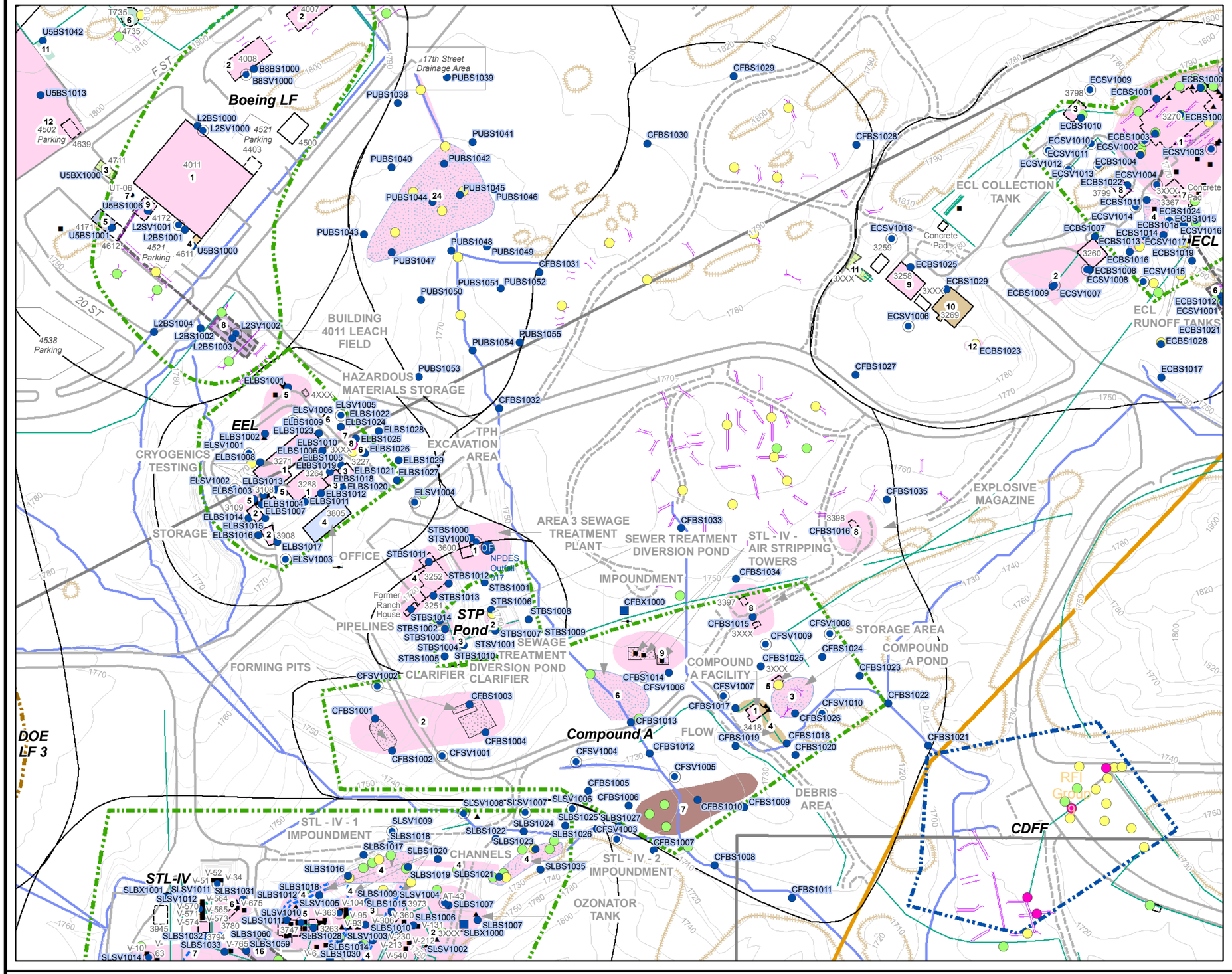
Figure 4



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

Compound A

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

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1 inch equals 150 feet

0 150 300 Feet

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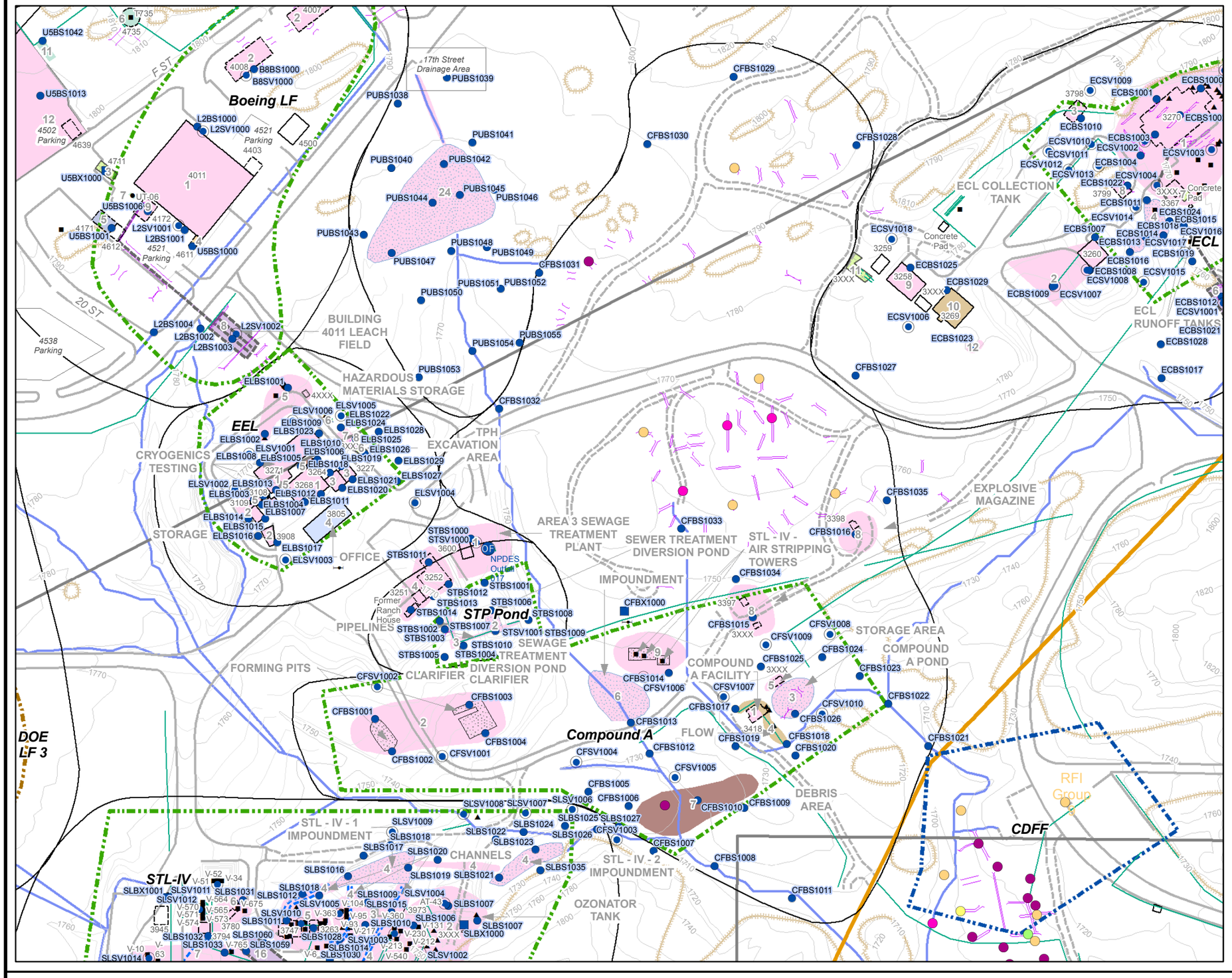
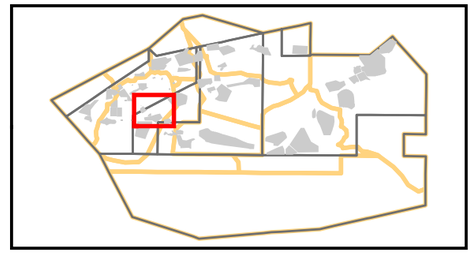
Figure 5





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

Compound A

Date: February 20, 2008

WORKING DRAFT

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1 inch equals 150 feet

0 150 300 Feet

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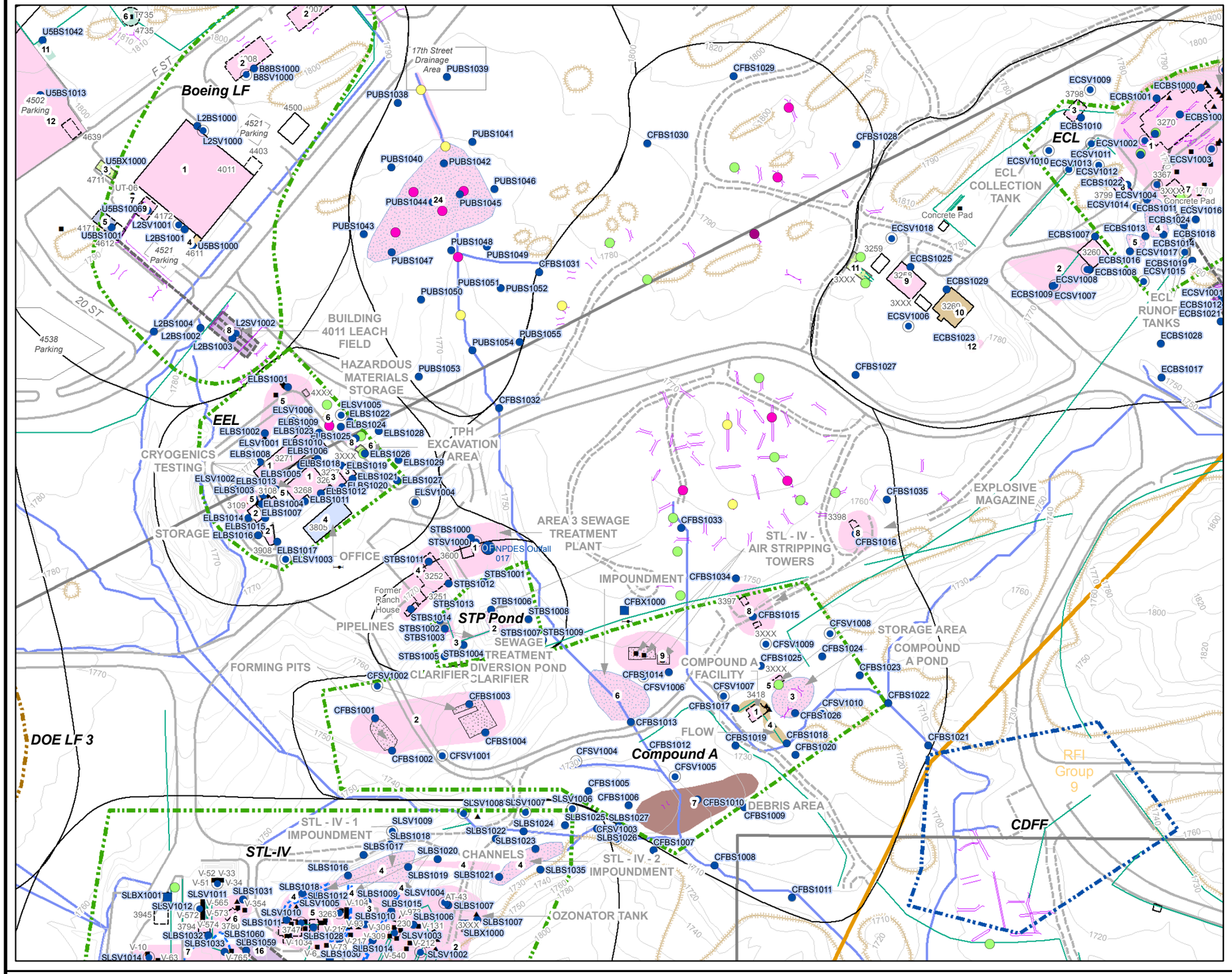
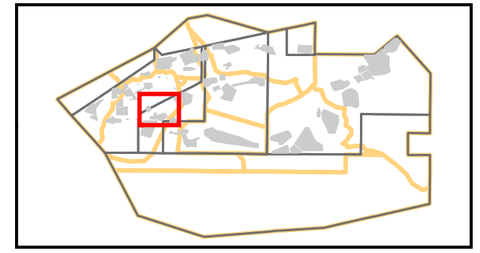
Figure 6





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

Compound A

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

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1 inch equals 150 feet

0 150 300 Feet

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Figure 7

Sampling and Analysis Plan for Engineering Chemistry Laboratory 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 Engineering Chemistry Laboratory (ECL) RCRA Facility Investigation (RFI) Site in Group 5 at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The ECL was used for research and development of rocket and gun propellants and new fuel additives. The site consists of Solid Waste Management Units (SWMU) 6.1 (Building 3270, Waste Tank, and Container Storage Area), 6.2 (ECL Pond and ECL Suspect Pond), and 6.3 (ECL Collection Tank), along with Areas of Concern (AOCs) Building 3260 ECL Runoff Tanks and Building 3270 Leach Field. Other chemical use areas evaluated with the ECL include Buildings 3258, 3269, 3367, 3798, and 3799, aboveground storage tanks (ASTs), two electrical substations, a distillation unit, a scrubber system, and two propellant/explosives storage areas.

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 ECL. 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 ECL 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 11 of the 13 chemical use areas identified for the ECL. Data gaps also were identified based on elevated detection limits of previous samples and lack of sediment or surface soil data in the surface water drainage pathway downstream of the site. In addition, data gaps were identified based on the need for documentation related to pipelines located at the site.

To address these data gaps, CH2M HILL proposes to collect 91 soil samples and 35 soil vapor samples. These samples will be collected from a total of 50 locations across the site (Table 1).

TABLE 1

Data Gaps

Sampling and Analysis Plan for Engineering Chemistry 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	Engineering Chemistry Lab - Chemical uses include solvents, petroleum distillates, semivolatile organic compounds (SVOCs), metals and other inorganic compounds, energetic constituents, propellants, and formaldehyde. Propellants (other than N-nitrosodimethylamine [NDMA]) have not been investigated. In addition, metals in soil, volatile organic compounds (VOCs) in soil, and VOCs in soil vapor have been detected at concentrations exceeding risk-based screening levels (RBSLs) and have not been characterized adequately (the lateral and vertical extents of metals in soil, the vertical extent of VOCs in soil, and the lateral extent of VOCs in soil vapor are undefined). These chemical groups require further investigation. Based on analytical data collected to date, a corrective measures study might be required. Soil grain analysis data and other lithologic data are needed to support a corrective measures study for the site. These data will be used to determine if soil vapor extraction is a viable remedial option to address VOCs in soil vapor.	X	X		15
2	Building 3260 - Chemical uses include metals and other inorganic compounds, VOCs, TPH, and propellants. These chemicals have not been investigated in soil (or soil vapor for VOCs).	X			5
3	Building 3798 - Chemicals uses include VOCs, total petroleum hydrocarbon (TPH), and propellants (hydrazine and nitrogen tetroxide [NTO]). Propellants (other than NDMA) have not been investigated in soil. In addition, VOCs in soil vapor have been detected at concentrations exceeding RBSLs and have not been characterized adequately (the lateral extent of VOCs in soil vapor is undefined).	X			6
4	ECL Pond - Chemical uses include solvents, petroleum distillates, SVOCs, metals and other inorganic compounds, energetic constituents, propellants, and formaldehyde. Propellants and metals have not been investigated. In addition, VOCs in soil and soil vapor have been detected at concentrations exceeding RBSLs and have not been characterized adequately (the vertical extent of VOCs in soil and the lateral extent of VOCs in soil vapor are undefined).	X			5

TABLE 1

Data Gaps

Sampling and Analysis Plan for Engineering Chemistry 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
5	ECL Suspect Pond - Chemical uses include solvents, petroleum distillates, SVOCs, metals and other inorganic compounds, energetic constituents, propellants, and formaldehyde. Propellants (other than NDMA) and metals have not been investigated. In addition, VOCs in soil vapor have been detected at concentrations exceeding RBSLs and have not been characterized adequately (the lateral extent of VOCs in soil vapor is undefined).	X			4
6	Building 3270 Leach Field - Chemical uses include solvents, petroleum distillates, SVOCs, metals and other inorganic compounds, energetic constituents, propellants, and formaldehyde. VOCs in soil vapor and propellants in soil (other than NDMA) have not been investigated. In addition, metals have been detected in soil at concentrations exceeding RBSLs and have not been adequately characterized (the lateral and vertical extents of metals in soil are undefined).	X			8
7	Substation adjacent to Building 3367 - Chemical uses include polycyclic biphenyls (PCBs). PCBs have been investigated, and have not been detected in soil. There are no data gaps associated with this area. This area is eligible for No Further Action.				N/A
8	Building 3799 - Chemical uses include propellants and solvents. Propellants (hydrazine and NTO) have not been investigated.	X			1
9	Building 3258 - Chemical uses include solvents, PCBs, oil, metals, and waste construction debris. Petroleum, SVOCs, PCBs, metals, and asbestos in soil have not been investigated. In addition, VOCs have been detected in soil vapor at concentrations exceeding RBSLs and have not been adequately characterized (the lateral extent of VOCs in soil vapor is undefined).	X			3
10	Building 3269 - Chemical uses include chloride, fluoride, and bromide. These chemicals have not been investigated in soil. Investigation is required to evaluate if previous uses of the building have resulted in an impact to environment.	X			1

TABLE 1

Data Gaps

Sampling and Analysis Plan for Engineering Chemistry 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
11	Substation west of Building 3259 - Chemical uses include PCBs. PCBs have been investigated and have not been detected in soil. There are no data gaps associated with this area. This area is eligible for no further action.				N/A
12	Location of bunkers with possible storage of propellants and explosives	X			1
13	Location of bunkers with possible storage of propellants and explosives	X			1
N/A	Limited information is available on the pipelines that are shown in site figures. Additional information is needed to evaluate the pipelines as potential sources of contamination and to verify the locations and depths of these pipelines.			X	N/A
Sitewide	Detection limits for VOCs in soil and soil vapor and most analytes in near-surface groundwater exceed human health screening levels. Detection limits for metals in soil exceed ecological screening levels.	X			Addressed by Other Sample Locations
Downstream of Site	Samples have not been collected to evaluate if chemicals are migrating from the ECL to downstream areas (the Coca/Delta Fuel Farm and R-2 Ponds) through surface water runoff.	X			Addressed by Other Sample Locations
				Total	**50**

Notes:
NA = Not Applicable
Sitewide = RFI Site "ECL"

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 PCBs in soil. The previous sample location symbols in Figures 2 through 7 are color coded to indicate whether the previous sample results (at any depth) were detected, were detected below RBSLs or background concentrations (for metals and dioxins), or were detected above RBSLs and/or background concentrations.

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 SAP is scheduled for implementation in 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 Engineering Chemistry Laboratory RFI Site

Sampling and Analysis Plan for Engineering Chemistry 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	ECBS1000	Soil	1					X		X			X	X					Propellants other than NDMA not previously analyzed in Chemical Use Area 1. VOCs were detected at 1.0 foot bgs at ECBS18; need vertical delineation.
		Soil	6		X			X					X	X			X		Soil grain size analysis data needed to support a corrective measures study.
		Soil	10		X			H					H	H					Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1001	Soil	1						X	X									Nature and extent of metals not studied on the north side of Bldg. 3270.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1002	Soil	1					X		X			X	X					Propellants other than NDMA not analyzed in Chemical Use Area 1. VOCs and Metals detected at 1.5 feet bgs in sample ECTS06S01; need vertical delineation.
		Soil	6		X			X	X				X	X			X		Soil grain size analysis data needed to support a corrective measures study.
		Soil	10		X			H	X				H	H					Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1003	Soil	1					X		X			X	X					Propellants other than NDMA not analyzed in Chemical Use Area 1. VOCs and metals detected at 3.5 feet bgs at ECTS03S01; need vertical delineation.
		Soil	7		X			X	X				X	X					
		Soil	10		X			H	X				H	H					Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1004	Soil	1							X									
		Soil	6						X										Metals detected at 1.5 feet bgs in ECTS02S01. Need lateral and vertical delineation. Proposed sample is located approximately 30 feet to the southwest of ECTS03S01.
		Soil	10						X										
1	ECBS1005	Soil	1	X				H	X	X									Metals detected at 1.0 feet bgs in sample D-5-04 and gasoline, kerosene, and diesel detected at 2.0 feet bgs in sample ECBS12. The proposed sample is located approximately 25 feet to the southeast and downgradient of the locations of previous detections. TPH in the lubricant oil-range may contain PAHs; PAHs will be analyzed if TPH is detected above 1,400 mg/kg.
		Soil	6	H				H	H										
		Soil	10	H				H	H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1006	Soil	1						X	X									The proposed sample is located approximately 60 feet southeast of locations where metals were detected at elevated concentrations within the footprint of Bldg. 3270.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1030	Soil	1						X	X									The proposed sample is located approximately 20 feet east of D-5-05, where metals were detected at elevated concentrations at 1 foot bgs.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1026	Soil	1							X									Vertically delineate metals detected at 1.0 foot bgs in sample D-5-05.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECBS1027	Soil	1							X									Vertically delineate metals detected at 1.0 foot bgs in sample D-5-04.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
1	ECSV1000	Soil Vapor	5			X													The proposed sample is located approximately 25 feet northeast and northwest of previous sample locations SV-6.1-7 and ECSV14, where VOCs were detected at elevated concentrations.
		Soil Vapor	10			X													
1	ECSV1002	Soil Vapor	5			X													Lateral and vertical delineation of VOCs in soil vapor.

TABLE 2

Proposed Samples for the Engineering Chemistry Laboratory RFI Site

Sampling and Analysis Plan for Engineering Chemistry 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)	
		Soil Vapor	10			X													
1	ECSV1003	Soil Vapor	5			X													Lateral and vertical delineation of VOCs in soil vapor at a location approximately 35 feet southwest of previous sample locations ECSV04, ECSV05, and SV-6.1-2 and 40 feet southeast of previous sample location ECSV06, where VOCs were previously detected at elevated concentrations.
		Soil Vapor	10			X													
1	ECSV1004	Soil Vapor	10			X													Vertical delineation for VOCs previously detected in soil vapor at 5.0 feet bgs in ECSP04.
1	ECSV1005	Soil Vapor	5			X													Lateral and vertical delineation of VOCs in soil vapor.
		Soil Vapor	10			X													
2	ECBS1007	Soil	1	X	X		X		X	X						X			Chemical uses include metals and other inorganic compounds, VOCs, TPH, and propellants. These chemicals have not been investigated in soil.
		Soil	6	X	X		X		X							X			
		Soil	10	H	X		H		H							H			Analysis is contingent on the results of analyses for more shallow samples.
2	ECBS1008	Soil	1	X	H		X		X	X						X			See above. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro ECSV1008.
		Soil	6	X	H		X		X							X			
		Soil	10	H	H		H		H							H			Analysis is contingent on the results of analyses for more shallow samples.
2	ECBS1009	Soil	1	X	H		X		X	X						X			See above. VOCs will be analyzed in soil if VOCs are detected in the soil vapor sample collected fro ECSV1007.
		Soil	6	X	H		X		X							X			
		Soil	10	H	H		H		H							H			Analysis is contingent on the results of analyses for more shallow samples.
2	ECSV1007	Soil Vapor	5			X													VOCs have not been investigated in soil vapor.
		Soil Vapor	10			X													
2	ECSV1008	Soil Vapor	5			X													See above.
		Soil Vapor	10			X													
3	ECBS1010	Soil	1										X						Chemical uses include VOCs, TPH, and propellants (hydrazine and NTO); Propellants other than NDMA have not been analyzed in Chemical Use Area 3.
		Soil	6										X						
		Soil	10										H						Analysis is contingent on the results of analyses for more shallow samples.
3	ECSV1009	Soil Vapor	5			X													The proposed sample is located approximately 35 feet north of previous sample location ECSV12, where VOCs were detected at elevated concentrations.
		Soil Vapor	10			X													
3	ECSV1010	Soil Vapor	5			X													The proposed sample is located approximately 30 feet southwest of previous sample location ECSV01, where VOCs were detected at elevated concentrations.
		Soil Vapor	10			X													
3	ECSV1011	Soil Vapor	10			X													Vertical delineation for VOCs in soil vapor previously detected at 6.0 feet bgs in ECSV27.
3	ECSV1012	Soil Vapor	5			X													The proposed sample is located approximately 45 feet south of previous sample location ECSV01, where VOCs were detected at elevated concentrations.
		Soil Vapor	10			X													
3	ECSV1013	Soil Vapor	5			X													The sample is proposed to laterally and vertically delineate VOCs at a location that is 35 feet southeast of previous sample location ECSV27, where VOCs were detected at elevated concentrations.
		Soil Vapor	10			X													
4	ECBS1011	Soil	1	X					X	X									VOCs previously detected at 1.0 foot bgs; Vertical delineation of VOCs. Metals and TPH not previously investigated.
		Soil	6	X	X				X								X		Soil grain size analysis data needed to support a corrective measures study.
		Soil	10	H	X				H										Analysis is contingent on the results of analyses for more shallow samples.
4	ECBS1013	Soil	1		X				X	X									Lateral delineation of VOCs at a location approximately 30 feet south of previous sample location SB_STW-IL, where VOCs were previously detected at elevated concentrations. Metals not previously investigated in the area between Chemical Use Areas 4 and 5.

TABLE 2

Proposed Samples for the Engineering Chemistry Laboratory RFI Site

Sampling and Analysis Plan for Engineering Chemistry 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)	
		Soil	6		X				X										
		Soil	10		X				H										Analysis is contingent on the results of analyses for more shallow samples.
4	ECBS1014	Soil	1					X	X				X	X					Vertical delineation of VOCs at a location where VOCs were previously detected at 2.5 and 3.0 feet bgs in SB_STS-13. Metals and propellants not previously investigated at this location, which is at the downslope end of the ECL Pond.
		Soil	6		X			X	X				X	X					
		Soil	10		X			H	H				H	H					Analysis is contingent on the results of analyses for more shallow samples.
4	ECBS1015	Soil	6		X														Vertical delineation of VOCs.
		Soil	10		X														Analysis is contingent on the results of analyses for more shallow samples.
4	ECSV1014	Soil Vapor	10			X													Vertical delineation of VOCs in soil vapor at a location where VOCs were previously detected at elevated concentrations at 5.0 feet bgs in ECSV03.
5	ECBS1016	Soil	1						X	X									Downslope of Bldg. 3260 (potentially surface water transport through former channels). Metals not previously investigated.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
5	ECBS1017	Soil	1	X	X		X		X	X									Lateral delineation of metals at a location approximately 50 feet south of previous sample location ECBS22, where metals were previously detected at elevated concentrations at 0.5 foot bgs. Also, investigate surface soil in the surface water flow drainage pathway downstream (south) of the site for site TPH, PAHs, and VOCs.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
5	ECBS1028	Soil	1							X									Vertical delineation of metals detected at 0.5 foot bgs in ECBS22.
		Soil	6						X										
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
5	ECSV1015	Soil Vapor	5			X													Lateral delineation of VOCs at a location approximately 30 feet southwest of previous sample location ECSP01, where VOCs were detected at elevated concentrations at 6.0 feet bgs.
		Soil Vapor	10			X													
6	ECBS1012	Soil	1							X									Metals detected at elevated concentrations at 6.5 and 7 feet bgs in previous sample locations ECTS18S01 and ECTS18S02; vertical delineation of metals at these locations.
		Soil	10						X										Analysis is contingent on the results of analyses for more shallow samples.
6	ECBS1018	Soil	1							X									Vertical delineation of metals and VOCs previously detected at 1.0 feet bgs in D-5-02.
		Soil	6		X				X										
		Soil	10		X				H										Analysis is contingent on the results of analyses for more shallow samples.
6	ECBS1019	Soil	1		X														Define the lateral extent of VOCs to the south of the ECL Pond.
		Soil	6		X														
		Soil	10		X														Analysis is contingent on the results of analyses for more shallow samples.
6	ECBS1021	Soil	1						X	X		X							Lateral delineation of metals. The proposed sample is approximately 35 feet south (and downslope) of previous sample locations ECTS18S01 and ECTS18S02, where metals were detected at elevated concentrations at 7 feet bgs.
		Soil	6						X			X							
		Soil	10						H			H							Analysis is contingent on the results of analyses for more shallow samples.
6	ECBS1024	Soil	1							X									Vertical delineation of metals previously detected at depths of 1.0 feet bgs at sample locations D-5-03 and ECSS02.
		Soil	6						X										

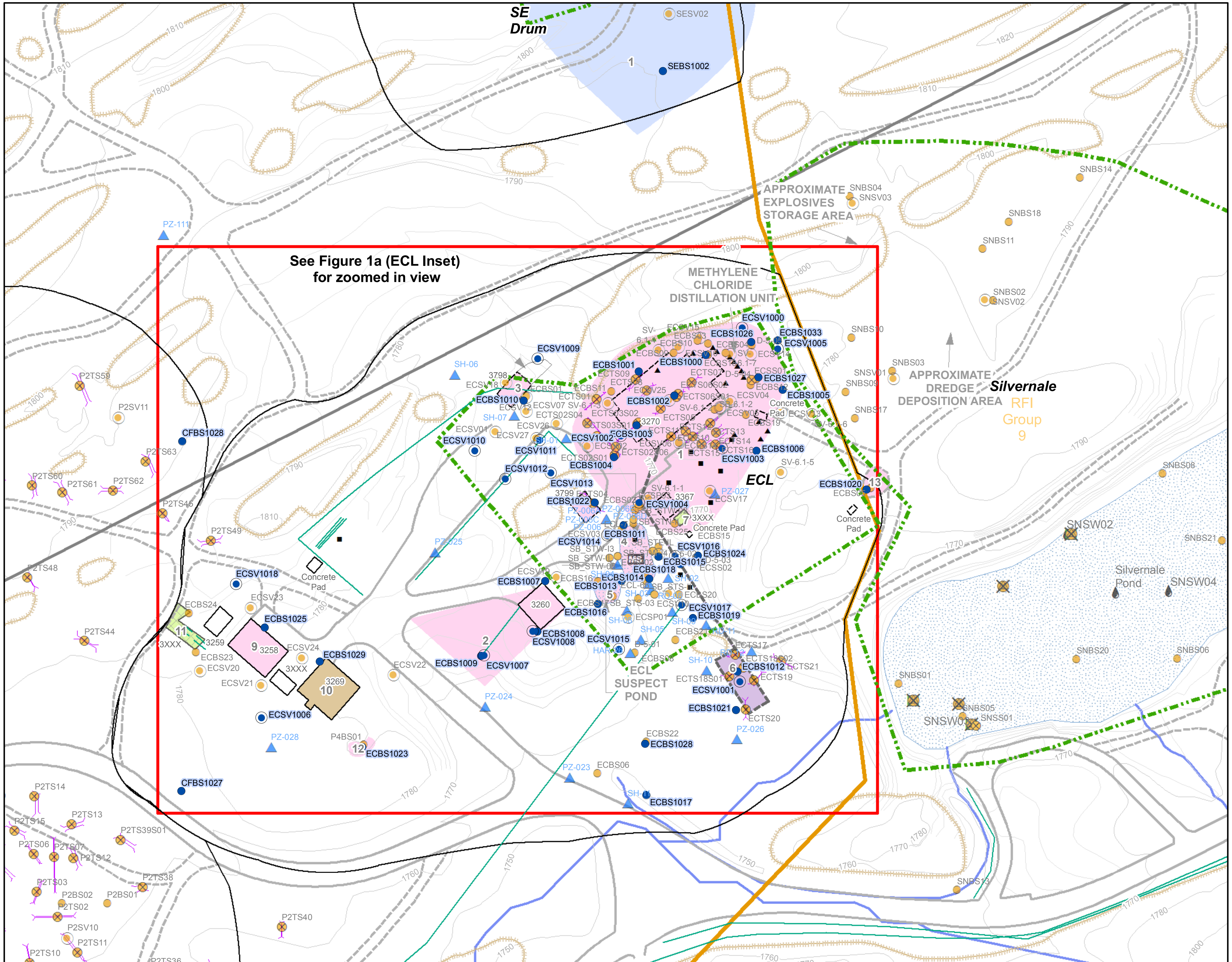
TABLE 2

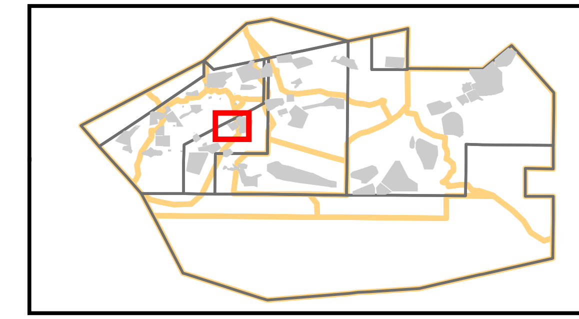
Proposed Samples for the Engineering Chemistry Laboratory RFI Site

Sampling and Analysis Plan for Engineering Chemistry 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)	
		Soil	10						H										Analysis is contingent on the results of analyses for more shallow samples.
6	ECSV1016	Soil Vapor	5			X													Lateral delineation of VOCs at a location approximately 10 feet east of ECSP02, where VOCs were previously detected at elevated concentrations at 4.0 feet bgs.
		Soil Vapor	10			X													
6	ECSV1017	Soil Vapor	5			X													Lateral delineation of VOCs at a location approximately 10 feet southeast of ECSV10, where VOCs were previously detected at elevated concentrations at 5.0 feet bgs.
		Soil Vapor	10			X													
6	ECSV1001	Soil Vapor	5			X													VOCs have not been analyzed in soil vapor at the location of the leach field.
		Soil Vapor	10			X													
7																			NO DATA GAPS
8	ECBS1022	Soil	1					X					X						Chemical uses include propellants and solvents. These chemical groups have not been investigated
		Soil	6					X					X						
		Soil	10					H					H						Analysis is contingent on the results of analyses for more shallow samples.
9	ECBS1025	Soil	1	X	X		X		X	X	X								Chemical uses at Building 3258 include TPH, solvents, oils, metals. These chemical groups have not been investigated.
		Soil	6	X	X		X		X		X								
		Soil	10	H	X		H		H		H								Analysis is contingent on the results of analyses for more shallow samples.
9	ECSV1018	Soil Vapor	5			X													Lateral delineation of VOCs at a location approximately 30 feet northwest of ECSV23, where VOCs were previously detected at an elevated concentration at 5.0 feet bgs.
		Soil Vapor	10			X													
9	ECSV1006	Soil Vapor	5			X													Lateral delineation of VOCs at a location approximately 30 feet south of ECSV21, where VOCs were previous detected at an elevated concentration at 3.0 feet bgs.
		Soil Vapor	10			X													
10	ECBS1029	Soil	1													X			Chemical uses include fluoride, chloride, bromide. These chemicals have not been previously investigated.
		Soil	6													X			
		Soil	10													H			Analysis is contingent on the results of analyses for more shallow samples.
11																			NO DATA GAPS
12	ECBS1023	Soil	1					X	X	X		X	X	X					The proposed sample is located at a bunker associated with storage of propellants and explosives. Metals, propellants, and energetics have not been investigated in this area.
		Soil	6					X	X			X	X	X					
		Soil	10					H	H			H	H	H					Analysis is contingent on the results of analyses for more shallow samples.
13	ECBS1020	Soil	1		X			X	X	X			X	X					The proposed sample is located at a bunker associated with storage of propellants and explosives. VOCs, metals, and propellants have not been investigated in this area.
		Soil	6		X			X	X				X	X					
		Soil	10		X			H	H				H	H					Analysis is contingent on the results of analyses for more shallow samples.
Total Soil Samples for Analysis				12	30		9	14	43	25	2	4	16	12		8	3		
Total Soil Samples on Hold				7	6		7	7	22		1	2	8	6		4			
Total Soil Vapor Samples for Analysis						35													
Total Soil Samples Collected			91																
Total Number of Locations			50																

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
- 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

ECL

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1 inch equals 100 feet

0 100 200 Feet

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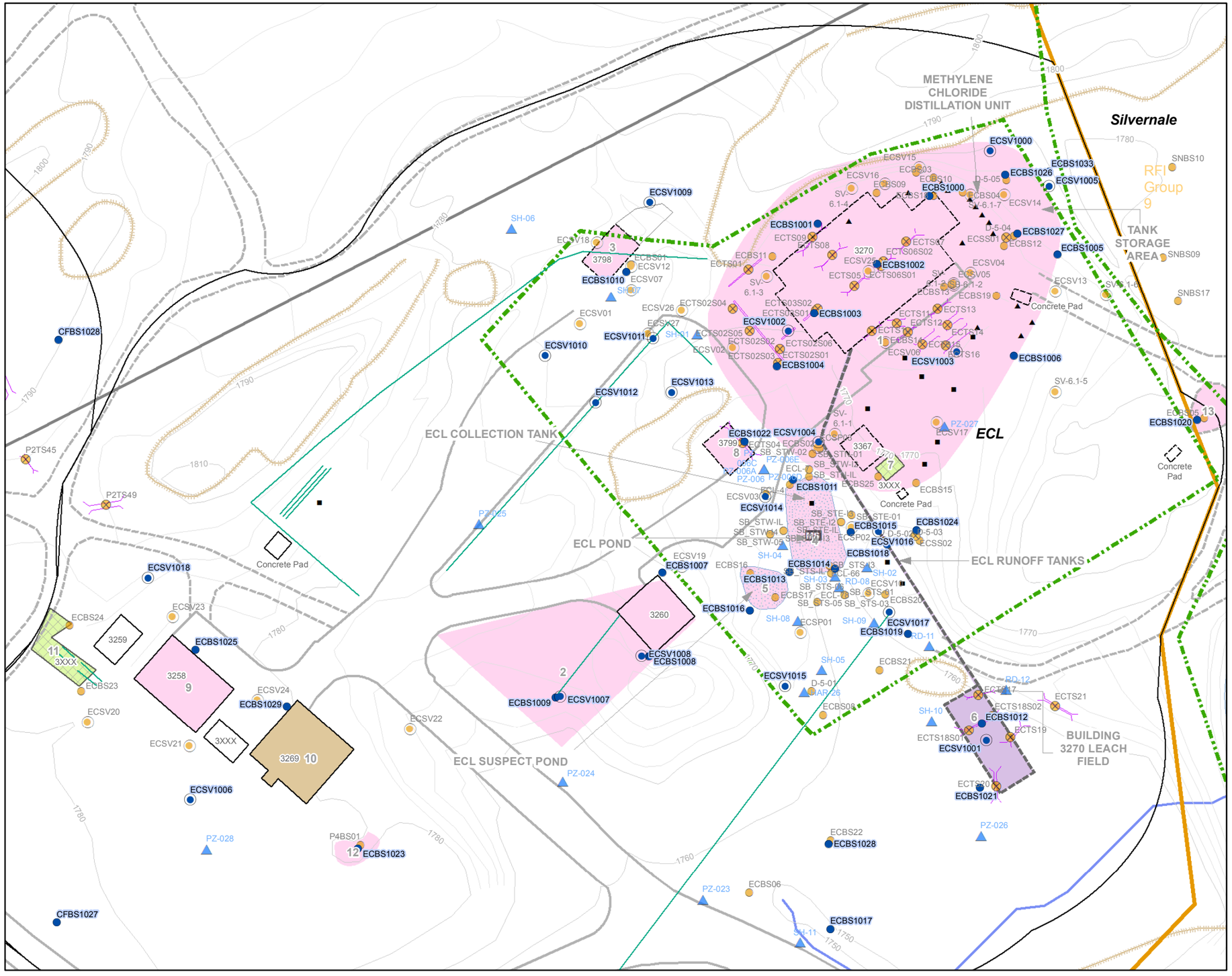
Figure 1



Proposed Sampling Locations

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

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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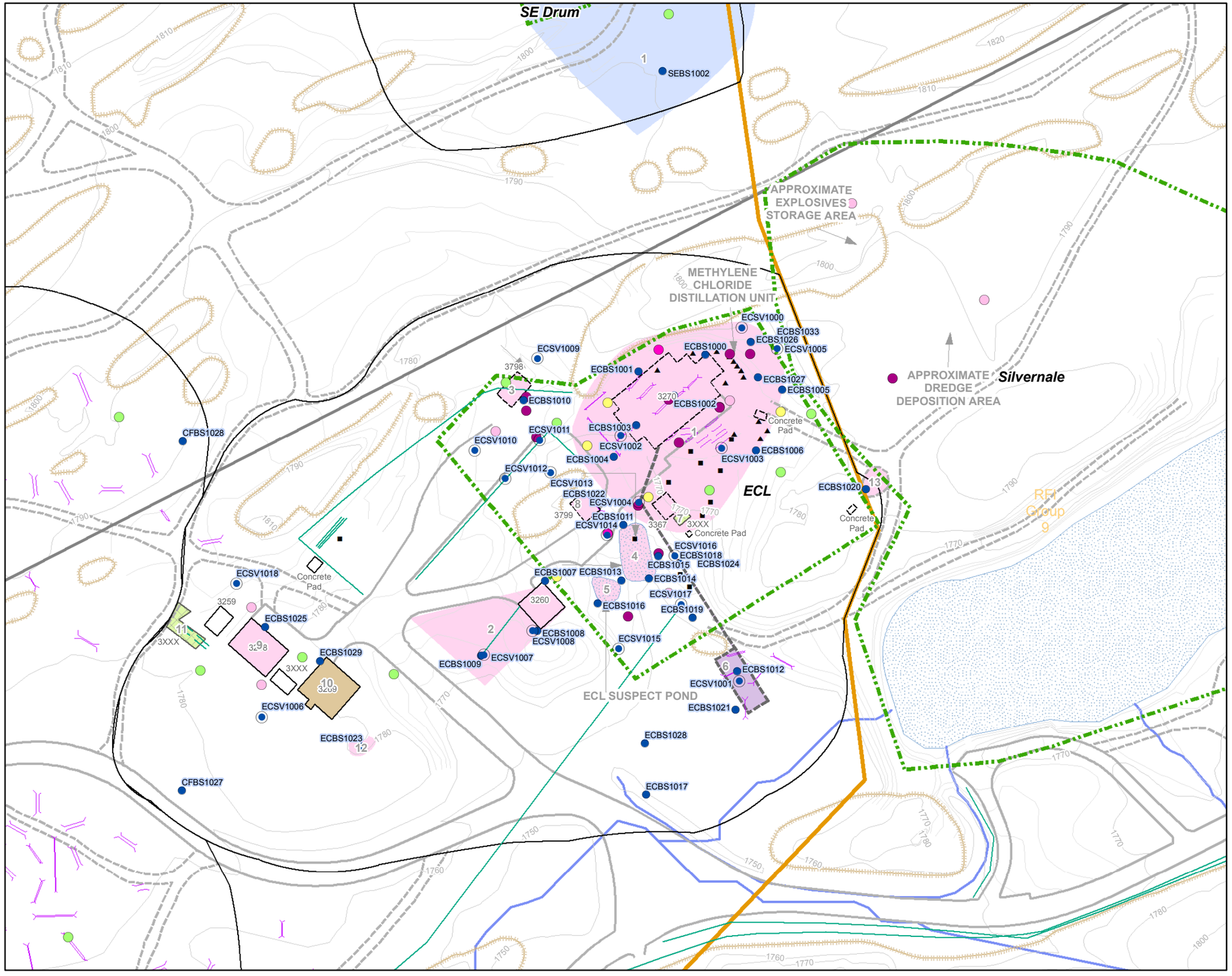
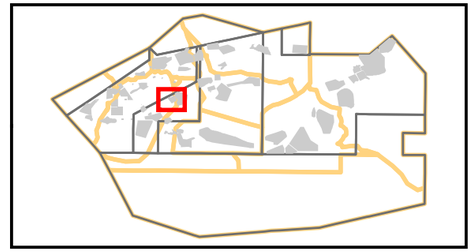
Figure 1a





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 100 feet

0 100 200 Feet

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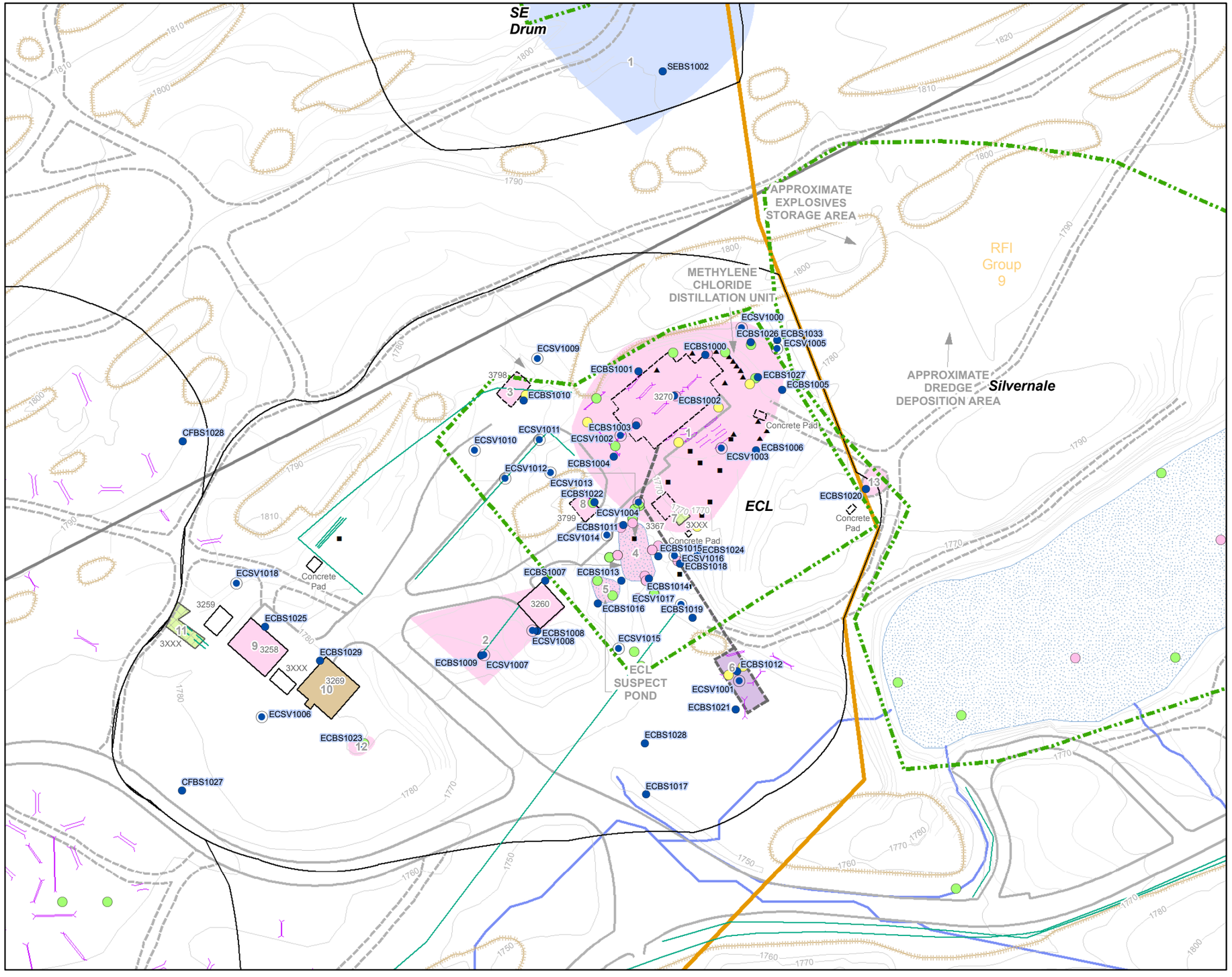
Figure 2



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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1 inch equals 100 feet

0 100 200 Feet

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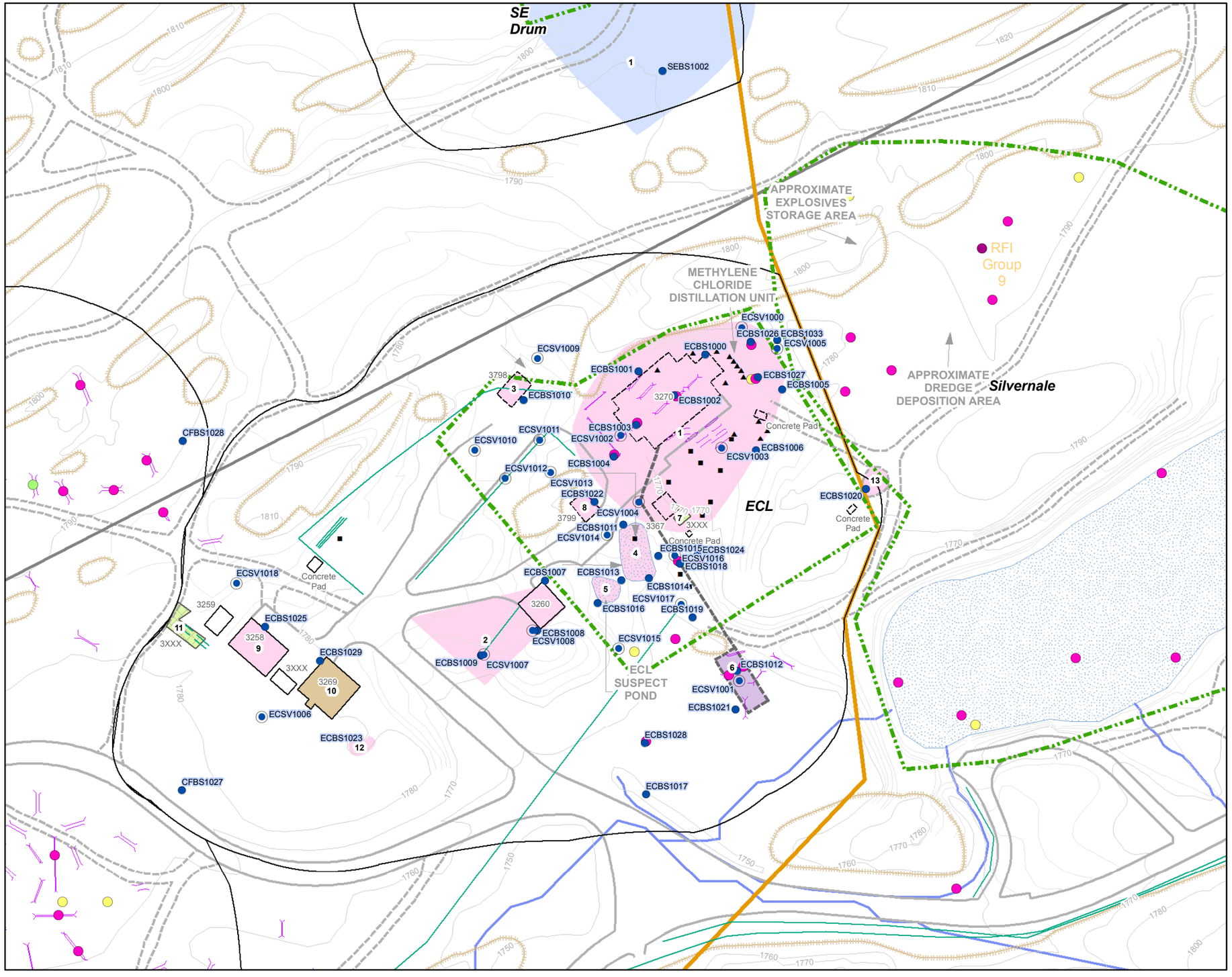
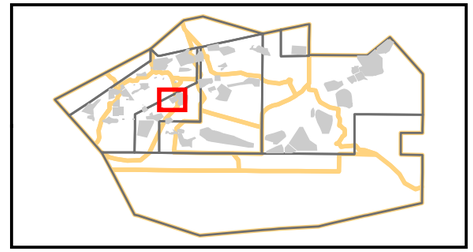
Figure 3





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 100 feet

0 100 200 Feet

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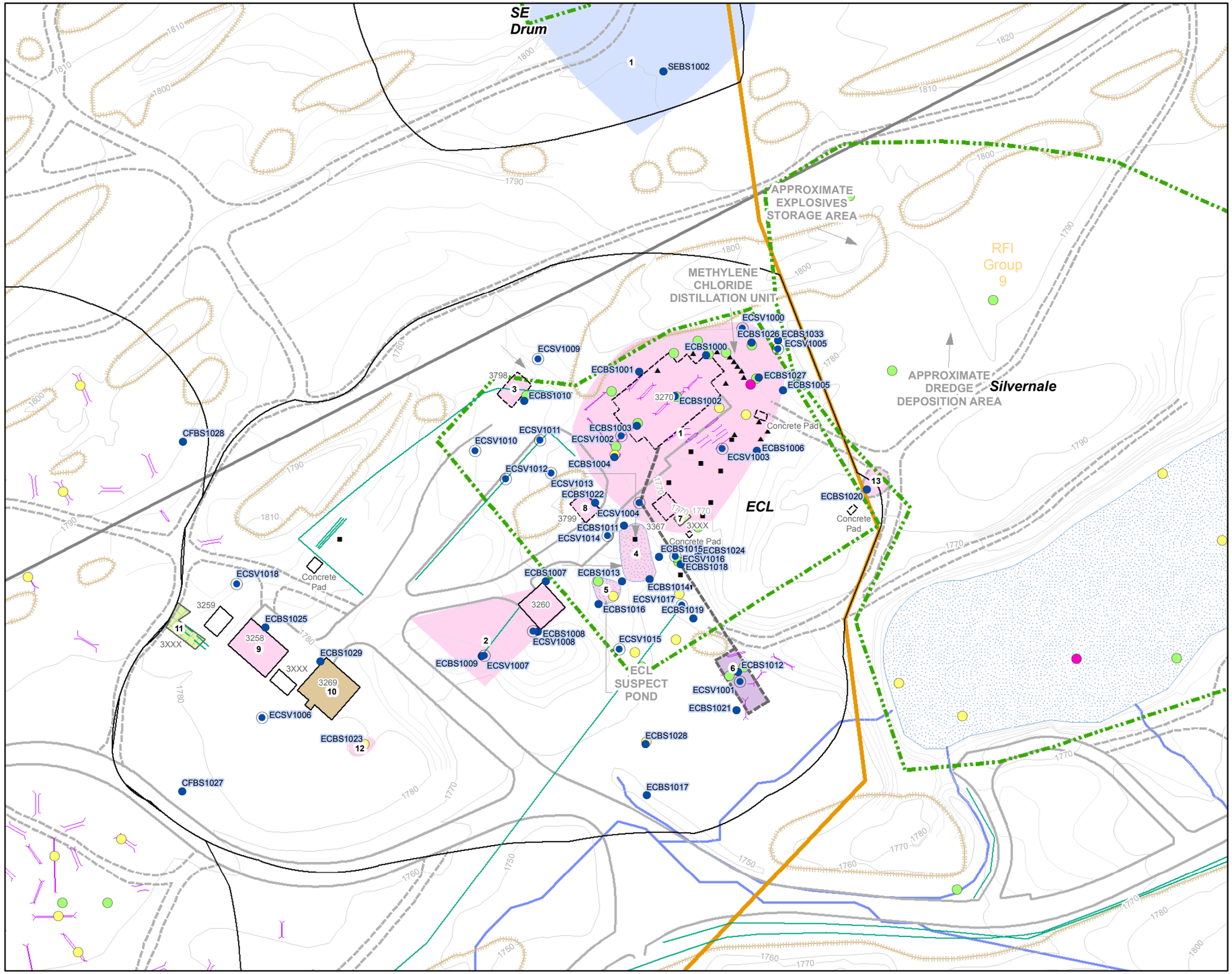
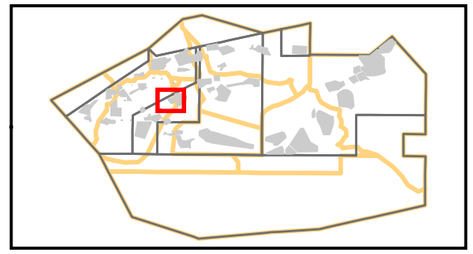
Figure 4





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 100 feet

0 100 200 Feet

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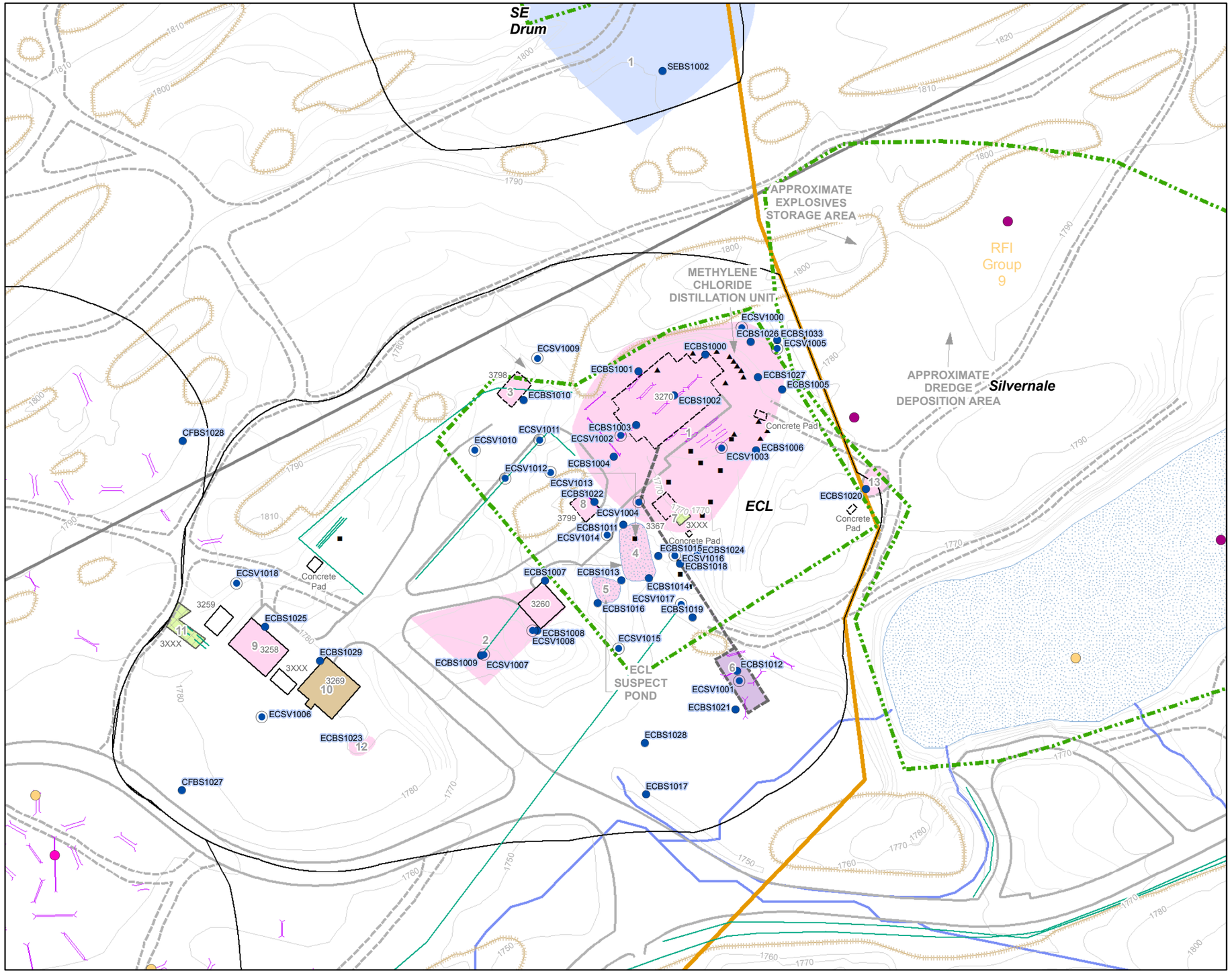
Figure 5



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

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Date: February 20, 2008

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1 inch equals 100 feet

0 100 200 Feet

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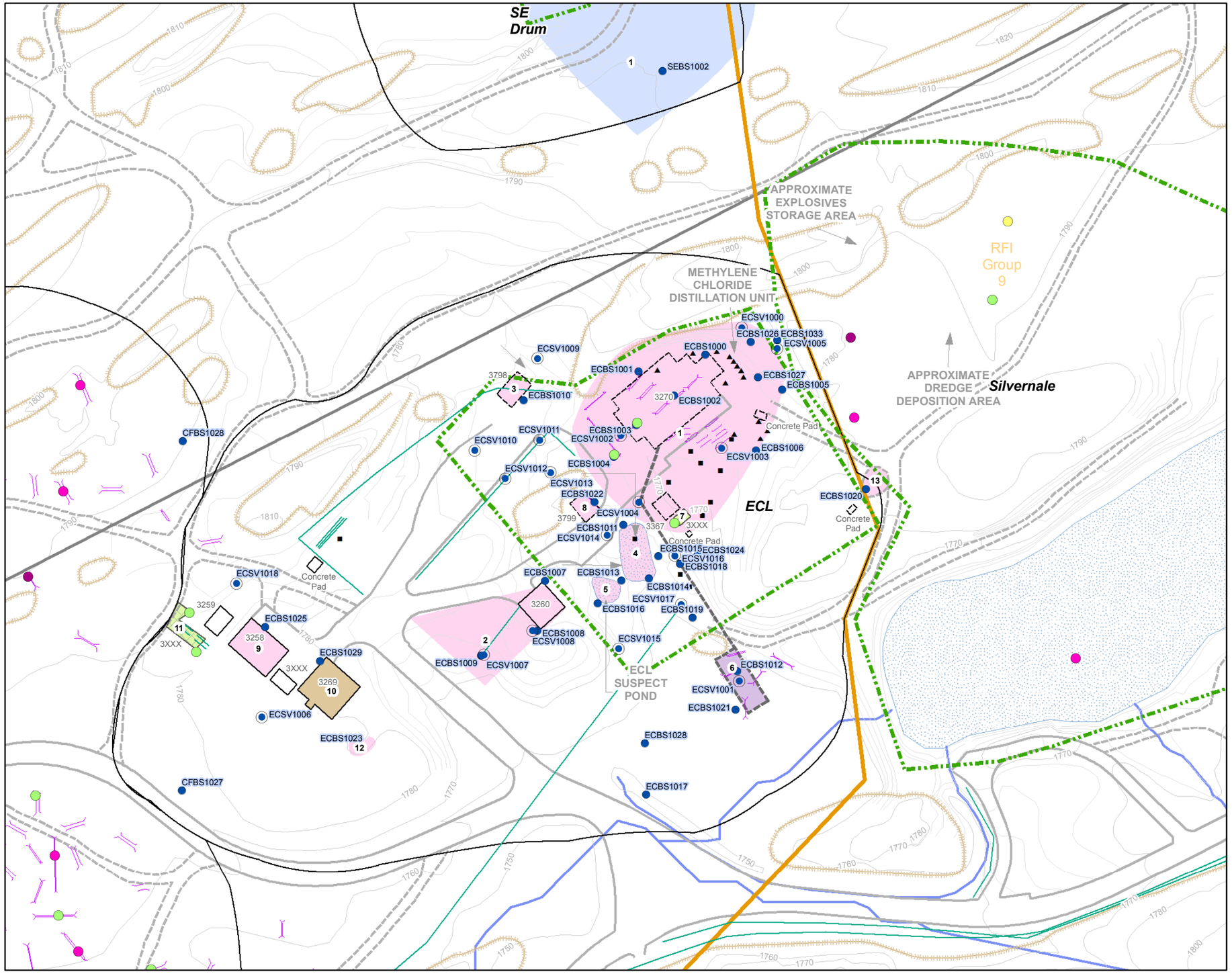
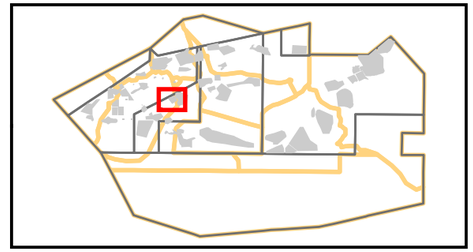
Figure 6





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

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1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

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Figure 7