Report

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

Volume IX – RFI Site Reports Appendix R

Hazardous Materials Storage Area

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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
Dioxins/Furans	*– see list following acronyms*
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 & Aldrich, Inc.
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
SCTI	Sodium Component Test Installation
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

Definition of dioxin/furan congeners

PCDD/PCDDs	Polychlorinated dibenzo-p-dioxins/dibenzofurans
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-PeCDD	1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
OCDD	1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin
2,3,7,8-TCDF	2,3,7,8-tetrachlorodibenzofuran
1,2,3,7,8-PeCDF	1,2,3,7,8-pentachlorodibenzofuran
2,3,4,7,8-PeCDF	2,3,4,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-hexachlorodibenzofuran
1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-hexachlorodibenzofuran
1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-heptachlorodibenzofuran
OCDF	1,2,3,4,6,7,8,9-octachlorodibenzofuran
TEQ	toxicity equivalency quotient (normalized to 2,3,7,8 TCDD)

Appendix R

R.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 Hazardous Materials Storage Area (HMSA) RFI Site of the Santa Susana Field Laboratory (SSFL). The HMSA Site contains one Area of Concern (AOC)—Building 4457. The HMSA Site, located within Area IV of the SSFL, was used in support of United States Department of Energy (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 HMSA Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the HMSA Site within the SSFL and Group 5 Reporting Area is shown in Figure R.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 Field (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 2 (DOE LF2) (AOC)
- Department of Energy Leach Field 3 (DOE LF3) (AOC)
- Rockwell International Hot Laboratory (RIHL) (SWMU 7.7)
- Systems for Nuclear Auxiliary Power Facility (SNAP) (AOC)

The HMSA Site is located in the northern portion of the Group 5 Reporting Area, north and west of the PDU RFI Site, south of the Group 7 Reporting Area, and east of DOE LF2 and SNAP RFI Sites (Figure R.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 (that is, the ecosystem), and (3) gather data for the next phase of RCRA Corrective Action support the recommendations included in this RFI Report regarding areas recommended

for no further action (NFA), corrective measures study (CMS) areas, and interim stabilization.

The SSFL has been divided into two operable units (OUs)—the Surficial Media Operable Unit (SMOU) and the Chatsworth Formation Operable Unit (CFOU). The HMSA Site characterization presented in this appendix comprises data for both the SMOU and the CFOU. 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.

R.1.1 Report Organization

This HMSA Site Report provides detailed sampling data and evaluation pertaining to the HMSA 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 R.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 R.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU, NSGW, and CFOU characterization information for the HMSA Site.
- **Section R.4 – Risk Assessment Findings Summary**. Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the HMSA Site. The complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section R.5 – Site Actions Recommendations**. Presents a summary of the HMSA Site areas recommended for either NFA or further evaluation in the CMS. CMS areas recommended for interim measures to prevent contaminant migration are identified, if any.
- **Section R.6 – References.** Includes a list of cited references.

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

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

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

- Figure R.1-1: Presents the location of the HMSA Site within the SSFL and the Group 5 Reporting Area.

- Figure R.2-1: Presents a plan view of the HMSA Site, showing known and potential chemical use areas. Tables R.2-1 through R.2-4 present summaries of buildings, tanks, transformers, and other site features at the HMSA Site.
- Figure R.2-2: Presents a plan view of the HMSA Site, showing soil and vapor sampling locations, and nearby monitoring wells.
- Figures R.2-3A and R.2-3B: Present geologic cross-sections across the HMSA Site.
- Figures R.3-1 through R.3-9: Summarize soil and vapor sampling at the HMSA Site. Soil and vapor sampling results are shown on these maps and correlate with appropriate sections of Tables R.3-2A and R.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 appendices. Pertinent appendices 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 HMSA 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.

R.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 included if they are relevant to Group 5. The Group 5 document database includes documents relevant to the HMSA Site. It is worth noting that information presented in this HMSA 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 (COCs), and the relationship of NSGW to CFOU groundwater.

- CFOU Characterization Reports (Montgomery Watson, 2000a; 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 COCs in the CFOU.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual Groundwater Monitoring Report 2007 (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 document 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, which 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 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

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

The HMSA Site is approximately 2.9 acres in the western portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure R.1-1, which also shows the Group 5 Reporting Area boundary. The site layout and the locations of identified and potential Chemical Use Areas are shown in Figure R.2-1. The sampling locations across the site are shown in Figure R.2-2.

During the RFI process, various SWMUs and AOCs within the SSFL were identified. Building 4457 was identified as an AOC in the WPAA (Ogden, 2000a). No other SWMUs or AOCs were identified in the WPAA within the boundary of the HMSA Site as it is defined in this report (Figure R.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps, as well as on interviews with site personnel that were conducted during the RFI, the HMSA Site boundary was defined to include operations associated with the AOC identified above. In addition, facilities or features near the AOC were included for assessment in the RFI. These include Buildings 4024, 4025, 4026, 4226, 4334, 4355, 4357, 4358, 4359, 4426, 4457, 4826, 4356, 4361, 4625, and 4656. Also included are 51 aboveground storage tanks (ASTs), 14 underground storage tanks (USTs), 1 undetermined tank, 4 transformers, 2 electrical substations, and 3 sumps. Known and potential chemical use areas at the HMSA Site are shown in Figure R.2-1 and described in Tables R.2-1 through R.2-4. A spill record is included in Table R.2-5.

The following sections describe the AOC, site history and operations, chemical uses, and current conditions at the HMSA Site.

R.2.1 SWMUs and/or AOCs at the HMSA

The HMSA Site contains one AOC, Building 4457 (Ogden, 2000a). A brief description of the AOC that is included in this RFI Site Report is presented below.

R.2.1.1 Building 4457 (AOC)

Building 4457 was used for proof and performance testing of sodium-lubricated bearings used in large sodium pumps during the 1960s. After completion of bearing testing, the building was used for storage and maintenance. Waste oils from nonradiological uses were stored in Building 4457. There was also a 1,000-gallon sulfuric acid storage tank. Three subsurface sumps beneath the building were used for hazardous materials storage of acids, bases, solvents, total petroleum hydrocarbons (TPH) oils, and lubricants. The building was demolished in 2002. Additional information is in Tables R.2-1 through R.2-4.

R.2.2 HMSA History

A summary of the site chronology, including descriptions of site operations and investigation activities for the HMSA 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 Section R.1.2.

R.2.2.1 Site Chronology

A summary of key historical investigation and remediation activities is presented in Tables R.2-6 and R.2-7. A more detailed description of the HMSA Site is presented below.

R.2.2.1.1 Late 1950s through 1980s

Various SNAP operations were conducted within the buildings located within the HMSA Site. Building 4024, the SNAP Environmental Test Facility, housed and tested prototype reactors. Building 4025 was a SNAP support building. Building 4026, first described as the Large Component Test Loop Building, was used for testing components of sodium-cooled, graphite, moderated reactors under simulated reactor operating conditions. In 1972, Building 4026 was referred to as the Small Component Test Loop Building. By 1987, Building 4026 was designated as the Sodium Component Test Laboratory.

R.2.2.1.2 1960s through 1990s

Sodium Component Test Installation (SCTI) operations, including component test loop and sodium steam generator testing, were conducted in the buildings located within the HMSA Site. Various buildings over time supported the SCTI operations. Building 4355 was the control room for the SCTI operations. Building 4356 was the SCTI, where steam was generated from a sodium source. Building 4457, the Area IV AOC, was used to test sodium-lubricated bearings used in large sodium pumps.

R.2.2.1.3 Early 1990s through Early 2000s

The Kalina program was conducted in the southwestern end of the HMSA Site to expand non-nuclear power technologies. Building 4334, constructed in the early 1990s, was used as the control building for Kalina operations. Building 4335 housed the turbine for Kalina operations.

R.2.2.1.4 1999 through 2003

Buildings associated with SCTI, Small Component Test Loop (SCTL), and Kalina operations were demolished during this period. The only building that has not been demolished at the HMSA Site is Building 4024.

R.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the HMSA 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 R.2-1. The inventories are included as the following tables:

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

R.2.3 HMSA 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 historical document review, 15 Chemical Use Areas were identified within the HMSA Site boundary. Chemicals that were potentially used or stored in these Chemical Use Areas include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), TPH, metals, and inorganics. Chemical Use Areas at the HMSA Site are shown in Figure R.2-1 and are described in detail in Table R.2-8.

R.2.4 Site Conditions

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

R.2.4.1 General Conditions and Topography

The HMSA Site is located within the western portion of Area IV. The site is currently inactive, and Building 4024 is the only structure remaining. Topography in the central portion of the site gently slopes to the south. Current surface elevations at the HMSA Site range from a low of approximately 1810 feet above mean sea level (msl) in the southern portion of the site to a high of approximately 1830 feet msl in the northeastern portions of the site. A summary site conceptual model is presented in Table R.2-9. Figure R.2-3B presents a cross-section developed for the HMSA Site (Surficial Cross Section N-N'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. The location of the cross-section is shown in Figure R.2-3A.

R.2.4.2 Geology

The HMSA Site is located north of the Coca Fault, near the Upper Burro Flats Member of the Upper Chatsworth Formation to the north of the fault (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 on Plate B-1 in Appendix B in the Group 5 RFI Report. Additional geologic information is presented in Appendix B of the Group 5 RFI Report.

R.2.4.3 Soil

Throughout most of the HMSA Site, soil depths are variable, typically ranging from approximately 1 feet to 11 feet in thickness. A map depicting the distribution of alluvial soil within the Group 5 Reporting Area is provided as Figure 2-4 in the Group 5 RFI Report (Volume I). Soil in the undisturbed areas of the site consist of weathered Chatsworth Formation materials, which are primarily fine-grained silty sands, sandy silts, lean clays, and poorly graded sands. Soil boring logs are included in Attachment R-2 to this appendix.

R.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 are 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 HMSA Site. Figure R.2-1 shows well locations in and around the HMSA Site.

At the HMSA Site, two piezometers (PZ-120 and PZ-121) were installed to monitor groundwater conditions in alluvium and weathered bedrock (that is, in NSGW). No monitoring wells have been in the unweathered bedrock (that is, in CFOU Groundwater). Construction details for these piezometers are discussed in Tables B-2 and B-3 of Appendix B of the Group 5 RFI Report, and their locations are shown in Figure R.2-2.

NSGW is perched above CFOU Groundwater in the HMSA Site area. A cross-sectional diagram of near-surface and Chatsworth Formation groundwater occurrence is shown in Figure B-6 in Appendix B of the Group 5 RFI Report. NSGW is encountered at depths ranging from 13 feet bgs (1793 feet msl) to 22 feet bgs (1787 feet msl) in piezometer PZ-121. NSGW in the HMSA Site area is laterally discontinuous, has limited areal extent, and flows to the south-southeast at a hydraulic gradient of approximately 0.04 foot/foot (ft/ft). The occurrence of NSGW in the HMSA Site area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report.

While no wells are screened in the CFOU within the HMSA Site, water level data for nearby wells indicate that CFOU Groundwater occurs at depths ranging from 13 feet bgs in well RD-29 to 41 feet bgs in well RD-89. CFOU Groundwater in the HMSA Site area flows to the northeast at a hydraulic gradient of approximately 0.04 ft/ft. The occurrence of CFOU Groundwater in the HMSA Site area is shown in plan view in Figure B-8 in Appendix B of the Group 5 RFI Report. Additional information related to CFOU groundwater at the HMSA Site is presented in Appendix B of the Group 5 RFI Report.

R.2.4.5 Surface Water

Surface water flow at the HMSA Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the HMSA Site as the result of seasonal precipitation events. While there are no perennial surface water bodies at the site, storm water flows south-southwest from 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 located at the discharge of the R-2 Ponds (Figure 2-7 of the Group Report [Volume I]). This discharge point is the ultimate discharge point for a large portion of the western half of SSFL.

R.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the HMSA Site, including habitat/vegetation types and sensitive species, are shown in 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."

R.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 HMSA Site. The presentation includes sampling objectives, scope, key decision points related to characterization activities, and findings.

Transport-and-fate evaluations are discussed in the following sections of the 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 volatile organic compound (VOC) migration from groundwater and subsurface soil to soil gas and soil gas to indoor and ambient air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

R.3.1 Sampling Objectives

Several soil and soil vapor samples were collected as part of the previous RFA, CCR, and preliminary RFI sample collection events (Ogden, 2000). Using information from the review of the historical documents summarized in Section R.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 R.3-1A and R.3-1B, with considerations 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 site-wide routine monitoring requirements and additional characterization objectives according to regulatory agency-approved work plans (see Section R.3.2). Based on detected RFI site chemicals, chemical distribution, and site conditions, additional groundwater sampling and analysis was also conducted to complete characterization of individual RFI sites and 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).

R.3.2 Sampling Scope

A total of 79 soil matrix samples and 19 soil vapor samples were collected between November 2000 and May 2008 to assess potential impacts associated with the Chemical Use Areas at the HMSA 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 summaries are presented in Tables R.3-1A and R.3-1B. Sample locations are shown in Figure R.2-2.

Both Chatsworth Formation groundwater and NSGW have been sampled and analyzed according to agency-approved work plans (GRC, 1995a and 1995b; Ogden, 2000b). Two piezometers (PZ-120 and PZ-121) were used to characterize NSGW. Groundwater characterization data for the HMSA 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 comply with RFI program requirements as defined by Quality Assurance Project Plans (QAPP) in Appendix V of the Group 5 RFI Report. The RFI QA program included individual sample data validation and assessment of the performance of each laboratory, as well as 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 R-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 HMSA Site are described by media in the sections below.

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

- Soil vapor
- Soil matrix
- Groundwater

R.3.3 Key Decision Points

Site assessment was performed to address revised, DTSC-approved requirements for risk assessment and evaluation of 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 R.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).

R.3.4 Soil Matrix and Soil Vapor Findings

Soil and soil vapor sampling results and characterization findings are summarized in Table R.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. For areas recommended for CMS, indicate that soil and soil vapor volumes 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 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 HMSA Site is provided in Tables R.3-3A and R.3-3B.

R.3.4.1 Soil and Soil Vapor Data Presentation

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

- Column 1 –Chemical Use Area 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 each chemical group in a particular Chemical Use Area. (A more detailed sitewide summary is presented in Section K.3.4.2 that follows.) 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 K.3-3A and K.3-3B.
- Column 6 – Assessment of whether characterization 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 the nature and extent of chemicals is defined sufficiently to estimate soil volumes (within a factor of 10) for areas that require further consideration in the CMS (if needed).

R.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Tables R.2-8, 15 individual confirmed and potential Chemical Use Areas were investigated at the HMSA Site. A summary of the chemicals detected above screening criteria is provided below by chemical analytical group. Concentrations denoted with a "J" flag indicated the results are estimated below the method reporting limits.

R.3.4.2.1 Volatile Organic Compounds

A total of 19 soil vapor samples was collected at 17 locations and analyzed for VOCs. Of the 19 samples collected, 7 had detectable levels of VOCs. Soil vapor sampling was also attempted at four additional locations (refer to Figure R.3-1A). However, no vapor samples could be collected at these locations due to the presence of shallow bedrock (i.e., less than 5 feet bgs) or insufficient flow from the vapor wells to allow sample collection. The results are shown in Figures R.3-1A and R.3-7.

- Toluene was detected above the Ecological RBSL of 0.084 micrograms per liter (µg/L) in a sample from HSSV1000 at a depth of 4 to 5 feet bgs (0.165 µg/L) (located in the former HMSA area).
- 1,1,2-Trichloro-1,2,2-trifluoroethane, dichlorodifluoromethane, TCE, trichlorofluoromethane, and xylenes were detected at concentrations that did not exceed their respective RBSLs.

A total of 38 soil samples was collected at 21 locations and analyzed for VOCs. Of the 38 samples, 23 had detectable levels of VOCs. The results are shown in Figures R.3-1B and R.3-7.

[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.

- 1,1-Dichloroethene (1,1-DCE), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, methyl ethyl ketone, styrene, toluene, TCE, and xylenes were detected at concentrations that did not exceed their respective RBSLs.

The toluene concentration above Ecological RBSL in a soil vapor sample collected at HSSV1000 is defined by step-out sampling locations where no RBSL exceedances were observed for VOCs in soil vapor samples. In addition, no VOCs were detected above their respective RBSLs in multiple shallow soil samples collected near this soil vapor sampling location. Based on these sampling results, further characterization of VOCs is not recommended.

R.3.4.2.2 Semivolatile Organic Compounds

A total of 42 soil samples was collected at 26 locations and analyzed for SVOCs. Of the 42 samples, 25 samples had detectable levels of SVOCs. The results are shown in Figures R.3-2 and R.3-8.

- The following SVOCs were detected at concentrations that did not exceed their respective RBSLs:
  - Butyl benzyl phthalate
  - Diethyl phthalate
  - Di-n-butyl phthalate
  - Di-n-octyl phthalate

  Bis(2-ethylhexyl) phthalate was detected in 12 of 35 soil samples at concentrations ranging from 0.00865 to 2.16 mg/kg. None of these concentrations exceed the Ecological RBSL of 4.9 mg/kg. Bis(2-ethylhexyl) phthalate is a common laboratory contaminant. As such, the low concentrations of this compound reported in the soil samples are likely attributable to the laboratory and are not representative of site conditions at the HMSA Site.

- Various polynuclear aromatic hydrocarbons (PAHs) were detected in 42 soil samples collected, as presented below.
  - In the surface soil sample at U5BS1600, benzo(a)pyrene was detected at a concentration (0.109 mg/kg), which exceeds the Residential RBSL (0.06 mg/kg) (former Building 4335 area). No other PAHs exceeded its RBSLs in this sample. In addition, in the deeper sample at this location (5 to 6 feet bgs), benzo(a)pyrene was not detected, and no other PAH concentrations exceeded its RBSLs. Based on cancer risk of future residential exposure due to benzo(a)pyrene exceeds $1x10^{-6}$ (see Section R.5 and Table R.5-1 and R.5-2), area east of Building 4035 is recommended for further characterization of benzo(a)pyrene.
  - The following PAHs were detected above Residential RBSLs and/or Ecological RBSLs in the sample collected from U5BS1127 at a depth of 4 to 5 feet bgs:
    - Benzo(a)anthracene (20.9 J mg/kg)
    - Benzo(a)pyrene (11 J mg/kg)
    - Benzo(b)fluoranthene (14.6 J mg/kg)
    - Benzo(k)fluoranthene (7.08 J mg/kg),

- Chrysene (20.3 J mg/kg)
- Acenaphthene (4.76 mg/kg)
- Anthracene (10.2 mg/kg)
- Fluoranthene (51.7 mg/kg)
- Fluorene (3.32 mg/kg)
- Phenanthrene (33.8 mg/kg)
- Pyrene (39.9 mg/kg)
- Indeno(1,2,3-cd)pyrene (4.87 J mg/kg)

In the surface soil sample at U5BS1127, no elevated PAH concentrations were detected. U5BS1127 is bounded to the north and east by step-out sampling locations where no RBSL exceedances were observed. No samples were collected to the west (Building 4024 present) or south. It is also noteworthy that diesel-range hydrocarbons (C21-C30) were detected (at 940 mg/kg, which is less than respective RBSLs) in this sample as well. This TPH sample result suggests that the elevated PAH concentrations are associated with a subsurface release of petroleum. Based on these sampling results, additional characterization of the PAHs in subsurface soil is needed at Building 4024.

– The following PAHs were detected at concentrations that did not exceed their respective RBSLs.

  - 1-Ethyl naphthalene
  - 2-Methylnaphthalene
  - Acenaphthylene
  - Benzo(ghi)perylene
  - Dibenzo(a,h)anthracene

R.3.4.2.3 Total Petroleum Hydrocarbons

A total of 45 soil samples was collected at 28 locations and analyzed for TPH. Of the 45 samples, 32 samples had detectable levels of TPH. The results are shown in Figures R.3-3 and R.3-8.

- Gasoline-range organics (C8-C11) were detected above the Residential RBSL of 1.1 mg/kg in the following trench samples collected in the former HMSA area:

  – HSTS01S03 at a depth of 8 feet bgs (7.7 mg/kg)
  – HSTS01S02 at a depth of 13 feet bgs (2.9 J mg/kg)

  Although the these concentrations exceed the Residential RBSL for gasoline-range hydrocarbons, no elevated benzene concentrations were detected in soil or soil vapor samples at the HMSA Site. Therefore, no further investigation of TPH appears warranted in the HMSA Site area.

- Kerosene-range hydrocarbons (C12-C14), diesel-range hydrocarbons (C14-C20 and C15-C20), and lubricating-oil-range hydrocarbons (C20-C30 and C21-C30) were detected at concentrations that did not exceed any RBSLs.

Further characterization of TPH is not recommended.

R.3.4.2.4 Polychlorinated Biphenyls

A total of 17 soil samples was collected at 13 locations and analyzed for PCBs. Of the 17 samples, 4 samples had detectable levels of PCBs, and results are presented in Figures R.3-4 and R.3-8.

- Aroclor 1248, Aroclor 1254, and Aroclor 1260 were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of PCBs is not recommended..

R.3.4.2.5 Metals/Inorganic Compounds

A total of 65 soil samples was collected at a total of 43 locations and analyzed for metals. At least one or more metals were detected in all sampling locations, and results are shown in Figures R.3-5 and R.3-9.

- Aluminum, antimony, boron, cadmium, copper, lead, mercury, selenium, silver, vanadium, and zinc concentrations were detected above their respective background concentrations and Ecological RBSLs.
  - Aluminum (background of 20,000 mg/kg, Ecological RBSL of 12 mg/kg) was detected at concentrations ranging from 1,700 mg/kg to 23,850 J mg/kg. Aluminum was detected above background and Ecological RBSLs in two samples:
    - U5BS1047 at a depth of 0 to 1 foot bgs (23,850 J mg/kg)
    - U5BS1010 at a depth of 0 to 1 foot bgs (23,450 J mg/kg).

    The elevated concentrations of aluminum may be consistent with naturally occurring concentrations in the soil derived from the Santa Susana Formation.
  - Antimony (background of 8.7 mg/kg, Ecological RBSL of 0.095 mg/kg) was detected at concentrations ranging from 0.025 J mg/kg to 16.7 to mg/kg. Antimony was detected above background and Ecological RBSL in three samples:
    - HSTS01S01 at a depth of 13 feet bgs (16.7 mg/kg)
    - HSTS01S02 at a depth of 13 feet bgs (10.5 mg/kg)
    - HSTS01S03 at a depth of 8 feet bgs (10.3 mg/kg)
  - Boron (background of 9.7 mg/kg, Ecological RBSL of 6.76 mg/kg) was detected at concentrations ranging from 1.12J mg/kg to 14.5 mg/kg. Boron was detected above background and Ecological RBSL in three surface soil samples collected at the following locations: U5BS1127 (14.5 mg/kg), U5BS1047 (13.35 mg/kg), and U5BS1010 (12.55 mg/kg).
  - Cadmium (background of 1 mg/kg, Ecological RBSL of 0.0045 mg/kg) was detected at concentrations ranging from 0.041J mg/kg to 1.3 mg/kg. Cadmium was detected above background and Ecological RBSL in the surface soil sample collected from U5BS1123 (1.3 mg/kg).
  - Copper (background of 29 mg/kg, Ecological RBSL of 1.1 mg/kg) was detected at concentrations ranging from 1.9 mg/kg to 56.6 mg/kg. Copper was detected above background and Ecological RBSL in two surface soil samples collected at the following locations: U5BS1100 (56.6 mg/kg) and U5BS1127 (43.8 mg/kg).

- Lead (background of 34 mg/kg, Ecological RBSL of 0.013 mg/kg) was detected at concentrations ranging from 0.88 J mg/kg to 91.8 mg/kg. Lead was detected above background and Ecological RBSL in a surface soil sample collected from U5BS1127 (91.8 mg/kg).
- Mercury (background of 0.09 mg/kg, Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 0.0017 J mg/kg to 0.6 J mg/kg. Mercury was detected above background and Ecological RBSL in a surface soil sample collected from U5BS1103 (0.6J mg/kg).
- Selenium (background of 0.655 mg/kg, Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.17J mg/kg to 0.686 mg/kg. Selenium was detected above background and Ecological RBSL in a sample collected from HSBS1000 at a depth of 3 to 4 feet bgs (0.686 mg/kg).
- Vanadium (background of 62 mg/kg, Ecological RBSL of 1.5 mg/kg) was detected at concentrations ranging from 7.8 mg/kg to 72.9 mg/kg. Vanadium was detected above background and Ecological RBSL in a surface soil sample collected from U5BS1101 (72.9 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 of 110 mg/kg, Ecological RBSL of 21 mg/kg) was detected at concentrations ranging from 7.6 J mg/kg to 340 J mg/kg. Zinc was detected above background and Ecological RBSL in four surface soil samples collected at the following locations: U5BS1123 (340 J mg/kg), U5BS1100 (237 mg/kg), U5BS1121 (161 mg/kg), and HSBS1000 (127.8 mg/kg).

- Metals detected above background (but below their respective RBSLs) include iron, sodium, and thallium. Background concentrations for metals are included in Table R.3-3A. Sodium was detected at concentrations ranging from 75 J mg/kg to 559 mg/kg. RBSLs for sodium have not been established.
- Available records indicate that perchlorate was previously used in Building 4358 and, as such, a surface soil sample was collected at this former building location (sample location U5BS1104). Perchlorate was not detected in this sample, and no further investigation is required.

R.3.4.2.6 Dioxins

Dioxins were not identified as having been previously used at the HMSA Site during the historical document review. Consequently, dioxins were not included for analysis at any sampling locations.

R.3.4.2.7 Energetics

One soil sample was collected at one location and analyzed for energetics. Energetics were not detected in this sample. Further characterization of energetics is not recommended.

R.3.5 Groundwater Findings

Groundwater occurrence and impacts at the HMSA Site are described below.

R.3.5.1 Groundwater Data Presentation

Groundwater sampling results and characterization findings are summarized in Tables R.3-2B in this appendix and in Appendix B of the Group 5 RFI Report. The purposes of Table R.3-2B are as follows:

- 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 R.3-2A, Table R.3-2B describes groundwater data by chemical group (such as metals, VOCs, and SVOCs). Table R.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

A detailed compilation of groundwater data is provided in Appendix B of 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.

R.3.5.2 Groundwater Data Summary

Groundwater conditions at the HMSA Site are characterized by two piezometers (PZ-120 and PZ-121) to characterize NSGW. Groundwater findings from these wells are presented in Table R.3-2B in this appendix and in Appendix B of the Group 5 RFI Report.

As described in Appendix B of the Group 5 RFI Report, samples from the NSGW wells at the site (PZ-120 and PZ-121) were analyzed for VOCs, SVOCs, metals, inorganics, and hydrocarbons.

- During the initial sampling event at PZ-120 in April 2003, a TCE concentration of 7 µg/L was detected, which exceeds the groundwater screening level (5 µg/L). During the subsequent and final sampling event performed to date at this piezometer in June 2003, TCE was not detected. Low concentrations (less than groundwater screening levels) of 1,2-dichloroethene, acetone, and cis-1,2-dichloroethene were also detected at PZ-120.
- SVOCs were not detected in any of the NSGW samples collected.
- Hydrocarbons were not detected in any of the NSGW samples collected.
- Metals collected over time were analyzed for dissolved and/or total metals. For the purposes of impacts to groundwater only dissolved metals are discussed. Concentrations for dissolved metals detected (arsenic, barium, boron, chromium, iron, lead, magnesium, manganese, nickel, selenium, strontium, and zinc) were all below groundwater screening levels, except the following metals.
  - Aluminum at a concentration of 808 µg/L at PZ-121 exceeded its groundwater screening level of 200 µg/L.
  - Cadmium at a concentration of 0.38 µg/L at PZ-121 exceeded its groundwater screening level of 0.2 µg/L.
  - Copper at a concentration of 7.2 µg/L at PZ-121 exceeded its groundwater screening level of 4.7 µg/L.
  - Molybdenum at a concentration of 7.9J µg/L at PZ-121 exceeded its groundwater screening level of 2.2 µg/L.
  - Vanadium at a concentration of 4.2J µg/L at PZ-121 exceeded its groundwater screening level of 2.6 µg/L.
- Concentrations for inorganic compounds detected (chloride, fluoride, perchlorates and sulfate) were all below screening levels.

Concentrations of TCE and metals in NSGW discussed above may be related to past operations at the HMSA Site. TCE was detected above groundwater screening levels during one of two sampling events at PZ-120. Additional groundwater monitoring appears warranted to further assess the presence of TCE and metals at the HMSA Site. NSGW will be evaluated further in Appendix B.

R.3.6 Surface Water Findings

Surface water may exist intermittently at the HMSA Site primarily as a result of seasonal precipitation events. The HMSA Site is located along a surface water divide. As a result, the eastern portion of this site is not impacted by upgradient sites. The western portion of the HMSA Site is downgradient from DOE LF2, however, the risk assessment performed for

the DOE LF2 site determined that the near-surface soil is not a risk to downgradient receptors, and the DOE LF2 site was recommended for NFA.

There are no features at the HMSA Site that indicate surface water flows from the site, and due to the relatively flat topography and distance to defined drainage channels, it is not likely that impacted soil from the HMSA site has impacted downgradient sites via surface water transport. However, surface water that may flow to the west from the site would be transported downgradient along 20th Street toward the Compound A Facility Site and the R-2 Ponds. Surface water the may flow to the east from the site would be transported downgradient along 17th Street and into the 17th Street Drainage.

R.4 Risk Assessment Findings

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

The following sections summarize the findings of the HRA and ERA performed for the HMSA. Details regarding how the HRA and ERA were conducted are presented in the SRAM (MWH, 2005) and in Appendix A of the Group 5 RFI Report. Details regarding the site-specific HRA and ERA are presented in Appendix A, Attachment A15, of the Group 5 RFI Report.

R.4.1 Key Decision Points

Site-specific key decision points for the HRA and ERA are listed below and are described more fully in Appendix A and Attachment A15 of 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 (vapor) exposures to groundwater COPCs were evaluated in the risk assessment (Appendix A).
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. All NSGW EPCs were based on the maximum concentrations detected in all NSGW piezometers and wells within the ECL Site for both indirect and direct exposure.
    - A review of time-series plots for chemical constituents, groundwater gradients, and source areas indicates 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 HMSA 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 report of the large home-range receptor risk assessment.

R.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 HMSA Site. A conceptual site model diagram for human health risk assessment is presented in Figure R.4-1 and a summary of COPCs and risk estimates for human health are presented in Table R.4-1 and Table R.4-2 respectively. Results of the risk characterization indicated the following:

- Soil – Benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, and benzo(k)fluoranthene were identified as COCs for direct contact with soil. No COCs were identified for direct contact with soil by future recreators. No COCs were identified for plant consumption by future residents.
- Soil Vapor – No COCs were identified for inhalation of indoor air by future residents. No COCs were identified for inhalation of ambient air by future residents or future recreators.
- Near-surface Groundwater – Trichloroethene was identified as COCs for domestic use of shallow groundwater by future residents.
- Chatsworth Groundwater – COCs will be identified and addressed as part of the Chatsworth Formation OU.

The uncertainties associated with the Group 5 RFI Sites in general were discussed in Appendix A. Uncertainties specific to the HMSA Site are summarized in Table R.4-3

R.4.3 Summary of 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 R.4-2, and a summary of risk estimate and chemicals of ecological concern (COECs) are presented in Tables R.4-4 and R.4-5. Results of the risk characterization indicated the following:

- Soil – Zinc, bis(2-ethyhexyl) phthalate, chrysene, and PCB_toxicity equivalency quotients (TEQs) (birds and mammals) were retained as chemicals of ecological concern (COECs). Vanadium was not retained as a COEC. The Aroclors, dioxin/furans (based on PCB_TEQ extrapolation), and PAHs were retained generally as chemical classes. Estimated risks were generally in the low range with risks in the medium range for dioxin/furans.
- Soil Vapor – No COECs. 1,1,2-Trichloroethane exceeded the inhalation toxicity reference value (TRV) (hazard quotient greater than 1), but was not retained as a COEC because it was never detected.

The general uncertainties associated with the Group 5 RFI Sites are discussed in Appendix A of the Group 5 RFI Report. The uncertainties associated specifically with the HMSA Site are presented in Table R.4-6.

R.4.4 HMSA Risk Assessment Conclusions

This section presents the overall conclusions for HMSA 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 HMSA Site consist of the former HMSA AOC and Buildings 4024, 4025, 4026, 4226, 4334, 4355, 4357, 4358, 4359, 4426, 4457, 4826, 4356, 4361, 4625, and 4656. Also included as potential sources of contamination are 51 AST locations, 14 UST locations, 1 undetermined tank, 4 transformer locations, 2 electrical substation locations, and 3 sumps.

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, while soil samples were collected and analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Data were considered adequate to evaluate potential risks. Benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, and benzo(k)fluoranthene were identified as COCs for direct contact with soil. No COCs were identified in soil vapor for human health. Zinc, bis(2-ethyhexyl) phthalate, chrysene, and PCB_toxicity equivalency quotients (TEQs) (birds and mammals) were retained as chemicals of ecological concern (COECs). No COECs were identified in soil vapor during ERA.

NSGW samples were collected and analyzed for VOCs, SVOCs, metals, inorganics, and hydrocarbons. Trichloroethene was identified as COCs for domestic use of shallow groundwater by future residents. Chatsworth groundwater will be addressed as part of the CFOU RFI report.

The locations within the HMSA Site that will require further action to address human health or ecological risk or both include areas at Buildings 4024, 4025, 4026, and 4335.

R.5 HMSA Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the HMSA Site. Section R.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 R.5.2. Site action recommendations for the HMSA Site are summarized in Sections R.5.3, R.5.4.

R.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), 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 HMSA 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 R.3-2A and R.3-2B). Section R.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 HMSA Site (Section R.4 and in Appendix A).
4. Identifying HMSA Site areas requiring further work (this section).

R.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the HMSA 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 and 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 further below.

R.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 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 hazard index (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 R.5-1. CMS Areas are also depicted graphically in Figure R.5-1 to illustrate locations and approximate areal extents, and are summarized in Table R.5-2.

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.

R.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 (e.g., 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).

R.5.3 CMS Site Action Recommendations

Based on the results of the RFI site investigation and the human health and ecological risk assessments, portions of the HMSA RFI Site is recommended for CMS.

As presented in Table R.4-2, the maximum cumulative human health risk for the HMSA Site is $3x10^{-5}$ under a hypothetical future residential exposure scenario, and the maximum hazard index is 8. For the hypothetical future recreational scenario, the risk and hazard index values are less than $1x10^{-6}$ and 1, respectively. The potential human health risks at the HMSA RFI Site exceed the low end of the risk management range ($1 X 10^{-6}$) (excess lifetime cancer risk [ELCR]) and also exceed a hazard index of 1 (noncancer risks). Consequently, a CMS is recommended. As shown in Table R.5-1, the primary risk drivers for the hypothetical future residential scenario are PAHs in soil and TCE in NSGW. PAHs in shallow soil in two locations at the HMSA Site (Buildings 4024 and 4335) are recommended for further evaluation in CMS.

As presented in Table R.4-4, Ecological HI values are greater than 1 for the hermit thrush and deer mouse. Because the hazard quotient values exceed 1, a CMS is recommended to address ecological risks.

The following four CMS areas are recommended to address the human health and ecological risks for the HMSA Site:

- **HMSA-1**: Building 4024. The chemical risk drivers are PAHs in soil for both human and ecological receptors.
- **HMSA-2:** Former Building 4025. The chemical risk driver is zinc in surface soil for ecological receptors.
- **HMSA-3:** Former Buildings 4026, 4357, and 4426. The chemical risk driver is zinc in shallow soil for ecological receptors.
- **HMSA-4:** Former Building 4334. The chemical risk driver is a PAH (benzo[a]pyrene) in shallow soil for human receptors.

All other portions of the HMSA Site are recommended for NFA. This NFA recommendation is based on a detailed review of 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. This NFA recommendation will be reevaluated and confirmed upon the assessment of the potential presence chemical impacts beneath the buildings that remain at the HMSA Site (refer to Figure R.5-1). As part of the planned demolition of these buildings, soil sampling will be performed, as needed, according to the process specified in the SSFL Building Demolition Standard Operating Procedure (SOP) (Boeing, 2008). The NFA recommendation will be reevaluated and confirmed during the building demolition sample data.

R.5.4 NFA Site Action Recommendations

Based on a detailed review of all available historical documents, an evaluation of sample data collected at the site during previous investigations and the current RFI, including the results of human health and ecological risk assessments performed for the site, all areas of the HMSA Site except the CMS area identified in the previous section are appropriate for an NFA designation. For the areas recommended for NFA, the sections below summarize the historical uses, the sampling data collected, and the results of the HRA and ERA.

The NFA recommendation for the HMSA Site will be reevaluated, and if appropriate revised, in the future after the existing structures are demolished. One structure (Building 4024) remains at the HMSA Site. As described above, a portion of this building is included in a CMS area. As part of the planned demolition of this building, soil sampling will be performed, as needed, according to the process specified in SOP: Building Feature Evaluation and Sampling (MWH and CH2M HILL, 2008) to assess the potential for chemical impacts beneath the building. The NFA recommendation for the HMSA Site will be confirmed based on the data collected following building demolition.

R.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 HMSA 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. Each of these Chemical Use Areas was subject to site investigation, and sample collection and analysis. In addition, a number of buildings and site features that had no record of historical chemical uses were investigated during the RFI. Consequently, all suspect areas of the HMSA Site were investigated and the findings presented and considered herein.

The area recommended for NFA at the HMSA Site includes all portions of the site that are not recommended for CMS (Figure R.5-1), including the following Chemical Use Areas:

- Chemical Use Area 2 – Building 4457, Sump #1, Sump #2
- Chemical Use Area 3 – Former Tank T-357
- Chemical Use Area 6 - Substation 4725
- Chemical Use Area 8 - Substation 4726
- Chemical Use Area 10 - Building 4358
- Chemical Use Areas 11 - Building 4355
- Chemical Use Areas 12 - Building 4356, including interior tanks and transformers
- Chemical Use Areas 13 - Building 4361, including interior tanks
- Chemical Use Areas 14 - Building 4656
- Chemical Use Areas 15 - Building 4625
- Chemical Use Areas 16 – Former UST UT-19

Available historical documentation indicates that operations at the Chemical Use Areas identified above involved or may 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.

R.5.4.2 Sampling and Analysis Results

As presented in Section R.3, numerous soil and soil vapor samples were collected in the HMSA Site areas recommended NFA. Soil vapor samples were collected and analyzed for VOCs. Soil samples were collected and analyzed for VOCs, SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics.

The toluene concentration above Ecological RBSL in a soil vapor sample collected at HSSV1000 is defined by step-out sampling locations where no RBSL exceedances were observed for VOCs in soil vapor samples. In addition, no VOCs were detected above their respective RBSLs in multiple shallow soil samples collected near this soil vapor sampling location. Based on these sampling results, no further investigation of VOCs appears warranted at the HMSA RFI Site.

Various metals were detected above their respective background concentrations and Ecological RBSLs. These exceedances appear to be isolated in nature, and not indicative of releases that warrant further action. These exceedances generally have either deeper sample or lateral sample results that do not exceed either background or the Ecological RBSL. Therefore, NFA appears warranted at these portions of the HMSA Site.

Bis(2-ethylhexyl) phthalate was detected at low concentrations in 12 of 35 soil samples at the HMSA Site. Although the concentrations of this compound did not exceed the Ecological

RBSL, it was retained as a COEPC in the ERA. Bis(2-ethylhexyl) phthalate is a common laboratory contaminant. As such, the low concentrations of this compound reported in the soil samples are likely attributable to the laboratory and are not representative of site conditions. Therefore, a CMS is not recommended to address bis(2-ethylhexyl) phthalate at the HMSA Site.

PCB-TEQs (Mammals) were retained as COEC in the ERA. Estimated risks (hazard quotients [HQs]) exceeded the level of 1 for deer mouse (low TRV) and fall in the medium-low risk category. 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 1254 and Aroclor 1260 were detected at concentrations significantly below their respective Ecological RBSLs (Section R.3.4.2.4), a CMS is not recommended to address the elevated HQs calculated for PCB-TEQs.

R.5.4.3 Risk Assessment

The CMS recommendations address all of the constituents that contribute to unacceptable risks to future potential human and ecological receptors at the SNAP Site. Therefore, an NFA designation is appropriate for the entire area outside the areas recommended for CMS at the SNAP Site.

R.5.5 Source Area Stabilization Site Action Recommendations

A large portion of the HMSA Site is located along a surface water divide. The CMS areas identified at the HMSA Site are located in a generally flat areas that are not affected by strong surface flow runoff during storm events. As a result, the HMSA Site CMS areas do not require stabilization measures.

R.6 References

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Tables

Table R.2-1
Building Inventory
Hazardous Materials Storage Area RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4024	1961	Unknown	SNAP Environmental Test Facility. This building housed and tested prototype reactors.	5		Boeing, 2000.
4025	1959 (constructed)	1999 (demolished)	Snap Support Building. This building was used for nuclear reactor remote handling and viewing mock-up work in support of SNAP. Following SNAP support, 4025 was used as a warehouse and for storage.	4		Sapere, 2005.
4026	1957 (constructed)	1998 (demolished)	Used for testing components of sodium-cooled, graphite moderated reactors under simulated reactor operating conditions. Consisted of a component area, a test tower and control building structures. Initially there were 3 sodium tanks, 2 ASTs and a drain tank located below grade in a concrete, steel plate lined pit. First described as a Large Component Test Loop (LCTL). By 1972 it was referred to as a Small Component Test Loop (SCTL). By 1987, Building 4026 was designated as a Sodium Component Test Laboratory.	7	Hydraulic line broke on heavy equipment, spilling onto the ground in March 1999. Broken pipe on April 1997 released a mixture of glycol, water, and ammonia. Deworals sodium, Dowanol and sodium, hydrocarbons were materials generated and disposed offsite.	Sapere, 2005; Unknown, 2007; Rockwell International, 1987.
4226	early 1980s (constructed)	1997 (demolished)	Small Component Test Loop Motor Generator Building. This building stored drummed non-radiological hazardous materials and housed a motor generator.	7	There was a motor generator room with oil stains (4' by 15') on the floor. PCB containing hydraulic oil used. Petroleum lines and spills.	Sapere, 2005; Unknown, 1996b.
4334	early 1990s (constructed)	2003 (demolished)	Served as a control room for the Kalina facility. General chemical storage which included aqueous ammonia, anhydrous ammonia, turbine lube oil, compressor oil, greases, and lubricants.	9	Uses waste heat from SCTI to boil water/ammonia mixture to generate power. Anhydrous ammonia is transferred in a closed system but leaks occurred and the odor of ammonia had been noticed.	Sapere, 2005; ETEC, 1992.
4335	late 1980s or early 1990s (constructed)	2003 (demolished)	Housed the turbine for the Kalina facility.	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4355	1958 (constructed)	2003 (demolished)	SCTI Control Room. This building housed the control room, data acquisition system, offices for facility management and engineering staff, restrooms, a small chemistry laboratory, and facility record storage. Building was also used for testing steam generators. Contained a cooling tower and emergency generator.	11		Boeing, 2003; Sapere, 2005; Rockwell International, 1990; Unknown, 1992-1994; DOE, 1991.
4356	1958	2002	Sodium Test Component Installation (SCTI). Operations included sodium tank cleaning, generation of steam from a sodium heat source, water treatment and X-ray operations. Chemicals used for water treatment include sulfuric acid, sodium hydroxide, hydrazine, and morpholine. Storage of chemicals (cadmium, chromium). A sodium leak occurred at the sodium test loop inside the building. In addition, releases of 200-300 gallons of 20 percent sulfuric acid (on June 19, 1988) and 6 to 8 gallons of sulfuric acid (date unknown) occurred.	12		Boeing, 2000; HDMSp001648630; Salazar, 1994; Unknown, 1980.
4357	1958 (constructed)	2002 (demolished)	Supply storage building for SCTI complex. This building was also used as the Pump Bearing Test Facility Control Building for LMEC and ETEC. Propellants for rocket motor tests were mixed and processed in 4357.	1		Boeing, 2002; Sapere, 2005.

Table R.2-1
Building Inventory
Hazardous Materials Storage Area RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4358	1966	2003 (demolished)	Building 4358 was initially used as a Chemical Storage Building and part of the SCTL support area. The function of the SCTL was to test components and instruments in a sodium environment. When SCTL was eliminated, Building 4358 became a storage building for SCTI and Kalina. The primary purpose of the SCTI was to test sodium-heated steam generators and sodium-to-sodium intermediate heat exchangers (IHX) under simulated sodium-cooled nuclear power plant operating conditions. Building 4358 was moved from its original location directly northwest of Building 4656 to a new location directly south of Building 4026 in approximately 1978. In 1997, this building stored SSME stability bombs. In addition, the building served as storage for ignitors that contained ammonium, magnesium, potassium perchlorates, and 55-gallon drums of lube oil. The building was demolished in 2003. The building was a 1,120-square-foot structure with the frame, siding and roof constructed of steel.	10		Sapere, 2005; Blandino, 1998; Sujata, 1997; Unknown, 1996c.
4359	1970s (constructed)	2001 (demolished)	SCTI Compressor Building/Storage. Transformer was located on the south side of the building and oil stain of unknown origin was found on building floor during site inspection.	7		Sapere, 2005; Unknown, 1996a.
4361	1992	2003	SCTI Hazardous Material Storage. Also known as the SCTI Effluent Storage Building. Chemicals were stored in underground storage tanks (see Table 2) within a 90,000 gallon secondary containment pit. Chlorine was stored in drums. A 4,400 gallon secondary containment trench was located northeast of Building 4361 and was used contain run-off from aboveground storage tanks at SCTI.	13		Sapere, 2005; Boeing, 2003; Unknown, Date Unknown (HDMSP01703301); Unknown, Date Unknown (HDMSP00019701).
4392	1992	2000 (demolished)	Electrical equipment building for SCTI and Kalina.	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005; Unknown, 2000.
4426	Unknown	Unknown	Uninterruptible Power Supply (UPS).	7		Sapere, 2005.
4457	~1972 (constructed)	1970s	This building was used for proof and performance testing of sodium lubricated bearings used in large sodium pumps. Waste oils from non-radiological uses were stored in 4457. There was also a 1,000 gallon sulfuric acid storage tank. Subsurface sumps beneath the building were used for hazardous materials storage of acids, bases, solvents, TPH oils, and lubricants.	2		Sherer, 1995; Lee, 1998; Sapere, 2005.
4478	1971	1981	Served as CDHC Office Support Trailer, SCTI Control Building Support Trailer; LMEC Support Trailer. 4478 was located at RIHL and SCTI before moving to the HMSA area.	N/A	No chemical uses based on available information on operations at this building.	Atomics International, 1960.
4615	early 1980s	Unknown	This building is listed as a combustion test facility. The activities at 4615 were non-radiological and there are no incidents reported for this building. It is unknown if there were any chemical uses at 4615.	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4625	1961	2003	Non-nuclear Component Storage Building. Connected to Building 4027 in 1964 and thereafter referred to as 4027.	16		
4656	1958	2002	Cooling stacks located southwest of Building 4356. The cooling tower was periodically treated with chlorine to control organic growth. Sulfuric acid and sodium hydroxide were used to regenerate ion-exchange resins. The acids and caustics are contained in separate 1,500 gallon tanks. Hydrazine and morpholine were injected from small day tanks into the circulating feed water to control oxygen and pH, respectively.	14		Sapere, 2005; Rockwell International, 1992c.
4826	1958 (constructed)	1984	Constructed to expand the testing capacities of Building 4026. Construction of the building consisted of adding a drain tank and enclosure to Building 4026. Building 4826 was designed to test components and instruments in a sodium environment. The building operated intermittently between 1960 and 1984 as the SPTF (Sodium Pump Test Facility). The building was demolished in 1998.	7		Sapere, 2005.

Table R.2-1
Building Inventory
Hazardous Materials Storage Area RFI Site

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4925	Unknown	Unknown	Mechanical equipment slab	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4926	Unknown	Unknown	Sodium Reactor Experiment Mock-up Equipment Area	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4927	pre-1962	1970s	Building 4927 was used to store nitrogen tanks.	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005.
4928	Unknown	Unknown	Cooling tower for building 4024	N/A	No chemical uses based on available information on operations at this building.	Sapere, 2005; Atkinson-Baker, 2003.

Table R.2-2
Tank Inventory
Hazardous Materials Storage Area 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-1	Building 4026	9,550	Sodium	Unknown	Removed	Regulated under Corrective Action		3		Rockwell International, 1992
T-2	Building 4026	10,000	Sodium	Unknown	Removed	Regulated under Corrective Action		3		ETEC, 1991
T-3	Building 4026	12,000	Sodium	Unknown	Removed	Regulated under Corrective Action		3		ETEC, 1991
T-15	Building 4026	125	Lube Oil	Unknown	Removed	Regulated under Corrective Action		3		Rockwell International, 1992
T-357	East of HMSA RFI boundary	2,000	Liquid Argon	Unknown	Removed	Regulated under Corrective Action		3		ETEC, 1991
KR-102	Building 4334	870	TG Lube Oil	1991 to Unknown	Removed	Regulated under Corrective Action	Carbon steel	9		Rockwell International, 1992
KB-105	Building 4334	3,000	Aqueous Ammonia	Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1992
KT-109	Building 4334	60	Aqueous Ammonia	1991 to Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1993
KR-1202	Building 334	60	Aqueous Ammonia	1991 to Unknown	Removed	Regulated under Corrective Action	Stainless steel	9		Rockwell International, 1992
KC-201	Building 4334	3,100	Aqueous Ammonia	Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1992
KC-203	Building 4334	1,950	Aqueous Ammonia	Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1992
KT-205	Building 4334	1,850	Aqueous Ammonia	Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1992
KC-208	Building 4334	1,943	Aqueous ammonia	Unknown	Removed	Regulated under Corrective Action		9		ETEC, 1992
KD-2201	Building 4334	170	Aqueous Ammonia	1991 to Unknown	Removed	Regulated under Corrective Action	Carbon steel	9		Rockwell International, 1992
KT-301	Building 4334	7,500	Aqueous Ammonia	1991 to Unknown	Removed	Regulated under Corrective Action	Aluminum	9		Rockwell International, 1992
KT-303	Building 4334	3,000	Anhydrous ammonia	1991 to Unknown	Removed	Regulated under Corrective Action	Carbon steel	9		Rockwell International, 1992
KT-309	Building 4334	8,500	Aqueous Ammonia	1991 to Unknown	Removed	Regulated under Corrective Action	Aluminum	9		Rockwell International, 1992

Table R.2-2
Tank Inventory
Hazardous Materials Storage Area RFI Site

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
AT-09	SCTI	6,500	Caustic Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989
AT-10	SCTI	6,500	Caustic Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989
AT-11	SCTI	6,500	Caustic Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989
AT-12	SCTI	6,500	Caustic Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989
AT-16	SCTI	5,000	Sodium Metal	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989
AT-54	SCTI	500	97% sulfuric acid	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989; Unknown, 1991
AT-55	SCTI	6,500	Acid Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989; Unknown, 1991
AT-56	SCTI	6,500	Acid Rinse Tank	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989; Unknown, 1991
AT-57	SCTI	1,500	100% sulfuric acid	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989; Unknown, 1991
AT-58	SCTI	1,500	20% sodium hydroxide	Unknown	Unknown	Regulated under Corrective Action		12		Unknown, 1989; Unknown, 1991
T-4	At Building 4356	9,700	Sodium	Unknown	Removed	Regulated under Corrective Action		NA	No chemical uses based on available information on uses of this tank.	Rockwell International, 1992d
T-9	At Building 4356	1,500	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-10	At Building 4356	40	$CaOH_2$	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-14	At Building 4356	40	Hydrazine	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-15	At Building 4356	40	Morpholine	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-20	At Building 4356	1,500	NaOH	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-202	At Building 4356	20,000	DI Water	Unknown	Unknown	Regulated under Corrective Action		12		Rockwell International, 1992d
T-204	At Building 4356	6,500	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-205	At Building 4356	9,000	Brine	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-206	At Building 4356	9,000	12% NaOH	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d

Table R.2-2
Tank Inventory
Hazardous Materials Storage Area RFI Site

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
T-207	At Building 4356	6,500	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-209	At Building 4356	80	Brine	1991 to Unknown	Unknown	Regulated under Corrective Action		12		Rockwell International, 1992d
T-701	At Building 4356	300	Gaseous Argon	Unknown	Removed	Regulated under Corrective Action		NA	No chemical uses based on available information on uses of this tank.	Rockwell International, 1992d
T-735	South of Building 4356	87,000	Clean	1977 to Unknown	Unknown	Regulated under Corrective Action		NA	No chemical uses based on available information on uses of this tank.	Rockwell International, 1992d
7593T-1	South of Building 4356	5,000	Sodium	1961 to Unknown	Unknown	Regulated under Corrective Action		NA	No chemical uses based on available information on uses of this tank.	Rockwell International, 1992d
TA-1	At Building 4356	50	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
TA-2	At Building 4356	30	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
TA-3	At Building 4356	55	Sulfuric Acid	Unknown	Unknown	Regulated under Corrective Action		12		Rockwell International, 1992d
TA-4	At Building 4356	35	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
TA-5	At Building 4356	500	Sulfuric Acid	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
TC-1	At Building 4356	100	NaOH	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
TC-2	At Building 4356	70	NaOH	Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-EMG1	At Building 4356	250	Diesel	1991 to Unknown	Removed	Regulated under Corrective Action		12		Rockwell International, 1992d
T-5	At Building 4361	Unknown	Unknown	Unknown	Removed	Regulated under Corrective Action	Drain Tank	13		Rockwell International, 1990b
Underground Tanks										
UT-73	Near Building 4926	500	Fuel oil/Diesel	1950s/1960s to 2000	Removed in 2000	Closed	Tank was removed and site closed under supervision of DTSC in October	4		Strata, 2001
UT-18 (also called T-102)	South of Building 4024	550	Fuel oil	1959 to 1989	Removed	Closed	No contamination. Tank was removed under VCEHD permit #703.	5		Unknown, 1989; Rockwell, 1994; Unknown, 1994; Unknown,
UT-19 (also called T-101)	Eastern side of Building 4024	1,500	Fuel oil	1959 to 1989	Removed 12/89	Regulated under Corrective Action	Tank removed under permit #703 by VCEHD	5		Unknown, 1994; Unknown, 1989; Unknown, Unknown Date
UT-20 (also called T-3)	Building 4826	12,000	Sodium	1958 to Unknown	Removed (1998)	Regulated under Corrective Action		7		Rockwell International, 1992; Unknown, 1994; Unknown, 1989
UT-21 (also called T-2)	Building 4826	10,000	Sodium	Unknown	Removed (1998)	Regulated under Corrective Action		7		Rockwell International, 1992; Unknown, 1994; Unknown, 1989
UT-29	At Building 4356	13,000	Sodium/React. Pd	1975 to Unknown	Removed	Regulated under Corrective Action		12		Rocketdyne 1999; Rockwell International, 1992d

Table R.2-2
Tank Inventory
Hazardous Materials Storage Area RFI Site

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
UT-30	At Building 4356	10,000	Sodium	1965 to Unknown	Removed	Regulated under Corrective Action		12		Rocketdyne 1999; Rockwell International, 1992d
UT-31	At Building 4356	10,000	Sodium	1974 to Unknown	Removed	Regulated under Corrective Action		12		Rocketdyne 1999; Rockwell International, 1992d
UT-32	At Building 4356	10,000	Sodium	1985 to Unknown	Removed	Regulated under Corrective Action		12		Rocketdyne 1999; Rockwell International, 1992d
UT-33	At Building 4356	12,000	Sodium	1975 to Unknown	Removed	Regulated under Corrective Action		12		Rocketdyne 1999; Rockwell International, 1992d
UT-60	At Building 4361	9,000	Acidic/caustic water w/ trace hydrazine	Unknown	Removed	Regulated under Corrective Action	Likely used to treat SCTI effluent from the cooling tower.	13		Unknown, 1994; DOE, Date Unknown; Rockwell
UT-61	At Building 4361	9,000	Water w/ trace hydrazine	Unknown	Removed	Regulated under Corrective Action	Likely used to treat SCTI effluent from the cooling tower.	13		Unknown, 1994; DOE, Date Unknown; Rockwell
UT-62	At Building 4361	6,500	Acidic water w/ trace hydrazine	Unknown	Removed	Regulated under Corrective Action	Likely used to treat SCTI effluent from the cooling tower.	13		Unknown, 1994; DOE, Date Unknown; Rockwell
UT-63	At Building 4361	6,500	Acidic water w/ trace hydrazine	Unknown	Removed	Regulated under Corrective Action	Likely used to treat SCTI effluent from the cooling tower.	13		Unknown, 1994; DOE, Date Unknown; Rockwell
Undetermined Tanks										
Unknown	SCTI	1500	Unknown Fill and Drain Tank	Unknown	Unknown	Unknown		N/A	May be aboveground or underground.	Atomics, International, 1964

Table R.2-3
Transformer Inventory
Hazardous Materials Storage Area RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4725	Southwest of Building 4025	Unknown	Removed	Substation for Building 4024. Contained 750 KVA transformer with 1440 kg liquid at 33,000 ppm PCBs.	6		Sapere, 2005; Rockwell International, 1985.
4726	South side of 4026 and west side of Building 4826	Unknown	Unknown	Substation for Building 4026. Contained 1000 KVA General Electric transformer with 2272 kg of Pyranol.	8		Unknown, 1969; Rockwell International, 1985.
Unknown	South side of Building 4359	Unknown	Unknown	750 KVA transformer	7		Unknown, 1996a.
Unknown	Inside Building 4356	Unknown	Unknown	Three oil-insulated transformers located north of the switchgear room in Building 4356.	12		Rockwell International, 1993b.

Table R.2-4
Inventory of Other Site Features
Hazardous Materials Storage Area RFI Site

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Sump #1	4457	Unknown	Backfilled and capped with concrete	Sump #1 was a sodium drain tank containment sump. Sump was backfilled with soil and capped with concrete and concrete berms were placed around the perimeter. The area was later used as storage for acids, bases, solvents, and petroleum-based oils and lubricants.	2		Ogden, 2000.
Sump #2	4457	1970s-1980s	Backfilled and capped with concrete	Sump #2 received rainwater, waste oils, and possibly solvents from spills or leakage. The sump was emptied, backfilled with soil, and capped with concrete.	2		Ogden, 2000.
Sump #3	4457	Unknown	Backfilled and capped with concrete	Sump #3 served as a physical low point for sodium processes. Hazardous chemicals were not used or disposed of in this sump. The sump was filled with concrete and capped following demolition of Building 4457.	---	Because hazardous chemicals were not disposed of in Sump #3, no further action is required for this feature.	Ogden, 2000.
Miscellaneous Pipelines	Across the site	Unknown	Unknown	The purpose and uses of the pipelines on site figures are unknown.	N/A		

Table R.2-5
Spill Inventory
Hazardous Materials Storage Area RFI Site

Date	Building/ Feature	Chemical Spilled	Amount (gallons)	Comments	References
9/26/88	4355	Sulfuric Acid	1	On September 26, 1988, approximately 1 gallon of sulfuric acid spilled onto the ground. The spilled material was then washed away into the drainage system.	Rockwell International, 1988.
8/23/93	4355	Sodium	3 to 5	On August 23, 1993, site security responded to a fire alarm in 4355. Source of the fire was later determined to be a sodium leak in the steam generator.	Rockwell International, 1993.
7/18/88	SCTI Area	Sulfuric Acid	25	On June 18, 1988, approximately 25 gallons of sulfuric acid spilled onto the ground at SCTI due to a leaking gasket in the piping.	Rockwell International, 1988.
August 1995	Kalina High Bay	Ammonia Spill	3900 lbs.	The Kalina system leaked 3,900 lbs. of ammonia.	Unknown, 2007.
Unknown	Kalina	Sodium Hydroxide	15	A battery broke and fell to the ground spilling 15 gallons of sodium hydroxide.	Unknown, Unknown Date. (HDMSe00187729).

Table R.2-6
Site History - Investigations
Hazardous Materials Storage Area RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed*	COPCs Reported*	Comments	Reference
2	Building 4457	Nov-00	Characterize soil at HMSA (8 samples)	VOCs, TPH, metals, pH, PCBs	VOCs, TPH, metals, pH, PCBs		MWH, 2004; Unknown, 1997.
Multiple	Across HMSA Buffer Area	2001-2002	Characterize soil vapor at HMSA (12 samples)	VOCs	VOCs		MWH, 2004; Unknown, 1997.

* COPCs - Chemicals of potential concern by chemical group - VOCs, SVOCs, etc.

Table R.2-7
Site History - Soil Disturbance
Hazardous Materials Storage Area RFI Site

Chemical Use Area Number	Chemical Use Area Name	Date	COPCs Targeted	Media	Key Activities	Status	Reference
2	Building 4457	Unknown	Unknown	Soil	Two large excavations occurred within the HMSA RFI site boundary. Location is known. Depth and reason for excavation is unknown.		GIS Files.
4	UT-73	2000	TRPH, VOC	Soil	Tank UT-73 was removed and closed under supervision of DTSC.	Closed	Strata, 2001.
5	UT-18	1989	TRPH, VOC	Soil	Tank UT-18 was removed and closed under supervision of VCEHD.	Closed	Rockwell, 1994.

Table R.2-8
Chemical Use Summary
Hazardous Materials Storage Area 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		Fluoride, Chloride, Nitrate, Sulfate, Bromide	Perchlorate	Dioxins, Furans	pH	Asbestos
1	Building 4357	metals						X									
2	Building 4457	Waste oils, acids, bases, solvents, TPH oils, lubricants	X		X		X	X					X			X	
2	Sump #1	Acids, bases, solvents, oils, lubricants	X				X						X				
2	Sump #2	Oils, solvents	X				X										
3	T-357	Liquid Argon															
4	Building 4025	VOCs, Acetic acid, potassium permanganate, sodium bisulfide, ammonium carbonate, ethylene diamine tetra-acetic acid (EDTA), and ferrous sulfate	X					X					X				
5	Building 4024	Metals, PCBs, General chemistry						X			X		X			X	
6	Substation 4725	PCBs									X						
7	Buildings 4026, 4426, 4826, 4359 and 4226	TPH. SVOCs, metals, and inorganic compounds		X	X			X					X				
8	Substation 4726	PCBs									X						
9	Building 4334	Aqueous ammonia, anhydrous ammonia, turbine lube oil, compressor oil, greases, and lubricants					X										
10	Building 4358	Metals, oils, and perchlorates					X						X	X			
11	Building 4355	Acid/base, oils, and general chemistry					X						X			X	
12	Building 4356, including tanks and transformers located inside Building 4356	Metals, hydrazine, morpholine, PCBs, Petroleum (diesel), sulfuric acid		X		X		X			X					X	
13	Building 4361, including tanks located inside Building 4361	Chlorine, hydrazine, acids/bases				X							X			X	
14	Building 4656	Hydrazine, Morpholine, Acids/bases				X										X	
15	Building 4625	Unknown	X	X			X	X		X			X				
16	UT-19	Fuel oil		X													

Notes:
1. VOCs are COPC for TPH-gasoline.
2. SVOCs and dioxins are evaluated as COPCs if burned materials are observed. PCBs are evaluated as COPCs if elevated concentrations of lubricant oil-range TPH is detected.

Table R.2-9
Conceptual Site Model
Hazardous Materials Storage Area 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
HMSA	1810 to 1830	1 to 11	1779 to 1783	13 to 22	0.04/south-southeast	13 to 41	0.04/northeast	No	While there are no perennial surface water bodies at the site, storm water flows south-southwest from the site.		Boring logs and groundwater level contour maps.

MSL = above mean sea level

Table R.3-1A
Sampling Summary for Soil
Hazardous Materials Storage Area 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
HSBS02	Soil Boring	RJ817	11/6/2000	5.5	6	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil		X		X	X		X
HSBS02	Soil Boring	RJ818	11/6/2000	5.5	6	MULTIPLE SAMPLE TYPES	In Place	OGDEN Environmental and Energy Services	Soil			X				
HSBS03	Soil Boring	RJ795	11/6/2000	4.5	5	Primary Sample	In Place	AMEC	Soil		X	X	X			
HSBS04	Soil Boring	RJ930	1/16/2001	10	10.5	Primary Sample	In Place	MWH	Soil		X	X		X		
HSTS01S01	Trench	MJ064	7/10/2002	13	13	Primary Sample	In Place	MWH	Soil		X	X	X	X		X
HSTS01S02	Trench	MJ065	7/10/2002	13	13	Primary Sample	In Place	MWH	Soil		X	X	X	X		X
HSTS01S03	Trench	MJ066	7/10/2002	8	8	Primary Sample	In Place	MWH	Soil		X	X	X	X		X
XFBS14	Soil Boring	WD048	8/18/2004	1	2	Composite Sample	In Place	MWH	Soil			X		X		
XFBS15	Soil Boring	WD058	8/18/2004	1	2	Composite Sample	In Place	CH2M HILL	Soil			X		X		
HSBS1002	Soil Boring		3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
HSBS1002	Soil Boring	HSBS1002S010	3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
HSBS1001	Soil Boring		3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
HSBS1001	Soil Boring	HSBS1001S010	3/11/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
HSBS1001	Soil Boring		3/11/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
HSBS1001	Soil Boring	HSBS1001S060	3/11/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1124	Soil Boring	U5BS1124S010	3/11/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1121	Soil Boring		3/11/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1121	Soil Boring	U5BS1121D010	3/11/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X				
U5BS1121	Soil Boring	U5BS1121S010	3/11/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
U5BS1121	Soil Boring		3/11/2008	3	4	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1121	Soil Boring		3/11/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1121	Soil Boring	U5BS1121S040	3/11/2008	3	4	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X			
U5BS1121	Soil Boring	U5BS1121X040	3/11/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X				
U5BS1125	Soil Boring	U5BS1125S010	3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1102	Soil Boring		3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1102	Soil Boring		3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1102	Soil Boring		3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1102	Soil Boring		3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1102	Soil Boring	U5BS1102S010	3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1102	Soil Boring	U5BS1102S060	3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1101	Soil Boring		3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1101	Soil Boring		3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1101	Soil Boring		3/13/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1101	Soil Boring	U5BS1101S010	3/13/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1101	Soil Boring	U5BS1101S060	3/13/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1101	Soil Boring	U5BS1101S100	3/13/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1100	Soil Boring		3/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1100	Soil Boring		3/13/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1100	Soil Boring	U5BS1100D010	3/13/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1100	Soil Boring	U5BS1100S055	3/13/2008	4.5	5.5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
HSBS1000	Soil Boring	HSBS1000D010	3/18/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
HSBS1000	Soil Boring	HSBS1000S040	3/18/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
HSBS1000	Soil Boring	HSBS1000X040	3/18/2008	3	4	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
U5BS1103	Soil Boring	U5BS1103S010	3/18/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1103	Soil Boring	U5BS1103D060	3/18/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1104	Soil Boring	U5BS1104S010	3/18/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
PUBS1002	Soil Boring	PUBS1002S010	3/18/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
PUBS1002	Soil Boring	PUBS1002S060	3/18/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BX1100	Soil Boring	U5BX1100C010	3/18/2008	0	1	Composite Sample	In Place	CH2M HILL	Soil			X		X		
U5BS1122	Soil Boring		3/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1122	Soil Boring		3/24/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1122	Soil Boring	U5BS1122S010	3/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X	X	X	
U5BS1122	Soil Boring	U5BS1122S060	3/24/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X	X	X	
U5BS1123	Soil Boring		3/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1123	Soil Boring	U5BS1123S010	3/24/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X		X	
U5BS1010	Soil Boring	U5BS1010S01	3/31/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1010	Soil Boring	U5BS1010S02	3/31/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1011	Soil Boring	U5BS1011D01	3/31/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	X

Table R.3-1A
Sampling Summary for Soil
Hazardous Materials Storage Area 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
U5BS1011	Soil Boring	U5BS1011S02	3/31/2008	3	4	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	X
U5BS1046	Soil Boring	U5BS1046S01	3/31/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	X
U5BS1046	Soil Boring	U5BS1046S02	3/31/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	X
U5BS1046	Soil Boring	U5BS1046S03	3/31/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X				X
U5BS1047	Soil Boring	U5BS1047S01	3/31/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1047	Soil Boring	U5BS1047S02	3/31/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1045	Soil Boring	U5BS1045S01	3/31/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	X
U5BS1045	Soil Boring	U5BS1045S02	3/31/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	X
U5BS1045	Soil Boring	U5BS1045S03	3/31/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X				X
U5BS1012	Soil Boring	U5BS1012D01	4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil	X					X	X
U5BS1012	Soil Boring	U5BS1012S01	4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1127	Soil Boring		4/8/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1127	Soil Boring	U5BS1127S010	4/8/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1127	Soil Boring		4/8/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1127	Soil Boring	U5BS1127S050	4/8/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1126	Soil Boring		4/8/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1126	Soil Boring	U5BS1126S010	4/8/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1126	Soil Boring		4/8/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1126	Soil Boring	U5BS1126S050	4/8/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1051	Soil Boring	U5BS1051S01	4/8/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1128	Soil Boring	U5BS1128S010	4/25/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X			X	
PUBS1401	Soil Boring	PUBS1401S01	5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
PUBS1400	Soil Boring	PUBS1400S01	5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
PUBS1402	Soil Boring	PUBS1402S01	5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1423	Soil Boring	U5BS1423S01	5/15/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1423	Soil Boring	U5BS1423S02	5/15/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X			X	
U5BS1421	Soil Boring	U5BS1421S01	5/15/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
U5BS1421	Soil Boring	U5BS1421S02	5/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil			X			X	
U5BS1129	Soil Boring	U5BS1129D01	5/15/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X		X		X	
U5BS1129	Soil Boring	U5BS1129S01	5/15/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X		X		
U5BS1129	Soil Boring	U5BS1129S02	5/15/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1426	Soil Boring	U5BS1426S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1426	Soil Boring	U5BS1426S02	5/19/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1427	Soil Boring	U5BS1427S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1427	Soil Boring	U5BS1427S02	5/19/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1424	Soil Boring	U5BS1424D01	5/19/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1424	Soil Boring	U5BS1424S01	5/19/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
U5BS1425	Soil Boring	U5BS1425S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1425	Soil Boring	U5BS1425S02	5/19/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1428	Soil Boring	U5BS1428S01	5/20/2008	0.5	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1429	Soil Boring	U5BS1429D01	5/20/2008	0.5	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
U5BS1429	Soil Boring	U5BS1429S01	5/20/2008	0.5	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
U5BS1430	Soil Boring	U5BS1430S01	5/20/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1431	Soil Boring	U5BS1431S01	5/20/2008	0.5	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
HSBS1400	Soil Boring	HSBS1400S01	5/21/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1051A	Soil Boring		5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1051A	Soil Boring	U5BS1051AS01	5/27/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1011A	Soil Boring		5/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1011A	Soil Boring	U5BS1011AS01	5/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1011A	Soil Boring		5/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1011A	Soil Boring	U5BS1011AS02	5/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1600	Soil Boring		5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1600	Soil Boring	U5BS1600S01	5/29/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X	X	X	
U5BS1600	Soil Boring		5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1600	Soil Boring	U5BS1600S02	5/29/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X	X	X	

Table R.3-1B
Sampling Summary for Soil Vapor
Hazardous Materials Storage Area 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
HSSV01	Soil Gas Probe		8/2/2000	11	11.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil Vapor	X
HSSV03	Soil Vapor Sample		7/17/2002	4.5	4.5	Primary Sample	In Place	MWH	Soil Vapor	X
HSSV04	Soil Vapor Sample		7/17/2002	5	5	Primary Sample	In Place	MWH	Soil Vapor	X
HSSV06	Soil Vapor Sample		7/19/2002	3.5	3.5	Primary Sample	In Place	MWH	Soil Vapor	X
HSSV07	Soil Vapor Sample		7/19/2002	3.5	3.5	Primary Sample	In Place	MWH	Soil Vapor	X
HSSV1000	Soil Vapor Sample		3/14/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
HSSV1000	Soil Vapor Sample		5/1/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1003	Soil Vapor Sample		4/10/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1005	Soil Vapor Sample		4/16/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1024	Soil Vapor Sample		4/9/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1100	Soil Vapor Sample		3/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1101	Soil Vapor Sample		3/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1101	Soil Vapor Sample		3/17/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1102	Soil Vapor Sample		3/17/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1105	Soil Vapor Sample		3/14/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1106	Soil Vapor Sample		3/27/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1107	Soil Vapor Sample		3/27/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1110	Soil Vapor Sample		4/16/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1111	Soil Vapor Sample		4/16/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
1	Building 4357	Metals	Chemical uses at Building include metals. Screen for potential metals at Building 4357. Soil samples were collected at two (2) locations.	Metals were detected above Eco RBSLs and background in two samples. HSBS1000 at 0-1 ft. bgs (Zinc) HSBS1000 at 3-4 ft. bgs (Selenium) Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** Characterization is sufficient for risk assessment.	**Yes.** **CMS Area - HMSA-3:** Further evauation of the lateral extent of zinc impacts in surface soil is recommended in CMS based on sampling and risk assessment results.
2	Building 4457 Sump #1, Sump #2	VOCs	Chemical uses at Building 4457 included disposal of solvents. These chemicals were used in Building 4457, stored in the building, and disposed of in the building. Building 4457 was screened for potential impacts. Soil Vapor: Samples were collected at three (3) locations. Soil Matrix: Samples were collected at six (6) locations.	Soil Vapor: Toluene were detected above the Eco RBSL in one sample. HSSV1000 at 4-5 ft. bgs Soil Matrix: VOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Building 4457 was screened for potential impacts. Soil samples were collected at two (2) locations.	SVOC were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.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 4457 included disposal of waste oils, TPH oils, and lubricants. These chemicals were used in Building 4457, stored in the building, and disposed of in the building. Building 4457 was screened for potential impacts. Soil samples were collected at eight (8) locations.	Gasoline range hydrocarbons (C8-C11) were detected above residential RBSLs in two samples. HSTS01S02 at 13 ft. bgs HSTS01S03 at 8 ft. bgs Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.3-8.	**Yes.** While samples collected in 2002 indicate exceedances of the RBSLs for gasoline range hydrocarbons, 2008 sampling shows all detectable concentrations below RBSLs and area is not recommended for further characterization. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	Building 4457 was screened for potential impacts. Soil samples were collected at five (5) locations.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical uses at Building 4457 included disposal of metals. These chemicals were used in Building 4457, stored in the building, and disposed of in the building. Building 4457 was screened for potential impacts. Soil samples were collected at seven (7) locations.	Antimony detected above Eco RBSLs and background in three samples HSTS01S01 at 13 ft bgs HSTS01S02 at 13 ft bgs HSTS01S03 at 8 ft bgs Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of antimony impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
3	T-357	**This tank contained liquid argon and no investigation was required**				

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
4	Building 4025	VOCs	Chemicals uses at included ethylene diamine tetra-acetic acid (EDTA). Screen for potential VOCs at Building 4025. Soil Vapor: Samples were collected at four (4) locations. Soil Matrix: Samples were collected at two (2) locations.	Soil Vapor: No VOCs were detected in any of the soil vapor samples. Soil Matrix: VOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Screen for potential SVOCs at Building 4025. Soil sample were collected at two (2) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	Screen for potential PCBs at Building 4025. Soil samples were collected at one (1) location.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemicals uses at included potassium permanganate, and ferrous sulfate. Screen for potential metals at Building 4025. Soil samples were collected at four (4) locations.	Cadmium and zinc were detected above Eco RBSLs and background in one sample. U5BS1123 at 0-1 ft bgs Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - HMSA-2:** The extent of zinc impacts may require further characterization. Area is recommended for further evaluation in CMS based on sampling and risk assessment results.
5	Building 4024	VOCs	Chemicals uses at Building 4024 include uses associated with a small chemistry laboratory. Screen for potential VOCs at Building 4024. Soil Vapor: Samples were collected at three (3) locations. Soil Matrix: Samples were collected at two (2) locations.	Soil Vapor: No VOCs were detected in any of the soil vapor samples. Soil Matrix: VOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemicals uses at Building 4024 include uses associated with a small chemistry laboratory. Screen for potential SVOCs at Building 4024. Soil samples were collected at five (5) locations.	SVOCs were detected above Residential and/or Eco RBSLs for 11 PAH compounds in one sample. U5BS1127 at 4-5 ft. bgs Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - HMSA-1:** The extent of PAH impacts may require further characterization. Area is recommended for further evaluation in CMS based on sampling and risk assessment results.
		TPH	Screen for potential TPH at Building 4024. Soil samples were collected at three (3) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
5	Building 4024	PCBs	Chemicals uses at Building 4024 include PCBs and uses associated with a small chemistry laboratory. Screen for potential PCBs at Building 4024. Soil samples were collected at one (1) location.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemicals uses at Building 4024 include uses associated with a small chemistry laboratory. Screen for potential metals at Building 4024. Soil samples were collected at five (5) locations.	Boron, copper, and lead were detected above Eco RBSLs and background in one sample. U5BS1127 at 0-1 ft bgs Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
6	Substation 4725	PCBs	Chemical use included PCBs. Screen for potential PCBs at substation 4725. Soil samples were collected at two (2) locations.	No PCBs were detected in any of the soil samples.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
7	Buildings 4026, 4426, 4826, 4359 and 4226	VOCs	Chemical use included VOCs. Screen for potential VOCs at Building 4026 area. Soil Vapor: Samples were collected at four (4) locations. Soil Matrix: Samples were collected at four (4) locations.	Soil Vapor: VOCs were detected but did not exceed their respective RBSLs. Soil Matrix: VOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.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 use included SVOCs. Screen for potential SVOCs at Building 4026 area. Soil samples were collected at four (4) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.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 use included TPH. Screen for potential TPH at Building 4026 area. Soil samples were collected at five (5) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	Screen for potential PCBs at Building 4026 area. Soil samples were collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment**.**	**N/A**

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
7	Buildings 4026, 4426, 4826, 4359 and 4226	Metals	Chemical use included metals. Screen for potential metals at Building 4026 area . Soil samples were collected at eight (8) locations.	Metals were detected above Eco RBSLs and background in three samples. U5BS1100 at 0-1 ft bgs (Copper, Zinc) U5BS1101 at 0-1 ft bgs (Vanadium) U5BS1121 at 0-1 ft bgs (Zinc) Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** Characterization is sufficient for risk assessment.	**Yes.** **CMS Area - HMSA-3:** Further evauation of the lateral extent of zinc impacts in surface soil is recommended in CMS based on sampling and risk assessment results.
8	Substation 4726	PCBs	Chemicals uses included PCBs. Screen for potential PCBs at substation 4726. Soil samples were collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
9	Building 4334	VOCs	Chemical uses include aqueous ammonia and anhydrous ammonia. Screen for potential VOCs at Building 4334. <u>Soil Matrix</u>: Soil samples were collected at one (1) location.	VOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Screen for potential SVOCs at Building 4334. Soil samples were collected at two (2) locations.	Benzo(a)pyrene were detected above Eco RBSL in one sample. U5BS1600 at 0-1 ft bgs Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** Characterization is sufficient for risk assessment.	**No.** **CMS Area - HMSA-4:** The lateral and vertical extent of PAH impacts may require further characterization. Area is recommended for further evaluation in CMS based on sampling and risk assessment results.
		TPH	Chemical uses include turbine lube oil, compressor oil, greases, and lubricants. Screen for potential TPH at Building 4334. Soil samples were collected at two (2) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	Screen for potential PCBs at Building 4334. Soil samples were collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Screen for potential metals at Building 4334. Soil samples were collected at two (2) locations.	Mercury was detected above Eco RBSLs and background in one sample. U5BS1103 at 0-1 ft. bgs Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of mercury impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
10	Building 4358	SVOCs	Chemical uses at Building 4358 have not been identified thoroughly. Screen for potential metals at Building 4358. Soil samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples.	**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 4358 have not been identified thoroughly. Screen for potential metals at Building 4358. Soil samples were collected at one (1) location.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.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 4358 have not been identified thoroughly. Screen for potential metals at Building 4358. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
11	Building 4355	SVOCs	Chemical use included SVOCs. Screen for potential metals at Building 4335. Soil samples were collected at two (2) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.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 use included TPH. Screen for potential TPH at Building 4335. Soil samples were collected at two (2) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.3-8.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		PCBs	Chemical use included PCBs. Screen for PCBs at building 4335. Soil samples were collected at one (1) location.	PCBs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Chemical use included metals. Screen for potential metals to at Building 4335. Soil sample were collected at four (4) locations.	Metals were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
12	Building 4356, including tanks and transformers located inside Building 4356	VOC	Chemical uses included morpholine. Screen for potential VOCs at Building 4356. Soil Vapor: Samples were collected at one (1) location. Soil Matrix: Samples were collected at two (2) locations.	Soil Vapor: VOCs were detected but did not exceed their respecive RBSLs. Soil Matrix: No VOCs were detected in any of the soil samples. Discussion of results are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
12	Building 4356, including tanks and transformers located inside Building 4356	SVOCs	Chemical uses included morpholine and hydrazine. Screen for potential SVOCs at Building 4356. Soil samples were collected at four (4) locations.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.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 included diesel. Screen for potential TPH at Building 4356. Soil samples were collected at four (4) locations.	TPH was detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.3 and Figures R.3-3 and R.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 include metals and sulfuric acid. Screen for potential metals at Building 4356. Soil samples were collected at four (4) locations.	Aluminum and Boron were detected above Eco RBSLs and background in two samples. U5BS1010 at 0-1 ft bgs U5BS1047 at 0-1 ft bgs Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of aluminum and boron impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
13	Building 4361, including tanks located inside Building 4361	VOCs	Screen for potential VOCs at Building 4361. <u>Soil Vapor</u>: Sample was collected at one (1) location. <u>Soil Matrix</u>: Soil sample was collected at one (1) location.	No VOCs were detected in any of the soil or soil vapor samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Chemical uses included hydrazine. Screen for potential SVOC at Building 4361. Soil samples were collected at one (1) location.	SVOCs were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.2 and Figures R.3-2 and R.3-8.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPHs	Screen for potential TPH at Building 4361. Soil samples were collected at one (1) location.	No TPH was detected in any of the soil samples	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Metals	Screen for potential metals at Building 4361. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respedctive RBSLs. Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
14	Building 4656	VOCs	Chemical uses included morpholine. Screen for potential VOCs at Building 4656. <u>Soil Vapor</u>: No samples were collected. <u>Soil Matrix</u>: Samples were collected at one (1) location	No VOCs were detected in any of the soil samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table R.3-2A
Evaluation of Soil and Soil Vapor Sampling Results
Hazardous Materials Storage Area 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 R.2-2 for sampling locations)	**Sampling Results** Chemical Concentrations detected greater than background and/or risk screening levels?	**Chemical Use Area sufficiently evaluated for risk assessment?**	**Is delineation sufficient to estimate soil volume in CMS?** (see Figure R.5-1 for CMS area)
14	Building 4656	SVOCs	Chemical uses include hydrazine and morpholine. Screen for potential SVOCs at Building 4656. Soil samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		Energetics	Screen for potential energetics at Building 4656. Soil samples were collected at one (1) location.	No energetics were detected in any of the soil samples.	**Yes.** The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment**.**	**N/A**
15	Building 4625	VOCs	Component Storage. No investigation has been performed. Screen for potential VOCs at Building 4625. 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 are presented in Section R.3.4.2.1 and Figures R.3-1A, R.3-1B, and R.3-7.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		SVOCs	Component Storage. No investigation has been performed. Screen for potential SVOCs at Building 4625. Soil samples were collected at one (1) location.	No SVOCs were detected in any of the soil samples.	**Yes.** The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
		TPHs	Component Storage. No investigation has been performed. Screen for potential TPH at Building 4625. Soil samples were collected at one (1) location.	No TPH was detected in any of the soil samples.	**Yes.** The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment**.**	**N/A**
		Metals	Component Storage. No investigation has been performed. Screen for potential metals at Building 4625. Soil samples were collected at one (1) location.	Metals were detected but did not exceed their respective RBSLs. Discussion of results are presented in Section R.3.4.2.5 and Figures R.3-5 and R.3-9.	**Yes.** The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**
16	UT-19	VOCs	UT-19 was closed by the Ventura County Environmental Health Division. However, soil vapor data has not been collected from the location of this former UST. Soil Vapor: Samples were collected at one (1) location. Soil Matrix: No samples were collected.	No VOCs were detected in any of the samples.	**Yes.** The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	**N/A**

Table R.3-2B
Evaluation of Groundwater Sampling Results
Hazardous Materials Storage Area RFI Site

Working Draft

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 below RBSLs in soils. Only toluene was detected above RBSL in a soil vapor matrix sample at one location.	**Yes.** Monitored at PZ-120 and PZ-121 in NSGW.	**Yes.** TCE was detected above groundwater screening level. 1,2-dichloroethenes, acetone and cis-1,2-dichloroethene were also detected below screening levels.	**No.** TCE was detected above screening level in groundwater but there are no indications of impacts to soil from TCE.	**NSGW** - Yes. **CFGW ***
SVOCs	Various PAHs were detected in two sampling locations. See Section R.3.4.2.2 for further information.	**Yes.** Monitored at PZ-120 and PZ-121 in NSGW.	**No.**	**N/A**	**NSGW** - Yes. **CFGW ***
TPH	TPH was detected above gasoline range hydrocarbon RBSLs in 2002 trench samples. No additional exceedances of RBSLs were found.	**Yes**. Monitored at PZ-120 and PZ-121 in NSGW.	**No.**	**N/A**	**NSGW** - Yes. **CFGW ***
PCBs	PCBs were detected below RBSLs.	**No.**	**N/A**	**No.** Although groundwater samples have not been analyzed for PCBs, detected concentrations in soil were low and PCBs do not readily migrate to groundwater.	**NSGW** - Yes. **CFGW ***
Metals	A variety of metals were detected above RBSLs and background in soil samples. See Section R.3.4.2.5 for further information.	**Yes.** Monitored at PZ-120 and PZ-121 in NSGW.	**Yes.** Aluminum, cadmium, molybdenum, and vanadium were detected above groundwater screening level.	**Possibly.** Metal exceedances of aluminum, cadmium, and vanadium were found above RBSLs in soil and groundwater and may be possibly related. However, metals tend to bind to soil particles and generally have limited mobility.	**NSGW** - Yes. **CFGW ***
Energetics	Energetics were not detected in soils matrix samples.	**No.**	**N/A**	**No.** Energetics were not detected in soil matrix.	**NSGW** - Yes. **CFGW ***

NOTE:
* Chatsworth Formation Groundwater is discussed further in Appendix B and will be evaluated for risk assessment purposes during the CFOU RFI Report.

Table R.3-3A
Data Screening and Statistical Summary for Soil
Hazardous Materials Storage Area 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		1						
2,6-Dinitrotoluene	mg/kg		1.71		1						
Nitrobenzene	mg/kg	29	2		1						
Hydrocarbons											
Diesel Range Organics (C12-C14)	mg/kg	1400			38	1	1.2	1.2			
Diesel Range Organics (C14-C20)	mg/kg	1400			6	2	1.9	4			
Diesel Range Organics (C15-C20)	mg/kg	1400			38	5	1.22	5.25			
Diesel Range Organics (C20-C30)	mg/kg	1400			6	4	14	72			
Diesel Range Organics (C21-C30)	mg/kg	1400			38	27	1.1	940			
Diesel Range Organics (C8-C11)	mg/kg	1.1			36						
Gasoline Range Organics (C8-C11)	mg/kg	1.1			6	2	2.9	7.7	2		
Kerosene Range Organics (C11-C14)	mg/kg	1400			6						
Total Petroleum Hydrocarbons	mg/kg				2						
Inorganics											
% Solids	%				5	5	88.1	95.9			
Bromide	mg/kg				5						
Chloride	mg/kg				5	5	2	4.2			
Fluoride	mg/kg	4600		6.7	5	2	0.82	1.74			
Moisture	%				48	48	3.125	14.5			
Nitrate-N	mg/kg	120000			5	3	0.55	1.14			
Nitrite-N	mg/kg				5	3	0.43	0.46			
Orthophosphate as P	mg/kg				3	2	0.78	1.3			
Perchlorate	mg/kg	9.1	0.000024		1						
pH	pH Units				28	28	4.45	10.15			
Phosphate	mg/kg				2						
Sulfate	mg/kg				5	5	2.9	12			
Total Solids	%				31	31	76	98			
Metals											
Aluminum	mg/kg	75000	12	20000	47	47	1700	23850		47	2
Antimony	mg/kg	30	0.095	8.7	45	10	0.025	16.7		9	3
Arsenic	mg/kg	0.095	1.9	15	47	47	0.91	7.7	47	43	
Barium	mg/kg	15000	15	140	47	47	13	140		46	
Beryllium	mg/kg	150	5	1.1	47	43	0.25	0.97			
Boron	mg/kg	15000	6.76	9.7	44	9	1.1195	14.5		4	3
Cadmium	mg/kg	39	0.0045	1	54	49	0.041	1.3		49	1
Calcium	mg/kg				5	5	3100	4670			
Chromium	mg/kg	3400	930	36.8	47	47	6.4	35.7			
Cobalt	mg/kg	1500	8.9	21	47	47	1.5	11.1		1	
Copper	mg/kg	3000	1.1	29	52	52	1.9	56.6		52	2
Iron	mg/kg			28000	5	5	15850	32100			1
Lead	mg/kg	150	0.013	34	49	49	0.88	91.8		49	1
Lithium	mg/kg	1521.66006		37	41	41	9.6	36.1			
Magnesium	mg/kg				5	5	3930	7290			
Manganese	mg/kg	1800	59	495	5	5	218	329		5	
Mercury	mg/kg	23	0.1	0.09	45	36	0.0017	0.6		1	1
Molybdenum	mg/kg	380	0.11	5.3	47	41	0.20725	0.94		41	

Table R.3-3A
Data Screening and Statistical Summary for Soil
Hazardous Materials Storage Area 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
Nickel	mg/kg	1500	0.1	29	47	47	3.8	20.35		47	
Potassium	mg/kg			6400	47	47	380	5730			
Selenium	mg/kg	380	0.17	0.655	44	9	0.17	0.6855		8	1
Silver	mg/kg	380	0.54	0.79	50	15	0.0098	1.9		2	1
Sodium	mg/kg			110	47	38	75	559			33
Thallium	mg/kg	6.1	2.9	0.46	47	36	0.023	1.38			1
Vanadium	mg/kg	76	1.5	62	50	50	7.8	72.9		50	1
Zinc	mg/kg	23000	21	110	54	54	7.6	340		52	4
Zirconium	mg/kg			8.6	42	40	0.82	7.3			
PCBs											
Aroclor 1016	mg/kg	3.9	1.6		16						
Aroclor 1221	mg/kg	0.35	1.6		16						
Aroclor 1232	mg/kg	0.35	0.077		16						
Aroclor 1242	mg/kg	0.35	0.079		16						
Aroclor 1248	mg/kg	0.35	0.0114		16	1	0.0068	0.0068			
Aroclor 1254	mg/kg	0.35	0.077		16	4	0.0036	0.016			
Aroclor 1260	mg/kg	0.35	0.077		16	2	0.0024	0.0045			
SVOC											
1,1-Dimethylhydrazine	mg/kg		0.05		6						
1,2-Diphenylhydrazine	mg/kg		8.5		1						
1-Methyl naphthalene	mg/kg	230			42	2	0.00067	0.282			
2,4,5-Trichlorophenol	mg/kg	5700	9		1						
2,4,6-Trichlorophenol	mg/kg	10	10		1						
2,4-Dichlorophenol	mg/kg	170	1.3		1						
2,4-Dimethylphenol	mg/kg	1100	110		1						
2,4-Dinitrophenol	mg/kg	110	0.59		1						
2-Chloronaphthalene	mg/kg		530		1						
2-Chlorophenol	mg/kg	290	21		1						
2-Methylnaphthalene	mg/kg	230	210		42	3	0.00088	0.134			
2-Nitroaniline	mg/kg		11		1						
2-Nitrophenol	mg/kg		11		1						
3,3'-Dichlorobenzidine	mg/kg		1.3		1						
3-Nitroaniline	mg/kg		5.9		1						
4,6-Dinitro-o-cresol	mg/kg	5.7	11		1						
4-Bromophenyl phenyl ether	mg/kg		4.3		1						
4-Chlorophenylphenyl ether	mg/kg		1.3		1						
4-Nitrophenol	mg/kg		7		1						
Acenaphthene	mg/kg	3400	2.46		42	2	0.0086	4.76		1	
Acenaphthylene	mg/kg	1700	370		42	1	0.00052	0.00052			
Aniline	mg/kg	130	11		1						
Anthracene	mg/kg	17000	2.4		42	4	0.00015	10.2		1	
Benzidine	mg/kg		2.3		1						
Benzo(a)anthracene	mg/kg	0.6	5.6		42	5	0.00023	20.9	1	1	
Benzo(a)pyrene	mg/kg	0.06	5.6		42	7	0.0003	11	2	1	
Benzo(b)fluoranthene	mg/kg	0.6	5.6		42	9	0.00079	14.6	1	1	
Benzo(ghi)perylene	mg/kg		6.4		42	8	0.00059	4.58			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		39	3	0.0043	7.08	1	1	

Table R.3-3A
Data Screening and Statistical Summary for Soil
Hazardous Materials Storage Area 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
Benzoic acid	mg/kg	230000	4.4		1						
Benzyl alcohol	mg/kg	17000	4.4		1						
bis(2-Chloroethoxy)methane	mg/kg		150		1						
bis(2-Chloroethyl) ether	mg/kg	0.29	150		1						
bis(2-Chloroisopropyl) ether	mg/kg	2300	150		1						
bis(2-Ethylhexyl) phthalate	mg/kg	250	4.9		35	12	0.00865	2.16			
Butyl benzyl phthalate	mg/kg	11000	340		35	2	0.001	0.0124			
Chrysene	mg/kg	6	2.4		42	9	0.00077	20.3	1	1	
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		42	3	0.000705	0.01375			
Dibenzofuran	mg/kg	110	62		1						
Diethyl phthalate	mg/kg	46000	6940		36						
Dimethyl phthalate	mg/kg	570000	4.4		40	1	0.00054	0.00054			
Di-n-butyl phthalate	mg/kg	5700	0.49		35	4	0.0023	0.00783			
Di-n-octyl phthalate	mg/kg	2300	39		40	6	0.0052	0.0205			
Diphenylamine	mg/kg				1						
Fluoranthene	mg/kg	2300	38		42	12	0.00022	51.7		1	
Fluorene	mg/kg	2300	1.6		42	2	0.0047	3.32		1	
Hexachlorobenzene	mg/kg	0.4	0.34		1						
Hexachlorocyclopentadiene	mg/kg	340	13		1						
Hexachloroethane	mg/kg	18	2.1		1						
Hydrazine	mg/kg		0.05		6						
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		42	4	0.00175	4.87	1		
Isophorone	mg/kg	750	320		1						
Monomethylhydrazine	mg/kg		0.05		6						
Naphthalene	mg/kg	6	210		42						
n-Nitrosodimethylamine	mg/kg	0.045	20		42						
n-Nitrosodi-n-propylamine	mg/kg	0.1	28		1						
o-Cresol	mg/kg	2867.0661	110		1						
p-Chloroaniline	mg/kg		4.4		1						
p-Chloro-m-cresol	mg/kg		21		1						
p-Cresol	mg/kg	290	4.3		1						
Pentachlorophenol	mg/kg	8.8	6		1						
Phenanthrene	mg/kg	1700	1.3		42	7	0.00041	33.8		1	
Phenol	mg/kg	18000	5		1						
p-Nitroaniline	mg/kg		3.3		1						
Pyrene	mg/kg	1700	18		42	12	0.00044	39.9		1	
VOC											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		25						
1,1,1-Trichloroethane	mg/kg	0.49	4300		28						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		28						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		24						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		28						
1,1-Dichloroethane	mg/kg	0.0016	210		28						
1,1-Dichloroethene	mg/kg	0.023	10.7		28	2	0.00079	0.001			
1,1-Dichloropropene	mg/kg		22		24						
1,2,3-Trichlorobenzene	mg/kg	0.12460452	20		24						
1,2,3-Trichloropropane	mg/kg	0.000051	12		24						

Table R.3-3A
Data Screening and Statistical Summary for Soil
Hazardous Materials Storage Area 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
1,2,4-Trichlorobenzene	mg/kg	0.12460452	20		25						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		25	1	0.000339	0.000339			
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		25						
1,2-Dibromoethane	mg/kg		25		24						
1,2-Dichlorobenzene	mg/kg	1.8	370		26						
1,2-Dichloroethane	mg/kg	0.0005	76		28						
1,2-Dichloroethenes	mg/kg	0.014			4						
1,2-Dichloropropane	mg/kg		250		27						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		25	1	0.000217	0.000217			
1,3-Dichlorobenzene	mg/kg	1.7	160		26						
1,3-Dichloropropane	mg/kg		22		24						
1,4-Dichlorobenzene	mg/kg	0.01	20		26						
2-Chloro-1,1,1-trifluoroethane	mg/kg				7						
2-Chloroethylvinyl ether	mg/kg	9.5691E-06	0.73		24						
2-Hexanone	mg/kg		1220		27						
Acetone	mg/kg	51	43		25	4	0.00644	0.056			
Benzene	mg/kg	0.00013	110		28						
Bromobenzene	mg/kg		110		24						
Bromochloromethane	mg/kg		25		24						
Bromodichloromethane	mg/kg	0.00031	15		28						
Bromoform	mg/kg		38		28						
Bromomethane	mg/kg		25		28						
Carbon Disulfide	mg/kg	0.06769541	47		3						
Carbon Tetrachloride	mg/kg	0.000042	1.5		28						
Chlorobenzene	mg/kg	0.097	40		28						
Chloroethane	mg/kg		190		28						
Chloroform	mg/kg	0.00077	11		28						
Chloromethane	mg/kg		25		28						
Chlorotrifluoroethylene	mg/kg		10.7		7						
cis-1,2-Dichloroethene	mg/kg	0.014	68		28						
cis-1,3-Dichloropropene	mg/kg		22		27						
Cumene	mg/kg	0.38255845	210		24						
Dibromochloromethane	mg/kg		46		27						
Dibromomethane	mg/kg		25		24						
Dichlorodifluoromethane	mg/kg	0.015	64		25						
Ethylbenzene	mg/kg	1.2	210		28						
Formaldehyde	mg/kg	12000	40.1		9						
Hexachlorobutadiene	mg/kg	9.2	0.85		25						
Methyl ethyl ketone	mg/kg	62	2540		28	2	0.00166	0.00297			
Methyl isobutyl ketone (MIBK)	mg/kg	19.6375697	2540		27						
Methyl tert-butyl ether	mg/kg		120		24						
Methylene chloride	mg/kg	0.004	25		28						
m-Xylene & p-Xylene	mg/kg	0.15	64		28	3	0.000246	0.000445			
n-Butylbenzene	mg/kg		210		24						
n-Propylbenzene	mg/kg	0.20326751	210		24						
o-Chlorotoluene	mg/kg	1222.09821	160		24						
o-Xylene	mg/kg	0.19	64		28						

Table R.3-3A
Data Screening and Statistical Summary for Soil
Hazardous Materials Storage Area 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
p-Chlorotoluene	mg/kg	1222.09821	160		24						
p-Cymene	mg/kg		64		24						
sec-Butylbenzene	mg/kg	76.7640458	210		24						
sec-Dichloropropane	mg/kg		22		24						
Styrene	mg/kg	7.2	427		27	15	0.000215	0.0065			
tert-Butylbenzene	mg/kg		210		24						
Tetrachloroethene	mg/kg	0.00043	6		28						
Toluene	mg/kg	0.3	3.4		28	1	0.000301	0.000301			
trans-1,2-Dichloroethene	mg/kg	0.016	970		28						
trans-1,3-Dichloropropene	mg/kg		4.4		28						
Trichloroethene	mg/kg	0.0022	3		28	1	0.001	0.001			
Trichlorofluoromethane	mg/kg	0.11	300		25						
Vinyl chloride	mg/kg	0.0000096	0.73		28						
Xylenes, Total	mg/kg	0.15	64		25	3	0.000246	0.000445			
Xylenes, Total	mg/kg	0.15	64		4						

Table R.3-3B
Data Screening and Statistical Summary for Soil Vapor
Hazardous Materials Storage Area 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		19					
1,1,1-Trichloroethane	ug/L	640	38	19					
1,1,2,2-Tetrachloroethane	ug/L	0.048		19					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	19	3	0.35	14		
1,1,2-Trichloroethane	ug/L	0.17	0.057	19					
1,1-Dichloroethane	ug/L	1.7	36	19					
1,1-Dichloroethene	ug/L	58	0.6	19					
1,2-Dichloroethane	ug/L	0.13	42	19					
Benzene	ug/L	0.095	0.57	19					
Carbon Tetrachloride	ug/L	0.063	0.63	19					
Chloroethane	ug/L		992	19					
Chloroform	ug/L	0.5	0.24	19					
cis-1,2-Dichloroethene	ug/L	10	1.9	19					
Dichlorodifluoromethane	ug/L	58	91	19	1	1.1	1.1		
Ethylbenzene	ug/L	290	23	19					
Methylene chloride	ug/L	2.7	0.87	19					
m-Xylene & p-Xylene	ug/L		16	19	1	0.11	0.11		
o-Xylene	ug/L	29	16	19					
Tetrachloroethene	ug/L	0.45232	24	19					
Toluene	ug/L	110	0.084	19	1	0.165	0.165		1
trans-1,2-Dichloroethene	ug/L	20	1.9	19					
Trichloroethene	ug/L	1.4	6.4	19	1	0.08	0.08		
Trichlorofluoromethane	ug/L	200	90.9	19	7	0.06	6.8		
Vinyl chloride	ug/L	0.035	0.56	19					
Xylenes, Total	ug/L		16	19	1	0.11	0.11		

Table R.4-1
Chemicals of Potential Concern for Human Health
Hazardous Materials Storage Area RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	1,1-Dichloroethene		Y	
Soil	0-2	1-Methyl naphthalene		N	< 5% Detection
Soil	0-2	2-Methylnaphthalene		N	< 5% Detection
Soil	0-2	Acenaphthene		N	< 5% Detection
Soil	0-2	Acenaphthylene		N	< 5% Detection
Soil	0-2	Acetone		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	Aroclor 1260		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		N	< 5% Detection
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 Organics (C12-C14)		N	< 5% Detection
Soil	0-2	Diesel Range Organics (C15-C20)		N	See BTEX, PAHs
Soil	0-2	Diesel Range Organics (C21-C30)		N	See BTEX, PAHs
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		N	< 5% Detection
Soil	0-2	Fluoride		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	Nickel	N	N	Below Background
Soil	0-2	Nitrate-N		Y	
Soil	0-2	Nitrite-N		Y	
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	Y	Y	
Soil	0-2	Xylenes, Total		Y	
Soil	0-2	Zinc	Y	Y	
Soil	0-2	Zirconium	N	N	Below Background

Table R.4-1
Chemicals of Potential Concern for Human Health
Hazardous Materials Storage Area RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	1,1-Dichloroethene		Y	
Soil	0-10	1,2,4-Trimethylbenzene		N	< 5% Detection
Soil	0-10	1,3,5-Trimethylbenzene		N	< 5% Detection
Soil	0-10	1-Methyl naphthalene		N	< 5% Detection
Soil	0-10	2-Methylnaphthalene		Y	
Soil	0-10	Acenaphthene		N	< 5% Detection
Soil	0-10	Acenaphthylene		N	< 5% Detection
Soil	0-10	Acetone		Y	
Soil	0-10	Aluminum	N	N	Below Background
Soil	0-10	Anthracene		Y	
Soil	0-10	Antimony	N	N	Below Background
Soil	0-10	Aroclor 1248		Y	
Soil	0-10	Aroclor 1254		Y	
Soil	0-10	Aroclor 1260		Y	
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	N	N	Below Background
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 Organics (C12-C14)		N	< 5% Detection
Soil	0-10	Diesel Range Organics (C14-C20)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C15-C20)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C20-C30)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Organics (C21-C30)		N	See BTEX, PAHs
Soil	0-10	Dimethyl phthalate		N	< 5% Detection
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	Fluoride		Y	
Soil	0-10	Gasoline Range Organics (C8-C11)		N	See BTEX, PAHs
Soil	0-10	Indeno(1,2,3-cd)pyrene		Y	
Soil	0-10	Iron	N	N	Below Background
Soil	0-10	Lead	N	N	Below Background
Soil	0-10	Lithium	N	N	Below Background
Soil	0-10	Manganese	N	N	Below Background
Soil	0-10	Mercury	N	N	Below Background
Soil	0-10	Methyl ethyl ketone		Y	
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	m-Xylene & p-Xylene		N	See Xylenes, Total
Soil	0-10	Nickel	N	N	Below Background
Soil	0-10	Nitrate-N		Y	
Soil	0-10	Nitrite-N		Y	

Table R.4-1
Chemicals of Potential Concern for Human Health
Hazardous Materials Storage Area RFI Site

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
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	Toluene		N	< 5% Detection
Soil	0-10	Trichloroethene		N	< 5% Detection
Soil	0-10	Vanadium	Y	Y	
Soil	0-10	Xylenes, Total		Y	
Soil	0-10	Zinc	Y	Y	
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	0-10	1,1,2-Trichloro-1,2,2-trifluoroethane		Y	
Soil Vapor	0-10	Dichlorodifluoromethane		Y	
Soil Vapor	0-10	m-Xylene & p-Xylene		N	See Xylenes, Total
Soil Vapor	0-10	Toluene		Y	
Soil Vapor	0-10	Trichloroethene		Y	
Soil Vapor	0-10	Trichlorofluoromethane		Y	
Soil Vapor	0-10	Xylenes, Total		Y	
Groundwater	-	1,2-Dichloroethenes		Y	
Groundwater	-	Acetone		Y	
Groundwater	-	Aluminum		Y	
Groundwater	-	Aluminum, Dissolved		Y	
Groundwater	-	Arsenic, Dissolved	N	Y	
Groundwater	-	Barium	N	Y	
Groundwater	-	Barium, Dissolved	N	Y	
Groundwater	-	Boron	Y	Y	
Groundwater	-	Boron, Dissolved	N	Y	
Groundwater	-	Cadmium, Dissolved	Y	Y	
Groundwater	-	Chromium, Dissolved	N	N	Below Background
Groundwater	-	cis-1,2-Dichloroethene		Y	
Groundwater	-	Cobalt	N	N	Below Background
Groundwater	-	Copper	N	N	Below Background
Groundwater	-	Copper, Dissolved	Y	Y	
Groundwater	-	Fluoride	N	N	Below Background
Groundwater	-	Iron	N	N	Below Background
Groundwater	-	Iron, Dissolved	N	N	Below Background
Groundwater	-	Lead	N	N	Below Background
Groundwater	-	Lead, Dissolved	N	N	Below Background
Groundwater	-	Manganese	N	N	Below Background
Groundwater	-	Manganese, Dissolved	N	N	Below Background
Groundwater	-	Molybdenum	Y	Y	
Groundwater	-	Molybdenum, Dissolved	N	N	Selected Higher of Total/Dissolved
Groundwater	-	Nickel, Dissolved	N	N	Below Background
Groundwater	-	Nitrate-NO3		Y	
Groundwater	-	Selenium, Dissolved	N	N	Below Background
Groundwater	-	Strontium, Dissolved	N	N	Below Background
Groundwater	-	Trichloroethene		Y	
Groundwater	-	Vanadium, Dissolved	Y	Y	
Groundwater	-	Zinc, Dissolved	N	N	Below Background

Table R.4-2
Human Health Risk Estimates[1]
Hazardous Materials Storage Area 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	0.000002	-	0.0002		3E-09	- 2E-07		NA	-	NA		NA	- NA		<0.01	-	<0.01		3E-09	- 2E-07	
Future Child Recreator	0.00005	-	0.0009		3E-08	- 2E-07		NA	-	NA		NA	- NA		<0.01	-	<0.01		3E-08	- 2E-07	
Future Adult Resident	0.006	-	0.01		5E-07	- 2E-05	a, b	1	-	2		3E-07	- 1E-06	c	1	-	2		8E-07	- 2E-05	a, b
Future Child Resident	0.05	-	0.1		3E-06	- 3E-05	a, b, d, e	5	-	8	c	7E-07	- 1E-06	c	5	-	8	c	4E-06	- 3E-05	a, b, c, d, e

Notes:
1. Risk estimates shown are a sum of all exposure pathways per medium; 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.

a = Benzo(a)pyrene
b = Benzo(b)fluoranthene
c = Trichloroethene
d = Benzo(a)anthracene
e = Benzo(k)fluoranthene

CD = Chemical risk driver
COPC = Chemical of potential concern
HI = Hazard index
NA = Not Applicable

Table R.4-3
Human Health Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	1,1,2-Trichloro-1,2,2-trifluoroethane, dichlorodifluoromethane, toluene, TCE, trichlorofluoromethane, and total xylenes were selected as soil vapor COPCs since they were directly detected in soil vapor. Acetone, cis-1,2-dichloroethene, methyl ethyl ketone, and styrene were also selected as soil vapor COPCs because they were detected in soil and/or groundwater 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
	Groundwater monitoring data and comparison concentrations (i.e., background) are filtered samples (i.e., dissolved concentrations) as per agency-approved groundwater monitoring work plan. Although dissolved concentrations represent the concentrations that may migrate, the total concentration in groundwater may be greater when there are significant amount of suspended solids present (i.e., total concentration).	Moderate	Realistic
EPC Calculations	EPCs are based on some data that are over 8 years old. In these cases available analytical data may not accurately reflect current site conditions. Source concentrations assumed constant over time. Chemical concentrations may decline as a result of migration or degradation	Low	Conservative
	Use of upper confidence limits and maximum detected concentrations will likely overestimate site risks.	Low	Conservative
	Soil vapor exposure point concentration for acetone, methyl ethyl ketone, 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

Table R.4-3
Human Health Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area RFI Site

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
EPC Calculations	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:
COPC - chemical of potential concern
PAH - polycyclic aromatic hydrocarbon
TPH - total petroleum hydrocarbons
BTEX - benzene, toluene, ethylbenzene, and xylenes
EPC - exposure point concentration
UCL - upper confidence limit

Table R.4-4
Chemicals of Ecological Concern - Soil
Hazardous Materials Storage Area RFI Site

Preferred Analyte Name	Range of HQs - RME Exposure (Refined Calculations)							Identification of COECs								
	Terrestrial Plant	Soil Invertebrate	Hermit Thrush	Red-Tailed Hawk	Deer Mouse	Bobcat	Mule Deer	Terrestrial Plants	Soil Invertebrates	Hermit Thrush	Red-Tailed Hawk	Deer Mouse	Bobcat	Mule Deer	COEC	Rationale
Vanadium	<1	<1	No TRV -- <1	No TRV -- <1	**2.5** -- **25**	<1 -- <1	<1 -- <1	<1	<1	-- -- <1	-- -- <1	<1 -- **1.9**	<1 -- <1	<1 -- <1	No	-Estimated risks >1 for only 1 receptor (mouse). -Only one result > background. -Estimated risks driven by single high detect (72.9 mg/kg) at U5BS1101. -Incremental risks <1 for all receptors except mouse. -Risks primarily due to background concentrations.
Zinc	<1	<1	<1 -- **4.9**	<1 -- <1	<1 -- **3.7**	<1 -- <1	<1 -- <1	<1	<1	<1 -- **2.5**	<1 -- <1	<1 -- <1	<1 -- <1	<1 -- <1	**Yes (hot spot)**	-Estimated risks for two receptors (thrush and mouse) at the Low TRV only. -Four results > background at U5BS1123, U5BS1121, U5BS1100, and HSBS1000. -Estimated risks driven by several elevated surface soil detects. -Incremental risks >1 for thrush only; all other receptors <1. -Risks primarily due to background concentrations.
bis(2-Ethylhexyl) phthalate	No TRV	No TRV	No TRV -- **2.7**	No TRV -- <1	<1 -- <1	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks >1 for 1 receptor (thrush) at the Low TRV only.
Chrysene	<1	<1	No TRV -- <1	No TRV -- <1	<1 -- **1.1**	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks >1 for mouse at the Low TRV only. -Summed risk estimate (HI) for PAHs exceeded 1 for mouse.
PCB_TEQ_Bird	No TRV	<1	<1 -- **5.4**	<1 -- <1	No TRV -- No TRV	No TRV -- No TRV	No TRV -- No TRV	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks for this analyte (HQ) exceeded 1 for thrush at the Low TRV. -Summed risk estimate (HI) for dioxin/furans exceeded 1 for thrush and mouse.
PCB_TEQ_Mammal	No TRV	<1	No TRV -- No TRV	No TRV -- No TRV	**1.3** -- **12.6**	<1 -- <1	<1 -- <1	n/a	n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	n/a -- n/a	**Yes**	-Estimated risks for this analyte (HQ) exceeded 1 for mouse. -Summed risk estimate (HI) for dioxin/furans exceeded 1 for thrush and mouse.

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 R.4-5
Chemicals of Ecological Concern - Soil Vapor
Hazardous Materials Storage Area RFI Site

Preferred Analyte Name	Inhalation of Soil Vapor (Deer Mouse)	Identification of COECs	
		COEC	Rationale
1,1,2-Trichloroethane	**18**	No	-Analyte was not detected in soil or soil vapor. -It was retained for evaluation because SQL>ESL. -ESL and TRV are same value (based on a Low TRV) and have uncertainty regarding their derivation. -None of the other VOCs detected at the site exceeded TRVs. -Not likely that the analyte is present at levels of ecological concern.

Notes:
HQs listed are based on Refined Screen
COEC - chemical of ecological concern
ESL - ecological screening level
SQL - sample quantitation limit

Table R.4-6
Ecological Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area 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 R.4-6
Ecological Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area 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 R.4-6
Ecological Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area 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 R.4-6
Ecological Risk Assessment Uncertainty Analysis
Hazardous Materials Storage Area 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 R.5-1
Suficial Media Site Action Recommendations
Hazardous Materials Storage Area RFI Site

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	Building 4357	HMSA-3	HRA COC:	No HRA COCs identified	***Soil Results***		
2	Building 4457, Sump #1, Sump #2	NFA			Any HQs>1?	COEC	Rationale
3	T-357	NFA	***Near Surface Groundwater Results:***		Vanadium	No	ERA-5
4	Building 4025	HMSA-2	Trichloroethene		Zinc	Yes	ERA-6
5	Building 4024	HMSA-1			bis(2-Ethylhexyl) phthalate	Yes	ERA-1
			Soil Results:		Chrysene	Yes	ERA-4
6	Substation 4725	NFA	Benzo(a)pyrene,		PCB_TEQ_Bird	Yes	ERA-3
7	Buildings 4026, 4426, 4826, and 4226	HMSA-3	Benzo(b)fluoranthene,		PCB_TEQ_Mammal	Yes	ERA-3
8	Substation 4726	NFA	Benzo(a)anthracene,				
9	Building 4334	HMSA-4	Benzo(k)fluoranthene		***Soil Vapor Results***		
10	Building 4358	NFA			Any HQ>1?	COEC	Rationale
11	Building 4355	NFA			1,1,2-Trichloroethane	No	ERA-2
12	Building 4356, including tanks and transformers located inside Building 4356	NFA					
13	Building 4361, including tanks located inside Building 4361	NFA					
14	Building 4656	NFA					
15	Building 4625	NFA					
16	UT-19	NFA					

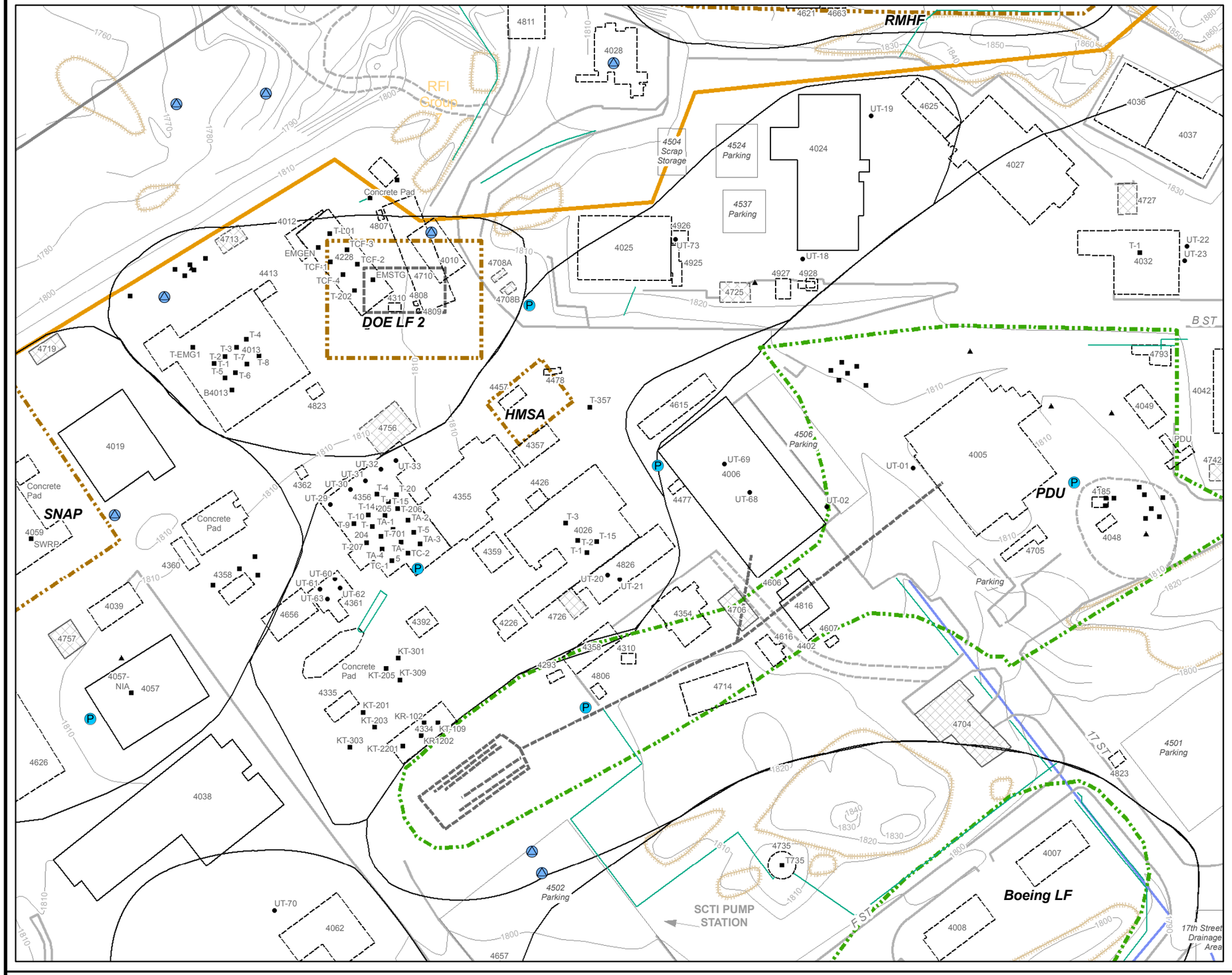
Notes:
1. NFA - Indicates area is recommended for No Further Action (NFA) for the CUA; not recommended for CMS evaluation.
2. CMS recommendations are based on compounds considered risk drivers (excess cancer risk > 1 x 10-6 or hazard index > 1) and/or significant risk contributors.

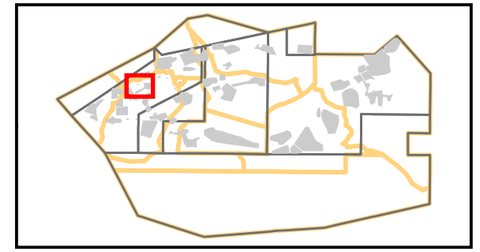
ERA-1 Estimated risks and or incremental risks >1 for 1 or more receptors. Magnitude of exceedance indicate potential risk.
ERA-2 Analyte was not detected in either soil or soil vapor. It was retained for risk calcs because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.
ERA-3 Estimated 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).
ERA-4 Estimated risks >1 for 1 or more receptors. Chemical class Hazard Index >1.
ERA-5 Site concentrations (RME and CTE) are similar to background. Estimated risk driven by one higher result although it is still within 1.5x background.
ERA-6 Estimated risks are driven by single high detect (340 mg/kg) at location HSBS1000. Only 4 results exceeded the maximum background value. -Estimated risks exceeded Low TRVs for a hermit thrush and deer mouse, all other HQs were <1.

Table R.5-2
Summary of Site Suficial Media CMS Recommendations
Hazardous Materials Storage Area RFI Site

CMS Area	Description	Chemical Risk Drivers and Contributors	Rationale
HMSA - 1	Building 4024	PAHs in soil	Cancer risk estimates exceed $1x10^{-6}$ for hypothetical future residential exposure scenario due to mulitple PAHs in shallow soil. Chrysene is the risk driver for ecological receptors (Deer mouse HQ = 1.1). Elevated PAH concentrations were detected in the soil sample collected at 5 to 6 feet bgs at one boring location adjacent to the east side of Buidling 4024.
HMSA - 2	Former Building 4025	Zinc in soil	Ecological HQ values exceed 1 for the Hermit Thrush and Deer Mouse due to a single detection of zinc in a surface soil sample at the southeast corner of former Building 4025.
HMSA - 3	Former Buildings 4026, 4357, and 4426	Zinc in soil	Ecological HQ values exceed 1 for the Hermit Thrush and Deer Mouse due to a single detection of zinc in surface soil at former Buildings 4026, 4357, and 4426.
HMSA - 4	Former Building 4334	Benzo(a)pyrene in soil	Cancer risk estimates exceed $1x10^{-6}$ for hypothetical future residential exposure scenario due to the benzo(a)pyrene in a surface soil sample collected northwest of former Building 4334 (near former Building 4335).

Figures





Basemap Legend

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

Site Location
HMSA RFI Site

Date: October 29, 2008 WORKING DRAFT

\\..MapFiles\RFI_05\RFI_Report\RFIGrp5_SiteLoc_BL_PLTS.mxd

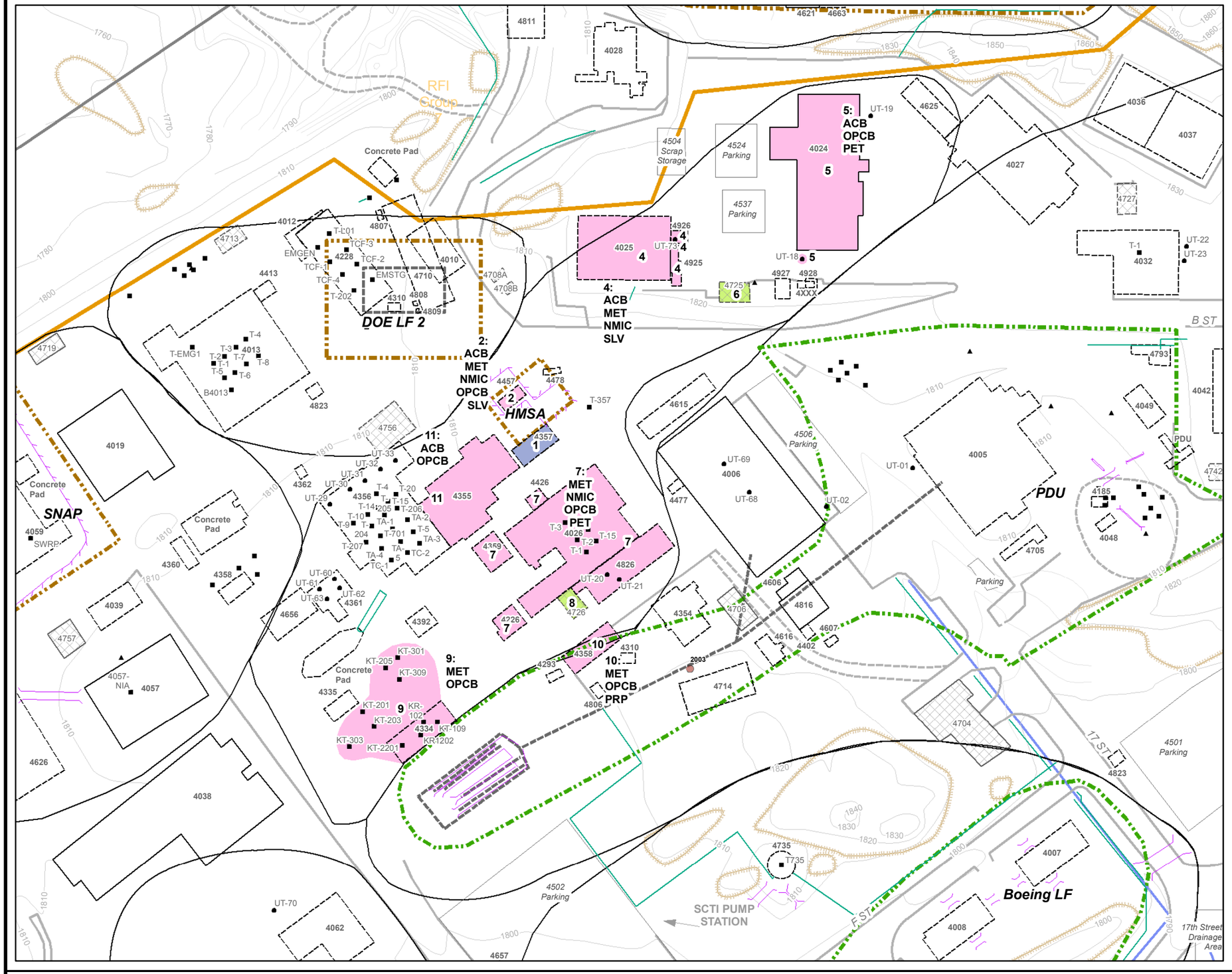
1 inch equals 100 feet

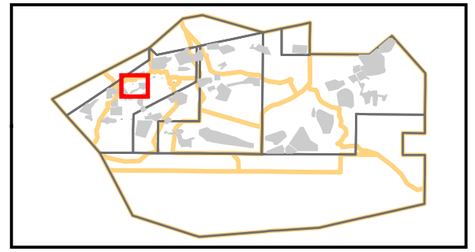
0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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
- Excavation
- Trench
- Leachfield
- Pipe
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- RFI Site Buffer
- RFI Group Boundary
- Administrative Area
- Property Boundary
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area

Chemical Use Areas
HMSA RFI Site

Date: September 18, 2008 **WORKING DRAFT**

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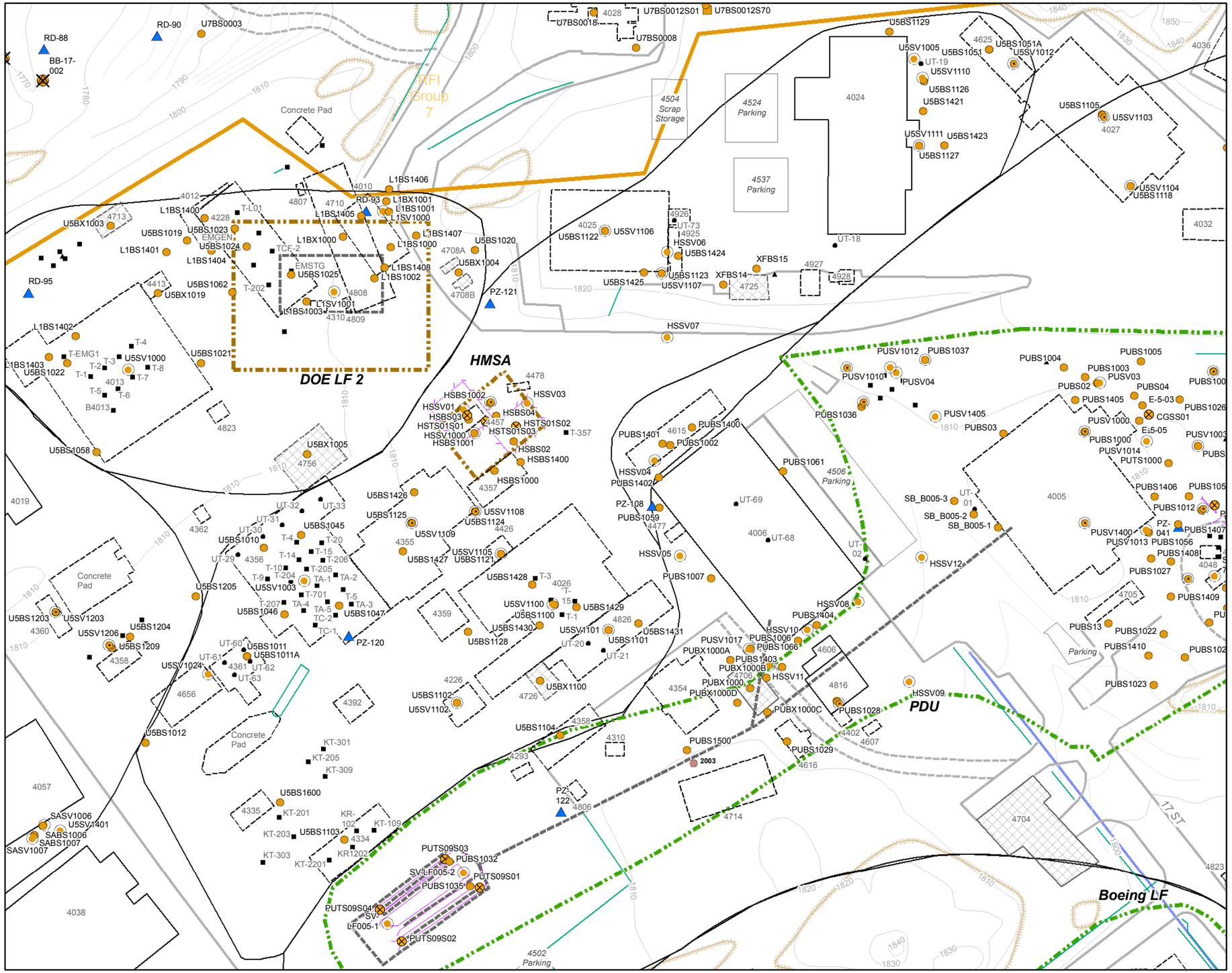
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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)
- B — Biological
- MO — Other
- MS — Sump

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Trench
- Leachfield
- Pipe
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

Sample Locations HMSA RFI Site

Date: October 30, 2008 WORKING DRAFT

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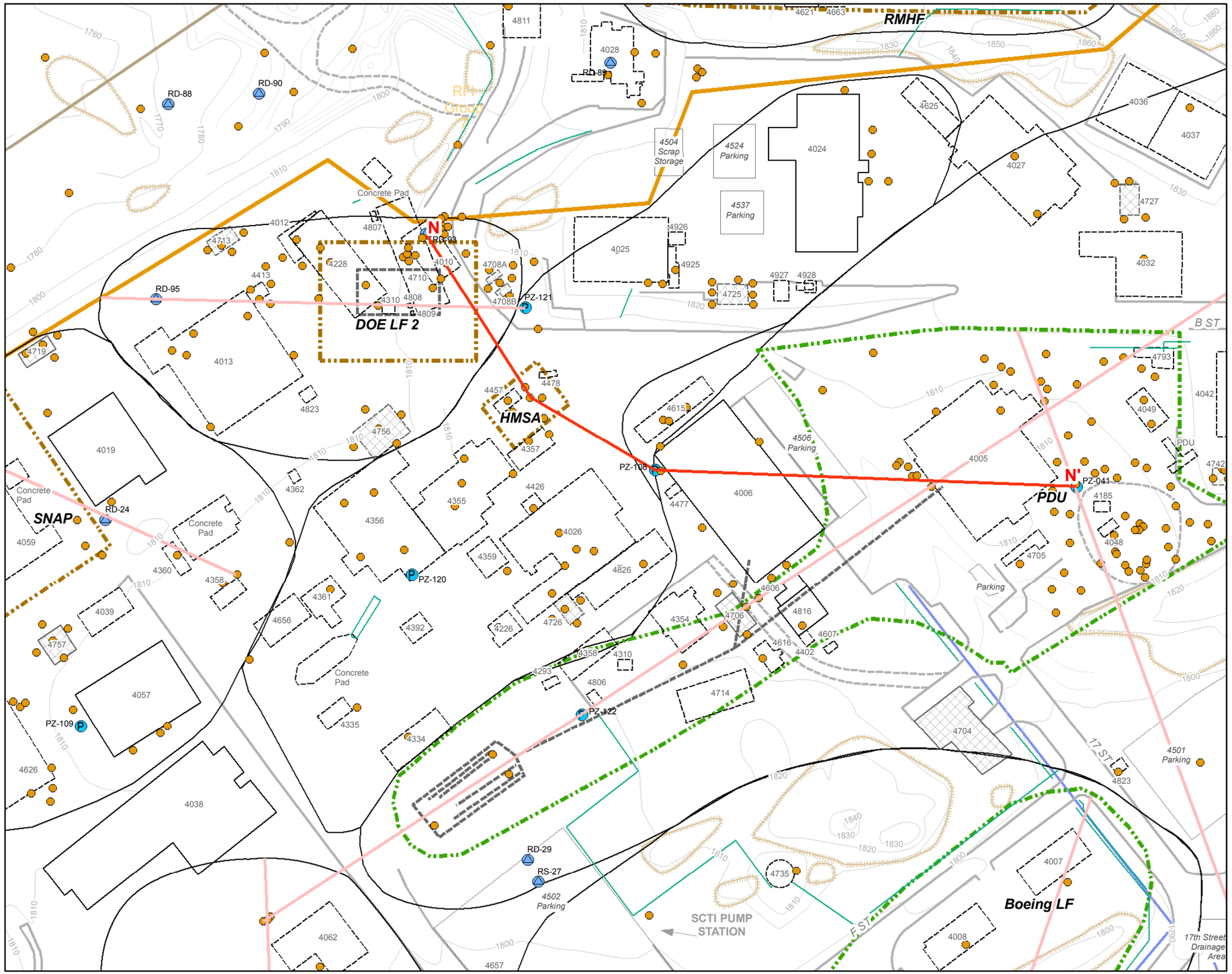
1 inch equals 80 feet

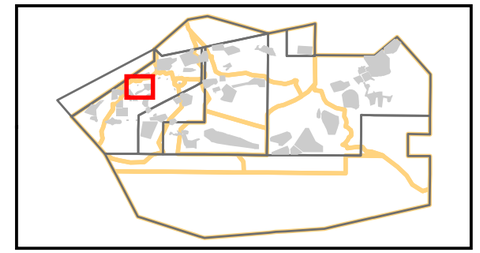
0 80 160 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.2-2





Cross-section Line

Basemap Legend

- Soil Boring
- Confirmation Sample
- Groundwater Monitoring Well
- Piezometer
- Groundwater Extraction Well
- Abandoned Groundwater Monitoring Well
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

HMSA Cross Section Location

N-N'

Date: September 18, 2008 **WORKING DRAFT**

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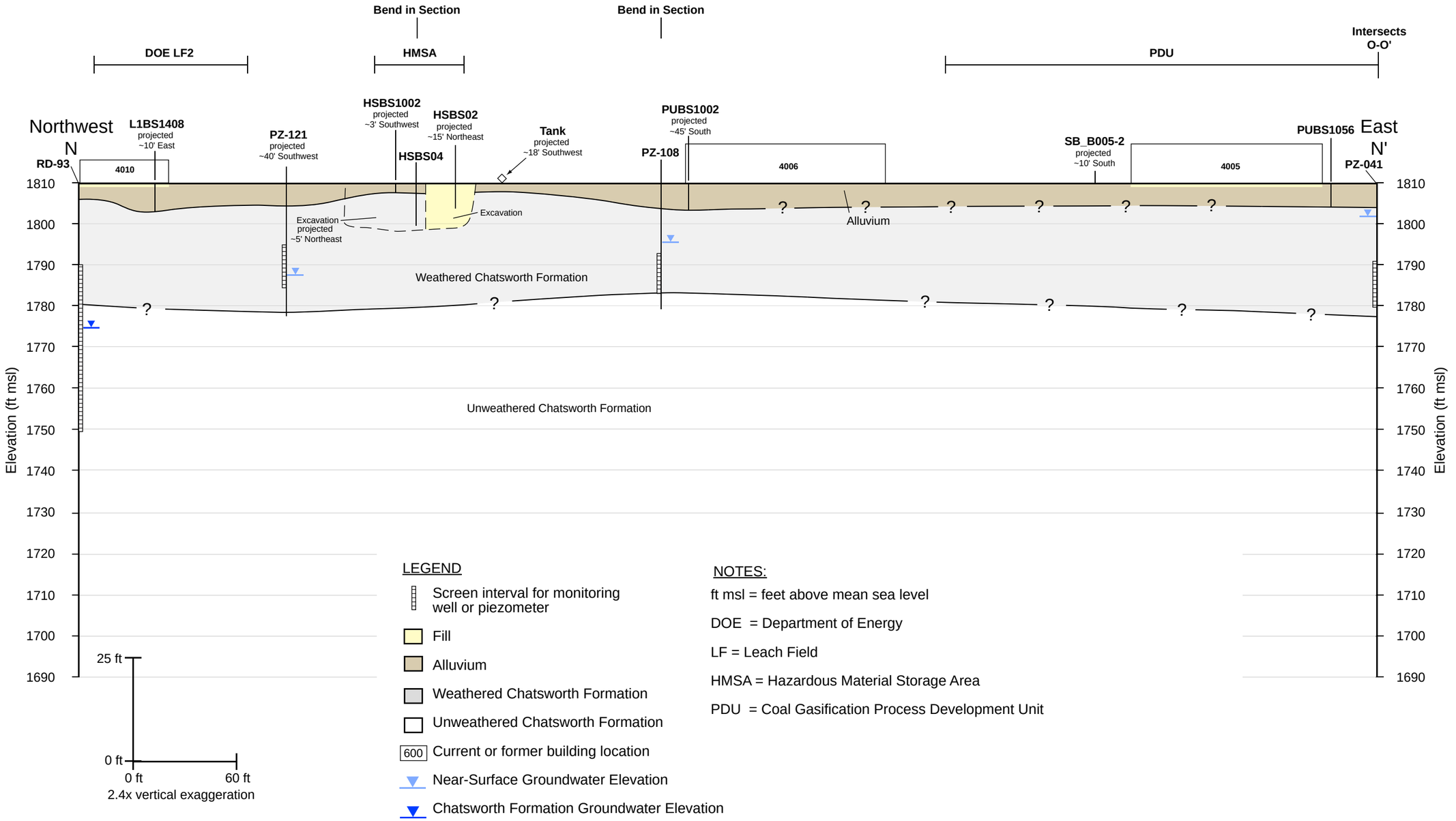
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.2-3A



LEGEND

- Screen interval for monitoring well or piezometer
- Fill
- Alluvium
- Weathered Chatsworth Formation
- Unweathered Chatsworth Formation
- 600 Current or former building location
- Near-Surface Groundwater Elevation
- Chatsworth Formation Groundwater Elevation

NOTES:

ft msl = feet above mean sea level

DOE = Department of Energy

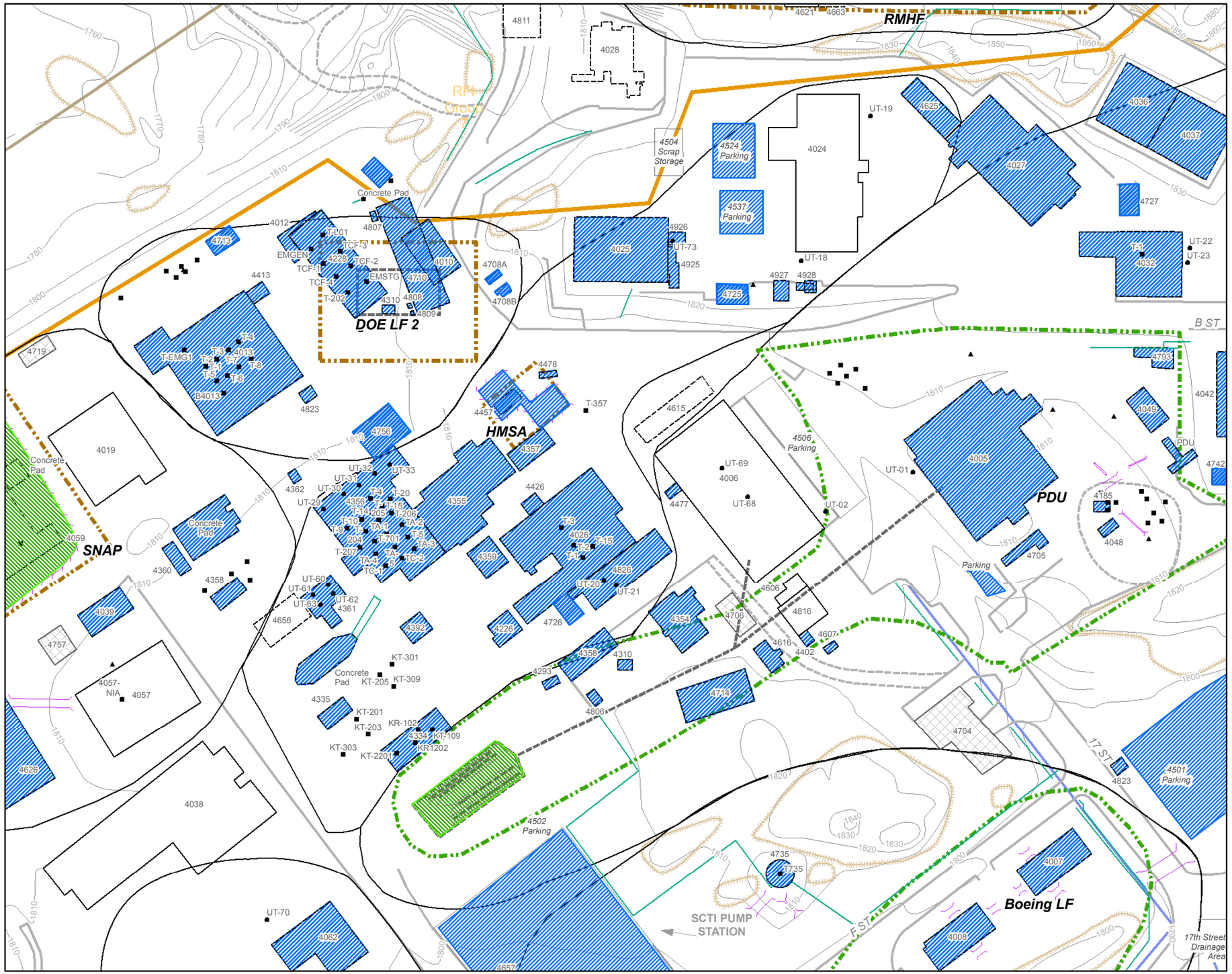
LF = Leach Field

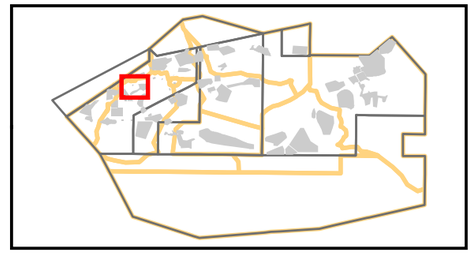
HMSA = Hazardous Material Storage Area

PDU = Coal Gasification Process Development Unit

FIGURE R.2-3B
Surficial Cross Section N-N'
HMSA
Santa Susana Field Laboratory
CH2MHILL

ES072007017SCO362070.FP.5A.05.BO CrossSect_NN_R23.ai 11/08





Approximate Areas of Soil Disturbance

- Grading
- Excavation - Backfill

Basemap Legend

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

Soil Disturbance Areas
HMSA RFI Site

Date: November 06, 2008 **WORKING DRAFT**

\\..MapFiles\RFI_05\RFI_Report\RFIGrp5_SiteLoc_BL_PLTS.mxd

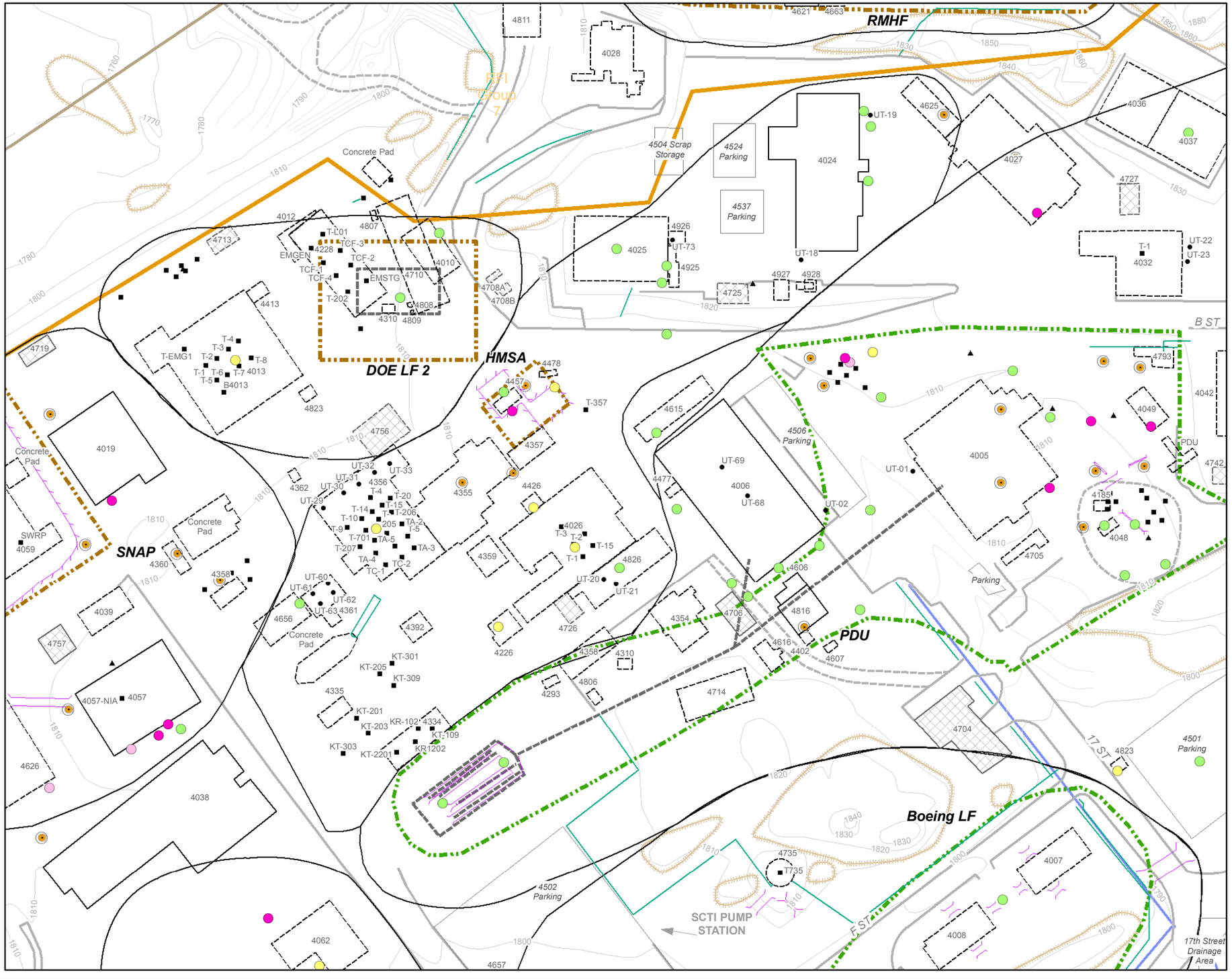
1 inch equals 100 feet

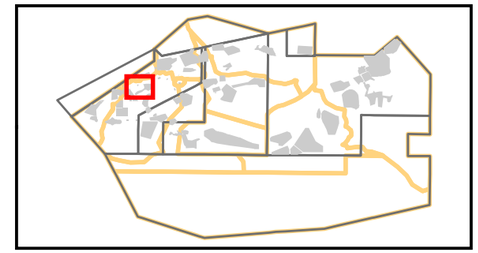
0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.2-4





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
- Trench
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

VOCs in Soil Vapor
HMSA RFI Site

Date: September 16, 2008

WORKING DRAFT

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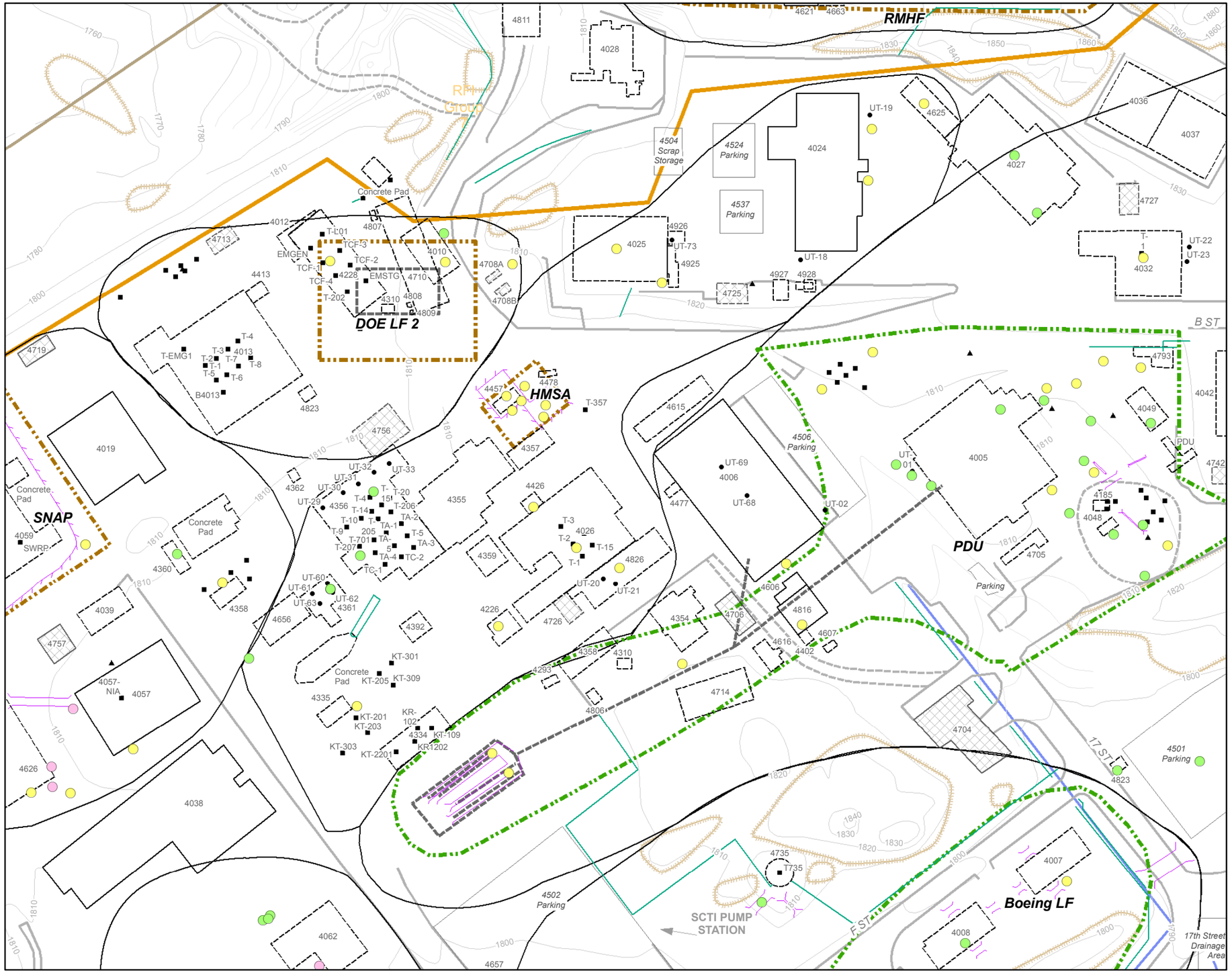
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

VOCs in Soil
HMSA RFI Site

Date: September 16, 2008 WORKING DRAFT

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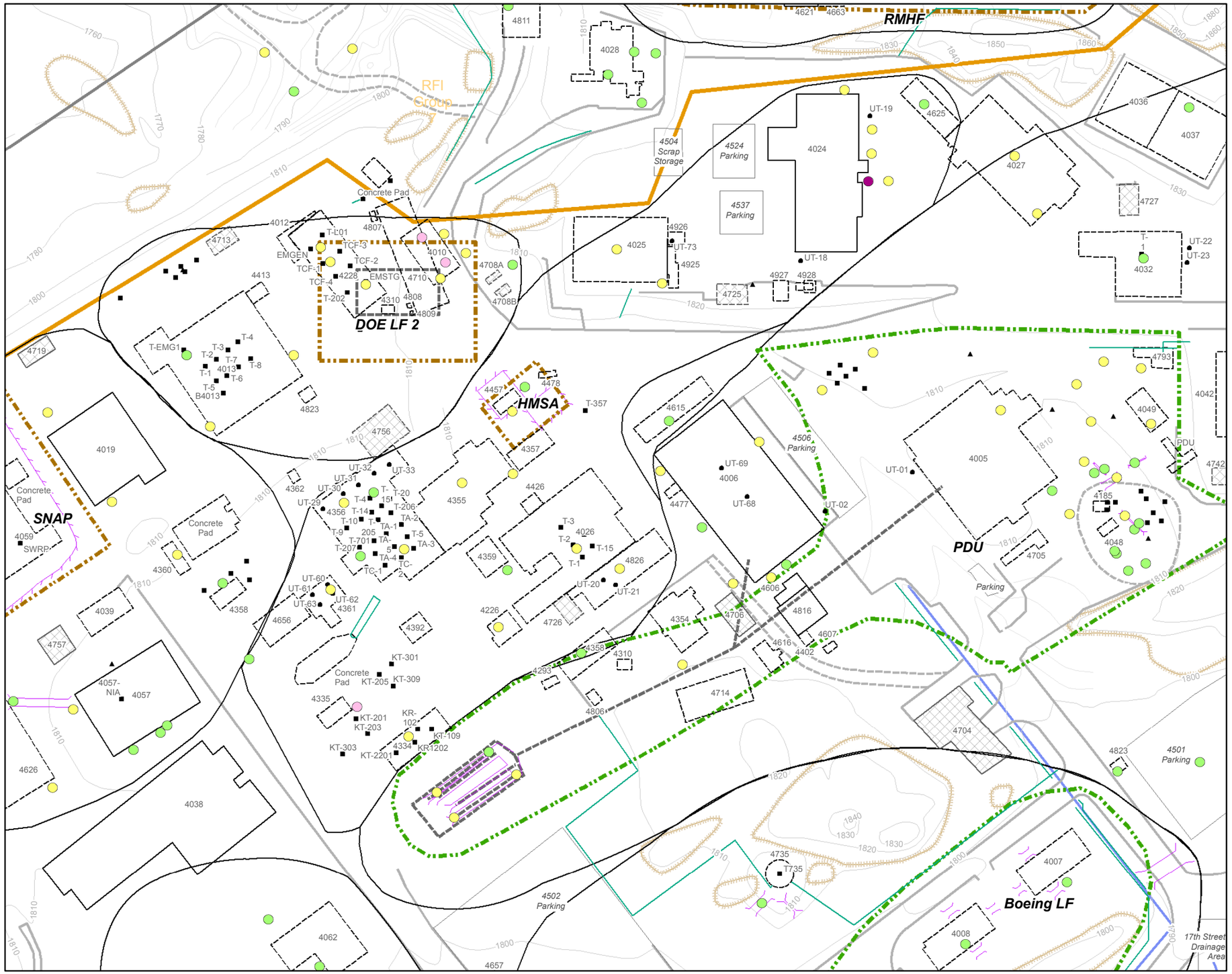
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

SVOCs in Soil
HMSA RFI Site

Date: September 16, 2008 WORKING DRAFT

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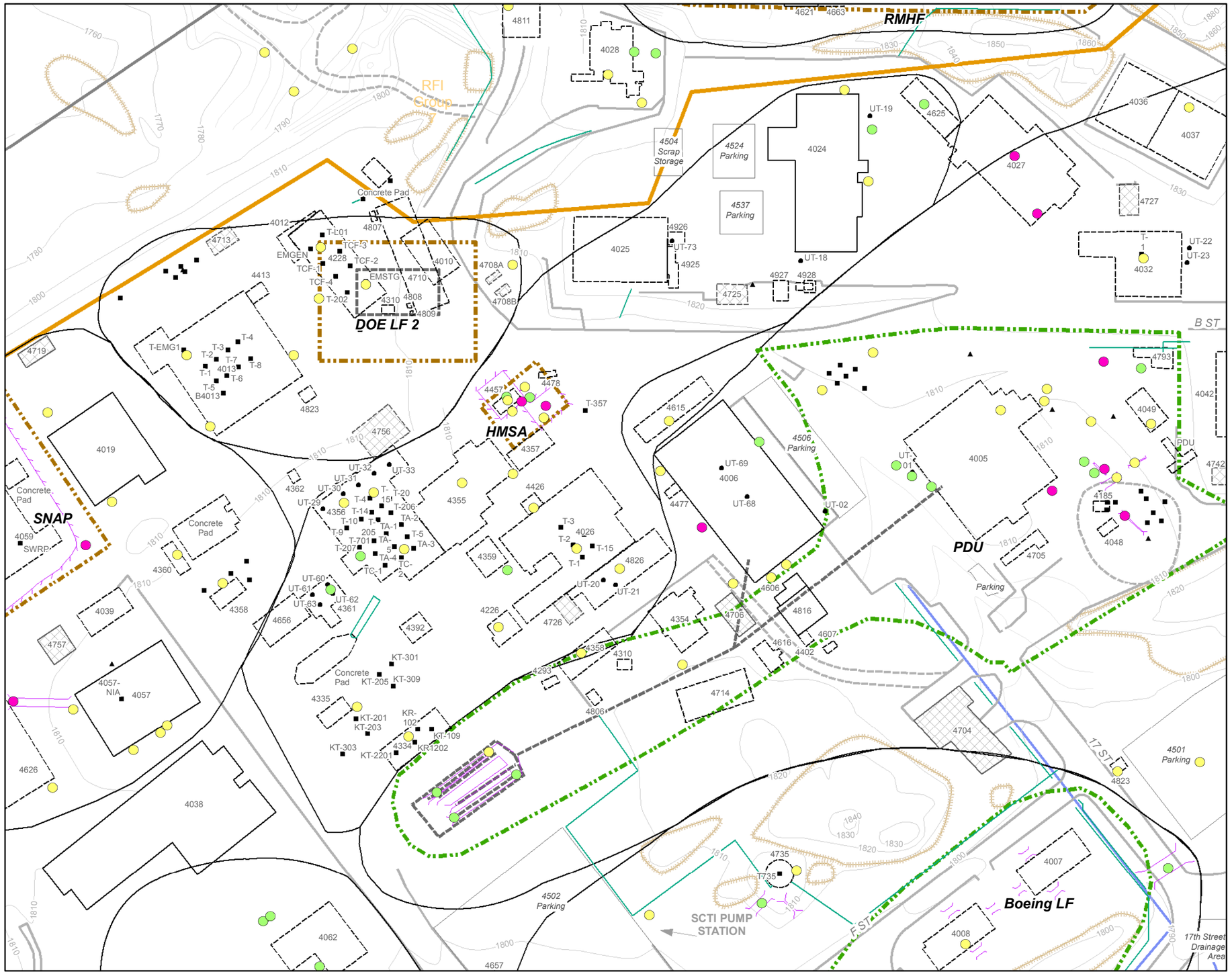
1 inch equals 100 feet

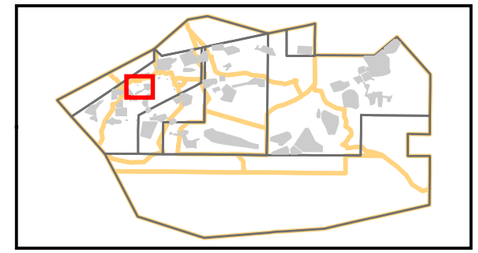
0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

TPH in Soil
HMSA RFI Site

Date: September 16, 2008 **WORKING DRAFT**

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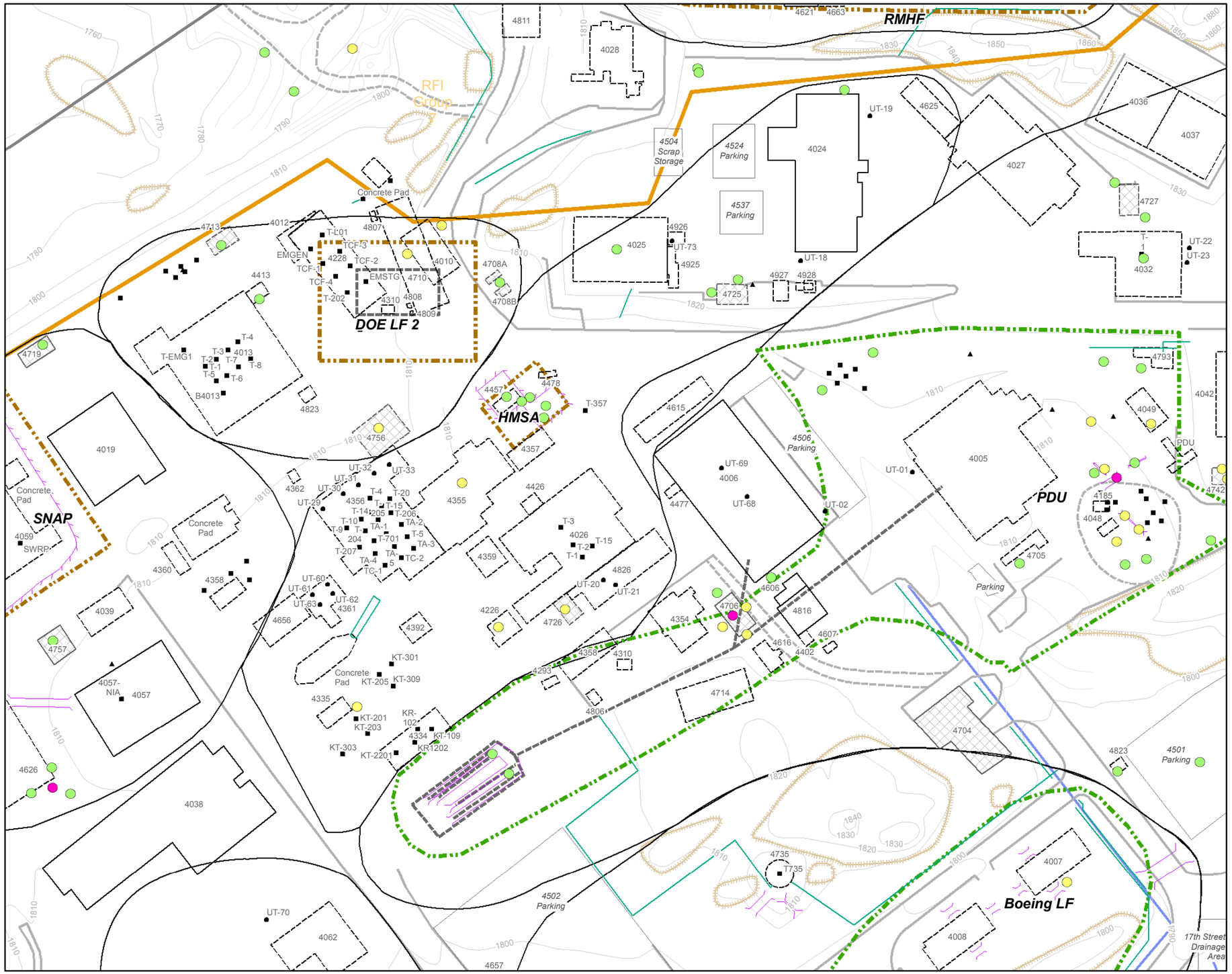
1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.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
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

PCBs in Soil
HMSA RFI Site

Date: September 11, 2008 **WORKING DRAFT**

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1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

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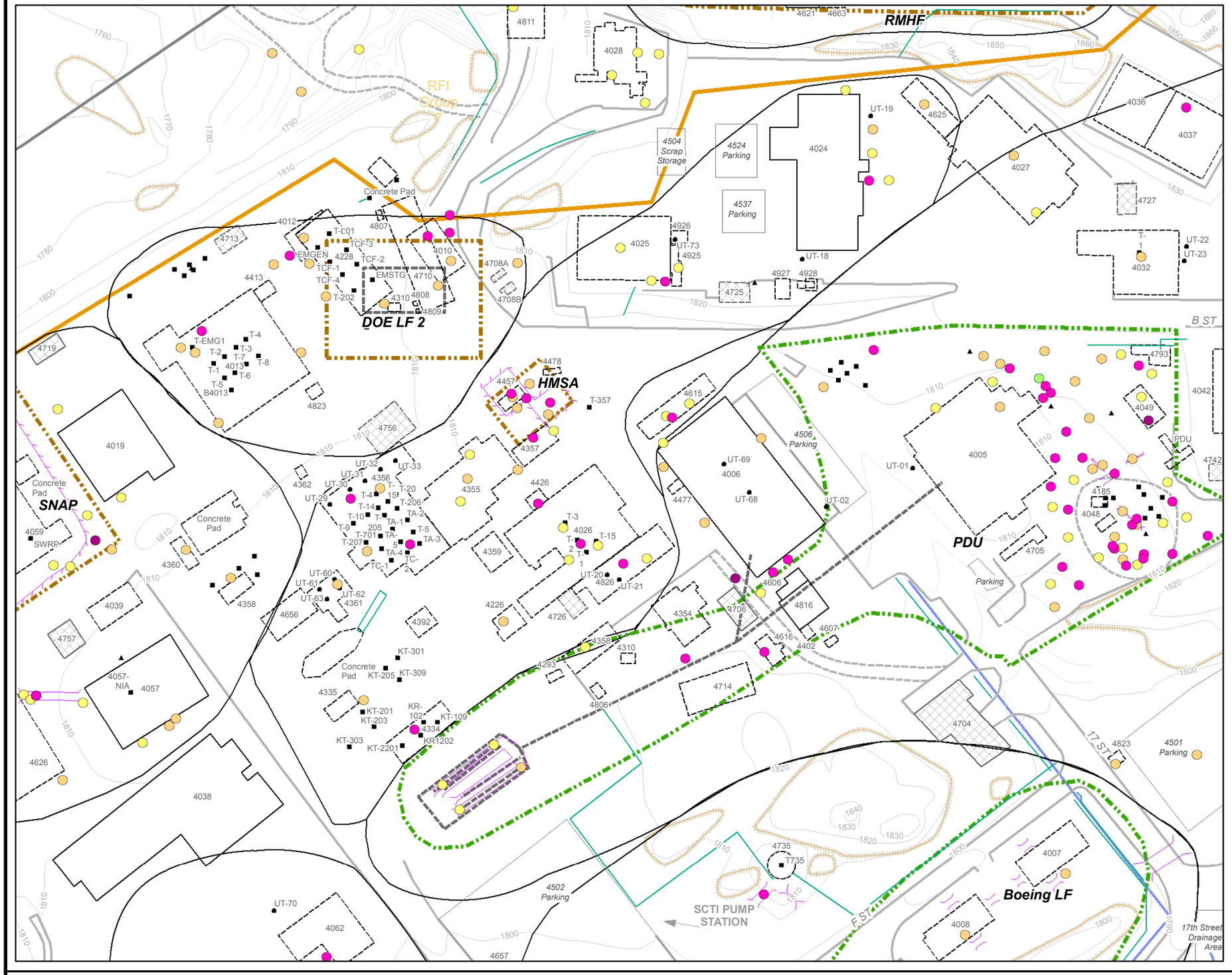
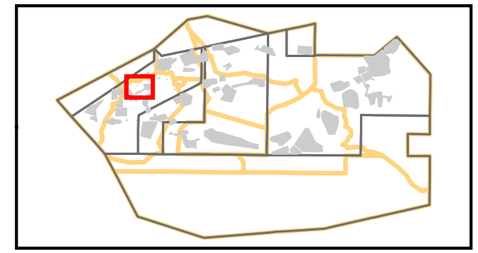
Figure R.3-4





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
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- 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

Metals in Soil
HMSA RFI Site

Date: September 11, 2008 **WORKING DRAFT**

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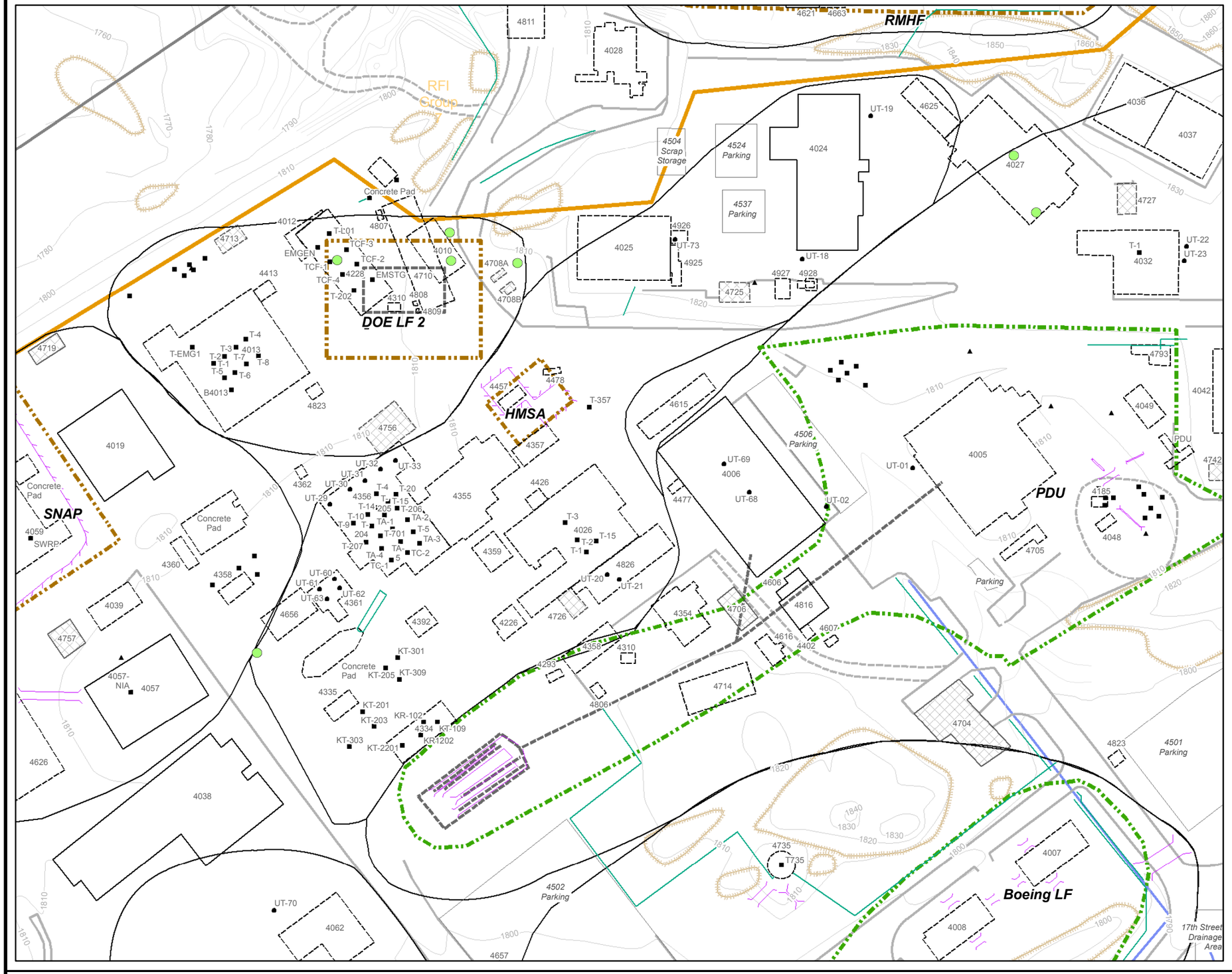
1 inch equals 100 feet

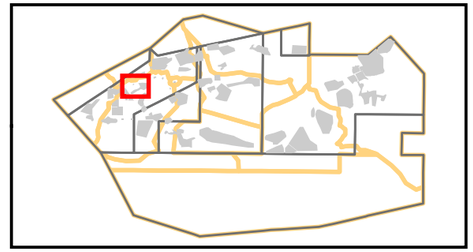
0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.3-5





Energetics in Soil

- Detect, Below All Screening Levels
- Non-detect; Soil, energetics, light green

Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Drainage
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Transformer - Existing
- Transformer - Removed
- Transformer - Not Yet Determined
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area
- Property Boundary

Energetics in Soil
HMSA RFI Site

Date: September 11, 2008 **WORKING DRAFT**

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1 inch equals 100 feet

0 100 200 Feet

SANTA SUSANA FIELD LABORATORY

CH2MHILL

Figure R.3-6

Soil Sample Locations

- Soil Sample Location With Detected VOCs Data
- Soil Sample Location Not Analyzed for VOCs Data
- Soil Sample Location With No Detected VOCs 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

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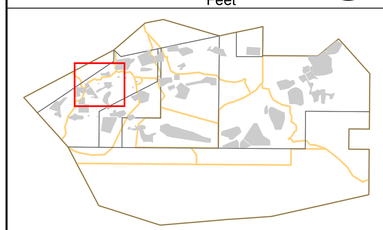
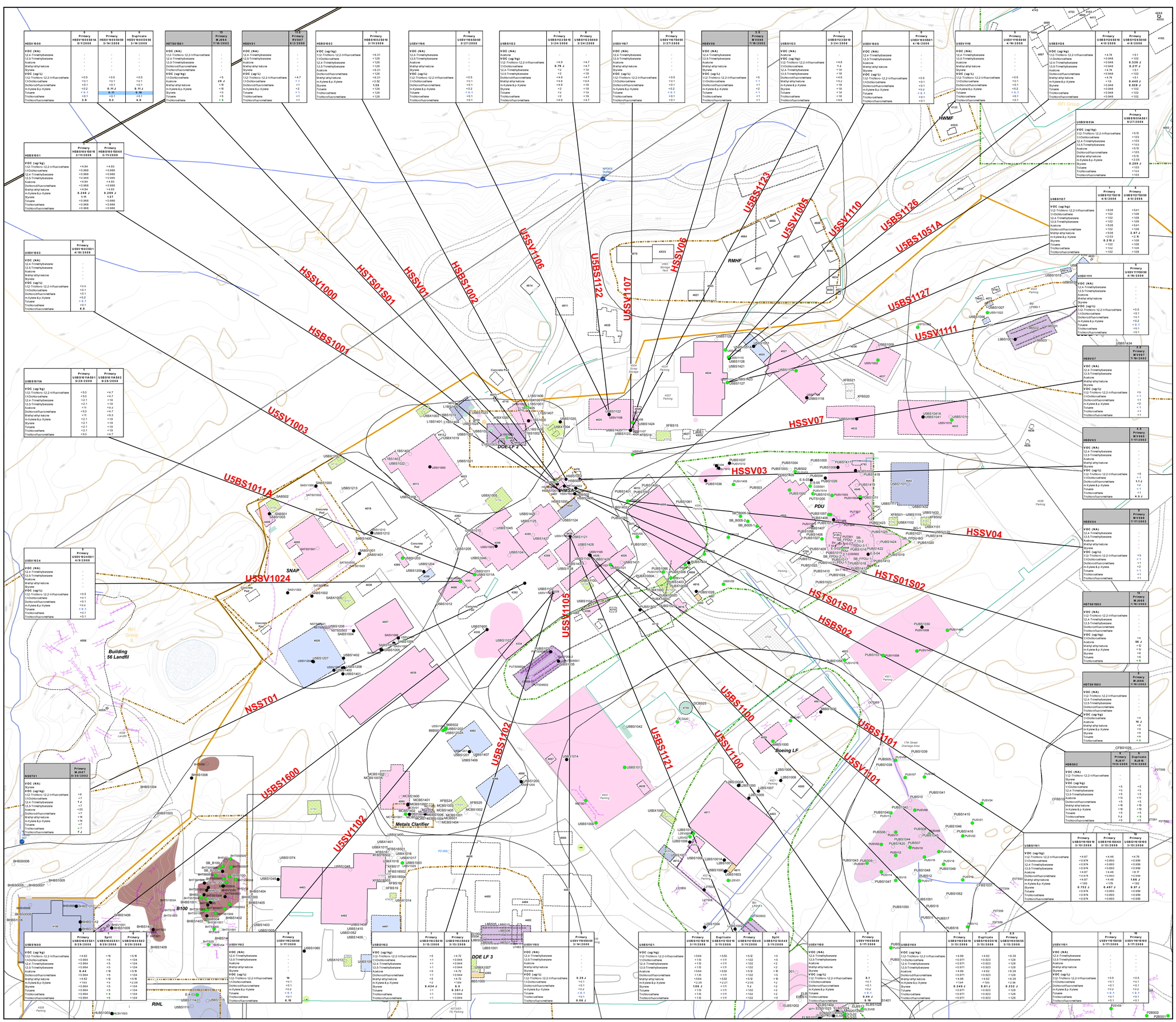
0 70 140

1 inch equals 70 feet

Feet





CH2MHILL

SANTA SUSANA FIELD LABORATORY

VOCs Data Results
HMSA RFI Site

FIGURE R.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
	B9BS01501	Unique Sample Identifier
	7/10/2005	Data

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 Inor-ganic Constituents
- Screening for Potential Impacts

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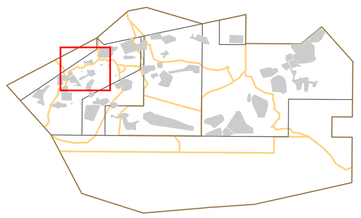
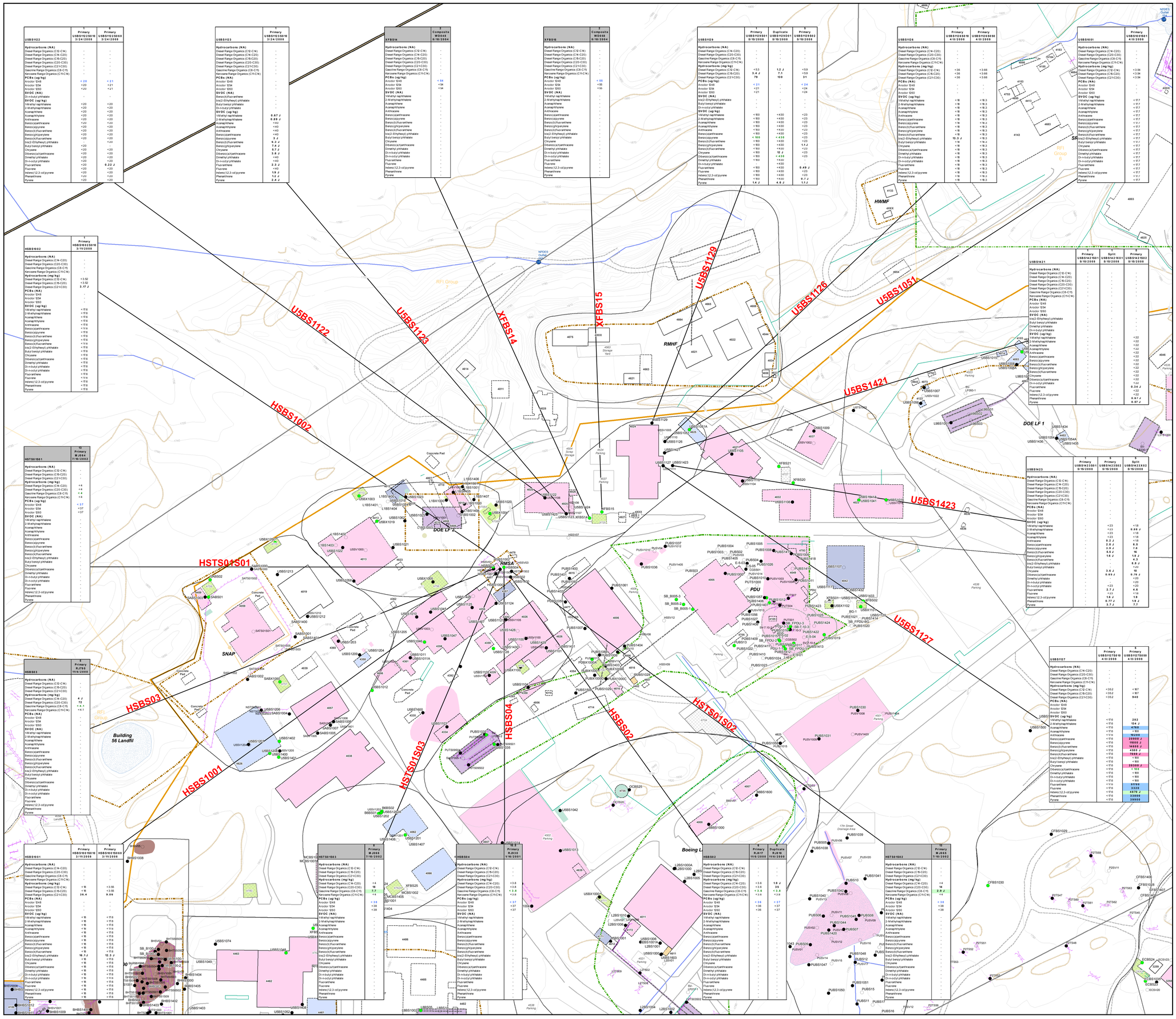
0 140

1 inch equals 70 feet

Feet





	1 Primary HSBS1002S10 3/1/2006
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C20-C30)	-
Gasoline Range Organics (C8-C12)	-
Kerosene Range Organics (C12-C14)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C9-C14)	< 3.52
Diesel Range Organics (C14-C20)	< 3.52
Diesel Range Organics (C21-C30)	**3.17 J**
PCBs (NA)	
Aroclor 1248	-
Aroclor 1254	-
Aroclor 1260	-
SVOC (ug/kg)	
1-Methyl naphthalene	< 17.6
2-Methylnaphthalene	< 17.6
Acenaphthene	< 17.6
Acenaphthylene	< 17.6
Anthracene	< 17.6
Benzo(a)anthracene	< 17.6
Benzo(a)pyrene	< 17.6
Benzo(b)fluoranthene	< 17.6
Benzo(g,h,i)perylene	< 17.6
Benzo(k)fluoranthene	< 17.6
bis(2-Ethylhexyl) phthalate	< 17.6
Butyl benzyl phthalate	< 17.6
Chrysene	< 17.6
Dibenzo(a,h)anthracene	< 17.6
Dimethyl phthalate	< 17.6
Di-n-butyl phthalate	< 17.6
Di-n-octyl phthalate	< 17.6
Fluoranthene	< 17.6
Fluorene	< 17.6
Indeno(1,2,3-cd)pyrene	< 17.6
Phenanthrene	< 17.6
Pyrene	< 17.6

	1 Primary HSTS01S01 7/10/2003
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C14-C20)	< 4
Diesel Range Organics (C21-C30)	< 4
Gasoline Range Organics (C8-C12)	< 4
Kerosene Range Organics (C12-C14)	< 4
PCBs (ug/kg)	
Aroclor 1248	< 37
Aroclor 1254	< 37
Aroclor 1260	< 37
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSBS03 11/6/2000
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	**4 J**
Diesel Range Organics (C21-C30)	**72**
Gasoline Range Organics (C8-C12)	< 4.1
Kerosene Range Organics (C12-C14)	< 4.1
PCBs (NA)	
Aroclor 1248	-
Aroclor 1254	-
Aroclor 1260	-
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSBS1001S10 3/10/2006	1 Primary HSBS1001S05 3/10/2006
Hydrocarbons (NA)		
Diesel Range Organics (C9-C14)	-	-
Diesel Range Organics (C14-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
Gasoline Range Organics (C8-C12)	-	-
Kerosene Range Organics (C12-C14)	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C9-C14)	< 18	< 3.55
Diesel Range Organics (C14-C20)	< 18	< 3.55
Diesel Range Organics (C21-C30)	**39.4**	**9.06**
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (ug/kg)		
1-Methyl naphthalene	< 18	< 17.6
2-Methylnaphthalene	< 18	< 17.6
Acenaphthene	< 18	< 17.6
Acenaphthylene	< 18	< 17.6
Anthracene	< 18	< 17.6
Benzo(a)anthracene	< 18	< 17.6
Benzo(a)pyrene	< 18	< 17.6
Benzo(b)fluoranthene	< 18	< 17.6
Benzo(g,h,i)perylene	< 18	< 17.6
Benzo(k)fluoranthene	< 18	< 17.6
bis(2-Ethylhexyl) phthalate	**19.1 J**	**12.3 J**
Butyl benzyl phthalate	< 18	< 17.6
Chrysene	< 18	< 17.6
Dibenzo(a,h)anthracene	< 18	< 17.6
Dimethyl phthalate	< 18	< 17.6
Di-n-butyl phthalate	< 18	< 17.6
Di-n-octyl phthalate	< 18	< 17.6
Fluoranthene	< 18	< 17.6
Fluorene	< 18	< 17.6
Indeno(1,2,3-cd)pyrene	< 18	< 17.6
Phenanthrene	< 18	< 17.6
Pyrene	< 18	< 17.6

	1 Primary HSTS01S03 7/10/2002
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C14-C20)	< 4
Diesel Range Organics (C21-C30)	**16**
Gasoline Range Organics (C8-C12)	**7.7**
Kerosene Range Organics (C12-C14)	< 4
PCBs (ug/kg)	
Aroclor 1248	< 38
Aroclor 1254	< 38
Aroclor 1260	< 38
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSBS04 9/16/2001
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C14-C20)	< 3.8
Diesel Range Organics (C21-C30)	< 3.8
Gasoline Range Organics (C8-C12)	< 3.8
Kerosene Range Organics (C12-C14)	< 2.8
PCBs (ug/kg)	
Aroclor 1248	< 37
Aroclor 1254	< 37
Aroclor 1260	< 37
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSBS02 11/6/2000	1 Duplicate HSBS16 11/6/2000
Hydrocarbons (NA)		
Diesel Range Organics (C9-C14)	-	-
Diesel Range Organics (C14-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C9-C14)	< 3.6	**1.9 J**
Diesel Range Organics (C14-C20)	< 3.6	**3.5**
Diesel Range Organics (C21-C30)	< 3.6	< 2.8
Kerosene Range Organics (C12-C14)	< 3.6	< 2.8
PCBs (ug/kg)		
Aroclor 1248	< 36	< 37
Aroclor 1254	< 36	< 37
Aroclor 1260	< 36	< 37
SVOC (NA)		
1-Methyl naphthalene	-	-
2-Methylnaphthalene	-	-
Acenaphthene	-	-
Acenaphthylene	-	-
Anthracene	-	-
Benzo(a)anthracene	-	-
Benzo(a)pyrene	-	-
Benzo(b)fluoranthene	-	-
Benzo(g,h,i)perylene	-	-
Benzo(k)fluoranthene	-	-
bis(2-Ethylhexyl) phthalate	-	-
Butyl benzyl phthalate	-	-
Chrysene	-	-
Dibenzo(a,h)anthracene	-	-
Dimethyl phthalate	-	-
Di-n-butyl phthalate	-	-
Di-n-octyl phthalate	-	-
Fluoranthene	-	-
Fluorene	-	-
Indeno(1,2,3-cd)pyrene	-	-
Phenanthrene	-	-
Pyrene	-	-

	15 Primary MJ065 7/16/2002
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C14-C20)	< 4
Diesel Range Organics (C21-C30)	**2.9 J**
Gasoline Range Organics (C8-C12)	< 4
Kerosene Range Organics (C12-C14)	< 4
PCBs (ug/kg)	
Aroclor 1248	< 38
Aroclor 1254	< 38
Aroclor 1260	< 38
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSTS01S02 7/10/2002
Hydrocarbons (NA)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C14-C20)	< 4
Diesel Range Organics (C21-C30)	**14**
Gasoline Range Organics (C8-C12)	**2.9 J**
Kerosene Range Organics (C12-C14)	< 4
PCBs (ug/kg)	
Aroclor 1248	< 38
Aroclor 1254	< 38
Aroclor 1260	< 38
SVOC (NA)	
1-Methyl naphthalene	-
2-Methylnaphthalene	-
Acenaphthene	-
Acenaphthylene	-
Anthracene	-
Benzo(a)anthracene	-
Benzo(a)pyrene	-
Benzo(b)fluoranthene	-
Benzo(g,h,i)perylene	-
Benzo(k)fluoranthene	-
bis(2-Ethylhexyl) phthalate	-
Butyl benzyl phthalate	-
Chrysene	-
Dibenzo(a,h)anthracene	-
Dimethyl phthalate	-
Di-n-butyl phthalate	-
Di-n-octyl phthalate	-
Fluoranthene	-
Fluorene	-
Indeno(1,2,3-cd)pyrene	-
Phenanthrene	-
Pyrene	-

	1 Primary HSBS1051S01 4/8/2006
Hydrocarbons (NA)	
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C20-C30)	-
Gasoline Range Organics (C8-C12)	-
Kerosene Range Organics (C12-C14)	-
Hydrocarbons (mg/kg)	
Diesel Range Organics (C9-C14)	-
Diesel Range Organics (C14-C20)	-
Diesel Range Organics (C21-C30)	-
PCBs (NA)	
Aroclor 1248	-
Aroclor 1254	-
Aroclor 1260	-
SVOC (ug/kg)	
1-Methyl naphthalene	< 16
2-Methylnaphthalene	< 16
Acenaphthene	< 16
Acenaphthylene	< 16
Anthracene	< 16
Benzo(a)anthracene	< 16
Benzo(a)pyrene	< 16
Benzo(b)fluoranthene	< 16
Benzo(g,h,i)perylene	< 16
Benzo(k)fluoranthene	< 16
bis(2-Ethylhexyl) phthalate	**15.3 J**
Butyl benzyl phthalate	< 16
Chrysene	< 16
Dibenzo(a,h)anthracene	< 16
Dimethyl phthalate	< 16
Di-n-butyl phthalate	< 16
Di-n-octyl phthalate	< 16
Fluoranthene	< 16
Fluorene	< 16
Indeno(1,2,3-cd)pyrene	< 16
Phenanthrene	< 16
Pyrene	< 16

	1 Primary HSBS1126S10 4/8/2006	1 Primary HSBS1126S05 4/8/2006
Hydrocarbons (NA)		
Diesel Range Organics (C14-C20)	-	-
Diesel Range Organics (C20-C30)	-	-
Gasoline Range Organics (C8-C12)	-	-
Kerosene Range Organics (C12-C14)	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C9-C14)	< 36	< 3.66
Diesel Range Organics (C14-C20)	< 36	< 3.66
Diesel Range Organics (C21-C30)	< 36	< 3.66
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (ug/kg)		
1-Methyl naphthalene	< 16	< 16.3
2-Methylnaphthalene	< 16	< 16.3
Acenaphthene	< 16	< 16.3
Acenaphthylene	< 16	< 16.3
Anthracene	< 16	< 16.3
Benzo(a)anthracene	< 16	< 16.3
Benzo(a)pyrene	< 16	< 16.3
Benzo(b)fluoranthene	< 16	< 16.3
Benzo(g,h,i)perylene	< 16	< 16.3
Benzo(k)fluoranthene	< 16	< 16.3
bis(2-Ethylhexyl) phthalate	**15.3 J**	**< 16.3**
Butyl benzyl phthalate	< 16	< 16.3
Chrysene	< 16	< 16.3
Dibenzo(a,h)anthracene	< 16	< 16.3
Dimethyl phthalate	< 16	< 16.3
Di-n-butyl phthalate	< 16	< 16.3
Di-n-octyl phthalate	< 16	< 16.3
Fluoranthene	< 16	< 16.3
Fluorene	< 16	< 16.3
Indeno(1,2,3-cd)pyrene	< 16	< 16.3
Phenanthrene	< 16	< 16.3
Pyrene	< 16	< 16.3

	1 Primary HSBS1129S10 5/15/2006	1 Duplicate HSBS1129S11 5/15/2006	1 Primary HSBS1129S02 5/15/2006
Hydrocarbons (NA)			
Diesel Range Organics (C14-C20)	-	-	-
Diesel Range Organics (C20-C30)	-	-	-
Gasoline Range Organics (C8-C12)	-	-	-
Kerosene Range Organics (C12-C14)	-	-	-
Hydrocarbons (mg/kg)			
Diesel Range Organics (C9-C14)	< 53	**1.2 J**	< 59
Diesel Range Organics (C14-C20)	**3.4 J**	**7.1**	< 59
Diesel Range Organics (C21-C30)	**79**	**130**	**31**
PCBs (ug/kg)			
Aroclor 1248	< 24	-	< 24
Aroclor 1254	< 21	-	< 24
Aroclor 1260	< 21	-	< 24
SVOC (NA)			
bis(2-Ethylhexyl) phthalate	-	-	-
Butyl benzyl phthalate	-	-	-
Di-n-octyl phthalate	-	-	-
SVOC (ug/kg)			
1-Methyl naphthalene	< 100	< 430	< 23
2-Methylnaphthalene	< 100	< 430	< 23
Acenaphthene	< 100	< 430	< 23
Acenaphthylene	< 100	< 430	< 23
Anthracene	< 100	< 430	< 23
Benzo(a)anthracene	< 100	< 430	< 23
Benzo(a)pyrene	< 100	< 430	< 23
Benzo(b)fluoranthene	< 100	< 430	< 23
Benzo(g,h,i)perylene	< 100	< 430	< 23
Benzo(k)fluoranthene	< 100	< 430	< 23
bis(2-Ethylhexyl) phthalate	< 100	**14 J**	< 23
Chrysene	< 100	< 430	< 23
Dibenzo(a,h)anthracene	< 100	< 430	< 23
Dimethyl phthalate	< 100	< 430	-
Di-n-butyl phthalate	< 100	< 430	-
Di-n-octyl phthalate	< 100	< 430	-
Fluoranthene	< 100	< 430	**0.49 J**
Fluorene	< 100	< 430	< 23
Indeno(1,2,3-cd)pyrene	< 100	< 430	**0.7 J**
Phenanthrene	< 100	< 430	**1.1 J**
Pyrene	**1.4 J**	**4.6 J**	**1.1 J**

	1 Primary HSBS1421S01 5/15/2006	1 Split HSBS1421S51 5/15/2006	1 Primary HSBS1421S02 5/15/2006
Hydrocarbons (NA)			
Diesel Range Organics (C9-C14)	-	-	-
Diesel Range Organics (C14-C20)	-	-	-
Diesel Range Organics (C20-C30)	-	-	-
Diesel Range Organics (C21-C30)	-	-	-
Gasoline Range Organics (C8-C12)	-	-	-
Kerosene Range Organics (C12-C14)	-	-	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
Aroclor 1260	-	-	-
SVOC (ug/kg)			
bis(2-Ethylhexyl) phthalate	-	-	-
Butyl benzyl phthalate	-	-	-
Dimethyl phthalate	-	-	-
Di-n-butyl phthalate	-	-	-
2-Methylnaphthalene	-	-	< 22
Acenaphthene	-	-	< 22
Acenaphthylene	-	-	< 22
Benzo(a)anthracene	-	-	< 22
Benzo(a)pyrene	-	-	< 22
Benzo(b)fluoranthene	-	-	< 22
Chrysene	-	-	< 22
Dibenzo(a,h)anthracene	-	-	< 22
Di-n-octyl phthalate	-	-	< 22
Fluoranthene	-	-	**0.34 J**
Fluorene	-	-	< 22
Indeno(1,2,3-cd)pyrene	-	-	< 22
Phenanthrene	-	-	**0.97 J**
Pyrene	-	-	**0.97 J**

	1 Primary HSBS423S01 5/15/2006	1 Primary HSBS423S05 5/15/2006	1 Split HSBS423S02 5/15/2006
Hydrocarbons (NA)			
Diesel Range Organics (C9-C14)	-	-	-
Diesel Range Organics (C14-C20)	-	-	-
Diesel Range Organics (C20-C30)	-	-	-
Diesel Range Organics (C21-C30)	-	-	-
Gasoline Range Organics (C8-C12)	-	-	-
Kerosene Range Organics (C12-C14)	-	-	-
PCBs (NA)			
Aroclor 1248	-	-	-
Aroclor 1254	-	-	-
Aroclor 1260	-	-	-
SVOC (ug/kg)			
1-Methyl naphthalene	-	< 23	< 18
2-Methylnaphthalene	-	< 23	**0.83 J**
Acenaphthene	-	< 23	< 18
Acenaphthylene	-	< 23	< 18
Anthracene	-	**0.2 J**	< 18
Benzo(a)anthracene	-	**2.8 J**	**6.5**
Benzo(a)pyrene	-	**3.9 J**	**7.8**
Benzo(b)fluoranthene	-	**5.5 J**	**16**
Benzo(g,h,i)perylene	-	**1.6 J**	**1.8 J**
Benzo(k)fluoranthene	-	-	**4.3**
bis(2-Ethylhexyl) phthalate	-	-	**0.8 J**
Butyl benzyl phthalate	-	-	< 20
Chrysene	-	**3.6 J**	**16**
Dibenzo(a,h)anthracene	-	**0.74 J**	< 20
Dimethyl phthalate	-	-	< 20
Di-n-butyl phthalate	-	-	< 20
Di-n-octyl phthalate	-	< 23	< 20
Fluoranthene	-	**2.7 J**	**4.2**
Fluorene	-	< 23	< 18
Indeno(1,2,3-cd)pyrene	-	**1.6 J**	**1.9**
Phenanthrene	-	**0.77 J**	**1.9 J**
Pyrene	-	**3.7 J**	**7.7**

	1 Primary HSBS1127S10 4/8/2006	1 Primary HSBS1127S05 4/8/2006
Hydrocarbons (NA)		
Diesel Range Organics (C14-C20)	-	-
Diesel Range Organics (C20-C30)	-	-
Gasoline Range Organics (C8-C12)	-	-
Kerosene Range Organics (C12-C14)	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C9-C14)	< 35.2	< 167
Diesel Range Organics (C14-C20)	< 35.2	< 167
Diesel Range Organics (C21-C30)	< 35.2	**940**
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (ug/kg)		
1-Methyl naphthalene	< 17.6	**282**
2-Methylnaphthalene	< 17.6	**134 J**
Acenaphthene	< 17.6	**4760**
Acenaphthylene	< 17.6	< 165
Anthracene	< 17.6	**16200**
Benzo(a)anthracene	< 17.6	**23900 J**
Benzo(a)pyrene	< 17.6	**19500 J**
Benzo(b)fluoranthene	< 17.6	**14800 J**
Benzo(g,h,i)perylene	< 17.6	**4565 J**
Benzo(k)fluoranthene	< 17.6	**7080 J**
bis(2-Ethylhexyl) phthalate	< 17.6	**1180**
Butyl benzyl phthalate	< 17.6	< 165
Chrysene	< 17.6	**20300 J**
Dibenzo(a,h)anthracene	< 17.6	< 165
Dimethyl phthalate	< 17.6	< 165
Di-n-butyl phthalate	< 17.6	< 165
Di-n-octyl phthalate	< 17.6	< 165
Fluoranthene	< 17.6	**31500**
Fluorene	< 17.6	**3320**
Indeno(1,2,3-cd)pyrene	< 17.6	**4870 J**
Phenanthrene	< 17.6	**33900**
Pyrene	< 17.6	**33900**

	1 Primary HSBS1053S10 3/10/2006	1 Primary HSBS1053S05 3/10/2006
Hydrocarbons (NA)		
Diesel Range Organics (C9-C14)	-	-
Diesel Range Organics (C14-C20)	-	-
Diesel Range Organics (C21-C30)	-	-
Gasoline Range Organics (C8-C12)	-	-
Kerosene Range Organics (C12-C14)	-	-
Hydrocarbons (mg/kg)		
Diesel Range Organics (C9-C14)	< 18	< 3.55
Diesel Range Organics (C14-C20)	< 18	< 3.55
Diesel Range Organics (C21-C30)	**39.4**	**9.06**
PCBs (NA)		
Aroclor 1248	-	-
Aroclor 1254	-	-
Aroclor 1260	-	-
SVOC (ug/kg)		
1-Methyl naphthalene	< 18	< 17.6
2-Methylnaphthalene	< 18	< 17.6
Acenaphthene	< 18	< 17.6
Acenaphthylene	< 18	< 17.6
Anthracene	< 18	< 17.6
Benzo(a)anthracene	< 18	< 17.6
Benzo(a)pyrene	< 18	< 17.6
Benzo(b)fluoranthene	< 18	< 17.6
Benzo(g,h,i)perylene	< 18	< 17.6
Benzo(k)fluoranthene	< 18	< 17.6
bis(2-Ethylhexyl) phthalate	**19.1 J**	**12.3 J**
Butyl benzyl phthalate	< 18	< 17.6
Chrysene	< 18	< 17.6
Dibenzo(a,h)anthracene	< 18	< 17.6
Dimethyl phthalate	< 18	< 17.6
Di-n-butyl phthalate	< 18	< 17.6
Di-n-octyl phthalate	< 18	< 17.6
Fluoranthene	< 18	< 17.6
Fluorene	< 18	< 17.6
Indeno(1,2,3-cd)pyrene	< 18	< 17.6
Phenanthrene	< 18	< 17.6
Pyrene	< 18	< 17.6

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SVOCs, TPH, and PCBs Data Results HMSA RFI Site

FIGURE R.3-8A

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

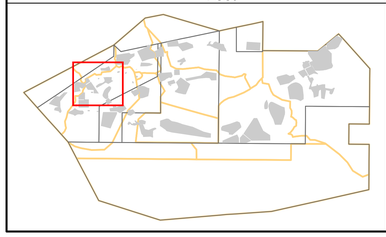
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area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

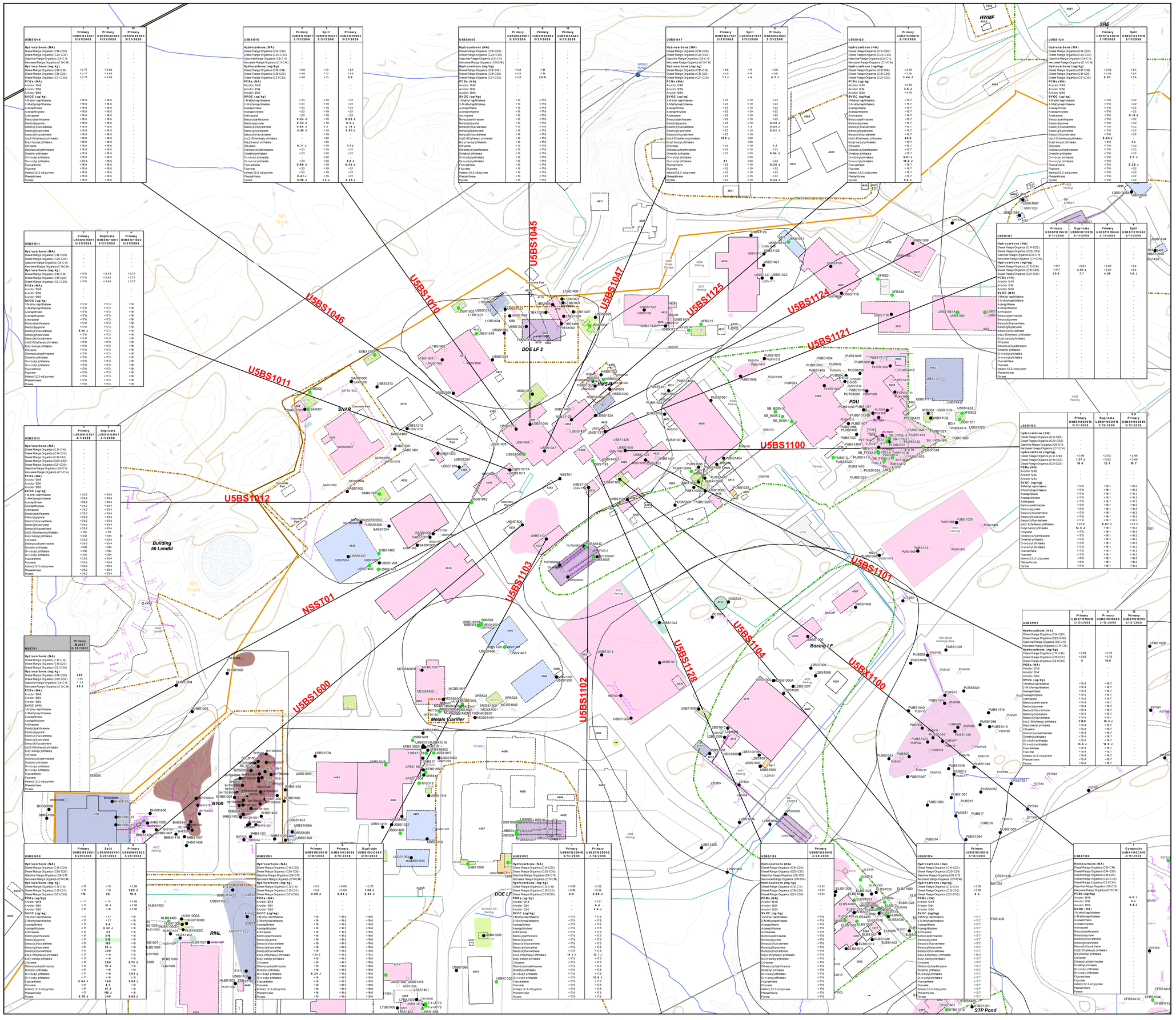
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 140

1 inch equals 70 feet

Feet





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

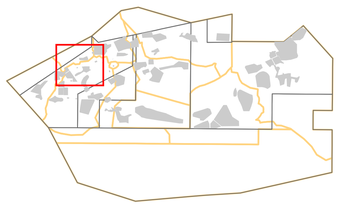
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area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

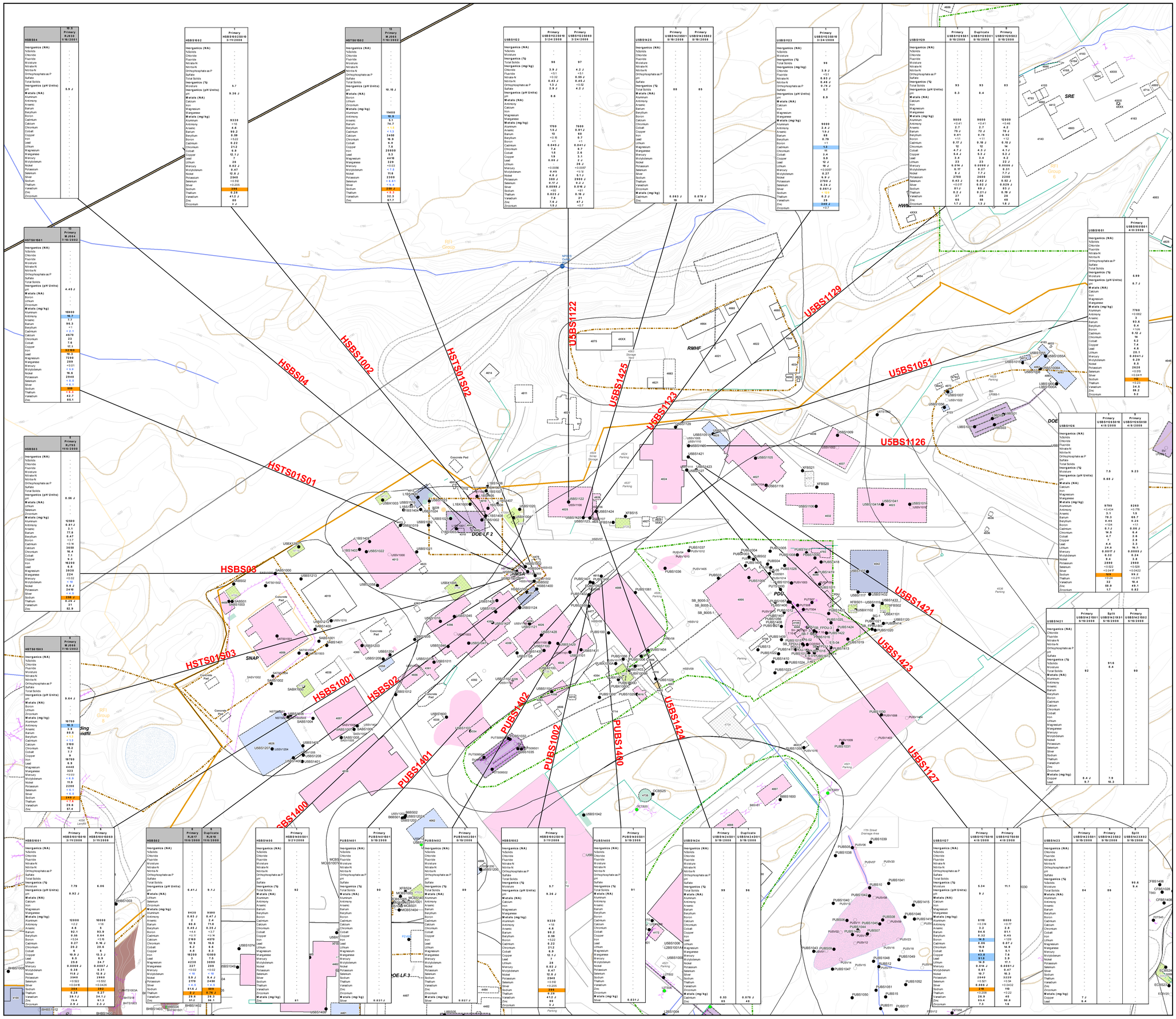
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 70 140

1 inch equals 70 feet

Feet





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Metals and Inorganics Data Results HMSA RFI Site

FIGURE R.3-9A

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

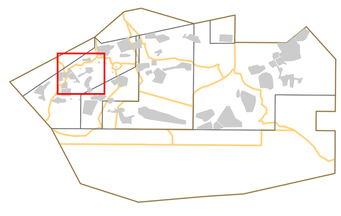
- Building - Existing
- Building - Removed
- Building - Not Yet Determined
- Road - Asphalt
- Roads - Dirt
- Rocks
- Debris
- Multiple Use
- Solvent
- Petroleum
- Oil/PCBs
- Metals
- RFI Site - Boeing
- RFI Site - DOE
- RFI Site - NASA
- Investigation Boundary
- RFI Group Boundary
- Administrative Area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

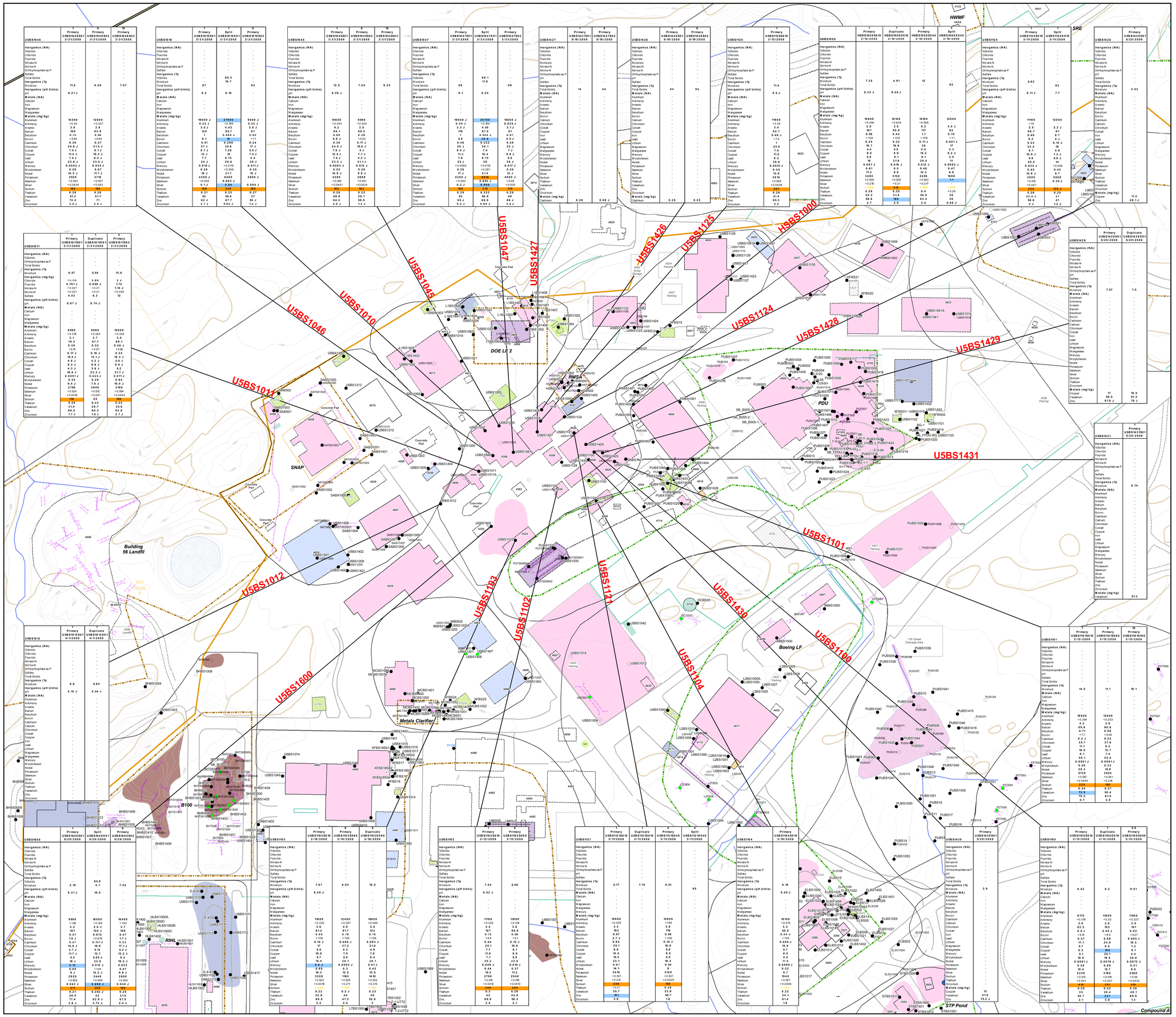
\\MapFiles\RFI_05\RFI_Report\SpiderDiagram\RFIGrp5_SpiderDiagram_EL.mxd

0 70 140

1 inch equals 70 feet

Feet





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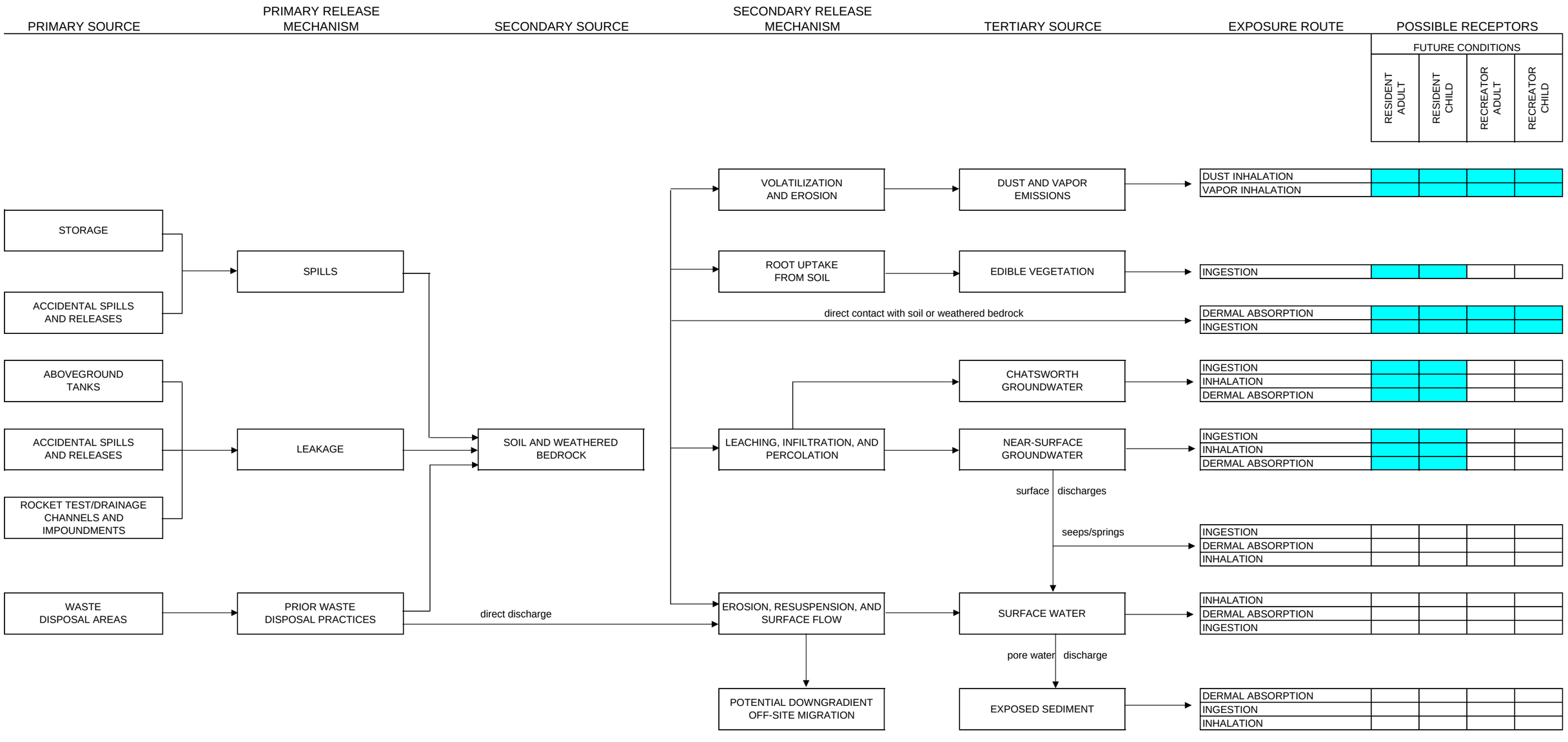
Metals and Inorganics Data Results
HMSA RFI Site

FIGURE R.3-9B

Table R.4-1

Human Health Risk Assessment Conceptual Site Model

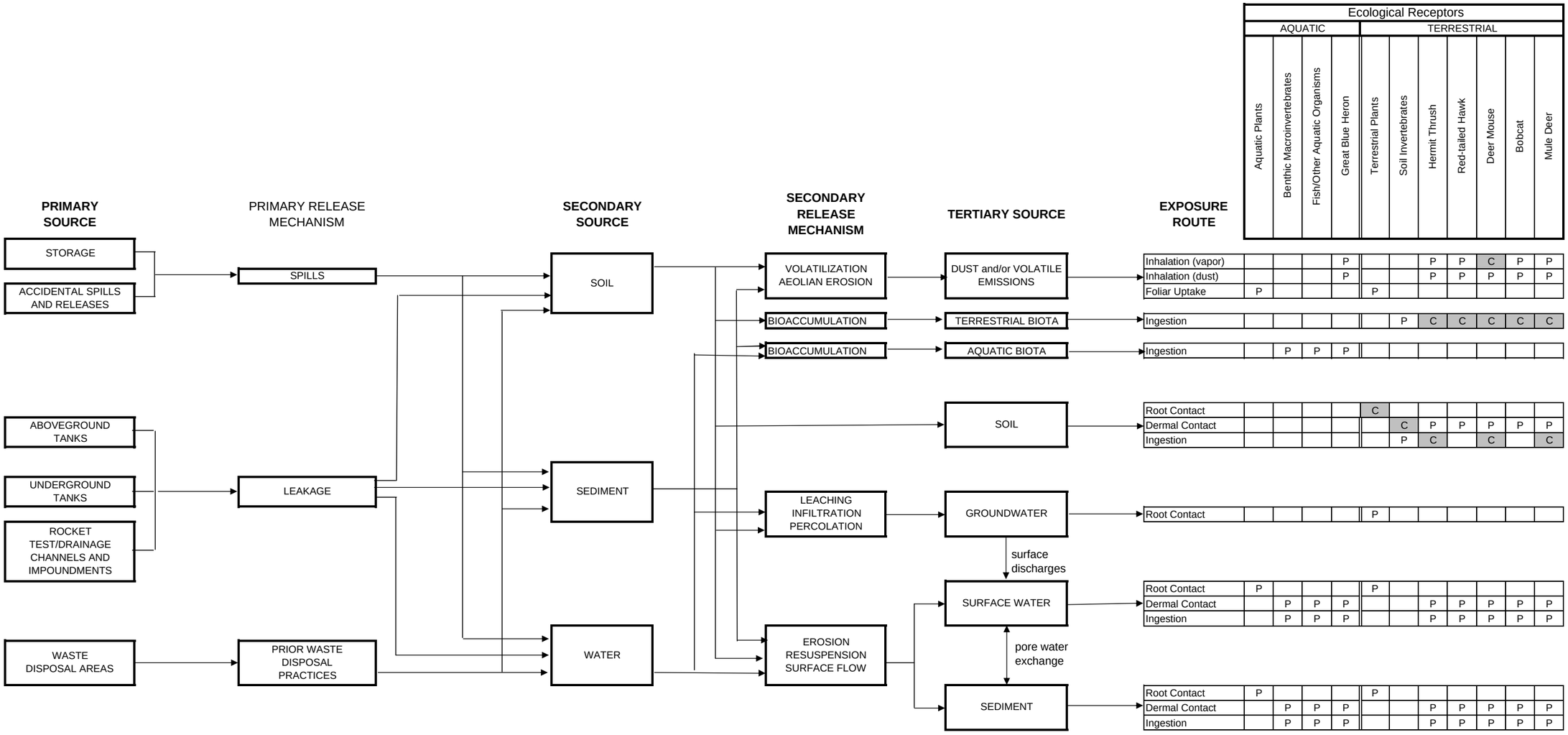
Hazardous Materials Storage Area RFI Site



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



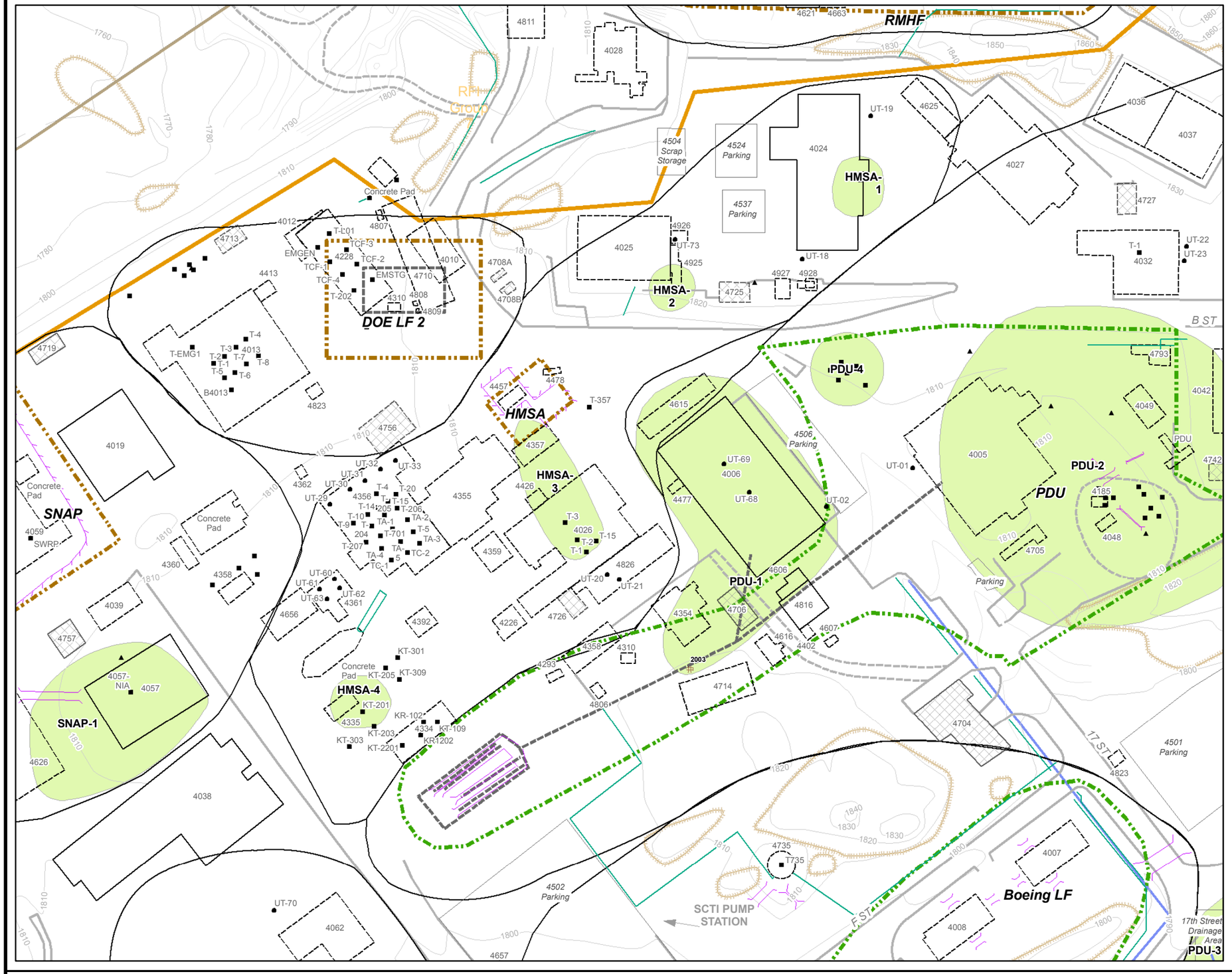
C - Pathway considered complete for purposes of ecological risk assessment

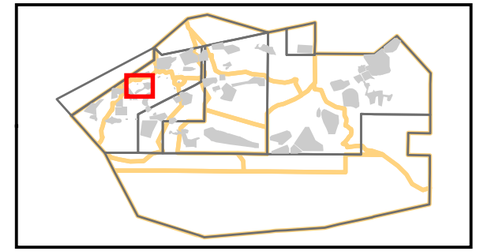
P - Pathway considered potentially complete

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

Pathways evaluated qualitatively or quantitatively in ecological risk assessment

Figure R.4-2
Ecological Conceptual Site Model
Group 5 RFI Report, Hazardous Material Storage Area
Santa Susana Field Laboratory





Basemap Legend

- Transformer Poles
- Tank - UST
- Tank - AST
- Tank - Not Yet Determined
- Excavation
- Leachfield
- Pipe
- Surface Drainage Divide
- Road - Asphalt
- Roads - Dirt
- Rocks
- Streams
- Pond
- Waste Debris Area
- CMS Area
- 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

Surficial Media Site Action Recommendations HMSA RFI Site

Date: September 09, 2008 WORKING DRAFT

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1 inch equals 100 feet

0 100 200 Feet

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Figure R.5-1

Attachments