Report

Group 5 – Central Portion of Areas III and IV RCRA Facility Investigation Report Santa Susana Field Laboratory, Ventura County, California

Volume VIII – RFI Site Reports Appendix P

United States Department of Energy Leach Fields 2

Prepared for:

The Boeing Company
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DRAFT IN PROGRESS

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Acronyms and Abbreviations

AI	Atomics International
AOC	Area of Concern
AST	aboveground storage tank
Boeing	The Boeing Company
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylenes
Cal-EPA	California Environmental Protection Agency
CCR	Current Conditions Report
CF	Chatsworth Formation
CFOU	Chatsworth Formation Operable Unit
CMS	Corrective Measures Study
COC	chemical of concern
COEC	chemical of ecological concern
COPC	chemical of potential concern
CPEC	chemical of potential ecological concern
CSM	conceptual site model
CTE	central tendency exposure
CUA	Chemical Use Area
DCA	dichloroethane
DCE	dichloroethene
DOE	United States Department of Energy
DQO	data quality objective
DTSC	Department of Toxic Substances Control
ECL	Engineering Chemistry Laboratory
EEL	Environmental Effects Laboratory
ELCR	estimated lifetime cancer risk
EPC	exposure point concentration
ERA	ecological risk assessment
ESL	ecological screening level

ETEC	Energy Technology Engineering Center
gpd	gallons per day
GRC	Groundwater Resource Consultants, Inc.
H&A	Haley and Aldrich
HAR	Hydrogeologic Assessment Report
HI	hazard index
HMSA	Hazardous Material Storage Area
HQ	hazard quotient
HRA	human health risk assessment
HSA	historical site assessment
ICF	ICF Kaiser Engineers
ILCR	incremental lifetime cancer risk
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
msl	mean sea level
MWH	Montgomery Watson Harza
NA	not applicable
ND	not detected
NDMA	n-nitrosodimethylamine
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
NSGW	near-surface groundwater
Ogden	Ogden Environmental and Energy Services Company, Inc.
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi/g	picocuries per gram
PDU	Coal Gasification Process Development Unit
pg/g	picograms per gram
ppb	parts per billion (µg/kg or µg/L)
ppm	parts per million (mg/kg or mg/L)

PRG	preliminary remediation goal
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	risk assessment
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RIHL	Rockwell International Hot Laboratory
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RME	reasonable maximum exposure
Rocketdyne	Rocketdyne Propulsion and Power
RWQCB	Los Angeles Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SE Drum Yard	Southeast Drum Storage Yard
SMOU	Surficial Media Operable Unit
SNAP	Systems for Nuclear Auxiliary Power
SOP	standard operating procedure
SQL	sample quantification limit
SRAM	Standardized Risk Assessment Methodology
SSFL	Santa Susana Field Laboratory
STL-IV	Systems Test Laboratory IV
STP-3	Area 3 Sewage Treatment Plant
SVOC	semivolatile organic compound
SWMU	solid waste management unit
3-D	three dimensional
TCDD-TEQ	2,3,7,8-tetrachlorodibenzodioxin toxicity equivalency quotient
TDS	total dissolved solids
TEQ	toxicity equivalency quotient
TIC	tentatively identified compound
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TRV	toxicity reference value

UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
µg/dl	micrograms per deciliter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/Lv	micrograms per liter vapor
µs/cm	micro siemens per centimeter
VOC	volatile organic compound
WPA	RFI Work Plan Addendum
WPAA	RFI Work Plan Addendum Amendments

Appendix P

P.1 Introduction

This appendix to the Group 5 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report presents findings and recommendations based on the results of the investigation conducted at the United States Department of Energy (DOE) Leach Fields 2 (DOE LF2) Site of the Santa Susana Field Laboratory (SSFL). The DOE LF2 Site contains one Area of Concern (AOC)—the Building 4010 Leach Field. The DOE LF2 Site, located within Area IV of the SSFL, was used in support of DOE operations. The RCRA Corrective Action Program at the SSFL is being conducted under the oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

The DOE LF2 Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the DOE LF2 Site within the SSFL and Group 5 Reporting Area is shown in Figure P.1-1. An RFI Site is an area that includes at least one solid waste management unit (SWMU) and/or an AOC, and some adjacent land for the purpose of characterization. The other 16 Group 5 RFI sites are:

- Boeing Area IV Leach Fields (AOC)
- Compound A Facility (SWMU 6.4)
- Engineering Chemistry Laboratory (ECL) (SWMUs 6.1, 6.2, 6.3, and AOC)
- Environmental Effects Laboratory (EEL) (SWMU 6.9)
- Pond Dredge Area (AOC)
- Coal Gasification Process Development Unit (PDU) (SWMU 7.10)
- Area 3 Sewage Treatment Plant (STP-3) (AOC)
- Southeast Drum Storage Yard (SE Drum Yard) (AOC)
- Systems Test Laboratory IV (STL-IV) (SWMUs 6.5, 6.6, and 6.7)
- Building 65 Metals Laboratory Clarifier (Building 65) (AOC)
- Building 100 Trench (SWMU 7.5)
- Department of Energy Leach Field 1 (DOE LF1) (AOC)
- Department of Energy Leach Field 3 (DOE LF3) (AOC)
- Hazardous Material Storage Area (HMSA) (AOC)
- Rockwell International Hot Laboratory (RIHL) (SWMU 7.7)
- Systems for Nuclear Auxiliary Power Facility (SNAP) (AOC)

The DOE LF2 Site is located in the northwestern corner of the Group 5 Reporting Area, northeast of the SNAP Site, northwest of the HMSA Site, and south and east of Group 7 Reporting Area (Figure P.1-1).

The SSFL RFI was conducted to (1) characterize the presence of SSFL-operation-related chemicals in environmental media, (2) estimate risks to human health and the environment (the ecosystem, that is), and (3) gather data for the next phase of RCRA Corrective Action to

support the recommendations included in this RFI Report regarding areas recommended for no further action (NFA), corrective measures study (CMS) areas, and interim stabilization areas.

The SSFL has been divided into two operable units (OUs)—the Surficial Media Operable Unit (SMOU) and the Chatsworth Formation Operable Unit (CFOU). The DOE LF2 Site characterization presented in this appendix comprises data for the SMOU and summaries of CFOU groundwater data. The SMOU includes soil, sediment, surface water, air, biota, and near-surface groundwater (NSGW) at the SSFL. NSGW is defined as groundwater occurring within alluvium or weathered bedrock of the Chatsworth Formation. The CFOU includes Chatsworth Formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth Formation.

P.1.1 Report Organization

This DOE LF2 Site Report provides detailed sampling data and evaluation pertaining to the DOE LF2 Site, including a summary of the site history, a summary of the RFI sampling and analyses, risk assessment results, and site recommendations. This information is presented in sections organized as follows:

- **Section P.2 – Site History, Chemical Use, and Current Conditions.** Presents the site history and chemical use, and the current conditions including geology and groundwater conditions. Changes in site conditions and soil disturbance areas are also described.
- **Section P.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU and CFOU groundwater characterization information for the DOE LF2 Site.
- **Section P.4 – Summary of Risk Assessment Findings**. Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the DOE LF2 Site; the complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section P.5 – DOE LF2 Site Actions Recommendations**. Presents a summary of the DOE LF2 Site areas recommended for either NFA or further evaluation in the CMS. CMS Areas recommended for interim measures to prevent contaminant migration are also identified, if any.
- **Section P.6 – References.** Includes a list of cited references.

Site-specific additional information is provided in the following attachments:

- **Attachment P-1**: Site-specific regulatory agency documents and correspondence.
- **Attachment P-2**: Subsurface information (soil boring, trench, piezometer, and well logs).
- **Attachment P-3**: Data quality, validation, and laboratory reports.
- **Attachment P**-4: Building surveys.

Information regarding characterization for the DOE LF2 Site is provided in the following figures and tables:

- Figure P.1-1: Presents the location of the DOE LF2 Site within the SSFL and the Group 5 Reporting Area.

- Figure P.2-1: Presents a plan view of DOE LF2 Site, showing known and potential Chemical Use Areas. Tables P.2-1 through P.2-5 present summaries of buildings, tanks, transformers, other site features, and spills at the DOE LF2 Site.
- Figure P.2-2: Presents a plan view of the DOE LF2 Site, showing soil and soil vapor sampling locations, and nearby monitoring wells.
- Figures P.2-3A through P.2-3C: Present geologic cross-sections across the DOE LF2 Site.
- Figures P.3-1 through P.3-9: Summarize soil and soil vapor sampling at the DOE LF2 Site. Soil and soil vapor sampling results are shown on these maps and are also listed in Tables P.3-2A and P.3-2B.

Information regarding Group 5 areawide conditions, transport and fate of chemicals between RFI sites, and other evaluations of areawide issues are contained in the Group 5 RFI Report (Volume I) and appendixes. Pertinent appendixes to this Group 5 RFI Report are:

- **Appendix A:** Presents risk assessment information, including risk calculations, result tables, all transport-and-fate modeling (except groundwater), and a description of any methodology variances from the Standardized Risk Assessment Methodology (SRAM) Work Plan.
- **Appendix B:** Presents information regarding groundwater conditions in the Group 5 Reporting Area, including the DOE LF2 Site. Information includes groundwater occurrence and quality, chemical transport, data set representativeness, and supporting data (monitoring results, time-series plots, and hydrographs), as well as an evaluation of naturally occurring constituents.

P.1.2 Historical Reference Documents

A searchable database of historical documents for the Group 5 Reporting Area is being submitted to DTSC along with this Group 5 RFI Report (Boeing, 2008). Included are facility records, maps and drawings, correspondence, and reports relevant to the RFI for each of Group 5 RFI sites. Documents pertaining to the entire SSFL are also included if they are relevant to Group 5. The Group 5 document database includes documents relevant to the DOE LF2 Site. It is worth noting that information presented in this DOE LF2 Site report is supplemented by background documents that contain information about site and facility background, SMOU Program background, and methodologies/procedures. Key historical documents are listed below with brief descriptions:

- RCRA Facility Assessment (RFA) (Science Applications International Corporation [SAIC], 1994). This report contains:
  - A brief description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight during the late 1980s and early 1990s.
  - Visual inspection records performed at facility operations.
  - Definition and description of SWMUs and AOCs identified during the assessment.

- Current Conditions Report (CCR) (ICF Kaiser Engineers [ICF], 1993). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight during the late 1980s and early 1990s.
  - Description of SWMUs and AOCs, including presentation of results from environmental sampling performed to assess current conditions.
  - A draft work plan for further investigation during the RFI for selected SWMUs and AOCs.
- RFI Work Plan Addendum (WPA) (Ogden Environmental and Energy Services Company, Inc. [Ogden], 1996), RFI Work Plan Addendum Amendments (WPAA) (Ogden, 2000a and 2000b]. These reports contain:
  - Sampling procedures and rationale.
  - RFI site descriptions and operational history.
  - Shallow groundwater characterization sampling and analysis plan for the SSFL.
- RFI Program Report (Montgomery Watson Harza [MWH], 2004). This report contains:
  - A general description of the SSFL facility, including an operational history, physical setting information, and regulatory programs and oversight.
  - A summary of the RCRA Corrective Action Program being conducted at the SSFL and a description of the OUs.
  - A comprehensive description of the SMOU field sampling program, including work plans followed, overall sampling scope performed, sampling methods and subcontractors used, and protocol followed.
  - Details of the analytical program for the SMOU RFI, including laboratories used, data validation findings, and Data Quality Assessment findings.
  - Programmatic key decision points or significant issues that influenced sampling, laboratory procedures, methodologies, or step-out requirements.
- Standardized Risk Assessment Methodology (SRAM) Work Plan, Revision 2 (MWH, 2005). This report contains:
  - Procedures for completing HRAs and ERAs.
  - Background soil concentrations and groundwater comparison concentrations.
  - A biological conditions report for the SSFL.
- Near-Surface Groundwater Characterization Report (MWH, 2003b). This report contains:
  - Nature and extent of near-surface groundwater at the SSFL.
  - Distribution, transport, and fate of trichloroethene (TCE) and other chemicals of concern, and the relationship of NSGW to CFOU groundwater.
- CFOU Characterization Reports (Montgomery Watson, 2000; MWH, 2002 and 2003a). These reports contain:

  - Geologic framework at the SSFL and hydrogeologic conditions of both NSGW and CFOU groundwater.
  - Transport and fate of TCE, and the occurrence and transport of other chemicals of concern in the CFOU groundwater.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual Groundwater Monitoring Report (Haley & Aldrich, Inc. [H&A], 2008a).
  - Second Quarter 2007 Groundwater Monitoring Report (H&A, 2007a).
  - Third Quarter 2007 Groundwater Monitoring Report (H&A, 2007b).
  - Fourth Quarter 2007 Groundwater Monitoring Report (H&A, 2008b).
  - First Quarter 2008 Groundwater Monitoring Report (H&A, 2008c).
- Historical Site Assessment (Sapere, 2005). This report contains:
  - Facility descriptions and historical operational information for buildings used for radiological research and development in Area IV.
  - Information regarding radiological demolition activities, surveys, releases, and removal actions conducted for radiological areas within Area IV.
- Debris Area Survey and Sampling Methodology (CH2M HILL, in progress). This Standard Operating Procedure (SOP) provides general guidelines for performing the following activities:
  - Visual inspections of the SSFL for surficial evidence of solid waste disposal (referred to herein as debris areas)
  - Sampling for chemical analytes at debris areas
- Quality Assurance Project Plan (QAPP) (MECx, 2008). This QAPP provides general guidelines that include:
  - Quality assurance/quality control (QA/QC) procedures to ensure that field and laboratory data quality and project work meet the data quality objectives (DQO).
  - Ensuring that the project work performed is in accordance with professional standards and regulatory guidelines.
- Building Feature Evaluation and Sampling (MWH, 2008). This SOP presents the procedures for evaluating environmental conditions associated with existing buildings, concrete pads, and supporting infrastructure under the following scenarios:
  - Environmental assessment prior to building demolition
  - Environmental assessment during/after building demolition
  - Environmental assessment for buildings not planned for demolition

P.2 Site History, Chemical Use, and Current Conditions

The DOE LF2 Site is approximately 1.8 acres in the western portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure P.1-1, which also shows the Group 5 Reporting Area boundary. The site layout and the locations of Chemical Use Areas are shown in Figure P.2-1. The sampling locations across the site are shown in Figure P.2-2.

During the RFA, various SWMUs and AOCs within the SSFL were identified. The Building 4010 Leach Field was identified as an AOC in the RFA (SAIC, 1994). No other SWMUs or AOCs were identified in the RFA within the boundary of the DOE LF2 Site as it is defined in this report (Figure P.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps, as well as on interviews with site personnel conducted during the RFI, the DOE LF2 Site boundary was defined to include operations associated with the Building 4010 Leach Field. In addition, facilities or features near this AOC were included for assessment in the RFI. These include former Buildings 4010, 4012, 4013, 4228, 4310, 4710, 4807, 4808, 4809, and 4823. Also included are 19 aboveground storage tanks (ASTs), 1 underground storage tank (UST), 2 transformers, 4 electrical substations, an air compressor pad, water cooling pipelines, and a tank pit. The identified chemical use areas at the DOE LF2 Site are shown in Figure P.2-1 and described in Tables P.2-1 through P.2-4. A spill record is included in Table P.2-5.

The following sections describe the AOC, site history and operations, chemicals used, and current conditions at the DOE LF2 Site.

P.2.1 SWMUs and/or AOCs at the DOE LF2 Site

The DOE LF2 Site contains one AOC—the Building 4010 Leach Field (SAIC, 1994). A brief description of the AOC that is included in this RFI Site Report is presented below.

P.2.1.1 Building 4010 Leach Field (AOC)

The Building 4010 Leach Field was located west of Building 4010 and received flow from a 750-gallon septic tank associated with Building 4010. The leach field was constructed of 4-inch-diameter terra cotta clay piping surrounded by gravel, buried at depths ranging from 2 to 6 feet below ground surface (bgs). The leach field consisted of 90 linear feet of leach lines. The leach fields and septic tanks were not used later than 1961, when a sanitary sewer system came online at the site. The Building 4010 leach field was covered with compacted fill to support the construction of adjacent buildings. The Building 4010 leach field was not located during geophysical surveys and subsurface investigations performed between 1999 and 2003. Additional information is described in Tables P.2-1 through P.2-5.

P.2.1.2 Other Site Features

Buildings and support features throughout the DOE LF2 Site were used as test facilities and component assembly for the SNAP program. The former Buildings include: 4010 (SNAP power demonstration test facility), 4012 (SNAP critical test facility), 4013 (SNAP reactor component assembly), 4228 (generator), 4310 (changing room), 4710 (cooling towers), 4807

(electrical equipment pad), 4808 (electrical equipment pad), 4809 (heating equipment pad), and 4823 (time clock).

P.2.2 DOE LF2 Site History

A summary of the site chronology, including descriptions of site operations and investigation activities for the DOE LF2 Site, is presented below. Facility correspondence, investigation reports, waste disposal records, facility maps, drawings, photographs, and personnel interview records were reviewed and evaluated to compile the site history information presented. Primary sources of information are summarized in Section P.1.2.

P.2.2.1 Site Chronology

A summary of key historic investigation and remediation activities are presented in Tables P.2-6 and P.2-7. A more detailed description of the DOE LF2 Site is presented below.

P.2.2.1.1 1959 through 1961

The Building 4010 leach field accepted sanitary wastes from Building 4010 from the time of construction until 1961, when a central sanitary sewer system became available throughout SSFL.

P.2.2.1.2 1959 through 1965

Building 4010 was used to test various experimental reactors developed in the SNAP program. The SNAP program tested compact reactors for various applications. Support and reactor operations were conducted in a variety of the buildings in Group 5. In 1959 and 1960, the SNAP 2 test program was conducted at Building 4010. In 1961, modifications to Building 4010 began to allow for testing of the SNAP 8 Experimental Reactor (S8ER). Actual testing of the S8ER reactor was conducted from 1963 to April 1965, at which time the reactor was removed from Building 4010.

P.2.2.1.3 1962 through Unknown Year (Pre-2003)

Building 4013 was constructed in 1962 to assemble non-nuclear SNAP 10A, SNAP 8, and SNAP 2 ground test and flight systems. Subsequently, the facility was used for thermal transient testing. The facility was also used for stress testing to simulate seismic events.

During this same period, low power nuclear experiments were performed in Building 4012 to collect critical data for the design of SNAP reactor cores for higher-power operation. Building 4012 was used as the SNAP Critical Test Facility No. 2 from 1962 to 1968, housed the Heavy Metal Reflected Fast Spectrum Reactor from 1970 to 1972, and used as an Energy Technology Engineering Center (ETEC) X-ray facility and storage from 1979 to 1992.

P.2.2.1.4 1977 through 1982

Decontamination and decommissioning of Building 4010 was conducted. The building was finally demolished in 1978. After demolition of the building, an asphalt parking was built over the footprint. In 1982, DOE released the former Building 4010 area for unrestricted use.

P.2.2.1.5 Early 1980s through 1993

Building 4228 was constructed in the early 1980s for use as the sodium component test installation (SCTI) Power Pak facility to generate power. Power was generated from 1988 through 1993 and sold on the grid through Edison Power.

P.2.2.1.6 2000

A geophysical survey was performed in 2000 to locate the Building 4010 leach field and associated septic tank. Neither the septic tank nor the leach field was found.

P.2.2.1.7 2003

Buildings 4012, 4013, 4228, and 4710 were demolished. No indications of the former leach field were observed during building demolition.

P.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the DOE LF2 Site were compiled during preparation of this RFI report. Historical reports and facility drawings were reviewed, and visual site inspections were conducted. The locations of identified buildings, tanks, transformers, and other site features are shown in Figure P.2-1. The inventories are included as the following tables:

- Building inventory – Table P.2-1
- Storage tank inventory – Table P.2-2
- Transformer inventory – Table P.2-3
- Inventory of other site features – Table P.2-4
- Spill Inventory – Table P.2-5

P.2.3 DOE LF2 Site Chemical Use Areas

Chemical Use Areas are locations where chemicals were documented to have been (or potentially have been) used, stored, spilled, discharged, and/or disposed of. Based on the review of historical documents, 17 Chemical Use Areas were identified within the DOE LF2 Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals. Chemical Use Areas at the DOE LF2 Site are shown in Figure P.2-1 and described in detail in Table P.2-8.

P.2.4 Site Conditions

This section provides summaries of site conditions near the DOE LF2 Site, including topography, geology, soil, groundwater, surface water, and biology.

P.2.4.1 General Conditions and Topography

The DOE LF2 Site is located within the western portion of Area IV. The site is currently inactive, with no remaining structures. Current surface elevations at the DOE LF2 Site are relatively flat at approximately 1808 to 1810 feet mean sea level (msl) across the site. Surface topography in the central portion of the site slopes to the south-southwest. Topography

north of the site slopes to the northwest. A summary site conceptual model is presented in Table P.2-9. Figures P.2-3B and P.2-3C present cross-sections developed for the DOE LF2 Site (Surficial Cross Sections N-N' and X-X'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. The location of the cross-section is shown in Figure P.2-3A.

P.2.4.2 Geology

The DOE LF2 Site is located north of the Coca Fault, in the Upper Burro Flats Member of the Upper Chatsworth Formation (Dibblee, 1992; MWH, 2002 and 2007C). Beds of the Upper Burro Flats Member generally strike N70°E and dip 25°NW. The Upper Burro Flats Member is predominantly composed of fine- and medium-grained sandstone with minor interbeds of siltstone and shale. Figure 2-5 of the Group 5 RFI Report (Volume I) shows the geologic units represented within the RFI site. The location of the Coca Fault is shown in Plate B-1 in Appendix B of the Group 5 RFI Report. Additional geologic information is also presented in Appendix B of the Group 5 RFI Report.

P.2.4.3 Soil

Throughout most of the DOE LF2 Site, soil is generally thin, typically ranging from approximately 1.5 feet to 10 feet thick. A map depicting the distribution of alluvial soil within the Group 5 Reporting Area is provided in Figure 2-4 in the Group 5 RFI Report (Volume I). Soil in the undisturbed areas of the site consists of weathered Chatsworth Formation materials, which are primarily fine-grained silty sands, silts, lean clays, clayey sands, and sandy lean clays. Soil boring logs are included as Attachment P-2 to this appendix.

P.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 is discussed in detail in Appendix B of the Group 5 RFI Report. In that appendix, Figure B-4 shows the locations of wells and piezometers that are used to monitor groundwater at and near the DOE LF2 Site. Figure P.2-1 shows well locations in and around the DOE LF2 Site.

At the DOE LF2 Site, no piezometers or shallow wells were installed to monitor groundwater conditions in alluvium and weathered bedrock (that is, in NSGW), while two wells (RD-93 and RD-95) were installed to monitor groundwater conditions in the unweathered bedrock (that is, in CFOU Groundwater). Construction details for these wells/piezometers are discussed in Tables B-2 and B-3 in Appendix B of the Group 5 RFI Report, and their locations are shown in Figure P.2-2.

NSGW is suspected to be laterally continuous with CFOU Groundwater at the DOE LF2 Site (MWH, 2003b). A cross-sectional diagram of NSGW and CFOU Groundwater occurrence is shown in Figure B-6 in Appendix B of the Group 5 RFI Report. NSGW is estimated to occur at depths ranging from of 13 feet below ground surface (bgs) (1796 feet msl) to 22 feet bgs (1787 feet msl) and flows northwest to northeast at a hydraulic gradient of approximately 0.04 foot per foot. The occurrence of NSGW in the DOE LF2 Site area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report. Since no NSGW wells or piezometers are installed within the DOE LF2 Site, the occurrence of NSGW at the DOE LF2

Site is estimated based on data for wells and piezometers located in adjacent RFI Sites. The locations of these wells are shown in Figure B-7 in Appendix B of the Group 5 RFI Report.

CFOU groundwater at the DOE LF2 Site is encountered at depths ranging from 32 feet bgs (1778 feet msl) at RD-93 to 52.4 feet bgs (1758.96 feet msl) in RD-95 and has a hydraulic gradient of approximately 0.08 foot/foot to the northwest. The occurrence of CFOU Groundwater in the DOE LF2 Site area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report. Depths to CFOU groundwater are quite variable at this site due to a combination of physical features that exist within the Group 5 Reporting Area. These physical features and their influence on groundwater occurrence are discussed further in Appendix B in Group 5 RFI Report.

P.2.4.5 Surface Water

Surface water flow at the DOE LF2 Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the DOE LF2 Site as the result of seasonal precipitation events. While there are no perennial bodies of surface water at the site, stormwater runoff flows generally south to southwest. A surface water divide is located immediately north of the site.

Surface water runoff at the site is regularly monitored as part of the National Pollutant Discharge Elimination System (NPDES) monitoring program under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB). One monitoring location, Outfall 018, occurs downgradient at the discharge of the R-2 Ponds (Figure 2-7 of the Group 5 RFI Report [Volume I]). This discharge point is the ultimate discharge point for a large portion of the western half of SSFL.

P.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the DOE LF2 Site, including habitat/vegetation types, are shown on Figure 2-10 of the Group 5 RFI Report (Volume I). The results of the biological survey and a qualitative plant evaluation are presented in Appendix A, Attachment A18, in the Group 5 RFI Report.

P.3 Nature and Extent of Chemical Impacts

This section describes the data used to define the nature and extent of chemical impacts to environmental media at the DOE LF2 Site. The presentation includes sampling objectives, scope, key decision points related to characterization activities, and findings.

Evaluations of the transport and fate are discussed in the following sections of the Group 5 RFI Report:

- Group 5 RFI Report (Volume I), Section 5, Contaminant Transport and Fate – Potential migration via surface water flow
- Group 5 RFI Report (Volume II), Appendix A, Risk Assessment - Potential VOC migration from groundwater and subsurface soil to soil vapor, and soil vapor to indoor and ambient air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

P.3.1 Sampling Objectives

Based on the review of historical documents summarized in Section P.2, additional soil and soil vapor samples were collected to further characterize the site based on the RFI DQOs. The process of selecting sampling locations, depths, and analytical methods considered objectives established in the Group 5 DQOs as summarized in the Group 5 RFI Report, Section 4.0 (Volume I).

To achieve these objectives, recent soil sampling was conducted as described in Tables P.3-1A and P.3-1B, with consideration of the following:

- Additional information regarding site use and observed site conditions
- Site sampling results and data trends
- Knowledge of chemical properties (such as mobility, volatility, and association with other chemicals)
- SSFL SRAM-based screening concentrations for human health and ecological receptors
- Risk assessment results and knowledge of areas recommended to require further evaluation during the CMS

Groundwater has been sampled to comply with sitewide routine monitoring requirements and additional characterization objectives according to regulatory agency-approved work plans (see Section P.3.2). Based on detected RFI site chemicals, chemical distribution, and site conditions, additional groundwater sampling and analysis were conducted to complete characterization of individual RFI sites and to provide data sufficient for risk assessment. Groundwater sampling was conducted as described in the Sampling Analysis Plans (GRC, 1995a and 1995b) and the Shallow Zone Groundwater Investigation Work Plan (Ogden, 2000b).

P.3.2 Sampling Scope

A total of 40 soil matrix samples and 5 soil vapor samples was collected during March 2008 and April 2008 to assess potential impacts associated with the chemical use areas at the DOE LF2 Site. Sampling locations and analytical suites were based on sampling results from previous investigations, additional facility information obtained from historical records, site inspections and/or personnel interviews, and historical and/or aerial photographs. Sampling schedules are presented in Tables P.3-1A and P.3-1B. Sample locations are shown in Figure P.2-2.

Both CFOU groundwater and NSGW have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). At the DOE LF2 Site, two Chatsworth Formation wells (RD-93 and RD-95) were used to characterize CFOU groundwater. No NSGW monitoring wells or piezometers are present at the DOE LF2 Site. Groundwater characterization data for the DOE LF2 Site are presented with the entire Group 5 groundwater data set in Appendix B of the Group 5 RFI Report.

In 2008, soil samples collected were submitted to two California-certified environmental laboratories—GEL Engineering Laboratories in Atlanta, Georgia, and Test America, Inc. in Arvada, Colorado. As an ongoing, additional QA measure, the field sampling effort consisted of collecting blind duplicates and split samples at a frequency of approximately 5 percent of primary samples. Blind duplicates were submitted along with the primary samples to the two environmental laboratories. Split samples were submitted for analyses to Lancaster Laboratories in Lancaster, Pennsylvania, a California-certified environmental laboratory previously designated for analyzing split samples only. Highest concentrations of usable data from primary, duplicate, and split samples were used when evaluating contamination at the site.

Based on a QA review conducted on soil and soil vapor sampling results, data have been deemed usable and in compliance with RFI program requirements as defined by the QAPP (MECx, 2008) in Appendix V of the Group 5 RFI Report. The RFI QA program included individual sample data validation, assessment of the performance of each laboratory, and a qualitative review of the precision, accuracy, representativeness, reliability, and completeness parameters for the datasets collected for this RFI. A summary of the data quality evaluation is presented in Attachment P-3 of this report. Historical samples (collected prior to the beginning of the RFI in 1996) data quality evaluation is described in the RFI Program Report (MWH, 2004). Site-specific data quality summaries for the DOE LF2 Site are described by media in the sections below.

This report presents results of media sampling, if the media exists at the RFI site, conducted during the RFI and previous investigations at DOE LF2 Site, including results for the following media:

- Soil vapor
- Soil matrix
- Groundwater
- Surface water

P.3.3 Key Decision Points

Site assessment was been performed to address revised, DTSC-approved requirements for risk assessment and evaluate new potential Chemical Use Areas. Sampling of new Chemical Use Areas and step-out sampling procedures followed the DTSC-approved work plan protocols for the RFI (MWH, 2005).

Site-specific characterization decision points are described in Table P.3-2A. These decision points represent either assumptions upon which sampling was based, or decisions made during step-out sampling or data evaluation. Programmatic decision points (those common to all RFI sites) are described and included in the RFI Program Report (MWH, 2004).

P.3.4 Soil Matrix and Soil Vapor Findings

Soil and soil vapor sampling results and characterization findings are summarized in Table P.3-2A. The goals of the table are to:

1. Present summaries of sampling results, including nature and extent of impacts.
2. Evaluate the soil and soil vapor characterization and assess whether further sampling is warranted.
3. Indicate that soil and soil vapor volumes for areas recommended for CMS can be estimated within a factor of 10 for comparison of remedial alternatives.

Goals 2 and 3 are achieved through an iterative evaluation process that takes into account the risk assessment results and CMS recommendations, as well as the soil and soil vapor analytical data. For example, if detected concentrations are sufficiently high to indicate that further evaluation in the CMS will be necessary, the data are considered to be adequate for the purpose of risk assessment. Similarly, the risk assessment results can be used along with the soil and soil vapor analytical results to delineate CMS areas and estimate soil and soil vapor volumes within an order of magnitude (Goal 3). Other criteria used to evaluate characterization completeness include the sampling results compared to screening levels, the presence and magnitude of concentration gradients, the types of historical site operations and chemical uses, and analytical detection limits.

The evaluation of site characterization data for the DOE LF2 Site is provided in Tables P.3-3A and P.3-3B.

P.3.4.1 Soil and Soil Vapor Data Presentation

The results by chemical group are summarized in Figures P.3-1 through P.3-9. Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table P.3-2A. This table discusses the sampling approach for each Chemical Use Area and a brief summary of the sampling results by chemical group, including:

- Column 1 – Chemical Use Number.
- Column 2 – Chemical Use Area Name.
- Column 3 – Chemical group sampled in a particular Chemical Use Area.

- Column 4 – Sampling scope and rationale for each chemical group in a particular Chemical Use Area.
- Column 5 – Abbreviated summary of sampling results for soil and soil vapor for each chemical group in a particular Chemical Use Area. (A more detailed sitewide summary is presented in Section P.3.4.2 below.) As appropriate, sample results are compared to established SSFL background concentrations (metals and dioxins only) and/or SSFL risk-based screening levels (RBSLs).[1] The screening levels are also displayed in Tables P.3-3A and P.3-3B.
- Column 6 – Assessment of whether characterization of chemical concentration gradients is sufficient such that the risk assessment reflects the approximate maximum analyte concentration or a concentration sufficiently high to result in risk requiring a recommendation for evaluation during CMS.
- Column 7 – Assessment of whether characterization is sufficient to estimate soil volumes (within a factor of 10) for areas that require further consideration in the CMS (if needed).

P.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Tables P.2-8, 17 Chemical Use Areas were investigated at the DOE LF2 Site. A summary of the chemicals detected above screening criteria is provided below by chemical analytical group. Concentrations denoted with a "J" flag indicate the results are estimated below the method reporting limits.

P.3.4.2.1 Volatile Organic Compounds

A total of five soil vapor samples was collected at three locations and analyzed for VOCs. Of the five samples, two samples had detectable levels of VOCs, and results are shown in Figures P.3-1A and P.3-7.

- Toluene, 1,1,1-trichloroethane (1,1,1-TCA), cis-1,2-dichloroethene (cis-1,2-DCE), and 1,1-dichloroethane (1,1-DCA) were detected at concentrations that did not exceed their respective RBSLs.

A total of eight soil samples was collected at four locations and analyzed for VOCs. Of the eight samples, four samples had detectable levels of VOCs and results are shown in Figures P.3-1B and P.3-7.

- Formaldehyde, styrene, and xylenes were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of VOCs in soil and soil vapor is not recommended.

[1]The use of the SRAM-based screening levels for comparison purposes does not serve as a risk assessment. These screening levels are not used to determine the significance of detected chemical concentrations or if a Chemical Use Area will be recommended for further consideration in the CMS, but only to provide the reader another tool to evaluate the characterization data. The SRAM-based screening levels represent conservative concentrations that pose a low level of risk. See Appendix A of the Group 5 RFI Report.

P.3.4.2.2 Semivolatile Organic Compounds

A total of 21 soil samples was collected at 12 locations and analyzed for SVOCs. Of the 21 samples, 15 samples had detectable levels of SVOCs, and results are shown in Figures P.3-2 and P.3-8.

- Bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, dimethyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, and pentachlorophenol were detected at concentrations that did not exceed their respective RBSLs.
- Out of the 20 samples collected and analyzed for polynuclear aromatic hydrocarbons (PAHs), 10 had detectable concentrations of PAHs.
  - Benzo(a) pyrene was detected above its Residential RBSL of 60 micrograms per kilogram (µg/kg) in two samples collected from L1BS1000 at a depth of 0 to 1 foot bgs (112 µg/kg) and L1BS1405 at a depth of 0 to 1 foot bgs (89 J µg/kg).
  - 15 additional PAHs were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of SVOCs in soil is not recommended.

P.3.4.2.3 Total Petroleum Hydrocarbons

A total of 13 soil samples was collected at seven locations and analyzed for TPH. All of the 13 samples contained detectable levels of TPH, and results are presented in Figures P.3-3 and P.3-8.

- Diesel-range hydrocarbons (C15 to C20) and lubricating oil-range hydrocarbons (C21 to C30) were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of TPH in soil is not recommended.

P.3.4.2.4 Polychlorinated Biphenyls

A total of six soil samples was collected at six locations and analyzed for PCBs. Of the six samples, three samples contained detectable levels of PCBs, and results are shown in Figures P.3-3 and P.3-8.

- Aroclor 1240 and Aroclor 1254 were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of PCBs in soil is not recommended.

P.3.4.2.5 Metals/Inorganic Compounds

A total of 27 soil samples was collected at 17 locations and analyzed for metals. At least one or more metals were detected in nearly all sampling locations, and results are shown in Figures P.3-5 and P.3-9.

- Selenium, vanadium, and zinc were detected above their respective background concentrations and Ecological RBSLs.

- Selenium (background concentration of 0.655 milligrams per kilogram [mg/kg] and Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.46 J mg/kg to 1.487 mg/kg. Selenium was detected above its background concentration and Ecological RBSL in three samples collected from U5BS1019 at a depth of 0 to 1 foot bgs (1.487 mg/kg), L1BS1406 at a depth of 3 to 4 feet bgs (1.0 J mg/kg), and L1BS1405 at a depth of 3.5 to 4.5 feet bgs (0.73 J mg/kg).
- Vanadium (background concentration of 62 mg/kg and Ecological RBSL of 1.5 mg/kg) was detected at concentrations ranging from 14.2 J mg/kg to 64.4 mg/kg. Vanadium was detected above its background concentration and Ecological RBSL in one sample collected from L1BS1402 at a depth of 5 to 6 feet bgs (66.4 mg/kg). The elevated concentrations of vanadium may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation.
- Zinc (background concentration of 110 mg/kg and Ecological RBSL of 21 mg/kg) was detected at concentrations ranging from 19.9 mg/kg to 428 mg/kg. Zinc was detected above its background concentration and Ecological RBSL in one sample collected from L1BS1001 at a depth of 5 to 6 foot bgs (428 mg/kg). Zinc was not detected at concentrations exceeding the background screening level in step-out samples from this location.

- Metals detected above background concentrations (but below their respective RBSLs) include chromium, mercury, and sodium. Background concentrations for metals are included in Table F.3-3A. Sodium was detected at concentrations ranging from 148.5 mg/kg to 1,590 mg/kg. RBSLs for sodium have not been established.
- Perchlorate was not identified as having been previously used at the DOE LF2 Site during the review of the historical documents. Therefore, perchlorate was not analyzed in samples collected from the DOE LF2 Site.

Further characterization of metals in soil is not recommended.

P.3.4.2.6 Dioxins

Dioxins were not identified as chemicals of potential concern (COPCs) for the DOE LF2 Site. Therefore, no soil samples were analyzed for dioxins.

P.3.4.2.7 Energetics

A total of seven soil samples was collected from four locations and analyzed for energetics. Energetics were not detected in any of the samples.

Further characterization of energetics in soil is not recommended.

P.3.5 Groundwater Findings

Groundwater occurrence and impacts at the DOE LF2 Site are described below.

P.3.5.1 Groundwater Data Presentation

Groundwater sampling results and characterization findings are summarized in Tables P.3-2B and Appendix B in Group 5 RFI Report. The purpose of Table P.3-2B is to:

- Summarize soil impacts as they potentially relate to groundwater impacts.
- Summarize groundwater sampling results.
- Demonstrate that groundwater characterization is sufficient for the purposes of risk assessment, including:
  - That groundwater characterization is adequate for detected site-related chemical constituents.
  - That site soil characterization is adequate for detected groundwater chemical constituents.

Similar to Table P.3-2A, Table P.3-2B describes groundwater data by chemical group (such as metals, VOCs, and SVOCs). Table P.3-2B is organized as follows:

- Column 1 – Analytical group
- Column 2 – Summary of site soil impacts
- Column 3 – Confirmation that chemicals detected in site soil are monitored in groundwater
- Column 4 – Summary of groundwater impacts
- Column 5 – Discussion of whether chemicals are site related
- Column 6 – Conclusion regarding adequacy of groundwater characterization for risk assessment purposes

A detailed compilation of groundwater data is provided in Appendix B in the Group 5 RFI Report. The groundwater appendix contains a description of hydrogeologic conditions (such as occurrence, water levels, recharge, and yield), groundwater quality, and transport and fate. These data include the following:

- Laboratory analytical results
- Hydrographs
- Time-series plots
- Cumulative distribution plots

A sitewide report on SSFL groundwater will be prepared as part of the RFI Program. This report will comprehensively address the same characterization and transport-and-fate issues addressed in Appendix B of the Group 5 RFI Report.

P.3.5.2 Summary of Groundwater Data

Groundwater conditions at the DOE LF2 Site are characterized by two CFOU groundwater monitoring wells (RD-93 and RD-95). Groundwater findings from these wells are presented in Table P.3-2B and in Appendix B of the Group 5 RFI Report.

As described in Appendix B of the Group 5 RFI Report, samples from RD-93 and RD-95 were analyzed for VOCs.

- Tetrachloroethene (PCE), TCE, 1,1-DCE, and 1,1-DCA were detected at concentrations that did not exceed their respective screening levels.

Past operations at the DOE LF2 Site are not expected to be the source of the low levels of VOCs detected in CFOU groundwater. CFOU Groundwater will be discussed further in Appendix B and in the CFOU RFI Report.

P.3.6 Surface Water Findings

Near-surface soil within the DOE LF2 Site has been impacted by selenium and benzo(a)pyrene. It is possible that these constituents could have been mobilized during storm events and subsequently deposited at downstream sites, including the HMSA Site. However, contaminant transport via surface water flow is unlikely due to the relatively flat topography of the site., and distance to defined drainages from the impacted areas.

P.4 Risk Assessment Findings

The objective of this risk assessment (RA) is to determine whether the DOE LF2 Site could pose unacceptable risks that might require remedial action, or if the DOE LF2 Site is eligible for an NFA designation.

The following sections summarize the findings of the HRA and ERA performed for the DOE LF2 Site. Details regarding how the HRA and ERA were conducted are presented in the SRAM (MWH, 2005) and in Appendix A in the Group 5 RFI Report. Details regarding the site-specific HRA and ERA are presented in Appendix A, Attachment A13, in the Group 5 RFI Report.

P.4.1 Key Decision Points

Site-specific key decision points for the HRA and ERA are listed below and described more fully in Appendix A and Attachment A13, in the Group 5 RFI Report. These decisions were made for the risk assessments based on site-specific conditions, chemical characteristics, and assessment findings. Programmatic decision points are described and included in the RFI Program Report (MWH, 2004). Site-specific key decision points include the following:

1. Both direct (drinking water) and indirect (soil vapor) exposures to groundwater COPCs were evaluated in the risk assessment (Appendix A of the Group 5 RFI Report).
2. Exposure point concentration (EPC) calculations were based on collected characterization data, as follows:
    - All CFOU Groundwater EPCs were based on maximum levels detected in a single highest-concentration well within Group 5, HAR-18, for both indirect and direct exposure.
    - A review of time-series plots for chemical constituents, groundwater gradients, and source areas indicates that maximum concentrations detected during the last consecutive 3 years conservatively represent potential future conditions for the purpose of estimating future risks.
    - Soil EPCs were calculated using ProUCL 4.0 following methods specified in the SRAM (MWH 2005). Two EPCs were used, the central tendency exposure (CTE) and the reasonable maximum exposure (RME). The CTE was the arithmetic mean of the data, and the RME was the 95 percent upper confidence limit (95UCL) as calculated by ProUCL 4.0. In cases where the 95UCL exceeded the maximum detected concentration, the RME defaulted to the maximum detected concentration. In some cases, the CTE also exceeded either the RME or the maximum detected concentration due to differences in assumptions regarding distribution (the arithmetic mean assumes a normal distribution whereas the method for calculating the 95UCL is based on data distribution) and handling of nondetected values in ProUCL 4.0. In these cases, the value selected as the RME EPC was also used for the CTE EPC.
3. Large home-range receptors were assumed to live only in source areas within the DOE LF2 Site. Risks for these receptors using home-range adjusted exposures were calculated for the purpose of evaluating RFI-site-related risks. Large home-range receptor

cumulative risk across the SSFL will be presented later in a sitewide summary large home-range receptor risk assessment report.

P.4.2 Summary of Human Health Risk Assessment Findings

Potential risks were estimated for future urban residents (child and adult) and future recreational users (child and adult) of the DOE LF 2 Site. A conceptual site model diagram for human health risk assessment is presented in Figure P.4-1. A summary of COPCs and risk estimates for human health are presented in Table P.4-1 and Table P.4-2, respectively. Results of the risk characterization indicated the following:

- Soil – No chemicals of concern (COCs) were identified for direct contact with soil or for plant consumption by future residents, or for direct contact with soil by future recreators.
- Soil Vapor – No COCs were identified for inhalation of ambient or indoor air by future residents or recreators.
- NSGW – No data were available for this zone and no COCs were identified.
- CFOU Groundwater – COCs will be identified and addressed as part of the CFOU Groundwater RFI Report.

The uncertainties associated with the Group 5 RFI Sites in general were discussed in Appendix A of the Group 5 RFI Report. Uncertainties specific to the DOE LF 2 Site are summarized in Table P.4-3.

P.4.3 Ecological Risk Assessment Findings

Potential risks were estimated for terrestrial plants, soil invertebrates, and terrestrial birds and mammals. A conceptual site model diagram for ecological receptors is presented in Figure P.4-2, and a summary of risk estimate and chemicals of ecological concern (COECs) are presented in Tables P.4-4 and P.4-5. Results of the risk characterization indicated the following:

- Soil – PCB-toxicity equivalent quotients (TEQs) (dioxin-like PCB congeners) were retained as COECs (Table P.4-4). Estimated risks might be overestimated due to uncertainties surrounding extrapolation of PCB values from Aroclors. Estimated risks were in the medium-low range (Table P.4-4).
- Soil Vapor – No COECs (Table P.4-5). 1,1,2-TCA was the only chemical with estimated risks to burrowing small mammals. Estimated risk was in the low range. However, it was never detected and was evaluated at the sample quantification limit (SQL). There were no estimated risks from other similar VOCs, and it is most likely that 1,1,2-TCA was not present at the SQL concentration (Table P.4-5).

The ecological risk assessment uncertainties associated with the Group 5 RFI Sites in general are discussed in Appendix A of the Group 5 RFI Report. Additional uncertainties specific to the DOE LF2 Site are listed in Table P.4-6.

P.4.4 Conclusions of the DOE LF2 Site Risk Assessment

This section presents the overall conclusions for DOE LF2 Site according to this RA. The risk assessment provides a quantitative and qualitative appraisal of the actual or potential effects of contaminants on human health or terrestrial wildlife.

The potential sources of contamination at the DOE LF2 Site include a leach field and numerous buildings, substations, and tanks that supported the SNAP program.

Potential risks associated with direct contamination of soil and soil vapor were assessed in this RA. Soil and soil vapor samples were collected and analyzed for VOCs, SVOCs, TPH, metals/inorganics, PCBs, and energetics. Data were considered adequate to evaluate potential risks. No COCs were identified in soil and soil vapor for human health. PCB-toxicity equivalent quotients (TEQs) (dioxin-like PCB congeners) were identified as a COEC in soil during the ERA. No COECs were identified in soil vapor during the ERA.

NSGW data were not available for this site, and no COCs were identified. CFOU groundwater will be addressed as part of the CFOU.

No locations within the DOE LF2 Site require further action to address human health or ecological risks.

P.5 DOE LF2 Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the DOE LF2 Site. Section P.5.1 describes the RFI reporting requirements, particularly with respect to the identification of areas recommended for additional work, or "site action" recommendations. The process and criteria used for making site action recommendations are described in Section P.5.2. Site action recommendations for the DOE LF2 Site are summarized in Sections P.5.3, P.5.4, and P.5.5.

P.5.1 RFI Reporting Requirements

As described in regulatory guidance documents for the SSFL RCRA Corrective Action Program (see Section 1.2.3 of Volume I of the Group 5 RFI Report), the purposes of the RFI are to: (1) characterize the nature and extent of contamination, and identify potential source areas, (2) assess potential migration pathways, (3) estimate risks to actual or potential receptors, and (4) gather necessary data to support the CMS (DTSC, 1995). The RFI Report is required to present findings regarding the above information, describe completeness of the investigation, and indicate if additional work is needed.

The DOE LF2 Site Report accomplishes these requirements by:

1. Presenting detailed characterization findings, source area identification, and investigation completeness determinations by media and by chemical class for all chemical use areas (and associated down-drainage locations) (Tables P.3-2A and P.3-2B). Section P.3 summarizes the overall characterization of contamination nature and extent, potential source areas, and an assessment of investigation completeness.
2. Evaluating groundwater migration pathways in Appendix B of the Group 5 RFI Site Report and other potential transport pathways in Appendix A of the Group 5 RFI Site Report.
3. Identifying potential receptors and estimating potential risks at the DOE LF2 Site (Section P.4 and Appendix A).
4. Identifying DOE LF2 Site areas requiring further work (this section).

P.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the DOE LF2 Site Report identify areas for the following:

- Further evaluation in the CMS (CMS Areas)
- No further action (NFA Areas)
- Interim corrective measures to stabilize source areas and control contaminant migration (Stabilization Areas)

Site action recommendations are based on the characterization and risk assessment findings. Characterization findings provide definition of the nature and extent of site contaminants, based on chemical data and transport-and-fate evaluation. Risk assessments evaluate

characterization data, estimate human health and ecological risks based on specified land use scenarios, and identify chemicals that drive or contribute to those risks.

The site action recommendations listed above result from two evaluations described below. CMS or NFA Area recommendations are based on an integrated evaluation of characterization and risk assessment results. Stabilization Area recommendations rely on characterization evaluations, including transport-and-fate analysis, and comparison to risk based levels. Each process is described in more detail below.

P.5.2.1 CMS and NFA Site Action Evaluation Process

CMS or NFA site action recommendations are based on a four-step process. This process, which is presented in detail in Section 7.1 of the Group 5 RFI Report, is summarized as follows:

- **Site Action Evaluation Step 1.** Risk assessment results for human and ecological receptors are compared to "acceptable" levels published by the United States Environmental Protection Agency (USEPA) or DTSC as guidance for site managers (DTSC, 1992; USEPA, 1992). The low end of the risk range (that is, 1×10^{-6}, or 1 in 1,000,000, or Hazard Index [HI] = 1.0) is used to conservatively estimate the areal extent that is recommended for site action.

- **Site Action Evaluation Step 2.** When estimated RFI site risks are greater than 1×10^{-6} (cancer risks) or HI values are greater than 1 (noncancer and ecological risks), the RFI site risks are reviewed on a chemical-by-chemical basis to identify risk drivers and significant risk contributors to the cumulative, total risk for each potential receptor.

- **Site Action Evaluation Step 3.** Characterization findings from the entire RFI site are evaluated to identify areas where higher concentrations of risk drivers and contributors are detected. The identified areas are termed in this report "CMS Areas" and represent locations recommended for further evaluation during the CMS. Areas recommended for further evaluation during the CMS are comprehensive of all appropriate potential receptors or land use scenarios.

- **Site Action Evaluation Step 4.** The fourth step identifies any uncertainties in the RFI site characterization and risk assessments that could affect the findings. For example, some chemicals are assumed to be present in soil based on TPH extrapolation factors (such as benzene and PAHs) and contribute to total risk for the RFI site above acceptable levels. Since this assumption is often highly conservative, its use as a basis for CMS recommendations could be further evaluated in the CMS.

Site action recommendations are tabulated by Chemical Use Area, and chemical risk drivers/contributors are identified for each appropriate receptor in Table P.5-1.

Two additional aspects of RFI reporting will serve to confirm and/or finalize the areas recommended in Group RFI Reports for evaluation in the CMS. The first is an ecological evaluation for large home-range receptors (for example, mule deer and hawk). The second is a groundwater evaluation that will be reported in the Sitewide Groundwater Report. Updates to this report will be prepared as needed.

P.5.2.2 Source Area Stabilization Site Action Evaluation Process

Chemical data collected during the RFI are evaluated to determine the potential for contaminant migration. Resulting site action recommendations focus on stabilization measures related to sediment transport via the surface water pathway.

Criteria used to evaluate if source area stabilization measures are needed to control surface water migration include the following:

- Presence of chemical concentrations above background or RBSLs in surficial (not deeper) soil
- Proximity of surficial impacts to an active surface water drainage pathway
- Moderate to steep topography
- Absence of containment features (such as surface coatings and dams)
- Concentration gradients that indicate prior transport away from the source of surficial impacts

Each criterion is considered important, and a weight-of-evidence evaluation is used to make a recommendation for source area stabilization measures. Source area stabilization measures, which include the use of best management practices (BMPs), are used to prevent migration to surface water. BMPs could include the installation of straw bales, fiber rolls, and silt fencing, and/or covering of areas with plastic tarps. Erosion control measures have been applied to many surficial soil source areas at the SSFL to prevent contaminant migration. These are described in the SSFL Storm Water Pollution and Prevention Plan (MWH, 2006a).

P.5.3 CMS Site Action Recommendations

Based on the findings presented in this RFI report, the entire DOE LF2 Site is recommended for a NFA designation. Corrective measures studies are not required for this site.

P.5.4 NFA Site Action Recommendations

Based on a detailed review of all available historic documents, an evaluation of sample data collected at the site during previous investigations and the current RFI, and the results of human health and ecological risk assessments performed for the site, the entire DOE LF2 Site is appropriate for an NFA designation. The sections below summarize the historical uses, the sampling data collected, and the results of the HRA and ERA for the site.

P.5.4.1 Historical Uses

CH2M HILL performed a detailed review of all available historical documents, conducted site inspections, interviewed current and previous SSFL employees, and prepared comprehensive maps and tabulations of all information related to chemicals used, stored, or released at the DOE LF2 Site. There are no records available to indicate that chemicals were used, stored, or released at locations outside the Chemical Use Areas identified during the review of historical records. The Chemical Use Areas were subject to site investigation,

sample collection, and analysis. Consequently, all suspect areas of the DOE LF2 Site were investigated, and the findings are presented and considered herein.

The area recommended for NFA includes the entire DOE LF2 Site, including the following Chemical Use Areas:

- Chemical Use Area 1 – Substation 4713
- Chemical Use Area 2 – Substation 4708A/4708B
- Chemical Use Area 3 – Substation 4756
- Chemical Use Area 4 – Substation on western side of Building 4010
- Chemical Use Area 5 – Substation on eastern side of Building 4010
- Chemical Use Area 6 – Building 4010 (Power Demonstration Test Facility)
- Chemical Use Area 7 – Building 4010 Leach Field
- Chemical Use Area 8 – Building 4012 (SNAP Critical Test Facility)
- Chemical Use Area 9 – Air Compressor Pad
- Chemical Use Area 10 – Building 4013 (reactor component assembly)
- Chemical Use Area 11 – EMGEN (aboveground tank)
- Chemical Use Area 12 – T-L01 (aboveground tank)
- Chemical Use Area 13 – TCF-1 (aboveground tank)
- Chemical Use Area 14 – TCF-2 (aboveground tank)
- Chemical Use Area 15 – TCF-3 (aboveground tank)
- Chemical Use Area 16 – EMSTG (aboveground tank)
- Chemical Use Area 17 – Substation 4413

Available historical documentation indicates that operations at the Chemical Use Areas identified above could have involved the use of chemicals. However, the sampling data collected at and around these Chemical Use Areas demonstrate that historical activities have not resulted in significant impacts to the site. These sampling data are summarized in the following section.

P.5.4.2 Sampling and Analysis Results

As presented in Section P.3, the DOE LF2 Site, including the additional buildings and features identified within the site, were investigated during this RFI. Soil and soil vapor samples were collected and analyzed for VOCs. Soil samples were also analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Of these, only three metals (vanadium, zinc, and selenium) and one SVOC (benzo[a]pyrene) were detected at concentrations that exceed both background concentrations (for metals) and their respective Residential or Ecological RBSLs.

As shown in Figure P.3-9, selenium, vanadium, and zinc exceeded their respective RBSLs and background concentrations in 3 or fewer of the 27 soil samples for which they were analyzed at the DOE LF2 Site. The low frequencies of exceedance of vanadium, zinc, and selenium in samples collected throughout the DOE LF2 Site indicate that there has not been a significant release of these metals to the environment.

The benzo(a)pyrene exceedances occurred in the two shallow soil samples collected in the footprint of former Building 4010. In both sample locations, benzo(a)pyrene was detected in the surface soil sample but was not detected in the deeper soil sample (3.5 to 6 feet bgs). Also, of the 20 soil samples analyzed for benzo(a)pyrene, 5 of the 7 detections occurred in surface soil samples. Benzo(a)pyrene is commonly detected in shallow soil following removal of asphalt pavement, and asphalt is the most likely source of the benzo(a)pyrene detected in surface soil at the DOE LF2 Site.

None of the other compounds analyzed in the soil and soil vapor samples collected from DOE LF2 Site were detected above their respective screening levels. Therefore, although there is documentation of chemicals being used and/or stored in the buildings and process areas throughout the DOE LF2 Site, the analytical data demonstrate that previous site activities have not resulted in significant impacts to the environment.

P.5.4.3 Risk Assessment

Finally, as presented in Section P.4, the maximum cumulative risk for the site is 7×10^{-7} for a hypothetical future residential exposure and 2×10^{-7} for a hypothetical future recreational exposure. These cumulative human health cancer risks are below the low end of the risk management range (1×10^{-6}). In addition, the hazard indices for human health noncancer risks are well below 1, indicating that the site does not pose a significant threat to future potential human receptors.

PCB-TEQs (Birds and Mammals) were retained as COECs in the ERA. Hazard quotients for the PCB-TEQs exceeded 1 for two ecological receptors (the hermit thrush and the deer mouse, with hazard quotients up to 2 and 6.1, respectively). Exceedances were for the low toxicity reference value (TRV) only. Neither receptor exceeded the high TRV, indicating that potential risks are somewhere between a "no effect" and "low effect." The HI for the dioxin/furan chemical class exceeded 1 at the low TRV (based on extrapolated values). PCB-TEQs were extrapolated using Aroclor 1260 and Aroclor 1254 data for the site. Because of the uncertainty inherent in this extrapolation, the fact that PCB-TEQs did not exceed the high TRV, and the fact that Aroclor 1260 and Aroclor 1254 were not detected at concentrations exceeding their RBSLs, a CMS is not recommended to address the elevated hazard quotients calculated for PCB-TEQs. The site does not pose a significant threat to ecological receptors.

Based on these results, an NFA designation is appropriate for the entire DOE LF2 Site.

P.5.5 Source Area Stabilization Site Action Recommendations

No source area stabilization is required for the DOE LF2 Site because cumulative risks for the site are below 10^{-6} and the site is recommended for NFA.

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Tables

Table P.2-1
Building Inventory
DOE Leach Fields 2 RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4010	1959	1978	Used as a Power Demonstration Test Facility to verify SNAP experimental reactor designs, including the SNAP 2 Experimental Reactor Test (1959 - 1960) and the SNAP 8 Experimental Reactor Test (1963 - 1965). Fueled by a hydrided zirconium-uranium alloy. Controlled by moveable parts in a beryllium reflector sleeve shielded by lithium hydride. Contained 3 concrete vaults (containment vessel, primary system vault, secondary equipment vault). Three pads located immediately east of the building were used as electical and mechanical equipment pads and contained a drain system sump. Water with hydrazine was used in the cooling water loop to reduce corrosion and scale buildup. TCE was also used in the building. Five incidents of possible release: 4/30/61, 7/5/61, 1/1/64 (fission gas release), 6/11/64, 10/19/65 (Co-60, Mn-54, Fe-59 released in hi bay area). NaK fire in the reactor pit beneath the building in 1965. DOE released building for unrestricted use on December 12, 1982.	6		MWH, 2003a; Sapere, 2005; Rocketdyne, 1992; Rockwell International/Atomics International, 1976; Atomics International, 1965; Atomics International, 1963; Boeing, 2000; Unknown, 1988.
4012	> 1962	2003	SNAP Critical Test Facility No. 2 (1962-1968), Heavy Metal Reflected Fast Spectrum Reactor (1970-1972), ETEC X-ray facility and storage (1979-1992). Low nuclear power experiments were performed to collect critical data for the design of SNAP reactor cores for higher power operation. Operations and control rooms demolished in 1986 to build the ETEC Sodium Component Test Installation Power Pak section of the Cogeneration Project.	8		Sapere, 2005; Atomics International, 1963.
4013	1962	2003	Non-nuclear component assembly and packaging of SNAP 10A, SNAP 2, and SNAP 8 flight systems prior to thermal, mechanical, and nuclear qualification tests. Thermal transient and mechanical testing and stress testing for seismic events were also performed. Spills of hydraulic oil (200 gallons in 1996) and oil (100 gallons in 1989 and 55 gallons in 1996) are reported.	10		Sapere, 2005; Rockwell International, 1996a; Atomics International, 1963; Unknown, Spill Record.

Table P.2-1
Building Inventory
DOE Leach Fields 2 RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4228	1988	2003	Generated commercial electric power using steam produced in SCTI's sodium experiments (1988-1993). Previously contained a tank containing hydrazine and a tank containing lubricating oil.	N/A	While hydrazine was previously stored here, there is no documentation of a release to the environment.	Sapere, 2005; Boeing, 1999.
4310	Unknown	Unknown	Changing Facility	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4710	late 1980s	mid 1990s	Consists of 4 cooling towers.	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4807	Unknown	Unknown	Electrical Equipment Pad	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4808	Unknown	Unknown	Electrical Equipment Pad	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4809	Unknown	Unknown	Air Blast Heat Exchanger Pad	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4823	Unknown	Unknown	Time Clock	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.

Table P.2-2
Tank Inventory
DOE Leach Fields 2 RFI Site

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
Aboveground Tanks										
T-EMG1	Inside Building 4013	250	Diesel	Unknown	Not in Use	Regulated under Corrective Action	Steel	10		
B013-T-1	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-2	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-3	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-4	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-5	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-6	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-7	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
B013-T-8	Inside Building 4013	6000 ft^3	Gaseous Nitrogen	Unknown	Not in Use	Regulated under Corrective Action	HP gas bottle	N/A		
EMGEN	Inside Building 4228	80	#2 fuel oil	Unknown	Not in Use	Regulated under Corrective Action	Steel	11		
T-L01 (Turbine)	Inside Building 4228	2,150	#797 oil	Unknown	Not in Use	Regulated under Corrective Action	Steel	12		
TCF-1	Inside Building 4228	55	Hydrazine	Unknown	Not in Use	Regulated under Corrective Action	Plastic	13		
TCF-2	Inside Building 4228	55	Morpholine	Unknown	Not in Use	Regulated under Corrective Action	Plastic	14		
TCF-3	Inside Building 4228	500	Sulfuric Acid	Unknown	Not in Use	Regulated under Corrective Action	Plastic	15		
TCF-4	Inside Building 4228	55	Polyphosphate	Unknown	Not in Use	Regulated under Corrective Action	Plastic	N/A		
T-202	Inside Building 4228	20,000	DI Water	Unknown	Not in Use	Regulated under Corrective Action	Stainless steel	N/A		
EMSTG	Inside Building 4228	2,500	#797 oil	Unknown	Not in Use	Regulated under Corrective Action	Steel	16		
Unknown	East side of Building 4010	Unknown	Compressed Gas	Unknown	Not in Use	Regulated under Corrective Action		N/A		
Unknown	North of Building 4013	Unknown	Unknown	Unknown	Unknown	Regulated under Corrective Action		N/A	7 tanks located north of Building 4013.	
Underground Tanks										
Unknown	23 feet from north corner of Building 4010	630	Unknown	Unknown	Unknown	Regulated under Corrective Action		N/A		

Table P.2-3
Transformer Inventory
DOE Leach Fields 2 RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4708A/4708B	East of Building 4010	Unknown	Not in Use	Electrical Substation.	2		Sapere, 2005.
4713	North of Building 4013	Unknown	Not in Use	Electrical Substation. supported operations at Building 4013	1	Staining at tank valve, 30 gallon drum, secondary containment	Sapere, 2005; Unknown, 2000.
4756	Southeast of Building 4013	Unknown	Not in Use	Electrical Substation	3		Rockwell International, 1993.
4XXX	Pad on Western Side of Building 4010	Unknown	Not in Use	Lighting Transformer Pad	4	Building number is unknown.	Rockwell International/Atomics International, 1976.
4XXX	Pad on Eastern Side of Building 4010	Unknown	Not in Use	Electrical Substation	5	Building number is unknown.	Rockwell International/Atomics International, 1976.
4413	Northeast corner of Building 4013	Unknown	Unknown	Power Supply for Building 4013.	17	Previously contained leaking transformer.	Sapere, 2005; Unknown, 2000.

Table P.2-4
Inventory of Other Site Features
DOE Leach Fields 2 RFI Site

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Building 4010 Leach Field	West of Building 4010	1950s to 1961	Not in Use	Received sanitary wastes from a 750-gallon septic tank. Likely consisted of 4-inch diameter terra cotta clay piping surrounded by gravel, buried at depth ranging from 2 to 6 feet bgs. Comprised of 90 linear feet of leach lines. The septic system was abandoned in place when the central sewer became available and later was covered with compacted fill to support the construction of adjacent buildings.	7		Rockwell International/Atomics International, 1976.
Drain System Sump	Northeast side of Building 4010	Unknown	Not in Use		N/A	No chemical uses based on available information on operations at this building.	Rockwell International/Atomics International, 1976.
Air Compressor Pad	East of Building 4010	1959 to 1978	Not in Use	Water with hydrazine was used in the cooling water loop to reduce corrosion and scale buildup.	9		Rockwell International/Atomics International, 1976.
Cooling Water Pipelines	Beneath Building 4010 and between Building 4010 and the air compressor pad	1959 to 1978	Not in Use	Water with hydrazine was used in the cooling water loop to reduce corrosion and scale buildup. Cooling water pipelines buried in soil beneath Building 4010 were corroded.	9		Rockwell International/Atomics International, 1976.
Tank Pit	South side of Building 4012	Unknown	Unknown	Unknown	8		Unknown, 1969.

Table P.2-5
Spill Inventory
DOE Leach Fields 2 RFI Site

Date	Building/Feature	Chemical Spilled	Amount (gallons)	Comments	References
10/19/65	4010	Co60, Mn54, Fe59	Unknown	Contamination of Building 010 Hi-Bay area with activation products (Co60, Mn54, Fe59) during saw cutting of control drum drive rods (stainless steel) to remove the Be control drums and reflectors. High level of contamination (2x10^4 dis/min) was released. A radiation intensity of 200 mrad/hr (including 100 mrad/hr due to gamma) were detected.	Atomics International, 1965a.
Unknown	4010	Tritium	Unknown	A safety review report by Rockwell international stated that there were possible releases of tritium from Building 4010. One possible source could have been during the S8ER test runs that occurred in Building 4010. Two leaks in cooling lines, once below the floor and once in the ground around the containment vessel of a holdup tank could have saturated the adjacent ground promoting the release of tritium. Another source could have been a concrete biological shield that was stored outside RMDF on February 16, 1978. Rain fell on the shield and could have extracted tritium form the concrete.	Rockwell International, Rocketdyne Division. 1992.
5/96	4013	Oil	15	A 15 gallon oil spill in the test lab. This release is addressed with Chemical Use Area 10.	Unknown, Unknown Date, Spill Records (HDMSE00187729).
5/22/96	4013	Hydraulic Fluid.	20	On May 22, 1996, a hydraulic spill was reported flowing out of Building 4013. This release is addressed with Chemical Use Area 10.	Rockwell International, 1996.
9/25/89	4013, near Building 4059	Oil	100	Oil spill of 100 gallons near Building 4059 and Building 4013. This release is addressed with Chemical Use Area 10 and investigations performed at the SNAP Site.	Unknown, Unknown Date (HDMSE00407379).
5/96	4013	Oil	40	An open valve leaked 40 gallons of oil. This release is addressed with Chemical Use Area 10.	Unknown, Unknown Date, Spill Records (HDMSE00187729).
9/25/89	4013	Oil	100	Approximately 100 gallons of oil spilled at Building 4013 when a test valve released the material outside of a control berm. This release is addressed with Chemical Use Area 10.	Rockwell International, 1989.
2000	4413	Transformer Fluid	Unknown	During a transformer inspection, the one next to Building 4413 was found leaking at a tap. This release is addressed with Chemical Use Area 17.	Unknown. 2000. HDMSe00025415.
1961 to 1965	4010	Radioactive Releases	Unknown	Five incidents of possible release: 4/30/61, 7/5/61, 1/1/64 (fission gas release), 6/11/64, 10/19/65 (Co-60, Mn-54, Fe-59 released in hi bay area).	Sapere, 2005.

Table P.2-6
Site History - Investigations
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed	COPCs Reported	Comments	Reference
7	Building 4010 Leach Field	2000	Geophysical Survey to locate septic tank. Tank (and leach field) were not found.	N/A	N/A		MWH, 2003a.
6	Building 4010	Unknown	Radiological Survey	Radiochemistry	Tritium	Tritium reported as COPC for groundwater only.	Rockwell International, 1996b; Sapere, 2005.

Table P.2-7
Site History - Soil Disturbance
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
7	Building 4010 Leach Field	2003	N/A	N/A	Demolition of Buildings 4012 and 4710. No indications of leach field (large gravel or terra cotta piping) were observed.	Not closed	MWH, 2003a.

Table P.2-8
Chemical Use Summary
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	Chemical Use Area Name	Potential Chemicals Used/Stored	Chemical Use Area Types and Typical Target Analytical Suites														
			Solvent	Petroleum Fuels		Hydrazine-Related Compounds	Oil-Related Materials	Metal Wastes (exclusive of debris areas)	Debris Areas/ Fill	Energetic Constituents	Transformers	Leach Field	Non-metal Inorganic Compounds	Non-metal Inorganic Compounds		Acids/ Bases	
			VOCs	TPH, VOCs [1]	SVOCs	VOCs, SVOCs (Hydrazines, Formaldehyde, NDMA, UDMH, and MMH)	SVOCs, TPH, PCBs, Metals	Metals, pH	TPH, Metals, VOCs, SVOCs, PCBs, Dioxins [2]	Energetics, Metals	PCBs	Site Specific	Fluoride, Chloride, Nitrate, Sulfate, Bromide	Perchlorate	Dioxins, Furans	pH	Asbestos
1	Substation 4713	PCBs									X						
2	Substation 4708A/4708B	PCBs									X						
3	Substation 4756	PCBs									X						
4	Substation on Western Side of Building 4010	PCBs									X						
5	Substation on Eastern Side of Building 4010	PCBs									X						
6	Building 4010	Hydrazine, metals, TCE	X			X		X						X			
7	Building 4010 Leach Field	Assumed to be the same as those for Building 4010 [3]										X [3]					
8	Building 4012	Metals						X									
9	Air Compressor Pad/Cooling Water Pipelines	Hydrazine				X								X			X
10	Building 4013	Oil (TPH, PCBs, metals), TPH		X			X										
11	EMGEN	#2 fuel oil		X													
12	T-L01 (Turbine)	#797 oil					X										
13	TCF-1	Hydrazine				X								X			
14	TCF-2	Morpholine	X														
15	TCF-3	Sulfuric Acid														X	
16	EMSTG	#797 oil					X										
17	Substation 4413	PCBs									X						

Notes:

1. VOCs are a COPC for TPH-gasoline.
2. SVOCs and dioxins are evaluated at COPCs if burned materials are observed. PCBs are evaluated as COPCs if elevated concentrations of lubricant oil-range TPH is detected.
3. Chemical uses for the Building 4010 Leach Field are assumed to be the same as those for Building 4010 (hydrazine, metals, TCE).

Table P.2-9
Conceptual Site Model
DOE Leach Fields 2 RFI Site

Chemical Use Area Name (or Site if appropriate)	Ground Surface Elevation (Feet MSL)	Alluvium Thickness (Feet)	Elevation of Unweathered Chatsworth (Feet MSL)	Depth to Near-Surface Groundwater (Feet)	Near-Surface Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Depth to Chatsworth Formation Groundwater (Feet)	Chatsworth Formation Groundwater Horizontal Gradient/Flow Direction (foot/foot)	Surface Water Present? (Yes/No)	Surface Water Flow Information	Other Information?	Reference
DOE Leach Fields 2	1808 to 1810	1.5 to 10	1770 to 1780	13 to 22	0.04/ northwest to northeast	32 to 52	0.08/ northwest	No	While there are no perennial surface water bodies at the site, storm water run-off flows south/ southwest.	The site is located in the Upper Burro Flats Member, which consists of medium-grained sandstone with minor siltstone/shale interbeds. A surface water divide is located immediately north of the site.	MWH, 2003.

MSL = above mean sea level

Table P.3-1A
Sampling Summary for Soil
DOE Leach Fields 2 RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	Energetics	Hydrocarbons	Inorganics	Metals	PCBs	SVOC	VOC
L1BS1000	Soil Boring		3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
L1BS1000	Soil Boring		3/11/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
L1BS1000	Soil Boring	L1BS1000S010	3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X		X	X		X	
L1BS1000	Soil Boring	L1BS1000S060	3/11/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X		X	X		X	
L1BS1001	Soil Boring	L1BS1001S010	3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X		X	X		X	X
L1BS1001	Soil Boring	L1BS1001S060	3/11/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil	X		X	X		X	X
L1BS1001	Soil Boring	L1BS1001S100	3/11/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X	X		X	X
L1BS1002	Soil Boring	L1BS1002D010	3/10/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
L1BS1002	Soil Boring	L1BS1002S010	3/10/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
L1BS1003	Soil Boring	L1BS1003S010	3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1003	Soil Boring	L1BS1003S060	3/13/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
L1BS1400	Soil Boring	L1BS1400D01	4/21/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
L1BS1401	Soil Boring	L1BS1401S01	4/21/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1402	Soil Boring	L1BS1402S01	4/21/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1403	Soil Boring	L1BS1403S01	4/21/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1404	Soil Boring	L1BS1404S01	4/21/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
L1BS1405	Soil Boring	L1BS1405D01	4/24/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil						X	
L1BS1405	Soil Boring	L1BS1405S01	4/24/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
L1BS1405	Soil Boring	L1BS1405S02	4/24/2008	3.5	4.5	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1406	Soil Boring	L1BS1406S01	4/24/2008	3	4	Primary Sample	In Place	CH2M HILL	Soil			X	X			
L1BS1407	Soil Boring	L1BS1407S01	4/24/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X			X	
L1BS1408	Soil Boring	L1BS1408S01	4/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X			X	
L1BX1000	Soil Boring	L1BX1000C005	3/12/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
L1BX1001	Soil Boring	L1BX1001C005	3/18/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BS1019	Soil Boring	U5BS1019D010	3/14/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
U5BS1019	Soil Boring	U5BS1019S060	3/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1020	Soil Boring		3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1020	Soil Boring	U5BS1020S010	3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X	X	X	X		X	
U5BS1021	Soil Boring	U5BS1021S010	3/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1021	Soil Boring	U5BS1021S060	3/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1022	Soil Boring	U5BS1022S010	3/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1022	Soil Boring	U5BS1022S060	3/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1022	Soil Boring	U5BS1022S100	3/14/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1023	Soil Boring	U5BS1023D010	3/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				X	
U5BS1023	Soil Boring	U5BS1023S010	3/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1023	Soil Boring	U5BS1023S060	3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X			X	
U5BS1024	Soil Boring	U5BS1024D060	3/13/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X		X			X	X
U5BS1024	Soil Boring	U5BS1024S010	3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil	X		X			X	X
U5BS1025	Soil Boring	U5BS1025D060	3/13/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X				X	
U5BS1025	Soil Boring	U5BS1025S010	3/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X			X	
U5BS1025	Soil Boring	U5BS1025S060	3/13/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1058	Soil Boring	U5BS1058S010	3/14/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1058	Soil Boring	U5BS1058S060	3/14/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1062	Soil Boring	U5BS1062S010	4/25/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X			
U5BS1062	Soil Boring	U5BS1062S060	4/25/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X			
U5BX1003	Soil Boring	U5BX1003C005	3/12/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BX1004	Soil Boring	U5BX1004C005	3/18/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BX1005	Soil Boring	U5BX1005C005	3/18/2008	0	0.5	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BX1019	Soil Boring	U5BX1019S01	4/17/2008	0	1	Composite Sample	In Place	CH2M HILL	Soil			X		X		

Table P.3-1B
Sampling Summary for Soil Vapor
DOE Leach Fields 2 RFI Site

Sample Location	Location Type	Sample Name	Collection Date	Top Depth (feet bgs)	Base Depth (feet bgs)	Sample Type	Remediation Status	Consultant	Matrix	VOC
L1SV1000	Soil Vapor Sample		3/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
L1SV1000	Soil Vapor Sample		3/14/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
L1SV1001	Soil Vapor Sample		3/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1000	Soil Vapor Sample		3/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1000	Soil Vapor Sample		3/14/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X

Table P.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure P.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Areas sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure P.5-1 for CMS area)
1	Substation 4713	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. A soil sample was collected at one (1) location.	No PCBs were detected in any of the soil samples collected.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
2	Substation 4708A/4708B	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. A soil sample was collected at one (1) location.	No PCBs were detected in any of the soil samples collected.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
3	Substation 4756	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. A soil sample was collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.4 and Figures P.3-4 and P.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
4	Substation on Western Side of Building 4010	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence A composite soil sample was collected from the area of the former substation from 0 to 0.5 feet bgs.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.4 and Figures P.3-4 and P.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
5	Substation on Eastern Side of Building 4010	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence A soil sample was collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.4 and Figures P.3-4 and P.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
6	Building 4010	VOCs	Chemical uses at Building 4010 included TCE. No prior sampling had occurred and was screened for VOCs to evaluate potential presence. <u>Soil Vapor</u> Samples were collected at one (1) location. <u>Soil Matrix</u> Samples were collected at two (2) locations.	<u>Soil Vapor</u>: No VOCs were detected in any of the samples collected. <u>Soil Matrix</u>: VOCs were detected below RBSLs. Discussion of results is presented in P.3.4.2.1 and Figures P.3-1A, P.3-1B, and P.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses at Building 4010 included hydrazine. No prior sampling had occurred and was screened for SVOCs to evaluate potential presence. Samples were collected at five (5) locations.	Benzo(a)pyrene was detected above the residential RBSL in two samples. L1BS1000 at 0-1 ft bgs L1BS1405 at 0-1 ft bgs Discussion of results are presented in Section P.3.4.2.2 and Figures P.3-2 and P.3-8.	**Yes.** The extent of benzo(a)pyrene impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table P.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure P.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Areas sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure P.5-1 for CMS area)
		Metals	Chemical uses at Building 4010 included metals. No prior sampling had occurred and was screened for metals to evaluate potential presence. Samples were collected at four (4) locations.	Metals were detected above background and Ecological RBSLs in three samples. L1BS1001 at 5-6 ft bgs (Zinc) L1BS1405 at 3.5-4.5 ft. bgs (Selenium) L1BS1406 at 3-4 ft. bgs (Selenium) Discussion of results is presented in Section P.3.4.2.5 and Figures P.3-5 and P.3-9.	**Yes.** The extent of zinc and selenium impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Energetics	No prior sampling had occurred and was screened for energetics to evaluate potential presence. Samples were collected at four (4) locations.	No energetics were detected in any of the soil samples collected.	**Yes.** The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
7	Building 4010 Leach Field	VOCs	No sampling has occurred at the Building 4010 leach field. Chemical uses of Building 4010 included TCE and was screened for VOCs to evaluate potential presence. <u>Soil Vapor</u>: Samples were collected at one (1) location. <u>Soil Matrix</u>: No samples were collected.	No VOCs were detected in any of the samples collected. Discussion of results is presented in Section P.3.4.2.1 and Figures P.3-1A and P.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	No sampling has occurred at the Building 4010 leach field. Chemical uses of Building 4010 included metals and was screened for metals to evaluate potential presence. Soil samples were collected at two (2) locations.	Metals were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.5 and Figures P.3-5 and P.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
8	Building 4012	TPH	Screen for TPH to evaluate potential presence. Soil samples were collected at one (1) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.3 and Figures P.3-3 and P.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4012 include metals. Metals have not been investigated in soil and were screened to evaluate potential presence. Soil samples were collected at five (5) locations.	Selenium was detected above Background and Ecological RBSLs in one sample. U5BS1019 at 0-1 ft bgs Discussion of results is presented in Section P.3.4.2.5 and Figures P.3-5 and P.3-9.	**Yes.** The extent of selenium impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
9	Air Compressor Pad/Cooling Water Pipelines	VOCs	Screen for VOCs to evaluate potential presence. <u>Soil Vapor</u>: No samples were collected. <u>Soil Matrix</u>: Samples were collected at one (1) location.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.1 and Figures P.3-1B and P.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	No sampling had occurred at the air compressor pad/cooling water pipelines that previously contained hydrazine. Screen for SVOCs to evaluate potential presence. Soil samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples collected.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table P.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure P.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Areas sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure P.5-1 for CMS area)
		TPH	No sampling had occurred at the air compressor pad/cooling water pipelines. Screen for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	No TPH was detected in any of the soil samples collected.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	No sampling had occurred at the air compressor pad/cooling water pipelines. Screen for metals to evaluate potential presence. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.5 and Figures P.3-5 and P.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Energetics	No sampling had occurred at the air compressor pad/cooling water pipelines. Screen for energetics to evaluate potential presence. Soil samples were collected at one (1) location.	No energetics were detected in any of the soil samples collected.	**Yes.** The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
10	Building 4013	VOCs	No prior sampling had been performed. Screen for VOCs to evaluate potential presence. <u>Soil Vapor</u>: Samples were collected at one (1) location. <u>Soil Matrix</u>: No samples were collected.	No VOCs were detected in any of the soil samples collected.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses at Building 4013 included TPH. No prior sampling had been performed. PAHs was analyzed based on the previous use of TPH in the building. Screen for SVOCs to evaluate potential presence. Soil samples were collected at three (3) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.2 and Figures P.3-2 and P.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	Chemical uses at Building 4013 included TPH. No prior sampling had been performed. Screen for TPH to evaluate potential presence. Soil samples were collected at three (3) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.3 and Figures P.3-3 and P.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4013 included metals. No prior sampling had been performed. Screen for metals to evaluate potential presence. Soil samples were collected at five (5) locations.	Vanadium was detected above Background and Ecological RBSLs in one sample L1BS1402 at 5-6 ft bgs Discussion of results is presented in Section P.3.4.2.5 and Figures P.3-5 and P.3-9.	**Yes.** The extent of vanadium impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
11 and 12	EMGEN and T-L01 (Turbine)	SVOCs	No prior sampling had occurred at aboveground tanks EMGEN and T-L01 (Turbine). These tanks both contained oil. Screen for SVOCs to evaluate potential presence. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.2 and Figures P.3-2 and P.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table P.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
DOE Leach Fields 2 RFI Site

Chemical Use Area Number	**Chemical Use Area Name** (see Section 2 texts and tables for Site History)	**Potential Chemicals Used/Stored**	**Sampling Scope and Rationale** (see Figure P.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Areas sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure P.5-1 for CMS area)
		TPH	No prior sampling had occurred at aboveground tanks EMGEN and T-L01 (Turbine). These tanks both contained oil. Screen for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.3 and Figures P.3-3 and P.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
13, 14, and 15	TCF-1, TCF-2, and TCF-3	VOCs	No prior sampling had occurred at aboveground tanks TCF-1, TCF-2, and TCF-3. These tanks contained hydrazine, morpholine, and sulfuric acid, respectively. Screen for VOCs to evaluate potential presence. Soil Vapor: No samples were collected. Soil Matrix: Samples were collected at one (1) location.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.1 and Figures P.3-1B and P.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	No prior sampling had occurred at aboveground tanks TCF-1, TCF-2, and TCF-3. These tanks contained hydrazine, morpholine, and sulfuric acid, respectively. Screen for SVOCs to evaluate potential presence. Soil samples were collected at two (2) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.2 and Figures P.3-2 and P.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Energetics	No prior sampling had occurred at aboveground tanks TCF-1, TCF-2, and TCF-3. These tanks contained hydrazine, morpholine, and sulfuric acid, respectively. Screen for energetics to evaluate potential presence. Soil samples were collected at one (1) location.	No energetics were detected in any of the soil samples collected.	**Yes.** The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
16	EMSTG	SVOCs	No prior sampling has occurred at aboveground tank EMSTG. This tank contained oil. Screen for SVOCs to evaluate potential presence. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.2 and Figures P.3-2 and P.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPH	No prior sampling has occurred at aboveground tank EMSTG. This tank contained oil. Screen for TPH to evaluate potential presence. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results is presented in Section P.3.4.2.3 and Figures P.3-3 and P.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
17	Substation 4413	PCBs	The substation had not been investigated and was screened for PCBs to evaluate potential presence. Soil samples were collected at one (1) location.	No PCBs were detected in any of the soil samples collected.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table P.3-2B
Evaluation of Groundwater Sampling Results
DOE Leach Fields 2 RFI Site

Analytical Group	Site Soil Impacts (Summary of relevant impacts)	Monitored in Groundwater?	Constituent detected in groundwater? (Above screening criteria?)	Site related?	Groundwater characterized sufficiently for risk assessment?
VOCs	VOCs were detected at low levels in soils and soil vapor matrix samples (below RBSLs).	**Yes.** Monitored at RD-93 and RD-95 in CFOU Groundwater. No NSGW wells or piezometers are located at the DOE LF2 Site.	**Yes.** Only low level detections of TCE, PCE, 1,1-DCE, and 1,1-DCA have been reported.	**No.** Low level VOC concentrations detected in soil are not likely the source of VOCs detected in CFOU Groundwater.	**NSGW - Yes** [2] **CFOU Groundwater** [1]
SVOCs	SVOCs were detected at 10 locations across the DOE LF2 Site. Benzo(a)pyrene was detected above RBSLs.	**No.**	**N/A**	**N/A**	**NSGW - Yes.** [2] **CFOU Groundwater** [1]
TPH	TPH was detected at low concentrations (below RBSLs) at 7 locations across the DOE LF2 Site.	**No.**	**N/A**	**N/A**	**NSGW - Yes.** [2] **CFOU Groundwater** [1]
PCBs	PCBs were detected at low levels (below RBSLs) in soils matrix samples collected at 3 locations at the DOE LF2 Site.	**No.**	**N/A**	**N/A**	**NSGW - Yes.** [2] **CFOU Groundwater** [1]
Metals	A variety of metals were detected above background concentrations. See Section P.3.2.6 for further information.	**No.**	**N/A**	**N/A**	**NSGW - Yes.** [2] **CFOU Groundwater** [1]
Energetics	Energetics were not detected in soil samples collected from the DOE LF2 Site.	**No.**	**N/A**	**N/A**	**NSGW - Yes.** [3] **CFOU Groundwater** [1]

Notes:

1. Chatsworth Formation Groundwater (CFOU Groundwater) is discussed further in Appendix B and will be evaluated for risk assessment purposes in the CFOU RFI Report.

2. Although VOCs, SVOCs, petroleum hydrocarbons, PCBs, and metals were not analyzed in NSGW, these chemical groups were detected at low concentrations in soil, indicating that significant releases of these chemical groups have not occurred at the DOE LF2 Site. Therefore, impacts to NSGW are not expected.

3. Although energetics have not been monitored in NSGW at the DOE LF2 Site, NSGW is not expected to have been impacted by energetics from the DOE LF2 Site since no energetics were detected in soil at the DOE LF2 Site.

4. NSGW - Near Surface Groundwater

Table P.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 2 RFI Site

		Screening Levels			Detect Data Summary						
Constituent	**Units**	**Residential RBSL**	**Ecological RBSL**	**Background**	**Number of Samples**	**Number of Detects**	**Minimum Detected Value**	**Maximum Detected Value**	**Number of Detects > Residential RBSL**	**Number of Detects > Ecological RBSL**	**Number of Detects > Background SL**
Energetics											
2,4-Dinitrotoluene	mg/kg		0.43		7						
2,6-Dinitrotoluene	mg/kg		1.71		7						
Nitrobenzene	mg/kg	29	2		7						
Hydrocarbons											
Diesel Range Hydrocarbons (C15-C20)	mg/kg	1400			13	7	1.38	7.29			
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			13						
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1400			13						
Lubricating Oil Range Hydrocarbons (C21-C30)	mg/kg	1400			13	13	2.51	62.1			
Inorganics											
% Solids	%				2	2	91.2	93.8			
Moisture	%				38	38	2.35	17.2			
pH	pH Units				10	10	7.68	9.86			
Total Solids	%				7	7	87	96			
Metals											
Aluminum	mg/kg	75000	12	20000	25	25	5975	16800		25	
Antimony	mg/kg	30	0.095	8.7	25	1	0.455	0.455		1	
Arsenic	mg/kg	0.095	1.9	15	25	25	0.47	5.8	25	23	
Barium	mg/kg	15000	15	140	25	25	48.25	130		25	
Beryllium	mg/kg	150	5	1.1	25	25	0.096	1			
Boron	mg/kg	15000	6.76	9.7	25	10	0.87	8.7		1	
Cadmium	mg/kg	39	0.0045	1	25	21	0.026	0.86		21	
Chromium	mg/kg	3400	930	36.8	26	26	3.6	38.8			2
Cobalt	mg/kg	1500	8.9	21	25	25	2.8	10		2	
Copper	mg/kg	3000	1.1	29	25	25	3.3	18.4		25	
Lead	mg/kg	150	0.013	34	25	25	1.5	10		25	
Lithium	mg/kg	1521.66006		37	25	25	5.3	26.8			
Mercury	mg/kg	23	0.1	0.09	25	24	0.0038	0.099			1
Molybdenum	mg/kg	380	0.11	5.3	25	25	0.17	3		25	
Nickel	mg/kg	1500	0.1	29	25	25	2.8	20.9		25	
Potassium	mg/kg			6400	25	25	1550	3400			
Selenium	mg/kg	380	0.17	0.655	24	4	0.46	1.48675		4	3
Silver	mg/kg	380	0.54	0.79	25	3	0.026	0.053475			
Sodium	mg/kg			110	25	25	148.5	1590			25
Thallium	mg/kg	6.1	2.9	0.46	25	17	0.16125	0.41			
Vanadium	mg/kg	76	1.5	62	25	25	14.2	66.4		25	1
Zinc	mg/kg	23000	21	110	26	26	19.9	428		25	1
Zirconium	mg/kg			8.6	25	25	0.42	6.2			
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		6						
Aroclor 1221	mg/kg	0.35	1.6		6						
Aroclor 1232	mg/kg	0.35	0.077		6						
Aroclor 1242	mg/kg	0.35	0.079		6						
Aroclor 1248	mg/kg	0.35	0.0114		6	1	0.0079	0.0079			
Aroclor 1254	mg/kg	0.35	0.077		6	3	0.0015	0.009			
Aroclor 1260	mg/kg	0.35	0.077		6						
SVOC											
1,1-Dimethylhydrazine	mg/kg		0.05		6						
1,2-Diphenylhydrazine	mg/kg		8.5		7						
1-Methyl naphthalene	mg/kg	230			20						

Table P.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 2 RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
2,4,5-Trichlorophenol	mg/kg	5700	9		7						
2,4,6-Trichlorophenol	mg/kg	10	10		7						
2,4-Dichlorophenol	mg/kg	170	1.3		2						
2,4-Dimethylphenol	mg/kg	1100	110		7						
2,4-Dinitrophenol	mg/kg	110	0.59		7						
2-Chloronaphthalene	mg/kg		530		7						
2-Chlorophenol	mg/kg	290	21		7						
2-Methylnaphthalene	mg/kg	230	210		20						
2-Nitroaniline	mg/kg		11		7						
2-Nitrophenol	mg/kg		11		7						
3,3'-Dichlorobenzidine	mg/kg		1.3		7						
3-Nitroaniline	mg/kg		5.9		7						
4,6-Dinitro-o-cresol	mg/kg	5.7	11		7						
4-Bromophenyl phenyl ether	mg/kg		4.3		7						
4-Chlorophenylphenyl ether	mg/kg		1.3		7						
4-Nitrophenol	mg/kg		7		7						
Acenaphthene	mg/kg	3400	2.46		20	1	0.0158	0.0158			
Acenaphthylene	mg/kg	1700	370		20	1	0.00565	0.00565			
Aniline	mg/kg	130	11		7						
Anthracene	mg/kg	17000	2.4		20	5	0.00061	0.0777			
Benzidine	mg/kg		2.3		3						
Benzo(a)anthracene	mg/kg	0.6	5.6		20	7	0.00066	0.187			
Benzo(a)pyrene	mg/kg	0.06	5.6		20	7	0.00068	0.112	2		
Benzo(b)fluoranthene	mg/kg	0.6	5.6		20	5	0.0014	0.175			
Benzo(ghi)perylene	mg/kg		6.4		20	6	0.00079	0.073			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		18	2	0.0081	0.0846			
Benzoic acid	mg/kg	230000	4.4		7						
Benzyl alcohol	mg/kg	17000	4.4		7						
bis(2-Chloroethoxy)methane	mg/kg		150		7						
bis(2-Chloroethyl) ether	mg/kg	0.29	150		7						
bis(2-Chloroisopropyl) ether	mg/kg	2300	150		7						
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		18	9	0.01	0.1912			
Butyl benzyl phthalate	mg/kg	11000	340		19	5	0.0007	0.071			
Chrysene	mg/kg	6	2.4		20	9	0.00087	0.28			
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		20	2	0.0013	0.019			
Dibenzofuran	mg/kg	110	62		7						
Diethyl phthalate	mg/kg	46000	6940		19						
Dimethyl phthalate	mg/kg	570000	4.4		20	4	0.00053	0.185			
Di-n-butyl phthalate	mg/kg	5700	0.49		19	2	0.0049	0.00811			
Di-n-octyl phthalate	mg/kg	2300	39		20	5	0.0014	0.027			
Diphenylamine	mg/kg				7						
Fluoranthene	mg/kg	2300	38		20	10	0.001	0.457			
Fluorene	mg/kg	2300	1.6		20	1	0.0174	0.0174			
Hexachlorobenzene	mg/kg	0.4	0.34		7						
Hexachlorocyclopentadiene	mg/kg	340	13		7						
Hexachloroethane	mg/kg	18	2.1		7						
Hydrazine	mg/kg		0.05		6						
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		20	6	0.00044	0.0427			
Isophorone	mg/kg	750	320		7						
Monomethylhydrazine	mg/kg		0.05		6						

Table P.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 2 RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Naphthalene	mg/kg	6	210		20	1	0.00091	0.00091			
n-Nitrosodimethylamine	mg/kg	0.045	20		20						
n-Nitrosodi-n-propylamine	mg/kg	0.1	28		7						
o-Cresol	mg/kg	2867.0661	110		7						
p-Chloroaniline	mg/kg		4.4		7						
p-Chloro-m-cresol	mg/kg		21		7						
p-Cresol	mg/kg	290	4.3		7						
Pentachlorophenol	mg/kg	8.8	6		7	1	0.0374	0.0374			
Phenanthrene	mg/kg	1700	1.3		20	6	0.00043	0.315			
Phenol	mg/kg	18000	5		7						
p-Nitroaniline	mg/kg		3.3		7						
Pyrene	mg/kg	1700	18		20	10	0.0011	0.708			
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		3						
1,1,1-Trichloroethane	mg/kg	0.49	4300		3						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		3						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		3						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		3						
1,1-Dichloroethane	mg/kg	0.0016	210		3						
1,1-Dichloroethene	mg/kg	0.023	10.7		3						
1,1-Dichloropropene	mg/kg		22		3						
1,2,3-Trichlorobenzene	mg/kg	0.124604521	20		3						
1,2,3-Trichloropropane	mg/kg	0.000051	12		3						
1,2,4-Trichlorobenzene	mg/kg	0.124604521	20		7						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		3						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		3						
1,2-Dibromoethane	mg/kg		25		3						
1,2-Dichlorobenzene	mg/kg	1.8	370		7						
1,2-Dichloroethane	mg/kg	0.0005	76		3						
1,2-Dichloropropane	mg/kg		250		3						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		3						
1,3-Dichlorobenzene	mg/kg	1.7	160		7						
1,3-Dichloropropane	mg/kg		22		3						
1,4-Dichlorobenzene	mg/kg	0.01	20		7						
2-Chloroethylvinyl ether	mg/kg	9.56905E-06	0.73		3						
2-Hexanone	mg/kg		1220		3						
Acetone	mg/kg	51	43		3						
Benzene	mg/kg	0.00013	110		3						
Bromobenzene	mg/kg		110		3						
Bromochloromethane	mg/kg		25		3						
Bromodichloromethane	mg/kg	0.00031	15		3						
Bromoform	mg/kg		38		3						
Bromomethane	mg/kg		25		3						
Carbon Tetrachloride	mg/kg	0.000042	1.5		3						
Chlorobenzene	mg/kg	0.097	40		3						
Chloroethane	mg/kg		190		3						
Chloroform	mg/kg	0.00077	11		3						
Chloromethane	mg/kg		25		3						
cis-1,2-Dichloroethene	mg/kg	0.014	68		3						
cis-1,3-Dichloropropene	mg/kg		22		3						

Table P.3-3A
Data Screening and Statistical Summary for Soil
DOE Leach Fields 2 RFI Site

		Screening Levels			Detect Data Summary						
Constituent	Units	Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Cumene	mg/kg	0.382558451	210		3						
Dibromochloromethane	mg/kg		46		3						
Dibromomethane	mg/kg		25		3						
Dichlorodifluoromethane	mg/kg	0.015	64		3						
Ethylbenzene	mg/kg	1.2	210		3						
Formaldehyde	mg/kg	12000	40.1		8	1	0.7925	0.7925			
Hexachlorobutadiene	mg/kg	9.2	0.85		7						
Methyl ethyl ketone	mg/kg	62	2540		3						
Methyl isobutyl ketone (MIBK)	mg/kg	19.63756975	2540		3						
Methyl tert-butyl ether	mg/kg		120		3						
Methylene chloride	mg/kg	0.004	25		3						
m-Xylene & p-Xylene	mg/kg	0.15	64		3	1	0.000285	0.000285			
n-Butylbenzene	mg/kg		210		3						
n-Propylbenzene	mg/kg	0.203267508	210		3						
o-Chlorotoluene	mg/kg	1222.098214	160		3						
o-Xylene	mg/kg	0.19	64		3						
p-Chlorotoluene	mg/kg	1222.098214	160		3						
p-Cymene	mg/kg		64		3						
sec-Butylbenzene	mg/kg	76.76404578	210		3						
sec-Dichloropropane	mg/kg		22		3						
Styrene	mg/kg	7.2	427		3	3	0.000621	0.000911			
tert-Butylbenzene	mg/kg		210		3						
Tetrachloroethene	mg/kg	0.00043	6		3						
Toluene	mg/kg	0.3	3.4		3						
trans-1,2-Dichloroethene	mg/kg	0.016	970		3						
trans-1,3-Dichloropropene	mg/kg		4.4		3						
Trichloroethene	mg/kg	0.0022	3		3						
Trichlorofluoromethane	mg/kg	0.11	300		3						
Vinyl chloride	mg/kg	0.0000096	0.73		3						
Xylenes, Total	mg/kg	0.15	64		3	1	0.000285	0.000285			

Table P.3-3B
Data Screening and Statistical Summary for Soil Vapor
DOE Leach Fields 2 RFI Site

		Screening Levels		Detect Data Summary					
Constituent	Units	Residential RBSL	Ecological RBSL	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL
VOC									
1,1,1,2-Tetrachloroethane	ug/L	0.048		5					
1,1,1-Trichloroethane	ug/L	640	38	5	1	0.09	0.09		
1,1,2,2-Tetrachloroethane	ug/L	0.048		5					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	5					
1,1,2-Trichloroethane	ug/L	0.17	0.057	5					
1,1-Dichloroethane	ug/L	1.7	36	5	1	0.17	0.17		
1,1-Dichloroethene	ug/L	58	0.6	5					
1,2-Dichloroethane	ug/L	0.13	42	5					
Benzene	ug/L	0.095	0.57	5					
Carbon Tetrachloride	ug/L	0.063	0.63	5					
Chloroethane	ug/L		992	5					
Chloroform	ug/L	0.5	0.24	5					
cis-1,2-Dichloroethene	ug/L	10	1.9	5	1	0.05	0.05		
Dichlorodifluoromethane	ug/L	58	91	5					
Ethylbenzene	ug/L	290	23	5					
Methylene chloride	ug/L	2.7	0.87	5					
m-Xylene & p-Xylene	ug/L		16	5					
o-Xylene	ug/L	29	16	5					
Tetrachloroethene	ug/L	0.45232	24	5					
Toluene	ug/L	110	0.084	5	1	0.06	0.06		
trans-1,2-Dichloroethene	ug/L	20	1.9	5					
Trichloroethene	ug/L	1.4	6.4	5					
Trichlorofluoromethane	ug/L	200	90.9	5					
Vinyl chloride	ug/L	0.035	0.56	5					
Xylenes, Total	ug/L		16	5					

Table P.4-1
Chemicals of Potential Concern for Human Health
DOE Leach Fields 2 RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	Acenaphthene		Y	
Soil	0-2	Aluminum	N	N	Below Background
Soil	0-2	Anthracene		Y	
Soil	0-2	Antimony	N	N	Below Background
Soil	0-2	Aroclor 1248		Y	
Soil	0-2	Aroclor 1254		Y	
Soil	0-2	Arsenic	N	N	Below Background
Soil	0-2	Barium	N	N	Below Background
Soil	0-2	Benzo(a)anthracene		Y	
Soil	0-2	Benzo(a)pyrene		Y	
Soil	0-2	Benzo(b)fluoranthene		Y	
Soil	0-2	Benzo(ghi)perylene		Y	
Soil	0-2	Benzo(k)fluoranthene		Y	
Soil	0-2	Beryllium	N	N	Below Background
Soil	0-2	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-2	Boron	N	N	Below Background
Soil	0-2	Butyl benzyl phthalate		Y	
Soil	0-2	Cadmium	N	N	Below Background
Soil	0-2	Chromium	N	N	Below Background
Soil	0-2	Chrysene		Y	
Soil	0-2	Cobalt	N	N	Below Background
Soil	0-2	Copper	N	N	Below Background
Soil	0-2	Dibenzo(a,h)anthracene		Y	
Soil	0-2	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-2	Dimethyl phthalate		Y	
Soil	0-2	Di-n-butyl phthalate		Y	
Soil	0-2	Di-n-octyl phthalate		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Fluorene		Y	
Soil	0-2	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	m-Xylene & p-Xylene		N	See Xylenes, Total
Soil	0-2	Naphthalene		Y	
Soil	0-2	Nickel	N	N	Below Background
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Pyrene		Y	
Soil	0-2	Selenium	N	N	Below Background
Soil	0-2	Silver	N	N	Below Background
Soil	0-2	Styrene		Y	
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	Vanadium	N	N	Below Background
Soil	0-2	Xylenes, Total		Y	
Soil	0-2	Zinc	N	N	Below Background
Soil	0-2	Zirconium	N	N	Below Background
Soil	0-10	Acenaphthene		N	< 5% Detection
Soil	0-10	Acenaphthylene		N	< 5% Detection
Soil	0-10	Aluminum	N	N	Below Background
Soil	0-10	Anthracene		Y	
Soil	0-10	Antimony	N	N	< 5% Detection
Soil	0-10	Aroclor 1248		Y	
Soil	0-10	Aroclor 1254		Y	
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	N	N	Below Background

Table P.4-1
Chemicals of Potential Concern for Human Health
DOE Leach Fields 2 RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Benzo(a)anthracene		Y	
Soil	0-10	Benzo(a)pyrene		Y	
Soil	0-10	Benzo(b)fluoranthene		Y	
Soil	0-10	Benzo(ghi)perylene		Y	
Soil	0-10	Benzo(k)fluoranthene		Y	
Soil	0-10	Beryllium	N	N	Below Background
Soil	0-10	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-10	Boron	N	N	Below Background
Soil	0-10	Butyl benzyl phthalate		Y	
Soil	0-10	Cadmium	N	N	Below Background
Soil	0-10	Chromium	N	N	Below Background
Soil	0-10	Chrysene		Y	
Soil	0-10	Cobalt	N	N	Below Background
Soil	0-10	Copper	N	N	Below Background
Soil	0-10	Dibenzo(a,h)anthracene		Y	
Soil	0-10	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Dimethyl phthalate		Y	
Soil	0-10	Di-n-butyl phthalate		Y	
Soil	0-10	Di-n-octyl phthalate		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Fluorene		N	< 5% Detection
Soil	0-10	Formaldehyde		Y	
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Mercury	N	N	Below Background
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	m-Xylene & p-Xylene		N	See Xylenes, Total
Soil	0-10	Naphthalene		N	< 5% Detection
Soil	0-10	Nickel	N	N	Below Background
Soil	0-10	Pentachlorophenol		Y	
Soil	0-10	Phenanthrene		Y	
Soil	0-10	Pyrene		Y	
Soil	0-10	Selenium	N	N	Below Background
Soil	0-10	Silver	N	N	Below Background
Soil	0-10	Styrene		Y	
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	Vanadium	N	N	Below Background
Soil	0-10	Xylenes, Total		Y	
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	-	1,1,1-Trichloroethane		Y	
Soil Vapor	-	1,1-Dichloroethane		Y	
Soil Vapor	-	cis-1,2-Dichloroethene		Y	
Soil Vapor	-	Toluene		Y	
Groundwater	-	None			

Table P.4-2
Human Health Risk Estimates[1]
DOE Leach Fields 2 RFI Site

Receptor	Soil Media[2]				Groundwater[3]				Total for Site Media[4]			
	HI Range	CD[5]	Risk Range	CD	HI Range	CD	Risk Range	CD	HI Range	CD	Risk Range	CD
Future Adult Recreator	0.0000003 - 0.000006		3E-09 - 2E-07		NA - NA		NA - NA		<0.01 - <0.01		3E-09 - 2E-07	
Future Child Recreator	0.000005 - 0.00002		4E-08 - 2E-07		NA - NA		NA - NA		<0.01 - <0.01		4E-08 - 2E-07	
Future Adult Resident	0.0001 - 0.0004		4E-08 - 3E-07		NA - NA		NA - NA		0.0007 - 0.001		5E-08 - 4E-07	
Future Child Resident	0.001 - 0.003		3E-07 - 6E-07		NA - NA		NA - NA		0.004 - 0.006		3E-07 - 7E-07	

Notes:
1. Risk estimates shown are a sum of all exposure pathways per media; the range reported is for the central tendency and reasonable maximum exposures, respectively.
2. Soil media risk estimates are a sum of all direct exposure routes, including incidental ingestion, dermal contact, and dust inhalation.
3. Groundwater media risk estimates are for domestic use of shallow groundwater.

4. Includes combined exposure from 1) direct contact with soil, 2) inhalation of indoor and ambient air vapors originating from soil gas, subsurface soil, and groundwater, and 3) domestic use of shallow groundwater.
5. Chemical risk drivers are those COPCs detected onsite with an HI > 1 or risk > 1x10-6. Only major risk contributors listed if cumulative HI >> 1 or cancer risk >> 1x10-6.
6. CD = Chemical risk driver
7. COPC = Chemical of potential concern
8. HI = Hazard index
9. NA = Not Applicable

Table P.4-3
Human Health Risk Assessment Uncertainty Analysis
DOE Leach Fields 2 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	1,1,1-trichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethene, and toluene were selected as soil vapor COPCs since they were directly detected in soil vapor. Naphthalene and styrene were also selected as soil vapor COPCs because they were detected in soil but not analyzed for in soil vapor.	Moderate	Conservative
	Petroleum hydrocarbons were not selected as COPCs since TPH-related constituents (BTEX and PAHs) were analyzed for.	Low	Realistic
Exposure Pathways	Risks associated with drinking of groundwater are not realistic because the groundwater beneath the SSFL is not currently used as a drinking water source and the presence of the contamination will likely require a restriction on its future use as well.	High	Conservative
	Future land use of the site is currently undecided but may be recreational, which has lower risks than for urban residential. If land use is assumed agricultural, risk estimates may be higher.	Moderate	Uncertain
	Risk estimates for fruit and vegetable consumption are based on conservative models that are based on associations with physical-chemical properties, such as Koc.	Moderate	Conservative
EPC Calculations	Use of upper confidence limits and maximum detected concentrations will likely overestimate site risks.	Low	Conservative
	Soil vapor exposure point concentration for naphthalene and styrene are estimated using soil to soil vapor partitioning extrapolations, introducing some degree of uncertainty.	Moderate	Conservative
	The 95% UCL concentration of some chemicals is greater than the maximum concentration, therefore the maximum was used as the EPC. This is considered to be a likely overestimation of the representative EPC because samples were collected in areas with the highest likelihood to detect the highest concentrations at the site.	Moderate	Conservative
	The maximum detected concentration of each COPC detected in groundwater was used as the EPC.	Moderate	Conservative
	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations to individual PCB congener concentrations introduces some uncertainty into the EPC estimates for the PCB congeners.	Low	Conservative
	Vapor migration into indoor air has been estimated using a model which is being validated for the site. Migration estimates may be changed once the model validation is complete.	Moderate	Uncertain
Cancer Slope Factor	Extrapolation of dose-response data from laboratory animals to humans.	High	Conservative
	Assumes that all carcinogens do not have a threshold below which carcinogenic response occurs and therefore, any dose, no matter how small, results in some potential risk.	Moderate	Conservative
	Not all slope factors represent the same degree of certainty. All are subject to change as new evidence becomes available. Some slope factors derived by OEHHA and considerably more conservative that corresponding factors derived by USEPA (e.g. arsenic, PCBs)	Moderate	Conservative
	Cancer slope factors derived from animal studies are the upper-bound maximum likelihood estimates based on a linear dose-response curve, and therefore, overstate carcinogenic potency.	Moderate	Conservative
Reference Dose	No dermal toxicity values are available, oral toxicity factors are used for the dermal route.	Moderate	Conservative
	High degree of uncertainty in extrapolation of dose-response data from laboratory animals to humans.	High	Conservative

Notes:
BTEX - benzene, toluene, ethylbenzene, and xylenes
COPC - chemical of potential concern
EPC - exposure point concentration
Koc - organic carbon sorption/adsorption coefficient
OEHHA - Office of Environmental Health Hazard Assessment
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
TPH - total petroleum hydrocarbons
UCL - upper confidence limit

Table P.4-4
Chemicals of Ecological Concern - Soil
DOE Leach Fields 2 RFI Site

Preferred Analyte Name	Range of Hazard Quotients - RME Exposure							Identification of COECs	
	Terrestrial Plant	Soil Invertebrate	Hermit Thrush	Red-Tailed Hawk	Deer Mouse	Bobcat	Mule Deer	COEC	Rationale
PCB_TEQ_Bird	No TRV	0.00002	0.20 -- **2.0**	0.00001 -- 0.0001	No TRV -- No TRV	n/a -- n/a	n/a -- n/a	**Yes**	-When dioxin-like PCB congeners are not analyzed on site, exposure point concentrations are modeled from Aroclor 1254 and 1260. At this site, Aroclor 1254 was detected, but not Aroclor 1260. -Extrapolated values have some degree of uncertainty and may over- or under-estimate actual concentrations. -HQs exceeded one only for 2 receptors (thrush and mouse), no other HQs exceeded one.
PCB_TEQ_Mammal	No TRV	0.00001	n/a -- n/a	n/a -- n/a	0.61 -- **6.1**	0.000003 -- 0.00003	0.0001 -- 0.0005		-Exceedances were for the Low TRV only. Neither receptor exceeded at the High TRV indicating that potential risks are somewhere between a no effect and low effect. -HI exceeded one for dioxin/furan chemical class at the Low TRV only (based on the extrapolated values).

Notes:
n/a - not applicable
HQs listed are based on Refined Screen
Low hazard quotient = EPC/High TRV
High hazard quotient = EPC/Low TRV
COEC - chemical of ecological concern
CTE - central tendency exposure
HI - hazard index
HQ - hazard quotient
RME - reasonable maximum exposure
TRV - toxicity reference value

Table P.4-5
Chemicals of Ecological Concern - Soil Vapor
DOE Leach Fields 2 RFI Site

Preferred Analyte Name	Inhalation of Soil Vapor (Deer Mouse)	Identification of COECs	
		COEC	Rationale
1,1,2-Trichloroethane	**1.8**	No	-Analyte was not detected. Retained for evaluation because SQL>ESL. -ESL and TRV are same value and have uncertainty regarding their derivation. -No other VOCs were detected at the site. -Not likely that the analyte is present at levels of ecological concern.

n/a - not applicable
HQs listed are based on Refined Screen
COEC - chemical of ecological concern
CTE - central tendency exposure
ESL - ecological screening level
HQ - hazard quotient
RME - reasonable maximum exposure
SQL - sample quantitation limit

Table P.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 2 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Problem Formulation			
Fate and Transport	It is assumed that chemical concentrations will not change over time, and that concentrations are constant during the exposure duration. Natural attenuation and/or other degradation processes may be significant in some areas resulting in an over-estimation of exposure.	Moderate	Over-estimation of exposure/risk
Data Collection/Analysis	Variability in analyses, laboratories, representativeness of samples, sampling errors, and homogeneity of the sample matrix can influence quality and quantity of data used in the risk assessment. Data were validated, but historical sampling programs may not have had the same standards as more recent ones.	Unknown	Over- or under-estimation of exposure/risk
Data Collection/Analysis	Detection Limits. Historical data were noted to have overly high detection limits, especially in regard to metals. Recent sampling was designed to have detection limits meeting ESLs. However, as data are combined into the EPCs, high detection limits may influence the resulting mean and 95UCLs.	Moderate	Over-estimation of exposure/risk
Data Collection/Analysis	Surface water samples were not collected from surface drainages. Potential exposure and risk to aquatic receptors could not be evaluated.	Moderate	Under-estimation of exposure/risk
Representative Species	Representative species were selected to reduce uncertainty; however, differences among species including physiology, reproductive biology, and/or foraging habits can result in different exposures and sensitivities for different receptors.	Low	Over- or under-estimation of exposure/risk
CPEC Selection	Background Comparison. Background evaluation was based on the WRS test. For some inorganics, the WRS test indicated that the site exceeded background, but site maximum, CTE, and RME concentrations were similar to or below background maximum, CTE, and/or RME concentrations.	Low	Over-estimation of exposure/risk
CPEC Selection	VOC Comparison. VOCs that were detected in soil but were not analyzed for in soil gas were retained as CPECs under the matrix "Modeled Soil Vapor". Concentrations were modeled from soil concentrations using SRAM Appendix G Equation 18.	Low	Over-estimation of exposure/risk
CPEC Selection	SQL Comparison. Chemicals that were never detected at the site were included as CPECs if they met the criteria in the SQL screening process: a) SQL>ESL b) at least 5 samples were collected c) at least 2 other chemicals in the same chemical class were detected.	Low	Over-estimation of exposure/risk
Exposure Pathway Analysis	Dermal and inhalation (for surface-dwelling animals) exposure pathways were not quantified.	Low	Under-estimation of exposure/risk
Analysis			
Wildlife Exposure Factors	Assumptions regarding exposure - likelihood, contact with contaminated media, concentrations at exposure points, and frequency/duration of contact are based on available information and assumptions of wildlife habits at the SSFL. Assumptions tend to simplify actual site conditions and may over- or under-estimate actual exposure.	Moderate	Over- or under-estimation of exposure/risk

Table P.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 2 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Bioaccumulation Factors	Site-specific data on CPEC concentrations in wildlife foods were used to derive BAFs for a limited number of CPECs (SRAM 2005). For the remaining CPECs, literature-based BAFs and regression models were used to estimate bioaccumulation. The suitability of these bioaccumulation models to conditions at the site is unknown. Therefore, concentrations of CPECs in biota present at the site and, consequently, the dietary exposures of birds and mammals, may be either higher or lower than values estimated in the Group 5 ERAs.	Moderate	Over- or under-estimation of exposure/risk
Bioavailability	Bioavailability of CPECs was assumed to be 100 percent. This likely overestimates risk to receptors at the site.	Low	Over-estimation of exposure/risk
Area Use Factors	Area use factors (AUFs) of less than 1 were applied to exposure estimates for wide-ranging receptors (red-tailed hawk, bobcat, and mule deer) in the "refined" assessment to account for the foraging range of the receptor. Use of the site may be greater or less than that predicted by the AUF.	Low	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	CTE EPC. CTE EPC is based on the arithmetic mean per the SRAM (MWH 2005). This assumes normal distribution. In some cases the CTE was >RME and/or CTE was >Maximum detect. The mean (CTE) could be biased high by higher detection limits from historic data. The RME EPC was used for the CTE EPC when the CTE was >RME or CTE was >Maximum.	Moderate	Over-estimation of exposure/risk
Exposure Point Concentrations	RME EPC. The RME EPC is the 95UCL, unless the 95UCL exceeds the maximum detect in which case the maximum detect is used as the RME EPC. Use of the maximum detect is considered to be a likely overestimation of the representative exposure point concentration because samples were collected in areas likely to have the highest concentrations at the site.	Moderate	Over-estimation of exposure/risk
Exposure Point Concentrations	The extrapolation of soil Aroclor 1254 and Aroclor 1260 concentrations to individual dioxin-like PCB congener concentrations introduces some uncertainty into the EPC estimates for the PCB congeners.	Low	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Soil vapor concentrations extrapolated from soil concentrations were used to calculate soil vapor EPC.	Moderate	Over- or under-estimation of exposure/risk
Exposure Point Concentrations	Estimation of soil vapor concentrations overstates actual burrow concentrations: 1) Model is conservative. 2) Air flow in burrows is not accounted for. 3) Model does not account for attenuation between depth to soil and 0-6 ft bgs interval for burrows.	Moderate	Over- or under-estimation of exposure/risk
Toxicity Reference Values	Toxicity data were not available for all CPECs or media considered in the Group 5 ERAs. CPECs for which toxicity data were unavailable were not evaluated, or surrogate toxicity data were used. Risks may be overestimated or underestimated.	Moderate	Over- or under-estimation of exposure/risk

Table P.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 2 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Toxicity Reference Values	Literature-derived toxicity data from laboratory studies were the only toxicity data used to evaluate risk to all receptor groups. Effects observed in laboratory species were assumed to be indicative of effects that would occur in wild species. The suitability of this assumption is unknown. Therefore, risk may be either overestimated or underestimated.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	There is uncertainty in extrapolation of dose-response data from laboratory animals to other wildlife.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	Use of standardized uncertainty factors to estimate chronic NOAEL-equivalent TRVs.	Moderate	Over- or under-estimation of risks
Toxicity Reference Values	Use of chronic NOAEL-equivalent TRVs may overestimate risk.	High	Over-estimation of exposure/risk
Toxicity Reference Values	TRVs based on high dose laboratory exposures (LD50) were adjusted to a NOAEL-equivalent TRV. The more variables that are normalized using uncertainty factors, the greater the uncertainty in the resulting value.	Moderate	Over-estimation of exposure/risk
Toxicity Reference Values	Sources of TRVs occasionally apply different uncertainty factors than those used in the SRAM to adjust a study to what they label a "Chronic NOAEL". When details of the study were available, SRAM-specified uncertainty factors were used. If the details of the study were not presented or were not sufficiently complete to make a determination, then the interpretations made by the source document were used.	Low	Over- or under-estimation of risks
Risk Characterization			
Risk Estimation	Potential ecological risks were quantified using the HQ approach. The magnitude of the HQ indicates potential for ecological risk, but is not an exact estimation of risk. For example, the actual risk from a chemical with an HQ of 70 could be less than that for a chemical with an HQ of 20 because of uncertainties involved in estimating exposure, selection of effects criteria (TRVs), or field conditions affecting exposure.	Moderate	Over- or under-estimation of risks
Risk Estimation	Data necessary to estimate potential risks from all pathways for all chemicals in the food-chain uptake model were not always available. For these chemicals and/or areas, the food-chain uptake model was completed using the available data.	Moderate	Under-estimation of exposure/risk
Risk Estimation	Risks estimated for exposure to some inorganics may represent a background risk, rather than a site-related risk. Although the WRS test sometimes indicated that the site exceeded background, the Maximum, CTE, and/or RME EPC concentrations, it was sometimes found that site values were less than or comparable to the background Maximum, CTE, and/or RME concentrations.	Moderate	Over- or under-estimation of exposure/risk

Table P.4-6
Ecological Risk Assessment Uncertainty Analysis
DOE Leach Fields 2 RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
Risk Description	The soluble and toxic forms of aluminum are only present in soil under soil pH values of less than 5.5 (USEPA 2003), and the average pH for the soils at the Group 5 sites exceeds 5.5. Aluminum, while evaluated in the ERA as a CPEC and identified as a risk driver, most likely does not cause effects to the various ecological receptors due to the soil pH range.	Moderate	Over-estimation of exposure/risk

Notes:

BAF - bioaccumulation factor
CPEC - chemical of potential ecological concern
CTE - central tendency exposure
EPC - exposure point concentration
ERA - ecological risk assessment
ESL - ecological screening level
LD50 - lethal doses to 50% of test animals
NOAEL - no observed adverse effect level
RME - reasonable maximum exposure
SQL - sample quantitation limit
TRV - toxicity reference value
UCL - upper confidence limit on the mean
VOC - volatile organic chemical
WRS - Wilcoxon Rank Sum test

Table P.5-1
Surficial Media Site Action Recommendations
DOE Leach Fields 2 RFI Site

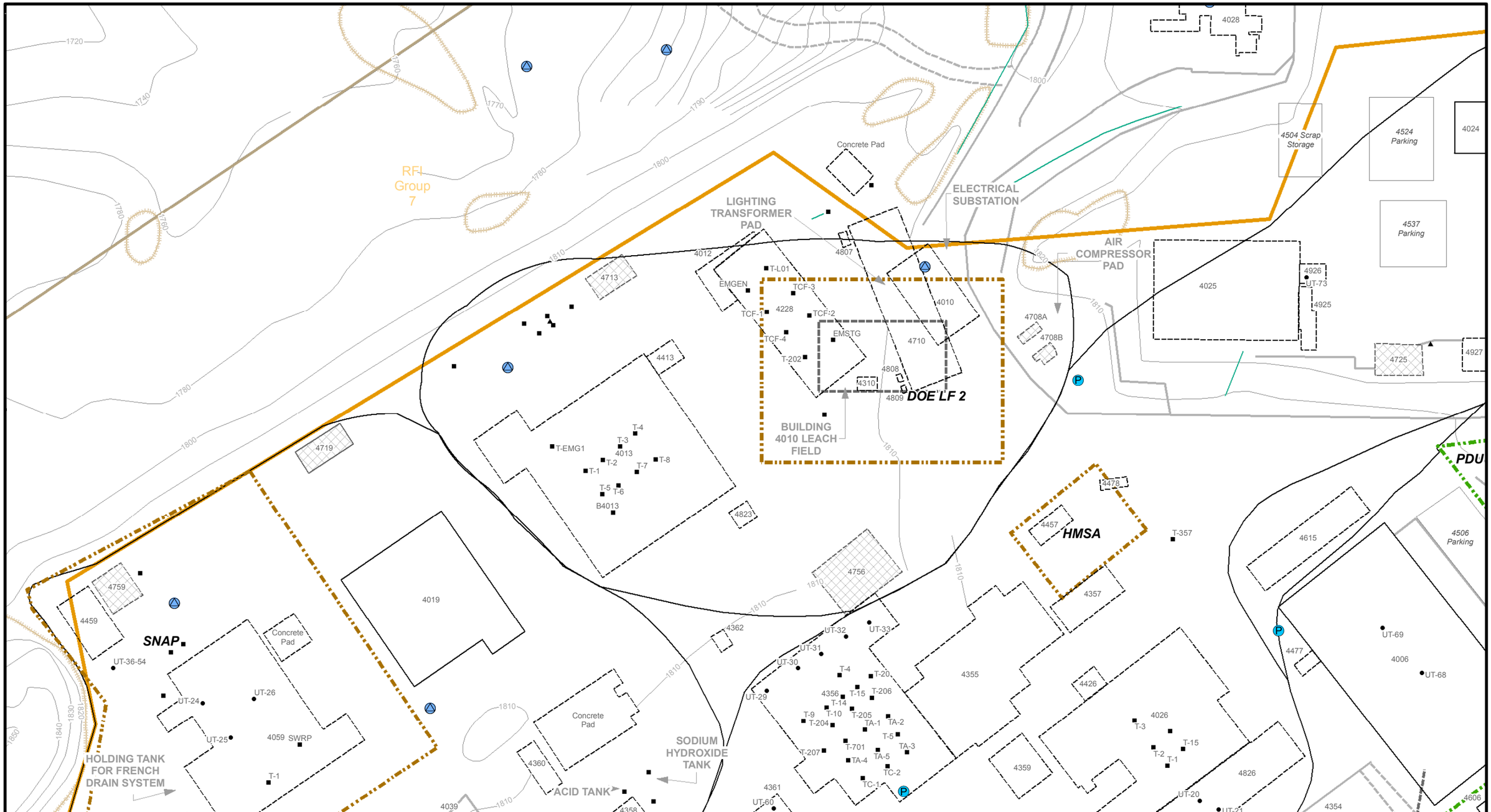
Chemical Use Area	Chemical Use Area Name	CMS Area [1]	Recommended for further consideration in CMS based on:				
			Residential Receptor [2]	Recreational Receptor [2]	Ecological Receptor [2]		
1	Substation 4713	NFA	No HRA COCs identified	No HRA COCs identified	***Soil Results***		
2	Substation 4708A/4708B	NFA			Any HQ>1	COEC	Rationale
3	Substation 4756	NFA			PCB_TEQ_Bird	Yes	ERA-2
4	Substation on Western Side of Building 4010	NFA			PCB_TEQ_Mammal	Yes	ERA-2
5	Substation on Eastern Side of Building 4010	NFA					
6	Building 4010	NFA			***Soil Vapor Results***		
7	Building 4010 Leach Field	NFA			Any HQ>1?	COEC	Rationale
8	Building 4012	NFA			1,1,2-Trichloroethane	No	ERA-1
9	Air Compressor Pad/Cooling Water Pipelines	NFA					
10	Building 4013	NFA					
11	EMGEN	NFA					
12	T-L01 (Turbine)	NFA					
13	TCF-1	NFA					
14	TCF-2	NFA					
15	TCF-3	NFA					
16	EMSTG	NFA					
17	Substation 4413	NFA					

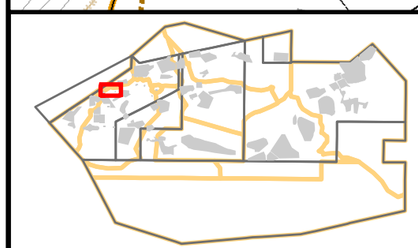
Notes:
1. NFA - Indicates area is recommended for No Further Action (NFA) for the CUA; not recommended for CMS evaluation.
2. CMS recommendations are based on compounds considered risk drivers (excess cancer risk > 1 x 10-6 or hazard index > 1) and/or significant risk contributors.

ERA-1 Analyte was not detected in either soil or soil vapor. It was retained for risk calcs because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.

ERA-2 Estimated risks >1 for 1 or more receptors and chemical class hazard index>1. NOTE- eposure point concentrations were extrapolated from Aroclor 1254 and 1260 (not directly measured).

Figures





Basemap Legend

- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Leachfield
- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Pipe

Site Location
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

October 31, 2008

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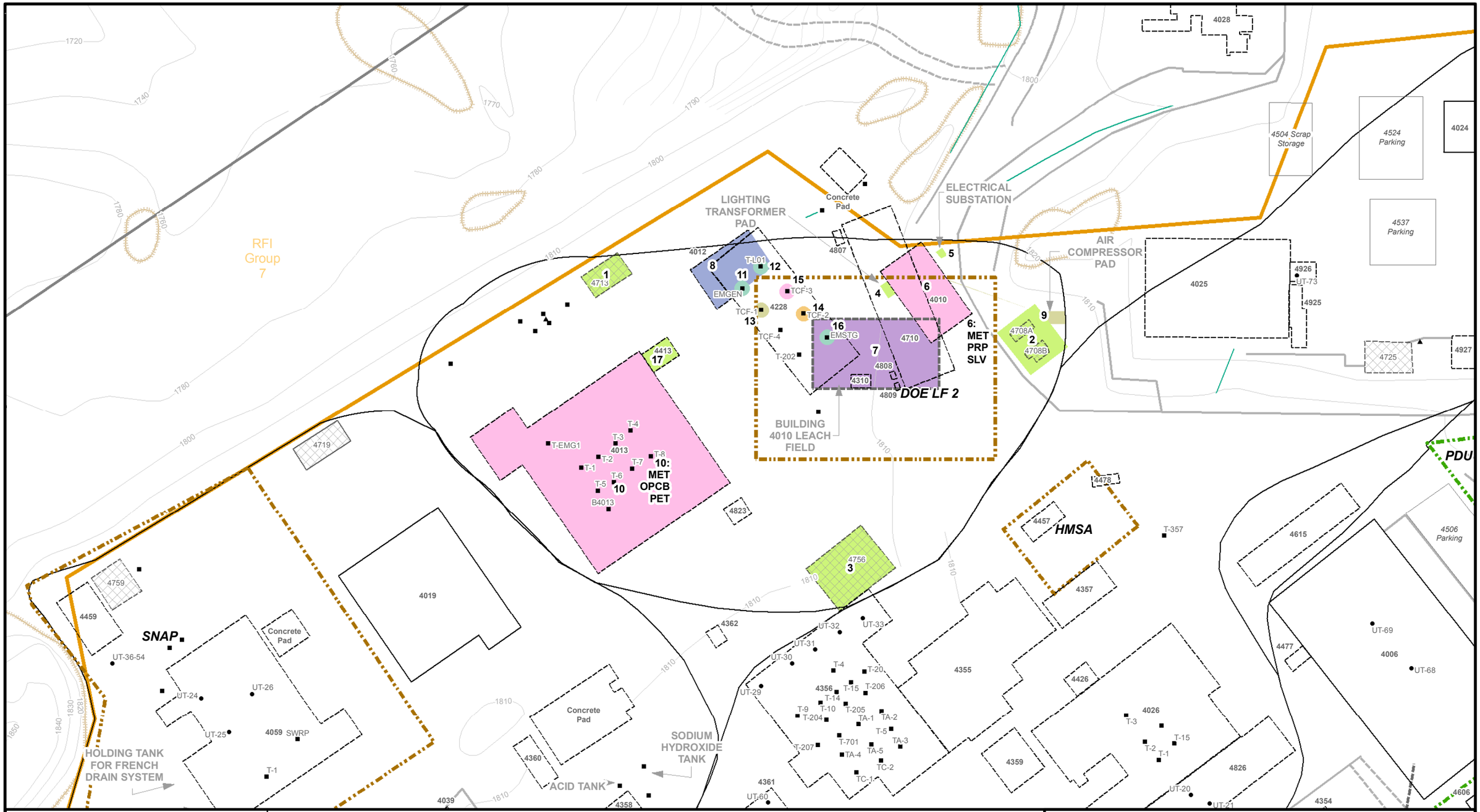
FIGURE P.1-1



Chemical Use

- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

Multiple Use Key

ACB - Acids and Bases
ASB - Asbestos
DEB - Debris
DIOX - Dioxins and Furans
ENC - Energetic Constituents
FRM - Formaldehyde
LCF - Leach Field
MET - Metals
NMIC - Non-metal Inorganic Constituents
OPCB - Oil/PCBs
PET - Petroleum
PRP - Propellants
SLV - Solvents
SVOC - SVOCs

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area

Chemical Use Areas
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

September 15, 2008

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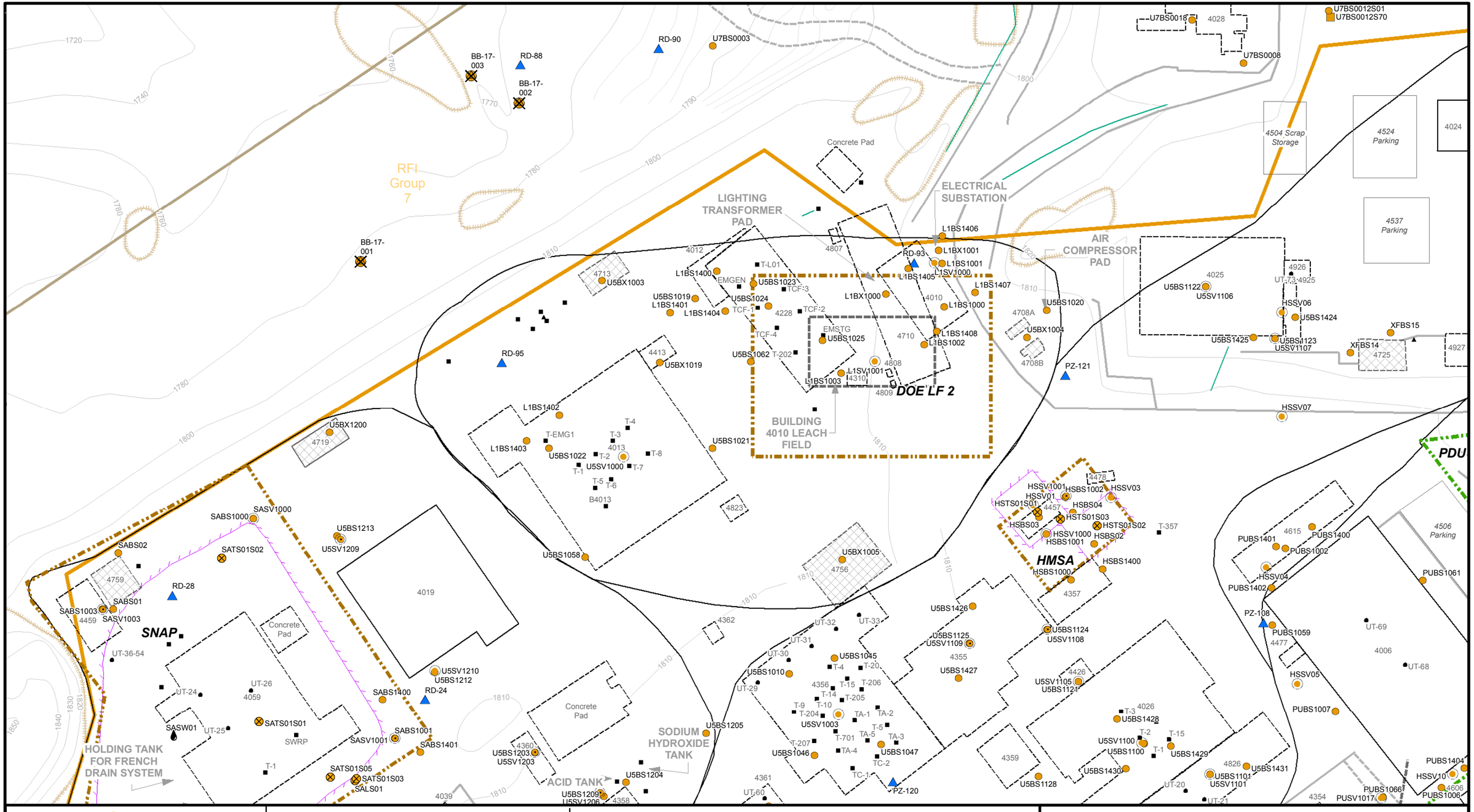
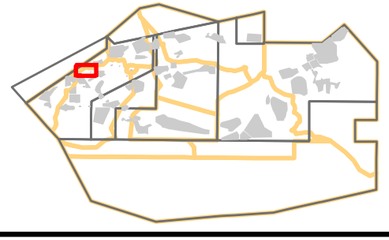
FIGURE P.2-1





Sample Type

- Soil
- Soil - Composite
- Soil - Sediment
- Soil - Surface
- Air - Soil Vapor
- SV points that were not sampled due to refusal or poor air flow
- Air
- Groundwater
- Groundwater - Lysimeter
- Groundwater - Spring
- Water - Artificial
- Water - Discharge
- Water - Surface
- Water - Surface (Seep)
- Biological
- MO Other
- MS Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Trench
- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

Sample Locations
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 04, 2008

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FIGURE P.2-2

RFI Group 7

RD-88 RD-90 RD-95 RD-93 RD-28 RD-24

PZ-121 PZ-120 PZ-108

X X' N N'

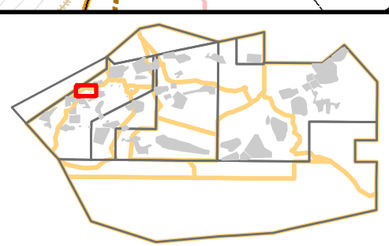
SNAP DOE LF 2 HMSA PDU

Concrete Pad Concrete Pad Concrete Pad

4504 Scrap Storage 4524 Parking 4537 Parking 4506 Parking

4012 4807 4713 4228 4010 4710 4708A 4708B 4413 4808 4310 4809 4719 4013 4823 4478 4457 4759 4459 4019 4362 4756 4357 4615 4477 4006 4355 4426 4026 4059 4360 4356 4359 4826 4039 4358 4361 4354 4606 4028 4024 4926 4925 4025 4927 4725

1720 1740 1760 1770 1780 1790 1800 1810 1820 1830 1840 1850



Cross-section Line

- Soil Boring
- Confirmation Sample
- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Abandoned Groundwater Monitoring Well

Basemap Legend

- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Leachfield
- Pipe

DOE LF2 Cross Section Locations

N-N' and X-X'

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

October 31, 2008

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FIGURE P.2-3A

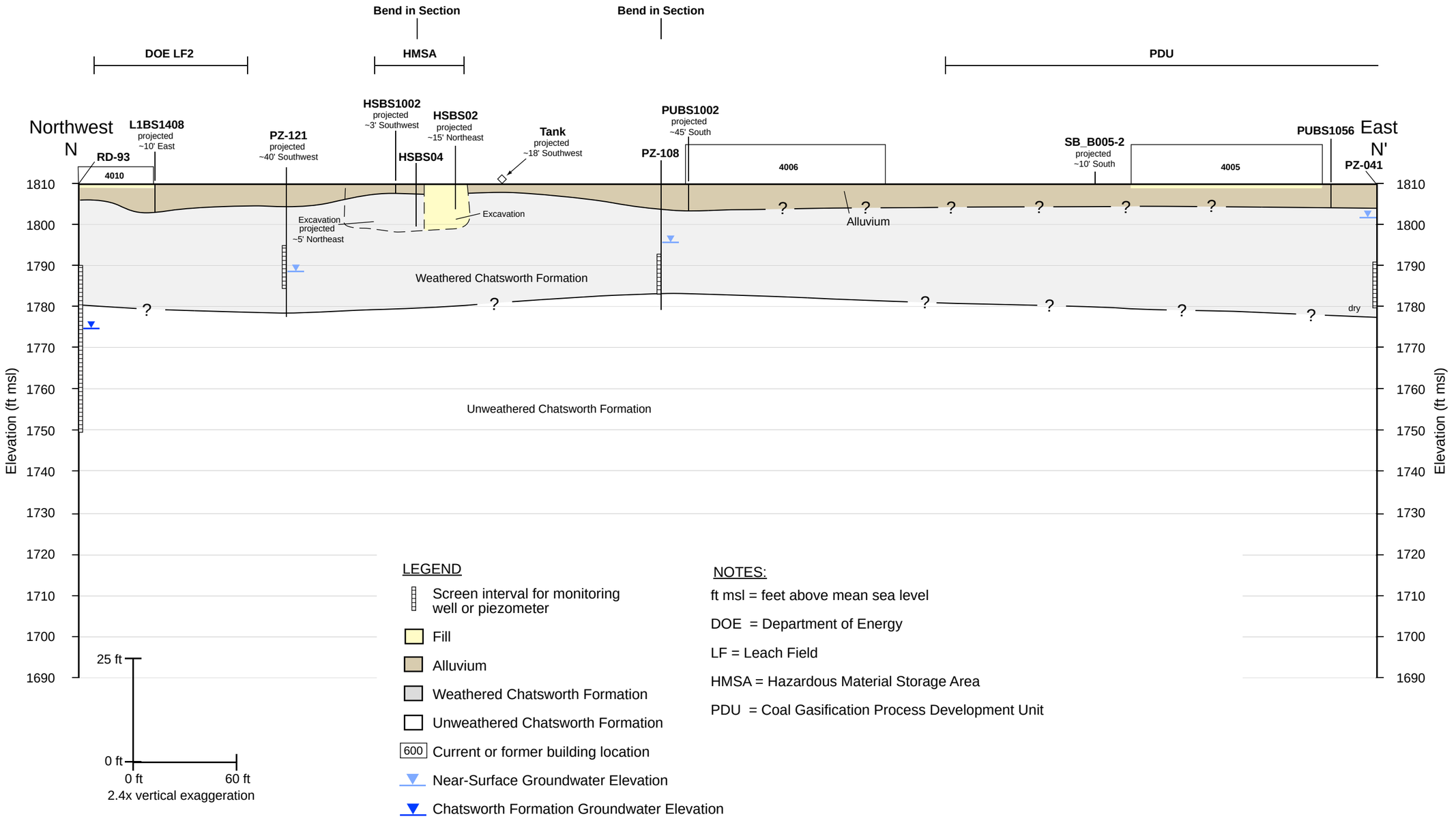


FIGURE P.2-3B
Surficial Cross Section N-N'
DOE LF2
Santa Susana Field Laboratory
CH2MHILL

ES072007017SCO362070.FP.5A.05.BO CrossSect_NN.ai 11/08

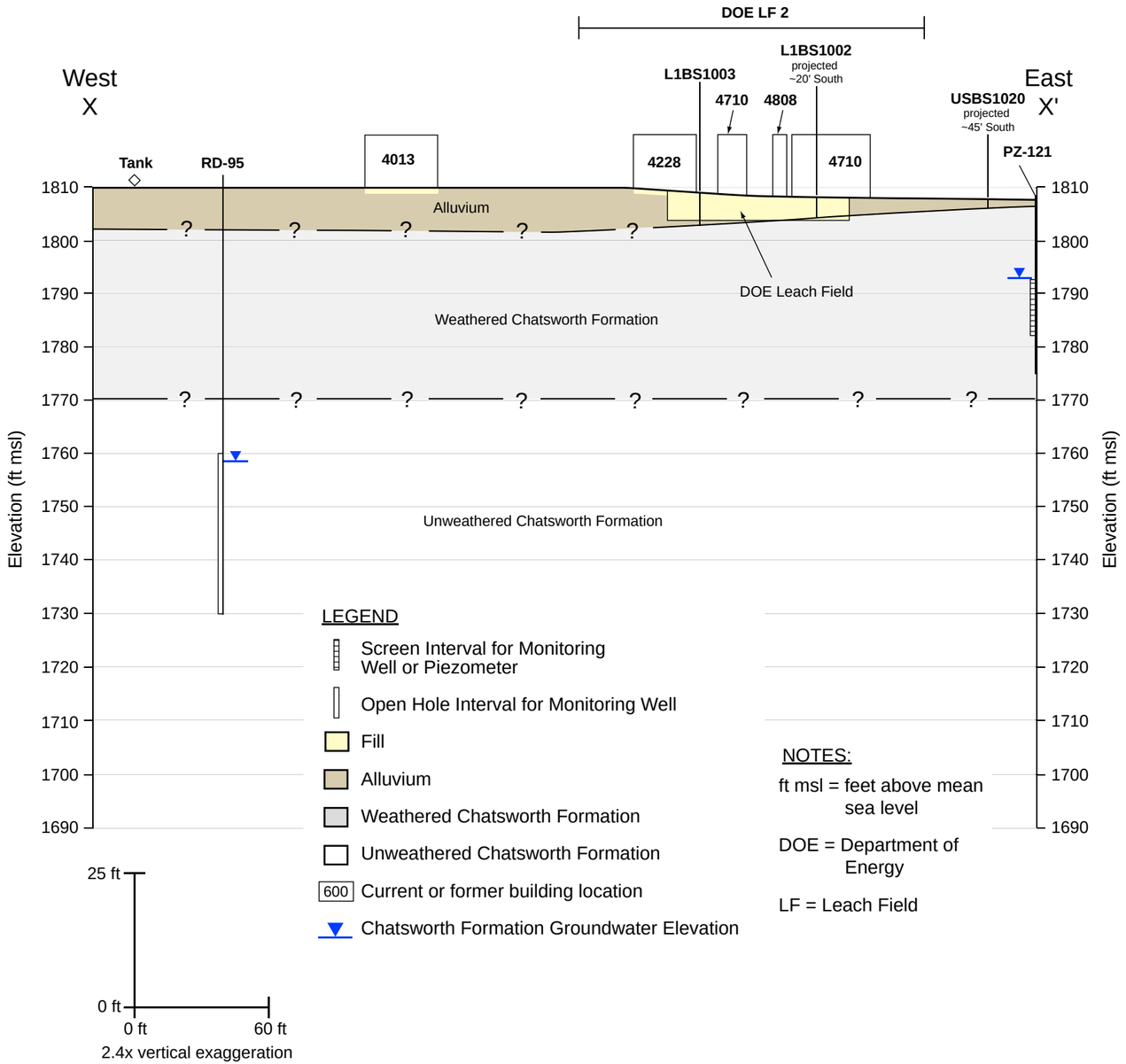
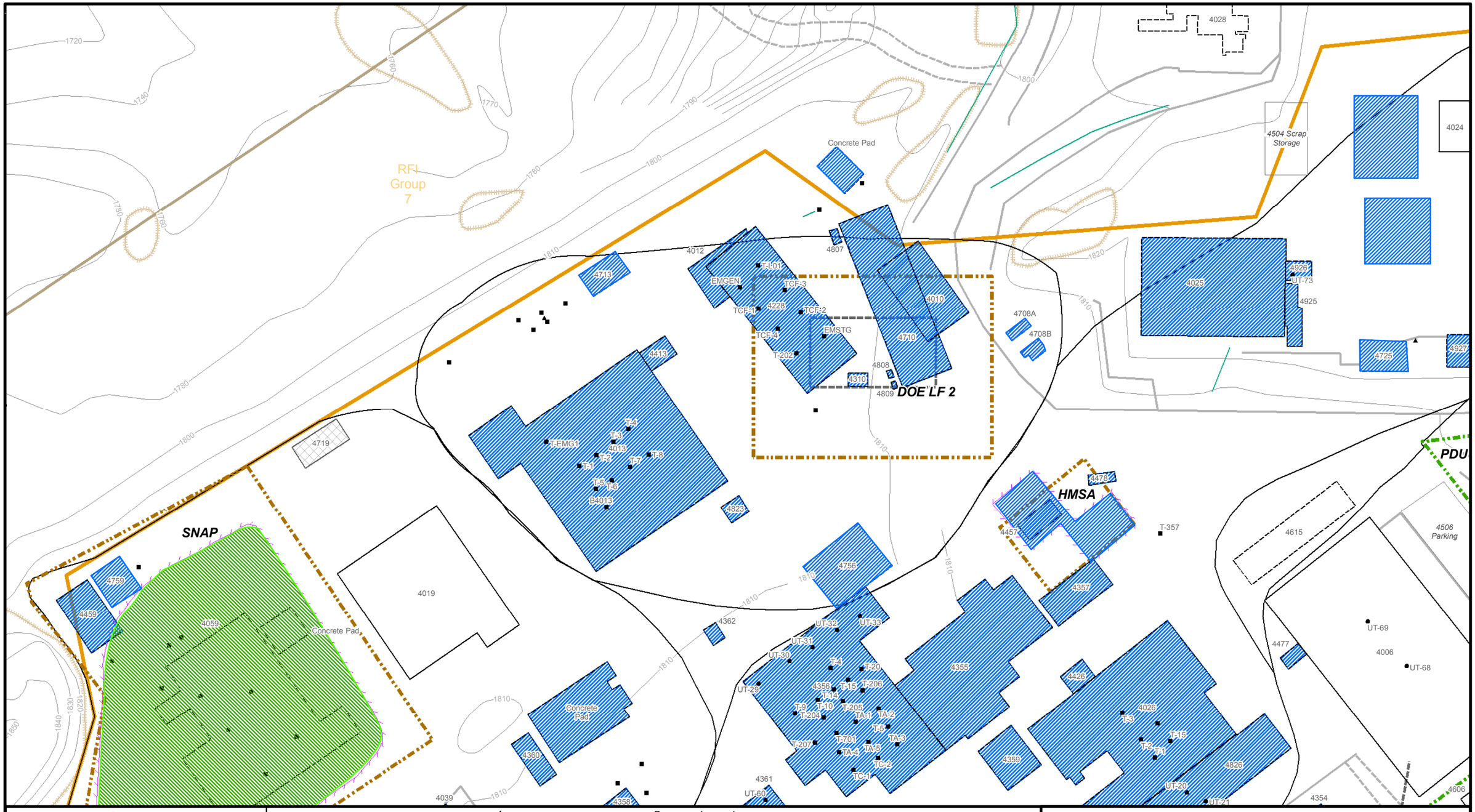
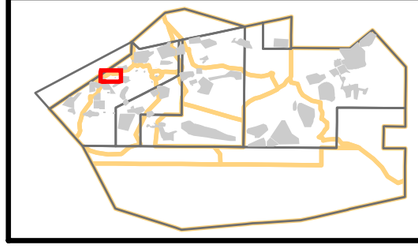


FIGURE P.2-3C
Surficial Cross Section X-X'
DOE LF2
Santa Susana Field Laboratory





Approximate Areas of Soil Disturbance

- Grading
- Excavation - Backfill

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Leachfield
- Excavation
- Trench
- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Pipe

Soil Disturbance Area
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

Feet

0 60 120

November 06, 2008

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FIGURE P.2-4

RFI Group 7

Concrete Pad

4504 Scrap Storage

4524 Parking

4537 Parking

4506 Parking

DOE LF 2

HMSA

SNAP

Concrete Pad

Concrete Pad

4059 SWRP

4012 4807 4713 4228 4010 4710 4708A 4708B 4925 4926 4725 4927 4024 4028 4025 4413 4719 4823 4478 4457 4357 4615 4759 4459 4019 4362 4756 4355 4426 4359 4477 4006 4826 4354 4606 4360 4361 4039 4358 4026

T-L01 EMGEN TCF-3 TCF-1 TCF-2 TCF-4 EMSTG T-202 4310 4808 4809 UT-73

T-4 T-3 T-EMG1 4013 T-2 T-8 T-1 T-7 T-5 T-6 B4013

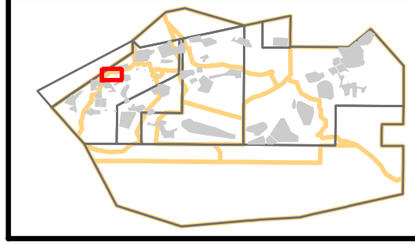
UT-32 UT-33 UT-31 UT-30 T-4 T-20 UT-29 4356 T-15 T-206 T-14 T-205 T-9 T-10 T-204 TA-1 TA-2 T-5 T-701 TA-3 T-207 TA-4 TA-5 TC-2 TC-1 UT-60

UT-36-54 UT-24 UT-26 UT-25 T-1

T-357 UT-69 UT-68 UT-20 UT-21 T-3 T-2 T-15 T-1

1720 1740 1760 1770 1780 1790 1800 1810 1820 1830 1840 1850

PDU



VOCs in Soil Vapor

- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect
- SV points that were not sampled due to refusal or poor air flow

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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Trench

VOCs in Soil Vapor
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

November 03, 2008

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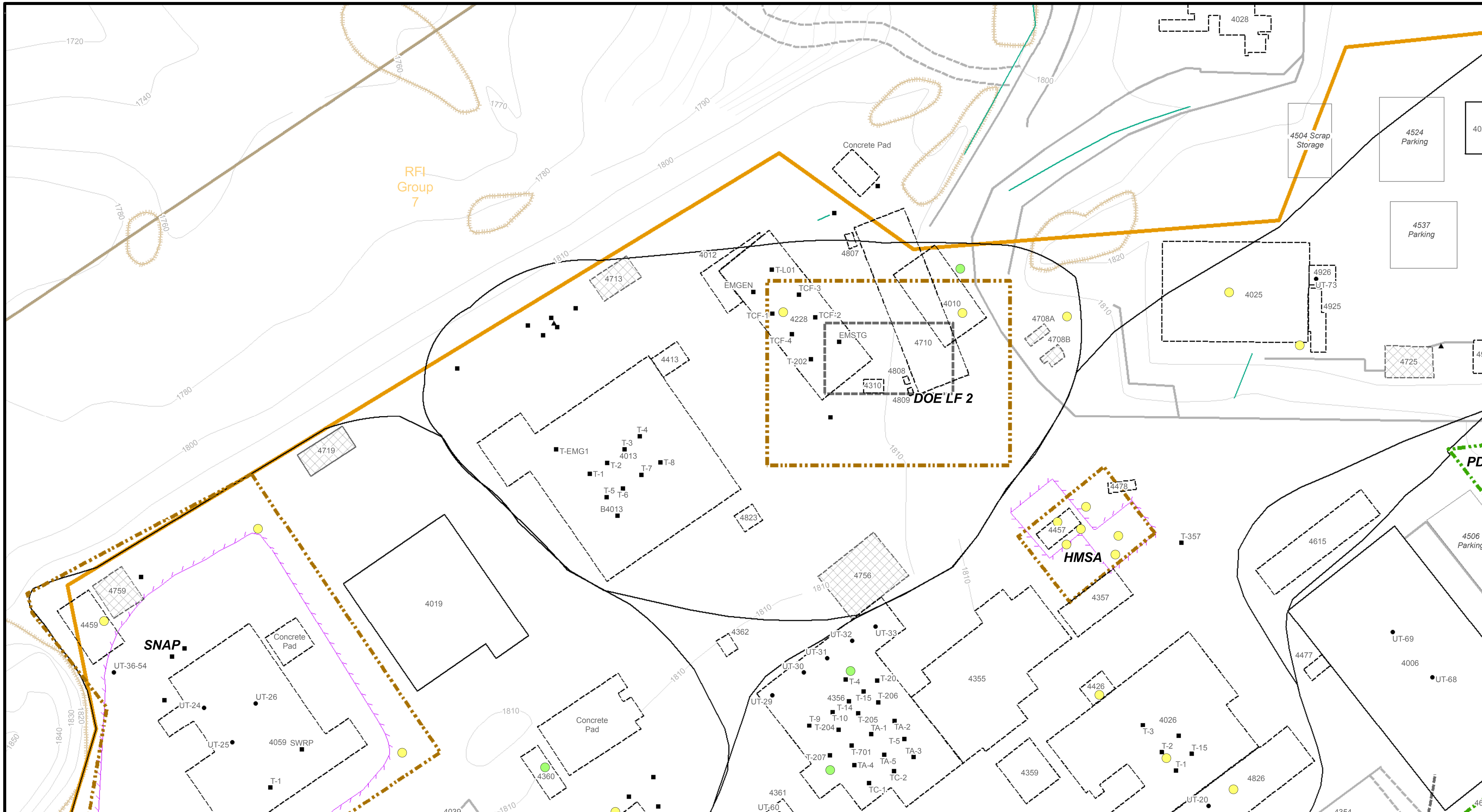
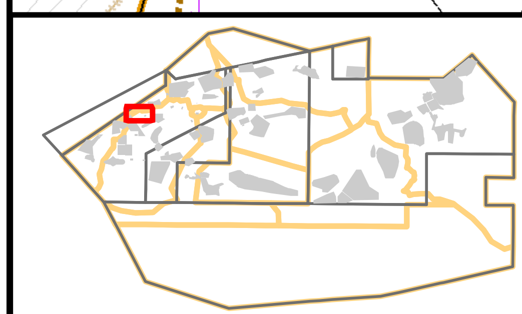
FIGURE P.3-1A





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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

VOCs in Soil
DOE LF2 RFI Site
SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

October 30, 2008

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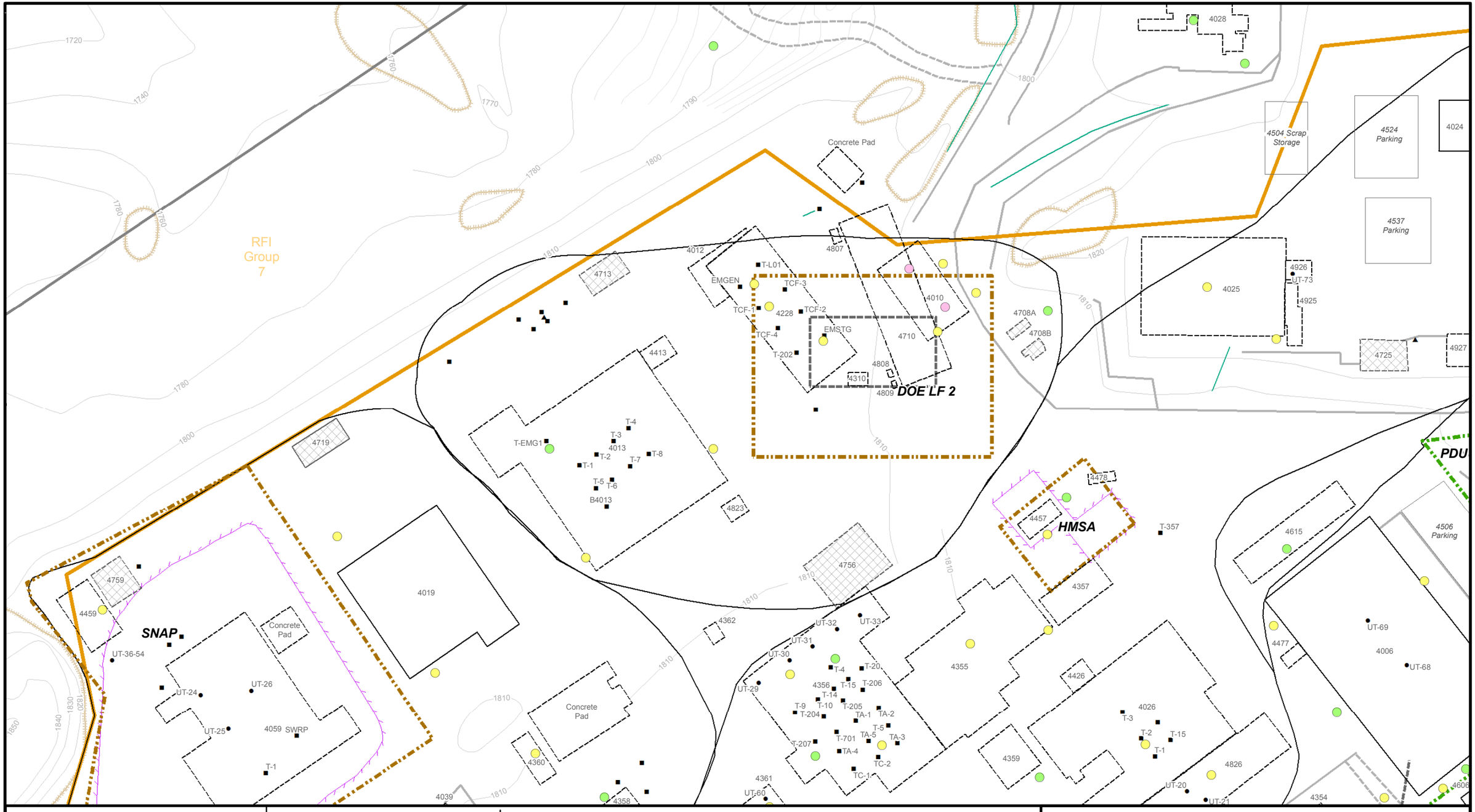
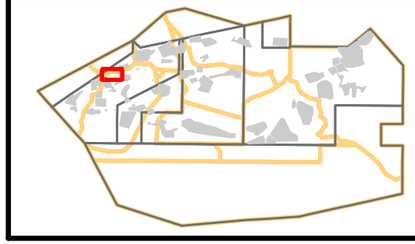
WORKING DRAFT

FIGURE P.3-1B





SVOCs in Soil

- 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

SVOCs in Soil
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

60 120 Feet

August 21, 2008

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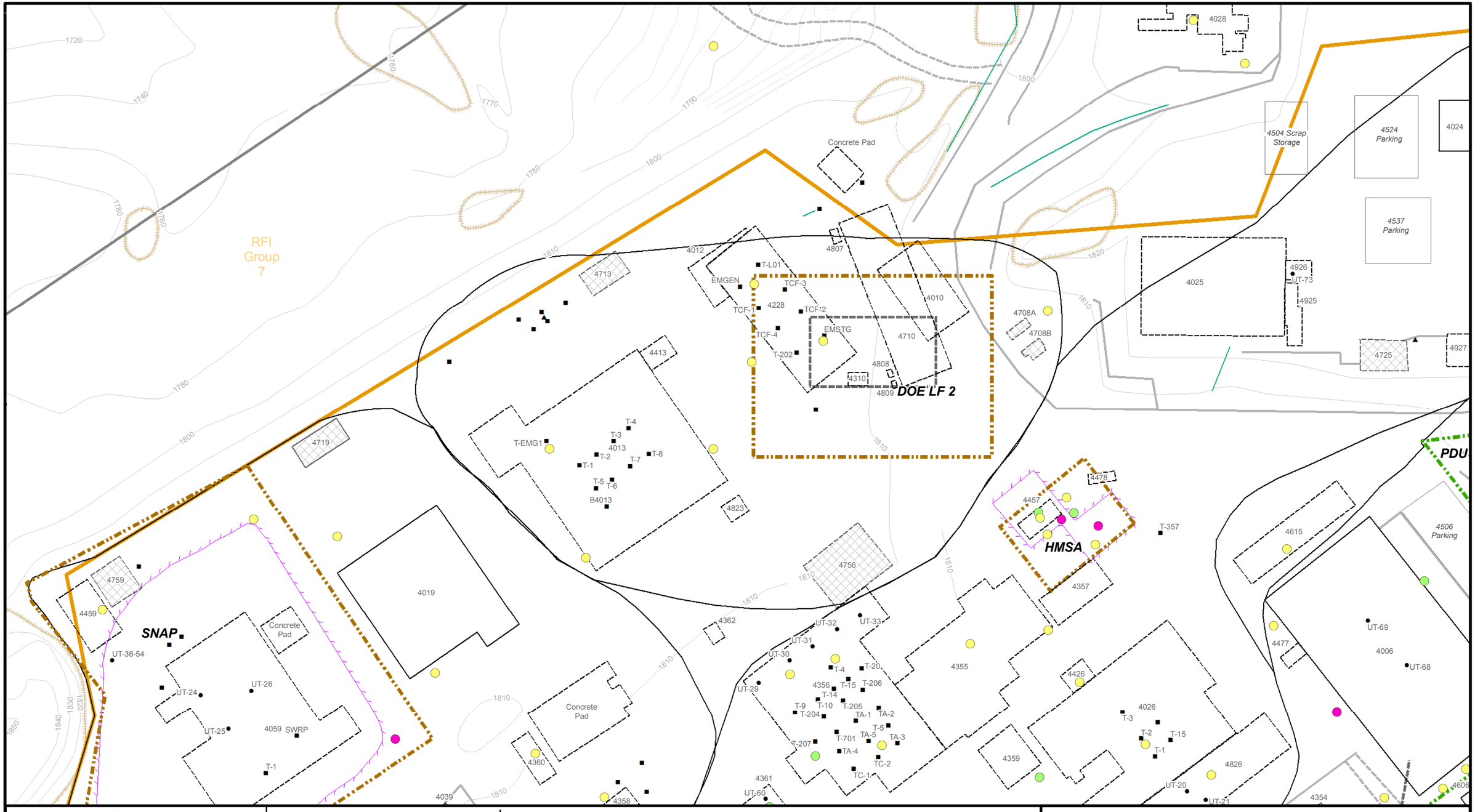
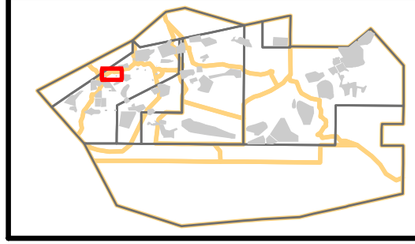
WORKING DRAFT

Figure P.3-2





TPH in Soil

- Exceeds Residential RBSL
- Detect, Below Residential RBSL
- 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

TPH in Soil
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

August 21, 2008

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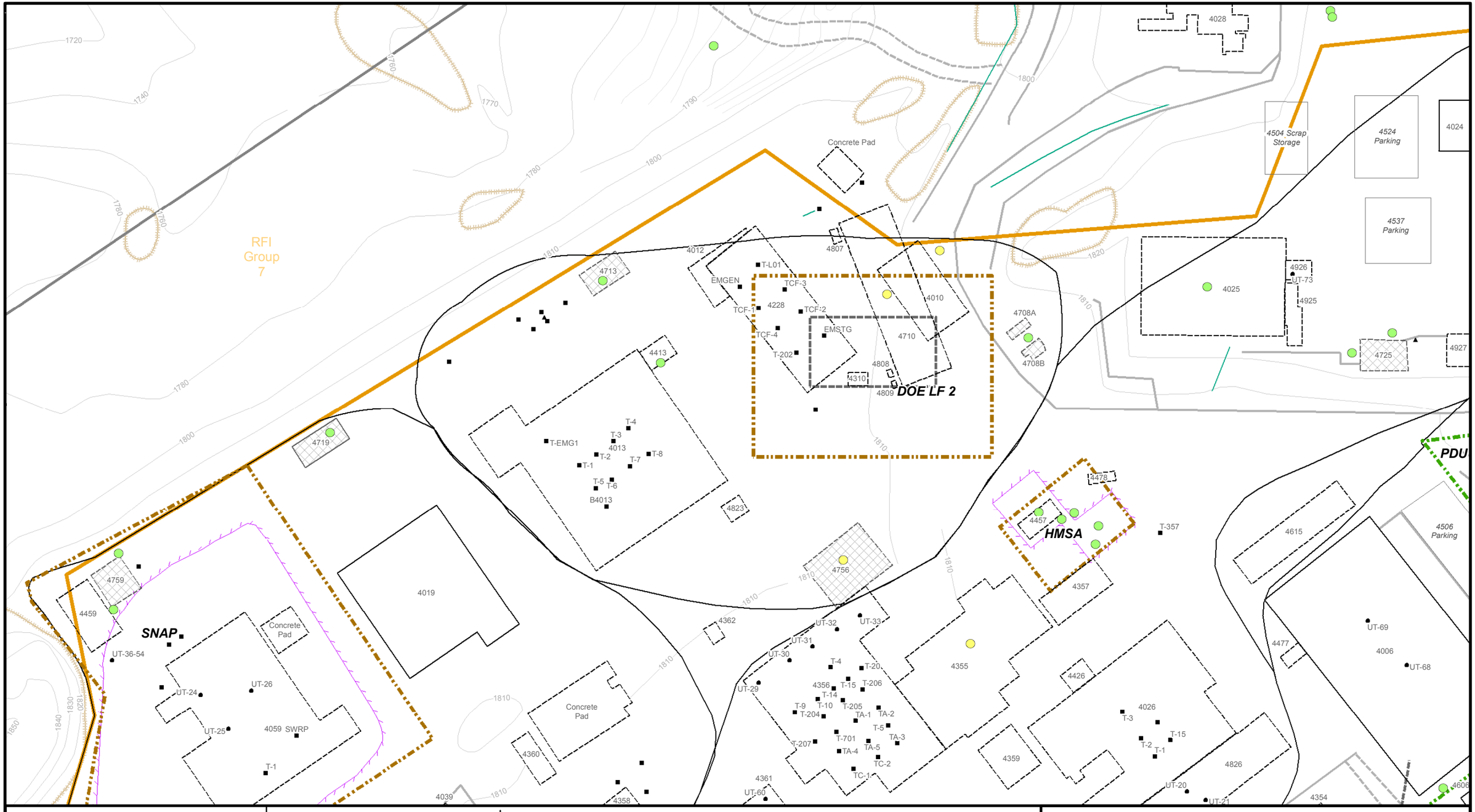
FIGURE P.3-3



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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

PCBs in Soil
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

September 11, 2008

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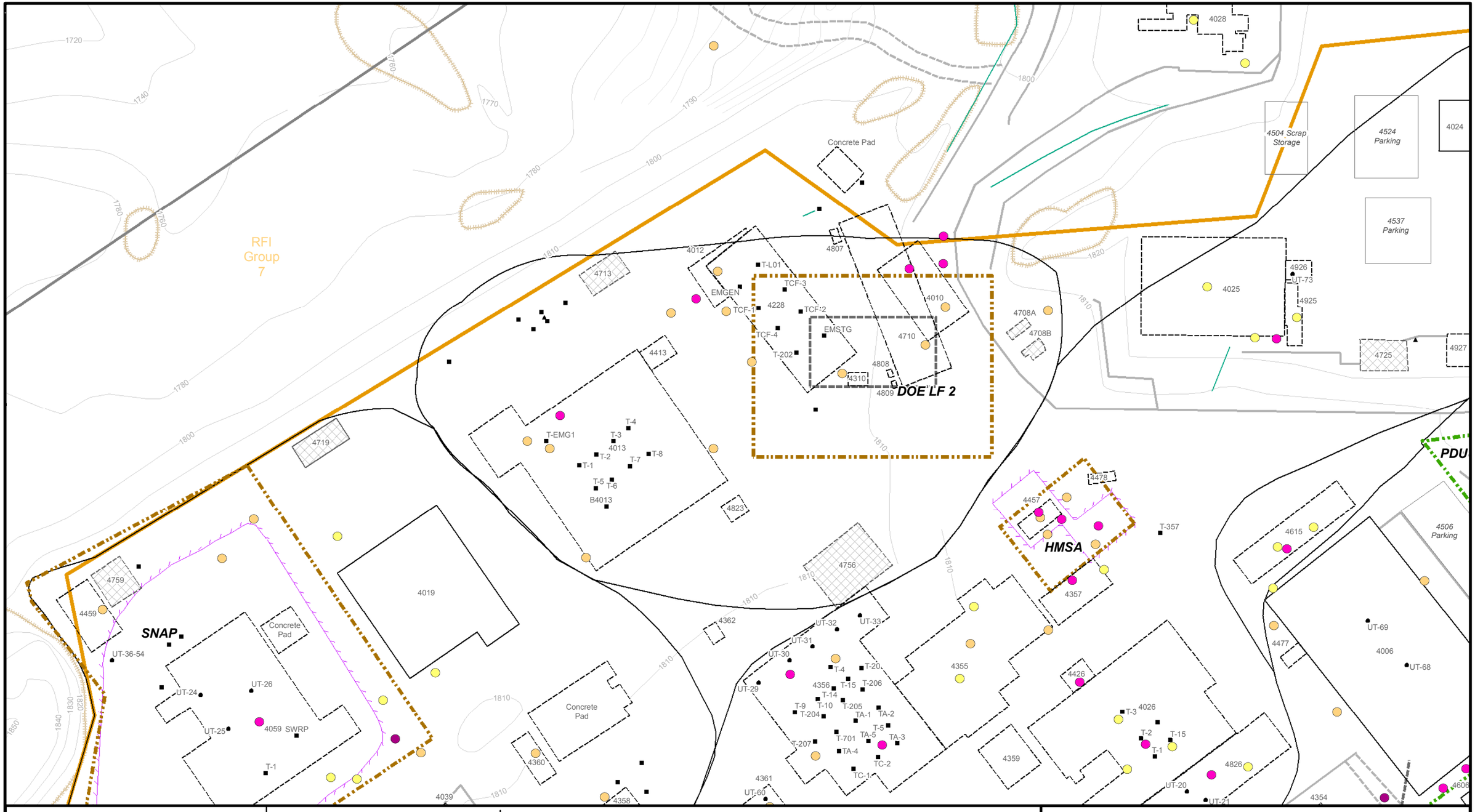
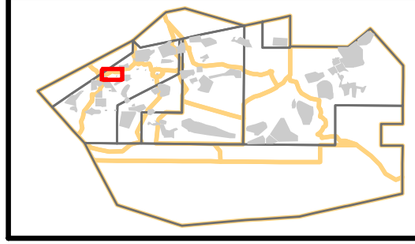
WORKING DRAFT

FIGURE P.3-4





Metals in Soil

- Exceeds Background + Residential RBSL + Eco RBSL
- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

Metals in Soil
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

September 11, 2008

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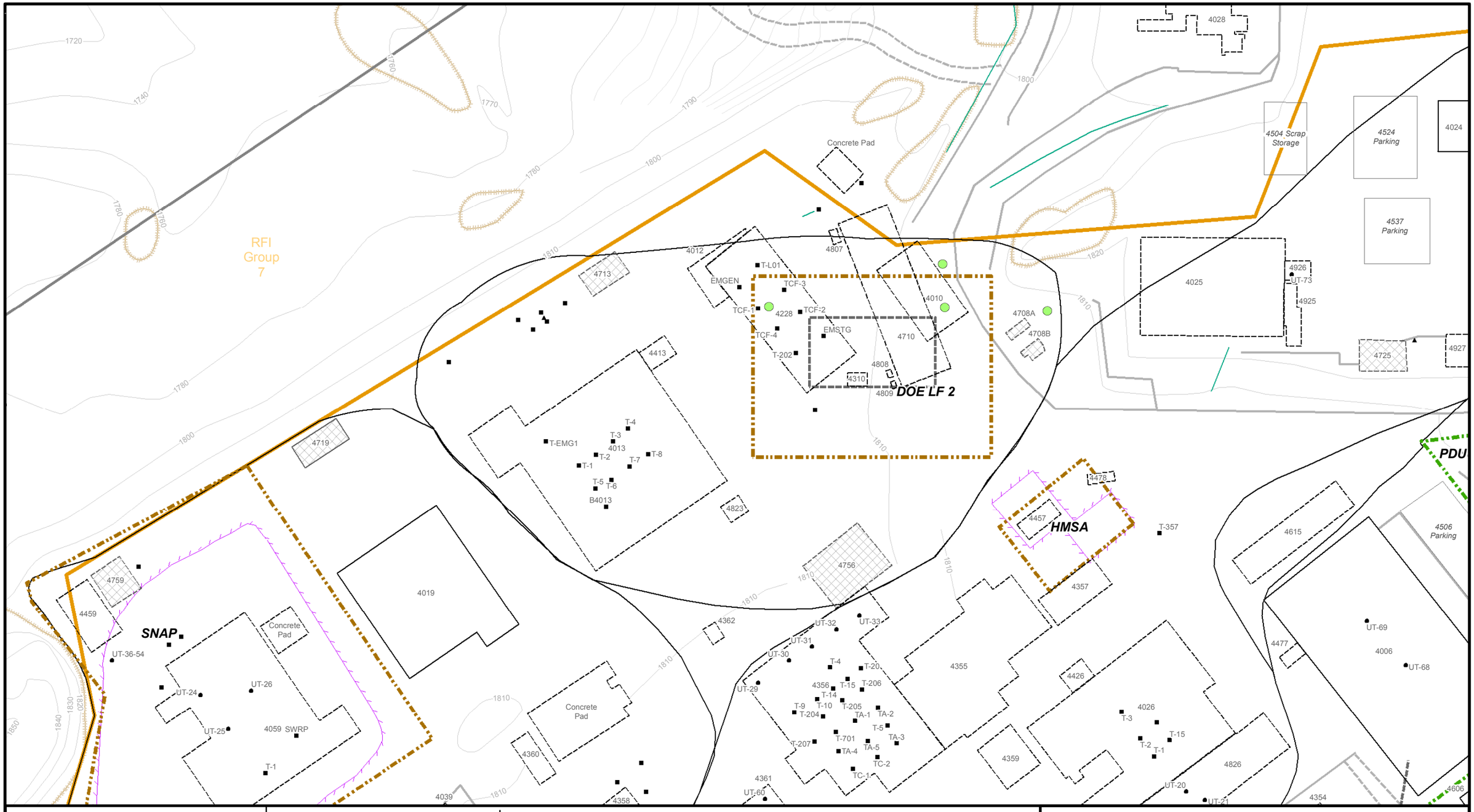
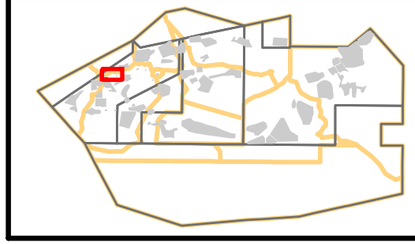
FIGURE P.3-5





Energetics in Soil

- 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
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond

Energetics in Soil
DOE LF2 RFI Site

SANTA SUSANA FIELD LABORATORY

1 inch equals 60 feet

0 60 120 Feet

September 11, 2008

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WORKING DRAFT

FIGURE P.3-6

Soil Sample Locations

- ● Soil Sample Location With Detected VOCs Data
- ○ Soil Sample Location Not Analyzed for VOCs Data
- ● (green) Soil Sample Location With No Detected VOCs Data

Data Box Information

Sample Location ID	1.00 / Primary / B9BS01S01 / 7/10/2005
B9BS01	Depth in Feet / Sample Type / Unique Sample Identifier / Date

- 12.05 — Detect with sample concentration shown
- < 0.06 — Non-Detect with lab detection limit shown
- J — Analyte positively identified; Associated numerical value is considered estimated
- NA and [-] — Analysis not conducted
- [#] — If more than one result per sample depth, the maximum is presented, with number of results in backets.

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results .

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

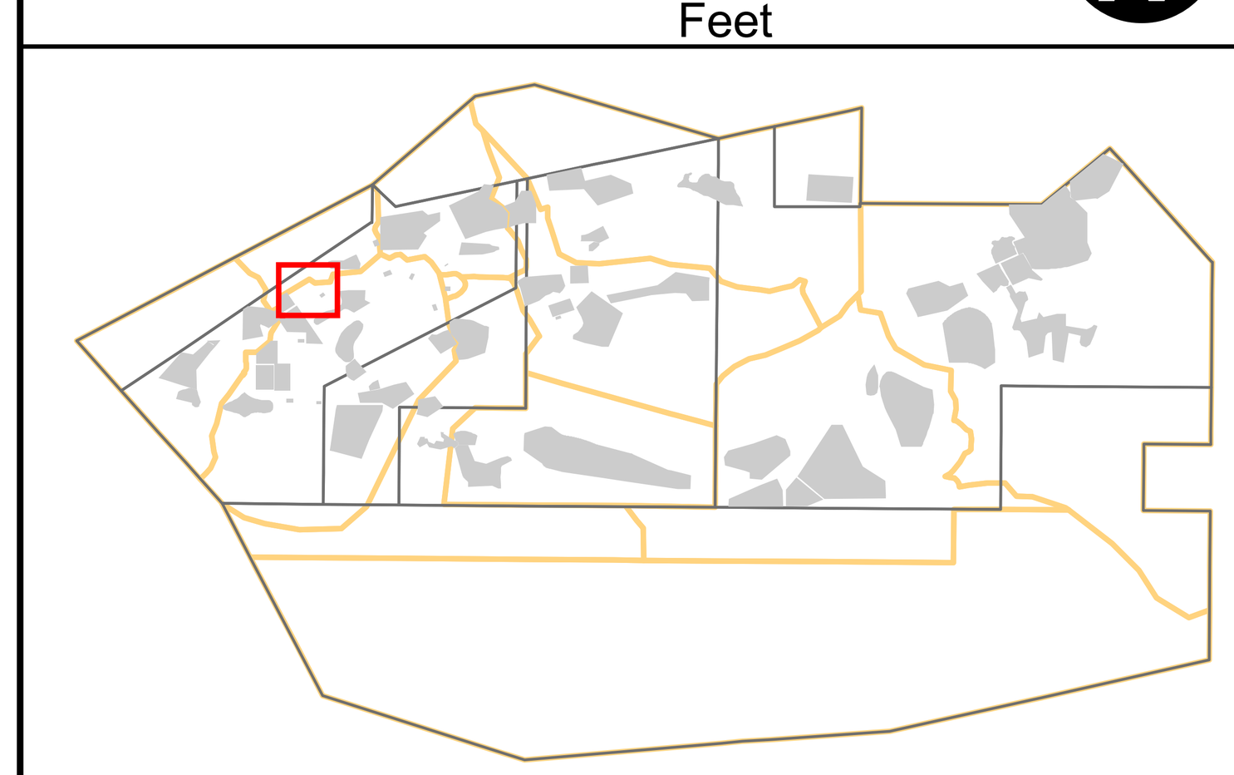
= Pre-2008 Data

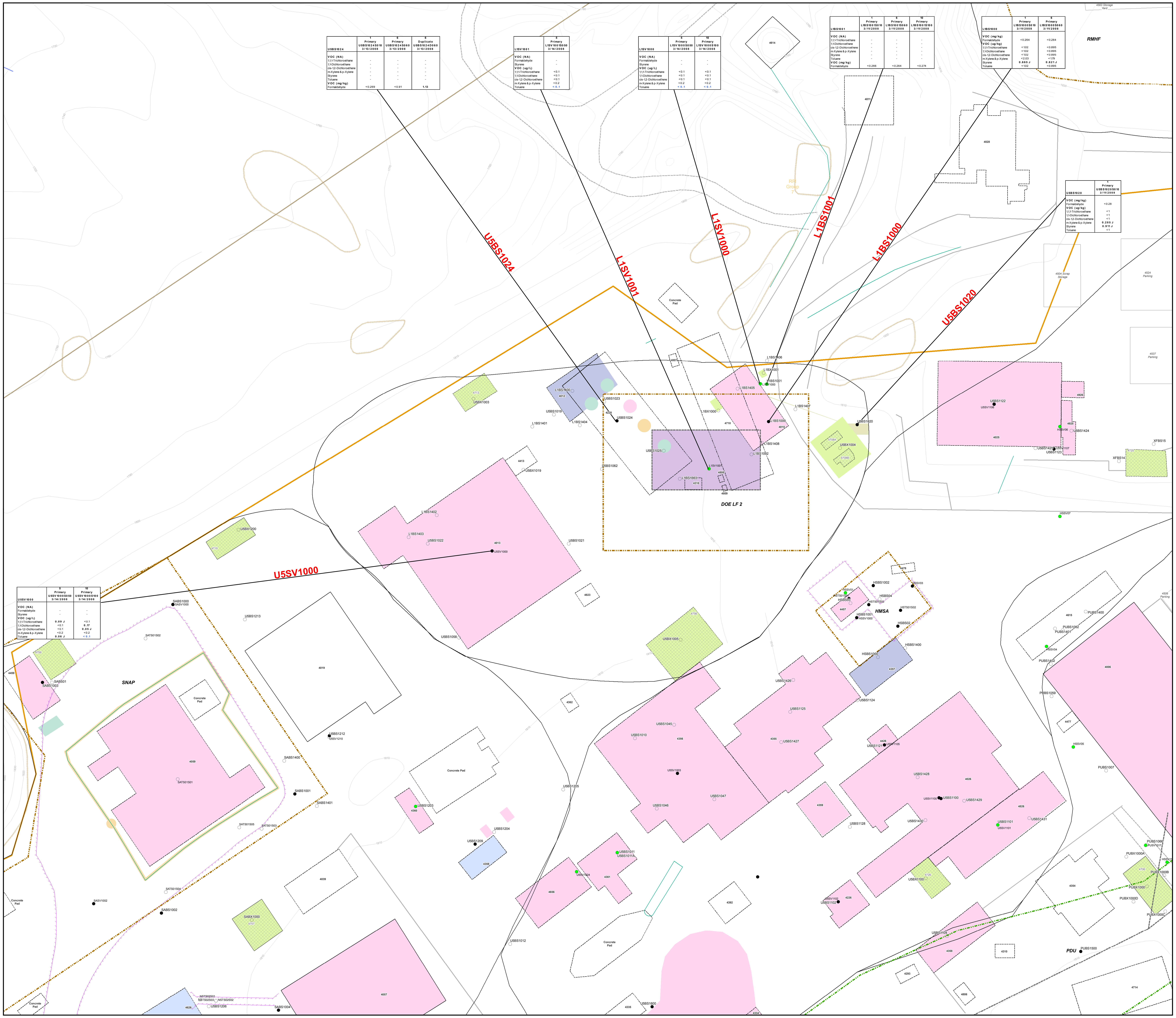
Basemap Legend

- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

1 inch equals 25 feet — 0 25 50 Feet





U5BS1024	1 Primary U5BS1024S010 3/13/2008	6 Primary U5BS1024S060 3/13/2008	6 Duplicate U5BS1024D060 3/13/2008
VOC (NA)			
1,1,1-Trichloroethane	-	-	-
1,1-Dichloroethane	-	-	-
cis-1,2-Dichloroethene	-	-	-
m-Xylene & p-Xylene	-	-	-
Styrene	-	-	-
Toluene	-	-	-
VOC (mg/kg)			
Formaldehyde	<0.269	<0.91	**1.13**

L1SV1001	5 Primary L1SV1001S050 3/14/2008
VOC (NA)	
Formaldehyde	-
Styrene	-
VOC (ug/L)	
1,1,1-Trichloroethane	<0.1
1,1-Dichloroethane	<0.1
cis-1,2-Dichloroethene	<0.1
m-Xylene & p-Xylene	<0.2
Toluene	< 0.1

L1SV1000	5 Primary L1SV1000S050 3/14/2008	10 Primary L1SV1000S100 3/14/2008
VOC (NA)		
Formaldehyde	-	-
Styrene	-	-
VOC (ug/L)		
1,1,1-Trichloroethane	<0.1	<0.1
1,1-Dichloroethane	<0.1	<0.1
cis-1,2-Dichloroethene	<0.1	<0.1
m-Xylene & p-Xylene	<0.2	<0.2
Toluene	< 0.1	< 0.1

L1BS1001	1 Primary L1BS1001S010 3/11/2008	6 Primary L1BS1001S060 3/11/2008	10 Primary L1BS1001S100 3/11/2008
VOC (NA)			
1,1,1-Trichloroethane	-	-	-
1,1-Dichloroethane	-	-	-
cis-1,2-Dichloroethene	-	-	-
m-Xylene & p-Xylene	-	-	-
Styrene	-	-	-
Toluene	-	-	-
VOC (mg/kg)			
Formaldehyde	<0.266	<0.264	<0.274

L1BS1000	1 Primary L1BS1000S010 3/11/2008	6 Primary L1BS1000S060 3/11/2008
VOC (mg/kg)		
Formaldehyde	<0.264	<0.264
VOC (ug/kg)		
1,1,1-Trichloroethane	<1.02	<0.895
1,1-Dichloroethane	<1.02	<0.895
cis-1,2-Dichloroethene	<1.02	<0.895
m-Xylene & p-Xylene	<2.03	<1.79
Styrene	**0.665 J**	**0.621 J**
Toluene	<1.02	<0.895

U5BS1020	1 Primary U5BS1020S010 3/11/2008
VOC (mg/kg)	
Formaldehyde	<0.28
VOC (ug/kg)	
1,1,1-Trichloroethane	<1
1,1-Dichloroethane	<1
cis-1,2-Dichloroethene	<1
m-Xylene & p-Xylene	**0.285 J**
Styrene	**0.911 J**
Toluene	<1

U5SV1000	5 Primary U5SV1000S050 3/14/2008	10 Primary U5SV1000S100 3/14/2008
VOC (NA)		
Formaldehyde	-	-
Styrene	-	-
VOC (ug/L)		
1,1,1-Trichloroethane	**0.09 J**	<0.1
1,1-Dichloroethane	<0.1	**0.17**
cis-1,2-Dichloroethene	<0.1	**0.05 J**
m-Xylene & p-Xylene	<0.2	<0.2
Toluene	**0.06 J**	< 0.1

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VOCs Data Results DOE LF2 RFI Site

FIGURE P.3-7

Soil Sample Locations

- Soil Sample Location With Detected SVOCs, TPH, and PCBs Data
- Soil Sample Location Not Analyzed for SVOCs, TPH, and PCBs Data
- Soil Sample Location With No Detected SVOCs, TPH, and PCBs Data

Data Box Information

Sample Location ID: B9BS01

- 1.00 — Depth in Feet
- Primary — Sample Type
- B9BS01S01 — Unique Sample Identifier
- 7/10/2005 — Date

12.05	Detect with sample concentration shown
< 0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and [-]	Analysis not conducted
[#]	If more than one result per sample depth, the maximum is presented, with number of results in backets.

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results .

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

= Pre-2008 Data

Basemap Legend

- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

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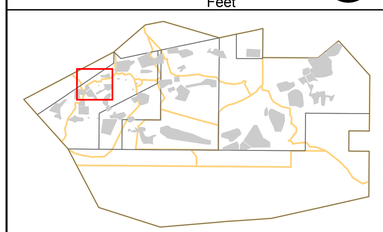
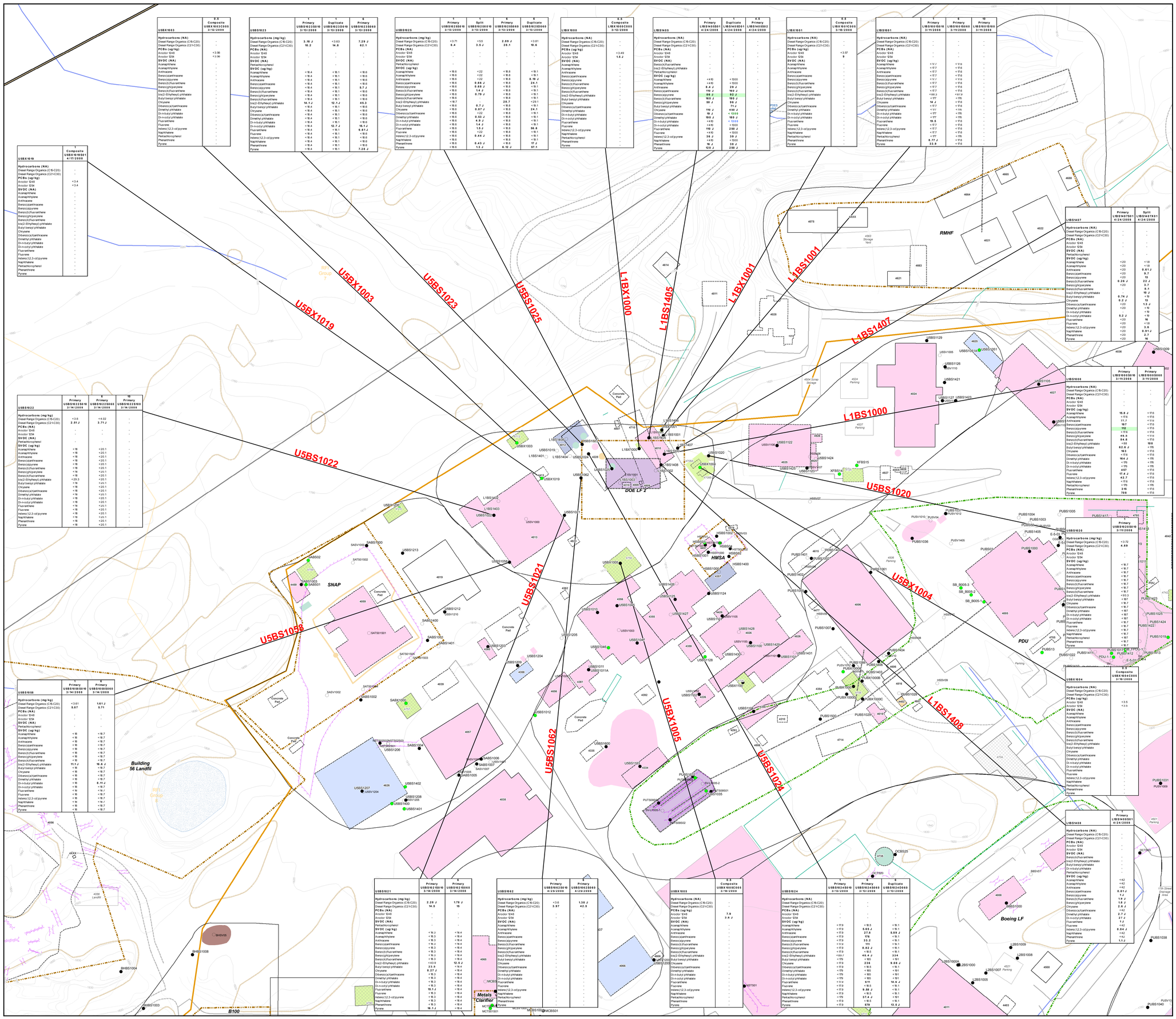
0 50 100

1 inch equals 50 feet

Feet





USBX1003	0.5 Composite USBX1003C005 3/12/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (ug/kg)	
Aroclor 1248	< 3.56
Aroclor 1254	< 3.56
SVOC (NA)	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(ghi)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Naphthalene	-
Pentachlorophenol	-
Phenanthrene	-
Pyrene	-

USBS1023	1 Primary USBS1023S010 3/13/2008	1 Duplicate USBS1023D010 3/13/2008	6 Primary USBS1023S060 3/13/2008
Hydrocarbons (mg/kg)			
Diesel Range Organics (C6-C20)	**3.16 J**	<3.63	**7.29 J**
Diesel Range Organics (C21-C30)	**10.2**	**14.8**	**62.1**
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
SVOC (NA)			
Pentachlorophenol	-	-	-
SVOC (ug/kg)			
Acenaphthene	< 16.4	< 18.1	< 16.6
Acenaphthylene	< 16.4	< 18.1	< 16.6
Anthracene	< 16.4	< 18.1	< 16.6
Benzo(a)anthracene	< 16.4	< 18.1	< 16.6
Benzo(a)pyrene	< 16.4	< 18.1	**5.7 J**
Benzo(b)fluoranthene	< 16.4	< 18.1	< 16.6
Benzo(ghi)perylene	< 16.4	< 18.1	< 16.6
Benzo(k)fluoranthene	< 16.4	< 18.1	< 16.6
bis(2-Ethylhexyl) phthalate	**14.1 J**	**12.1 J**	**45.3**
Butyl benzyl phthalate	< 16.4	< 18.1	< 16.6
Chrysene	< 16.4	< 18.1	< 16.6
Dibenz(a,h)anthracene	< 16.4	< 18.1	< 16.6
Dimethyl phthalate	< 16.4	< 18.1	< 16.6
Di-n-butyl phthalate	< 16.4	< 18.1	< 16.6
Di-n-octyl phthalate	< 16.4	< 18.1	< 16.6
Fluoranthene	< 16.4	**12.7 J**	**15.1 J**
Fluorene	< 16.4	< 18.1	**6.61 J**
Indeno(1,2,3-cd)pyrene	< 16.4	< 18.1	< 16.6
Naphthalene	< 16.4	< 18.1	< 16.6
Phenanthrene	< 16.4	< 18.1	< 16.6
Pyrene	< 16.4	< 18.1	**7.28 J**

USBS1025	1 Primary USBS1025S010 3/13/2008	1 Split USBS1025X010 3/13/2008	6 Primary USBS1025S060 3/13/2008	6 Duplicate USBS1025D060 3/13/2008
Hydrocarbons (mg/kg)				
Diesel Range Organics (C6-C20)	<3.71	<5.5	**2.89 J**	<3.81
Diesel Range Organics (C21-C30)	**6.4**	**3.8 J**	**28.1**	**10.6**
PCBs (NA)				
Aroclor 1248	-	-	-	-
Aroclor 1254	-	-	-	-
SVOC (NA)				
Pentachlorophenol	-	-	-	-
SVOC (ug/kg)				
Acenaphthene	< 16.6	< 22	< 16.8	< 16.1
Acenaphthylene	< 16.6	< 22	< 16.8	< 16.1
Anthracene	< 16.6	< 22	< 16.8	**8.19 J**
Benzo(a)anthracene	< 16.6	**0.66 J**	< 16.8	**24.1**
Benzo(a)pyrene	< 16.6	**0.68 J**	< 16.8	< 16.1
Benzo(b)fluoranthene	< 16.6	**1.4 J**	< 16.8	< 16.1
Benzo(ghi)perylene	< 16.6	**0.79 J**	< 16.8	< 16.1
Benzo(k)fluoranthene	< 16.6	< 22	< 16.8	< 16.1
bis(2-Ethylhexyl) phthalate	< 16.7	< 22	**28.7**	<29.1
Butyl benzyl phthalate	< 16.6	**0.7 J**	< 16.8	< 16.1
Chrysene	< 16.6	**0.87 J**	< 16.8	**2.41**
Dibenz(a,h)anthracene	< 16.6	< 22	< 16.8	< 16.1
Dimethyl phthalate	< 16.6	**0.53 J**	< 16.8	< 16.1
Di-n-butyl phthalate	< 16.6	**4.9 J**	< 16.8	< 16.1
Di-n-octyl phthalate	< 16.6	**1.4 J**	< 16.8	< 16.1
Fluoranthene	< 16.6	**1.5 J**	< 16.8	**56.6**
Fluorene	< 16.6	< 22	< 16.8	< 16.1
Indeno(1,2,3-cd)pyrene	< 16.6	**0.44 J**	< 16.8	< 16.1
Naphthalene	< 16.6	< 22	< 16.8	< 16.1
Phenanthrene	< 16.6	**0.43 J**	< 16.8	**17 J**
Pyrene	< 16.6	**1.3 J**	**6.12 J**	**57.1**

L1BX1000	0.5 Composite L1BX1000C005 3/12/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (ug/kg)	
Aroclor 1248	< 3.49
Aroclor 1254	**1.5 J**
SVOC (NA)	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(ghi)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Naphthalene	-
Pentachlorophenol	-
Phenanthrene	-
Pyrene	-

USBS1405	1 Primary LNBS1405S01 4/24/2008	1 Duplicate LNBS1405D01 4/24/2008	4.5 Primary LNBS1405S02 4/24/2008
Hydrocarbons (NA)			
Diesel Range Organics (C6-C20)	-	-	-
Diesel Range Organics (C21-C30)	-	-	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
SVOC (NA)			
Benzo(b)fluoranthene	-	-	-
bis(2-Ethylhexyl) phthalate	-	-	-
Pentachlorophenol	-	-	-
SVOC (ug/kg)			
Acenaphthene	<410	< 1000	-
Acenaphthylene	<410	< 1000	-
Anthracene	**8.4 J**	**29 J**	-
Benzo(a)anthracene	**110 J**	**160 J**	-
Benzo(a)pyrene	**86 J**	**92 J**	-
Benzo(b)fluoranthene	**160 J**	**190 J**	-
Benzo(ghi)perylene	**50 J**	**86 J**	-
Benzo(k)fluoranthene	-	**71 J**	-
Chrysene	**110 J**	**4 00 J**	-
Dibenz(a,h)anthracene	**19 J**	< 1000	-
Dimethyl phthalate	**160 J**	**160 J**	-
Di-n-butyl phthalate	<410	< 1000	-
Di-n-octyl phthalate	<410	< 1000	-
Fluoranthene	**110 J**	**250 J**	-
Fluorene	<410	< 1000	-
Indeno(1,2,3-cd)pyrene	**35 J**	**39 J**	-
Naphthalene	<410	< 1000	-
Phenanthrene	**16 J**	**30 J**	-
Pyrene	**120 J**	**200 J**	-

USBX1001	0.5 Composite LNBX1001C005 3/18/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (ug/kg)	
Aroclor 1248	<3.97
Aroclor 1254	**9**
SVOC (NA)	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(ghi)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Naphthalene	-
Pentachlorophenol	-
Phenanthrene	-
Pyrene	-

LNBS1001	1 Primary LNBS1001S00 3/11/2008	6 Primary LNBS1001S00 3/11/2008	10 Primary LNBS1001S00 3/11/2008
Hydrocarbons (NA)			
Diesel Range Organics (C6-C20)	-	-	-
Diesel Range Organics (C21-C30)	-	-	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
SVOC (ug/kg)			
Acenaphthene	< 16.7	< 17.6	-
Acenaphthylene	< 16.7	< 17.6	-
Anthracene	< 16.7	< 17.6	-
Benzo(a)anthracene	< 16.7	< 17.6	-
Benzo(a)pyrene	< 16.7	< 17.6	-
Benzo(b)fluoranthene	< 16.7	< 17.6	-
Benzo(ghi)perylene	< 16.7	< 17.6	-
Benzo(k)fluoranthene	< 16.7	< 17.6	-
bis(2-Ethylhexyl) phthalate	**< 16.7**	**< 17.6**	-
Butyl benzyl phthalate	< 16.7	< 17.6	-
Chrysene	**14 J**	< 17.6	-
Dibenz(a,h)anthracene	< 16.7	< 17.6	-
Dimethyl phthalate	< 16.7	< 17.6	-
Di-n-butyl phthalate	< 16.7	< 17.6	-
Di-n-octyl phthalate	< 16.7	< 17.6	-
Fluoranthene	**19 J**	< 17.6	-
Fluorene	< 16.7	< 17.6	-
Indeno(1,2,3-cd)pyrene	< 16.7	< 17.6	-
Naphthalene	< 16.7	< 17.6	-
Pentachlorophenol	< 16.7	< 17.6	-
Phenanthrene	**8.77 J**	< 17.6	-
Pyrene	**33.9**	< 17.6	-

LNBS1407	1 Primary LNBS1407S01 4/24/2008	1 Split LNBS1407X01 4/24/2008
Hydrocarbons (NA)		
Diesel Range Organics (C6-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
SVOC (NA)		
Pentachlorophenol	-	-
SVOC (ug/kg)		
Acenaphthene	<20	< 18
Acenaphthylene	<20	< 18
Anthracene	<20	**0.81 J**
Benzo(a)anthracene	<20	**2.7 J**
Benzo(a)pyrene	<20	**3J**
Benzo(b)fluoranthene	**0.26 J**	**2.2 J**
Benzo(ghi)perylene	<20	**3.7**
Benzo(k)fluoranthene	-	**8.1**
bis(2-Ethylhexyl) phthalate	-	**10 J**
Butyl benzyl phthalate	**0.74 J**	< 18
Chrysene	**0.2 J**	**13**
Dibenz(a,h)anthracene	<20	**1.3 J**
Dimethyl phthalate	<20	< 18
Di-n-butyl phthalate	<20	< 18
Di-n-octyl phthalate	**5.2 J**	< 18
Fluoranthene	<20	**16**
Fluorene	<20	< 18
Indeno(1,2,3-cd)pyrene	<20	**2.6**
Naphthalene	<20	**0.81 J**
Phenanthrene	<20	**2.7**
Pyrene	<20	**16**

LNBS1008	1 Primary LNBS1008S00 3/11/2008	1 Primary LNBS1008D00 3/11/2008
Hydrocarbons (NA)		
Diesel Range Organics (C6-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
SVOC (ug/kg)		
Acenaphthene	**15.6 J**	< 17.6
Acenaphthylene	< 17.6	< 17.6
Anthracene	**77.7**	< 17.6
Benzo(a)anthracene	**167**	< 17.6
Benzo(a)pyrene	**152**	< 17.6
Benzo(b)fluoranthene	< 17.6	< 17.6
Benzo(ghi)perylene	**44.9**	< 17.6
Benzo(k)fluoranthene	**84.6**	< 17.6
bis(2-Ethylhexyl) phthalate	< 93	**18.8**
Butyl benzyl phthalate	**62.4 J**	< 18
Chrysene	**161**	< 17.6
Dibenz(a,h)anthracene	< 17.6	< 17.6
Dimethyl phthalate	**< 18**	< 18
Di-n-butyl phthalate	< 17.6	< 18
Di-n-octyl phthalate	< 17.6	< 18
Fluoranthene	**< 18**	< 17.6
Fluorene	**17.4 J**	< 17.6
Indeno(1,2,3-cd)pyrene	**42.3**	< 17.6
Naphthalene	< 17.6	< 17.6
Pentachlorophenol	< 176	< 176
Phenanthrene	**316**	< 17.6
Pyrene	**159**	< 17.6

USBS1020	1 Primary USBS1020S010 3/10/2008
Hydrocarbons (mg/kg)	
Diesel Range Organics (C6-C20)	**<3.79**
Diesel Range Organics (C21-C30)	**4.69**
PCBs (NA)	
Aroclor 1248	-
Aroclor 1254	-
SVOC (ug/kg)	
Acenaphthene	< 16.7
Acenaphthylene	< 16.7
Anthracene	< 16.7
Benzo(a)anthracene	< 16.7
Benzo(a)pyrene	< 16.7
Benzo(b)fluoranthene	< 16.7
Benzo(ghi)perylene	< 16.7
Benzo(k)fluoranthene	< 16.7
bis(2-Ethylhexyl) phthalate	<93.3
Butyl benzyl phthalate	< 167
Chrysene	< 16.7
Dibenz(a,h)anthracene	< 167
Dimethyl phthalate	< 167
Di-n-butyl phthalate	< 167
Di-n-octyl phthalate	< 167
Fluoranthene	< 16.7
Fluorene	< 16.7
Indeno(1,2,3-cd)pyrene	< 16.7
Naphthalene	< 16.7
Pentachlorophenol	< 16.7
Phenanthrene	< 16.7
Pyrene	< 16.7

USBX1004	0.5 Composite USBX1004C005 3/18/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (ug/kg)	
Aroclor 1248	<3.5
Aroclor 1254	<3.5
SVOC (NA)	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(ghi)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Naphthalene	-
Pentachlorophenol	-
Phenanthrene	-
Pyrene	-

USBS1056	1 Primary USBS1056S010 3/14/2008	6 Primary USBS1056S060 3/14/2008
Hydrocarbons (mg/kg)		
Diesel Range Organics (C6-C20)	<3.61	**1.61 J**
Diesel Range Organics (C21-C30)	**5.87**	**5.71**
PCBs (ug/kg)		
Aroclor 1248	-	-
Aroclor 1254	-	-
SVOC (NA)		
Pentachlorophenol	-	-
SVOC (ug/kg)		
Acenaphthene	< 16	< 16.7
Acenaphthylene	< 16	< 16.7
Anthracene	< 16	< 16.7
Benzo(a)anthracene	< 16	< 16.7
Benzo(a)pyrene	< 16	< 16.7
Benzo(b)fluoranthene	< 16	< 16.7
Benzo(ghi)perylene	< 16	< 16.7
Benzo(k)fluoranthene	< 16	< 16.7
bis(2-Ethylhexyl) phthalate	**11.1 J**	**16.4 J**
Butyl benzyl phthalate	< 16	< 16.7
Chrysene	< 16	< 16.7
Dibenz(a,h)anthracene	< 16	< 16.7
Dimethyl phthalate	< 16	< 16.7
Di-n-butyl phthalate	< 16	**8.11 J**
Di-n-octyl phthalate	< 16	< 16.7
Fluoranthene	< 16	< 16.7
Fluorene	< 16	< 16.7
Indeno(1,2,3-cd)pyrene	< 16	< 16.7
Naphthalene	< 16	< 16.7
Phenanthrene	< 16	< 16.7
Pyrene	< 16	< 16.7

USBS1022	1 Primary USBS1022S010 3/14/2008	6 Primary USBS1022S060 3/14/2008	10 Primary USBS1022S100 3/14/2008
Hydrocarbons (mg/kg)			
Diesel Range Organics (C6-C20)	<3.6	<4.02	-
Diesel Range Organics (C21-C30)	**2.51 J**	**3.71 J**	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
SVOC (NA)			
Pentachlorophenol	-	-	-
SVOC (ug/kg)			
Acenaphthene	< 16	< 20.1	-
Acenaphthylene	< 16	< 20.1	-
Anthracene	< 16	< 20.1	-
Benzo(a)anthracene	< 16	< 20.1	-
Benzo(a)pyrene	< 16	< 20.1	-
Benzo(b)fluoranthene	< 16	< 20.1	-
Benzo(ghi)perylene	< 16	< 20.1	-
Benzo(k)fluoranthene	< 16	< 20.1	-
bis(2-Ethylhexyl) phthalate	<29.3	< 20.1	-
Butyl benzyl phthalate	< 16	< 20.1	-
Chrysene	< 16	< 20.1	-
Dibenz(a,h)anthracene	< 16	< 20.1	-
Dimethyl phthalate	< 16	< 20.1	-
Di-n-butyl phthalate	< 16	< 20.1	-
Di-n-octyl phthalate	< 16	< 20.1	-
Fluoranthene	< 16	< 20.1	-
Fluorene	< 16	< 20.1	-
Indeno(1,2,3-cd)pyrene	< 16	< 20.1	-
Naphthalene	< 16	< 20.1	-
Phenanthrene	< 16	< 20.1	-
Pyrene	< 16	< 20.1	-

USBS1021	1 Primary USBS1021S010 3/14/2008	6 Primary USBS1021S060 3/14/2008
Hydrocarbons (mg/kg)		
Diesel Range Organics (C6-C20)	**2.28 J**	**1.78 J**
Diesel Range Organics (C21-C30)	**14.5**	**15**
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
SVOC (NA)		
Pentachlorophenol	-	-
SVOC (ug/kg)		
Acenaphthene	< 16.3	< 16.4
Acenaphthylene	< 16.3	< 16.4
Anthracene	< 16.3	< 16.4
Benzo(a)anthracene	< 16.3	< 16.4
Benzo(a)pyrene	< 16.3	< 16.4
Benzo(b)fluoranthene	< 16.3	< 16.4
Benzo(ghi)perylene	< 16.3	< 16.4
Benzo(k)fluoranthene	< 16.3	< 16.4
bis(2-Ethylhexyl) phthalate	<31.9	**12.3 J**
Butyl benzyl phthalate	**2.2 J**	< 16.4
Chrysene	**4.29 J**	< 16.4
Dibenz(a,h)anthracene	< 16.3	< 16.4
Dimethyl phthalate	< 16.3	< 16.4
Di-n-butyl phthalate	< 16.3	< 16.4
Di-n-octyl phthalate	**16.1 J**	< 16.4
Fluoranthene	< 16.3	< 16.4
Fluorene	< 16.3	< 16.4
Indeno(1,2,3-cd)pyrene	< 16.3	< 16.4
Naphthalene	< 16.3	< 16.4
Phenanthrene	< 16.3	< 16.4
Pyrene	**16.1 J**	< 16.4

USBS1062	1 Primary USBS1062S010 4/26/2008	6 Primary USBS1062S060 4/26/2008
Hydrocarbons (mg/kg)		
Diesel Range Organics (C6-C20)	<3.6	**1.33 J**
Diesel Range Organics (C21-C30)	**3.97**	**42.5**
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
SVOC (NA)		
Acenaphthene	-	-
Acenaphthylene	-	-
Anthracene	-	-
Benzo(a)anthracene	-	-
Benzo(a)pyrene	-	-
Benzo(b)fluoranthene	-	-
Benzo(ghi)perylene	-	-
Benzo(k)fluoranthene	-	-
bis(2-Ethylhexyl) phthalate	-	-
Butyl benzyl phthalate	-	-
Chrysene	-	-
Dibenz(a,h)anthracene	-	-
Dimethyl phthalate	-	-
Di-n-butyl phthalate	-	-
Di-n-octyl phthalate	-	-
Fluoranthene	-	-
Fluorene	-	-
Indeno(1,2,3-cd)pyrene	-	-
Naphthalene	-	-
Pentachlorophenol	-	-
Phenanthrene	-	-
Pyrene	-	-

USBX1005	0.5 Composite USBX1005C005 3/18/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	**7.9**
PCBs (ug/kg)	**3.6 J**
Aroclor 1248	-
SVOC (NA)	
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(ghi)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Naphthalene	-
Pentachlorophenol	-
Phenanthrene	-
Pyrene	-

USBS1024	1 Primary USBS1024S010 3/10/2008	1 Primary USBS1024S060 3/10/2008	1 Duplicate USBS1024D060 3/10/2008
Hydrocarbons (NA)			
Diesel Range Organics (C6-C20)	-	-	-
Diesel Range Organics (C21-C30)	-	-	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
SVOC (ug/kg)			
Acenaphthene	< 17.9	< 16.5	< 19.1
Acenaphthylene	< 17.9	**5.65 J**	< 19.1
Anthracene	< 17.9	**27.8**	**8.93 J**
Benzo(a)anthracene	< 17.9	**176**	< 19.1
Benzo(a)pyrene	< 17.9	**33.2**	< 19.1
Benzo(b)fluoranthene	< 17.9	**111**	< 19.1
Benzo(ghi)perylene	< 17.9	**8.82 J**	< 19.1
Benzo(k)fluoranthene	< 17.9	< 16.5	< 19.1
bis(2-Ethylhexyl) phthalate	<89.7	**49.4 J**	**3.4**
Butyl benzyl phthalate	<179	< 165	< 191
Chrysene	< 17.9	**23.6**	**9.33 J**
Dibenz(a,h)anthracene	< 17.9	< 16.5	< 19.1
Dimethyl phthalate	< 179	< 165	< 191
Di-n-butyl phthalate	< 179	< 165	< 191
Di-n-octyl phthalate	< 179	**8.11**	**14.8 J**
Fluoranthene	< 17.9	< 16.5	< 19.1
Fluorene	< 17.9	**9.58 J**	< 19.1
Indeno(1,2,3-cd)pyrene	< 17.9	< 16.5	< 19.1
Naphthalene	< 17.9	**37.4 J**	< 19.1
Phenanthrene	< 17.9	< 16.5	< 19.1
Pyrene	< 17.9	**879**	**15.8 J**

LNBS1408	1 Primary LNBS1408S01 4/24/2008
Hydrocarbons (NA)	
Diesel Range Organics (C6-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (NA)	
Aroclor 1248	-
Aroclor 1254	-
SVOC (NA)	
Benzo(b)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenz(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Pentachlorophenol	-
SVOC (ug/kg)	
Acenaphthene	**< 42**
Acenaphthylene	**< 42**
Anthracene	**< 42**
Benzo(a)anthracene	**0.83 J**
Benzo(a)pyrene	**1 J**
Benzo(b)fluoranthene	**1.9 J**
Benzo(ghi)perylene	**1.3 J**
Benzo(k)fluoranthene	**2.4 J**
Dibenz(a,h)anthracene	**2.7 J**
Dimethyl phthalate	**47 J**
Di-n-butyl phthalate	**1 J**
Fluoranthene	**< 42**
Fluorene	**< 42**
Indeno(1,2,3-cd)pyrene	**0.84 J**
Naphthalene	**< 42**
Phenanthrene	**< 42**
Pyrene	**1.1 J**

SANTA SUSANA FIELD LABORATORY

CH2MHILL

SVOCs, TPH, and PCBs Data Results DOE LF2 RFI Site

FIGURE P.3-8

Soil Sample Locations

- Soil Sample Location With Detected Metals and Inorganics Data
- Soil Sample Location Not Analyzed for Metals and Inorganics Data
- Soil Sample Location With No Detected Metals and Inorganics Data

Data Box Information

Sample Location ID: B9BS01

1.00	Depth in Feet
Primary	Sample Type
B9BS01S01	Unique Sample Identifier
7/10/2005	Date

12.05	Detect with sample concentration shown
< 0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and [-]	Analysis not conducted
[#]	If more than one result per sample depth, the maximum is presented, with number of results in backets.

Note: "12.05" and "<0.06" are for reference only and may not represent actual sample results .

Detect	Non-Detect	
12.05	<0.06	Exceeds Background (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL or Exceeds Background + Res RBSL (Metals +Dioxins Only)
12.05	<0.06	Exceeds Eco RBSL or Exceeds Background + Eco RBSL (Metals + Dioxins Only)
12.05	<0.06	Exceeds Res RBSL + Eco RBSL or Exceeds Background + Res RBSL + Eco RBSL (Metals + Dioxins Only)

= 2008 Data

= Pre-2008 Data

Basemap Legend

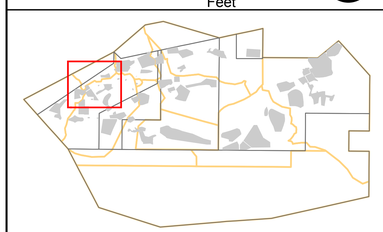
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- Energetic Constituents
- Propellants
- Leach Field
- Non-metal Inorganic Constituents
- Screening for Potential Impacts

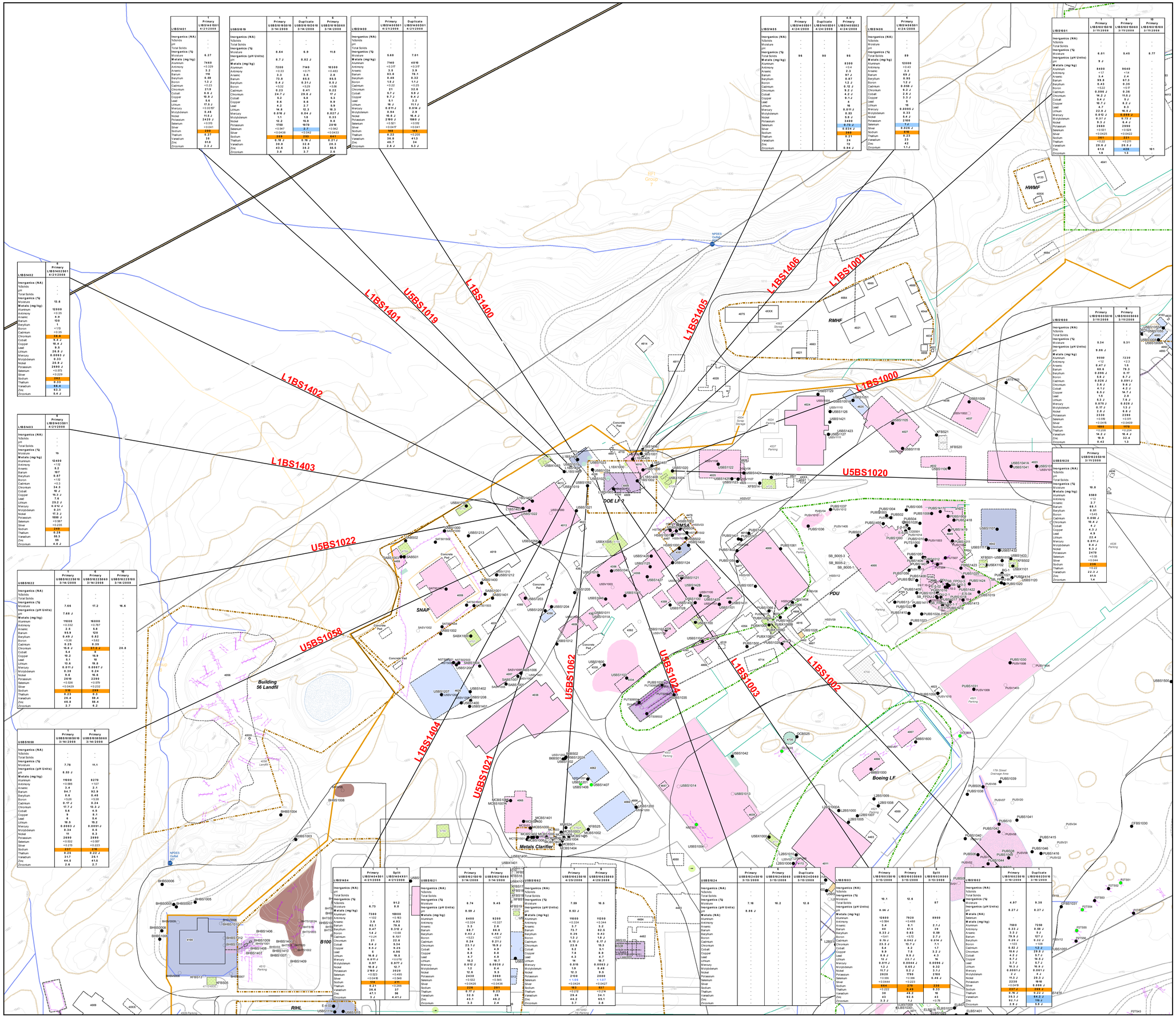
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 75 150

1 inch equals 75 feet

Feet





CH2MHILL

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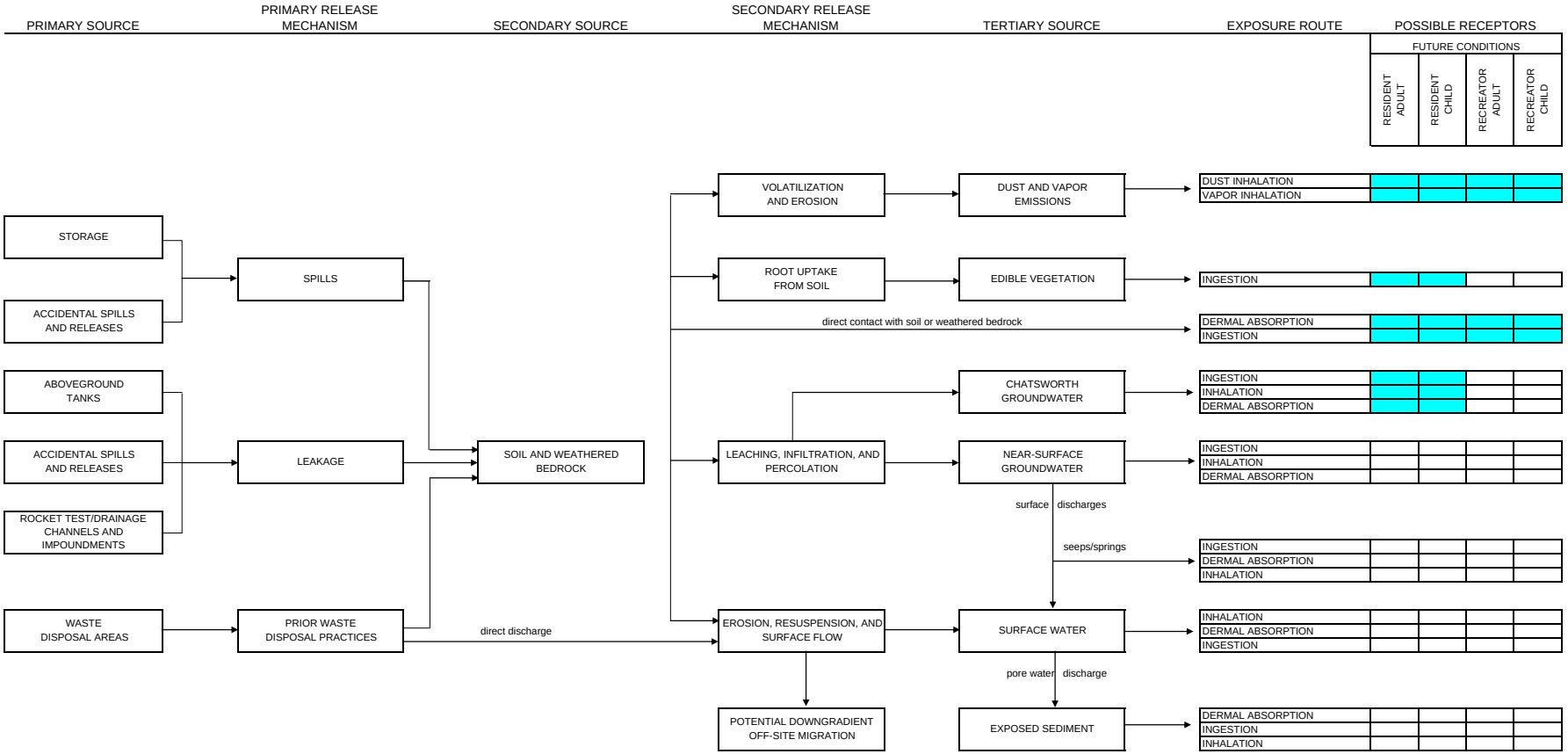
Metals and Inorganics Data Results DOE LF2 RFI Site

FIGURE P.3-9

Figure P.4-1

Human Health Risk Assessment Conceptual Site Model

DOE LF2 RFI Site

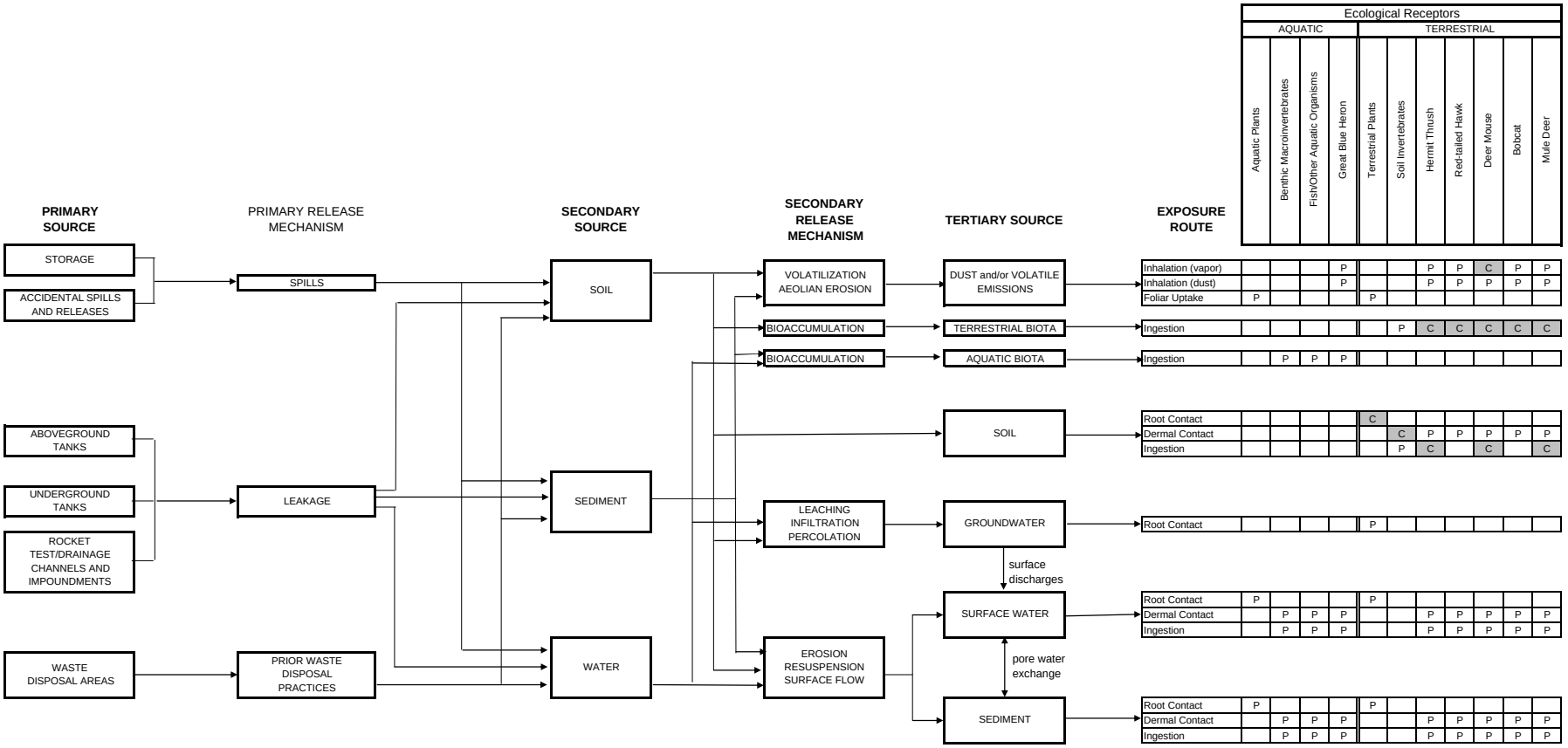


NOTES:

As described in the SRAM (MWH 2005), note that risk estimates for the potential future recreational user (recreator) are used as surrogate risk estimates for the trespasser.

- complete and potentially complete exposure pathways evaluated in this risk assessment

- incomplete exposure pathways not evaluated in this risk assessment



C - Pathway considered complete for purposes of ecological risk assessment

P - Pathway considered potentially complete

Q - Pathway evaluated qualitatively unless site conditions indicate need for quantitative evaluation

Pathways evaluated qualitatively or quantitatively in ecological risk assessment

Figure P.4-2
Ecological Conceptual Site Model
Group 5 RFI Report, DOE Leachfield 2
Santa Susana Field Laboratory

Attachments