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*Report*

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

**Volume VII - RFI Site Reports  
Appendix M**

**Building 65 Metals Laboratory Clarifier**

Prepared for:

**The Boeing Company  
and  
United States Department of Energy**

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***DRAFT IN PROGRESS***



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- M-2 Subsurface Information (Electronic Copy)
- M-3 Data Quality, Validation and Laboratory Reports (Electronic Copies)
- M-4 Building Surveys

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# Acronyms and Abbreviations

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

## WORKING DRAFT

### ACRONYMS AND ABBREVIATIONS

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ESL	environmental screening level
ETEC	Energy Technology and 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 ( $\mu\text{g}/\text{kg}$ or $\mu\text{g}/\text{L}$ )

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

## WORKING DRAFT

### ACRONYMS AND ABBREVIATIONS

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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	microsiemens per centimeter
VOC	volatile organic compound
WPA	RFI Work Plan Addendum
WPAA	RFI Work Plan Addendum Amendments

# Appendix M

## M.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 Building 65 Metals Laboratory Clarifier RFI Site at the Santa Susana Field Laboratory (SSFL). The Building 65 Metals Laboratory Clarifier RFI Site contains one Area of Concern (AOC) – the Metals Laboratory Clarifier. The Building 65 Metals Laboratory Clarifier, 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 Building 65 Metals Laboratory Clarifier Site is 1 of 17 RFI sites included in the Group 5 RFI Report. The location of the Building 65 Metals Laboratory Clarifier Site within the SSFL and Group 5 Reporting Area is shown in Figure M.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 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)
- Hazardous Material Storage Area (HMSA) (AOC)
- Rockwell International Hot Laboratory (RIHL) (SWMU 7.7)
- Systems for Nuclear Auxiliary Power Facility (SNAP) (AOC).

The Building 65 Metals Laboratory Clarifier Site is located in the west portion of the Group 5 Reporting Area, north of the DOE LF3 RFI Site, west of the Boeing Area IV Leach Fields RFI Site, southwest of the HMSA and PDU RFI Sites, southeast of the SNAP RFI Site, and east of the Building 100 RFI Site (Figure M.1-1).

The SSFL RFI was conducted to (1) characterize the presence of SSFL-operation-related chemicals in environmental media, (2) estimate risks to human health and the environment

(the ecosystem, that is), and (3) gather data for the next phase of RCRA Corrective Action to support the recommendations included in this RFI Report regarding areas recommended for no further action (NFA), corrective measures study (CMS) areas, and interim stabilization.

The SSFL has been divided into two operable units (OUs) – the Surficial Media Operable Unit (SMOU) and the Chatsworth Formation Operable Unit (CFOU). The Building 65 Metals Laboratory Clarifier Site characterization presented in this appendix comprises data for the SMOU and summaries of the CFOU data. The SMOU includes soil, sediment, surface water, air, biota, and near-surface groundwater (NSGW) at the SSFL. NSGW is defined as groundwater occurring within alluvium or weathered bedrock of the Chatsworth Formation. The CFOU includes Chatsworth Formation bedrock and deeper groundwater that occurs within the unweathered bedrock of the Chatsworth Formation.

### M.1.1 Report Organization

This Building 65 Metals Laboratory Clarifier Site Report provides detailed sampling data and evaluation pertaining to the Building 65 Metals Laboratory Clarifier 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 M.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 M.3 – Nature and Extent of Chemical Impacts.** Presents a summary of SMOU and CFOU characterization information for the Building 65 Metals Laboratory Clarifier Site.
- **Section M.4 – Summary of Risk Assessment Findings.** Presents the results of the human health risk assessment (HRA) and ecological risk assessment (ERA) for the Building 65 Metals Laboratory Clarifier Site. The complete risk assessment is included in Appendix A of the Group 5 RFI Report.
- **Section M.5 – Site Action Recommendations for Building 65 Metals Laboratory Clarifier Site.** Presents a summary of Building 65 Metals Laboratory Clarifier Site areas recommended for either NFA or further evaluation in the CMS. CMS areas recommended for interim measures to prevent contaminant migration are also identified, if any.
- **Section M.6 – References.** Includes a list of cited references.

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

- **Attachment M-1:** Site-specific regulatory agency documents and correspondence.
- **Attachment M-2:** Subsurface information (soil boring, trench, piezometer, and well logs).

- **Attachment M-3:** Data quality, validation and laboratory reports.
- **Attachment M-4:** Building surveys.

Information regarding characterization for the Building 65 Metals Laboratory Clarifier Site is provided in the following figures and tables:

- Figure M.1-1: Presents the location of the Building 65 Metals Laboratory Clarifier Site within the SSFL and the Group 5 Reporting Area.
- Figure M.2-1: Presents a plan view of Building 65 Metals Laboratory Clarifier Site, showing known and potential Chemical Use Areas. Tables M.2-1 through M.2-5 present summaries of buildings, tanks, transformers, other site features, and spills at the site.
- Figure M.2-2: Presents a plan view of the Building 65 Metals Laboratory Clarifier Site, showing soil and vapor sampling locations, and nearby monitoring wells.
- Figures M.2-3A through M.2-3B: Present geologic cross-sections across the Building 65 Metals Laboratory Clarifier Site.
- Figures M.3-1 through M.3-9: Summarize soil and soil vapor sampling at the Building 65 Metals Laboratory Clarifier Site. Soil and soil vapor sampling results are shown on these maps and are listed in Tables M.3-2A and M.3-2B, respectively.

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 Building 65. 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.

## M.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 the 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 Building 65 Metals Laboratory Clarifier Site. It is worth noting that information presented in this 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 NSGW at the SSFL.
  - Distribution, transport, and fate of trichloroethene (TCE) and other chemicals of concern, as well as 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 chemicals of concern in the CFOU.
- Annual and quarterly groundwater monitoring reports, including:
  - Annual Groundwater Monitoring Report (Haley & Aldrich, Inc. [H&A], 2008a).
  - Second Quarter 2007 Groundwater Monitoring Report (H&A, 2007a).
  - Third Quarter 2007 Groundwater Monitoring Report (H&A, 2007b).
  - Fourth Quarter 2007 Groundwater Monitoring Report (H&A, 2008b).
  - First Quarter 2008 Groundwater Monitoring Report (H&A, 2008c).
- Historical Site Assessment (Sapere, 2005). This report contains:
  - Facility descriptions and historical operational information for buildings 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 achieve the data quality objectives (DQOs).
  - Assurance that the project work performed is in accordance with professional standards and regulatory guidelines.

- Building Feature Evaluation and Sampling (MWH, 2008). This standard operating procedure (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

## M.2 Site History, Chemical Use, and Current Conditions

The Building 65 Metals Laboratory Clarifier Site covers approximately 1.7 acres located in the west-central portion of Area IV at the SSFL. The site location within the SSFL is shown in Figure M.1-1, which also shows the Group 5 Reporting Area boundary. The site layout and the locations of chemical use areas are shown in Figure M.2-1. The sampling locations across the site are shown in Figure M.2-2.

During the WPAA, various SWMUs and AOCs within the SSFL were identified. The Building 65 Metals Laboratory Clarifier 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 Building 65 Metals Laboratory Clarifier Site as it is defined in this report (Figure M.1-1).

Based on site inspections, reviews of historical aerial photographs, drawings, and facility maps as well as on interviews with site personnel conducted during the RFI, the Building 65 Metals Laboratory Clarifier Site boundary was defined to include operations associated with the Building 65 Metals Laboratory Clarifier. In addition, facilities or features near the AOC were included for assessment in the RFI. These include Buildings 4062 and 4066, three aboveground storage tanks (ASTs), two underground storage tanks (USTs), and one electrical substation. Known and potential Chemical Use Areas at the Building 65 Metals Laboratory Clarifier Site are shown in Figure M.2-1 and listed in Table M.2-7.

The following sections describe the AOC, site history and operations, chemicals used, and current conditions at the Building 65 Metals Laboratory Clarifier Site.

### M.2.1 SWMUs and/or AOCs at Building 65 Metals Laboratory Clarifier Site

The Building 65 Metals Laboratory Clarifier Site contains one AOC – Building 65 Metals Laboratory Clarifier (Ogden, 2000a). A brief description of the AOC included in this RFI Site Report is presented below.

#### M.2.1.1 Building 65 Metals Laboratory Clarifier (AOC)

Building 4065, constructed in 1963, was used as a Vacuum Test Facility from 1963 until 1972. After 1973, the building was used as the Chemical and Metallographic Analysis Laboratory. Metals preparation and analysis occurred under large fume hoods. Waste fluids from under the hoods were piped to the three-stage clarifier (the Building 65 Metals Laboratory Clarifier) on the south side of the building via belowgrade pipes in a concrete trench. The clarifier measured approximately 4 feet by 12 feet and was approximately 6 feet deep. Clarifier effluent discharged via underground pipe to the Area III Sewage Treatment Plant RFI Site. Building 4065 was demolished in 1999. An electrical substation was located approximately 90 feet east of Building 4065. Specific information for this site feature is presented in Tables M.2-1 through M.2-4.

### M.2.2 Building 65 Metals Laboratory Clarifier Site History

A summary of the site chronology, including descriptions of site operations and investigation activities for Building 65, 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 below. Primary sources of information are summarized in Section M.1.2.

### M.2.2.1 Site Chronology

A summary of key historic investigation activities is presented in Tables M.2-6. A more detailed description of the Building 65 Metals Laboratory Clarifier Site is presented below.

#### M.2.2.1.1 1963 through 1999

The Building 65 Metals Laboratory Clarifier Site RFI Site buildings were used in support of the DOE Energy Technology Engineering Center (ETEC) program. Building 4065 was initially used as a Vacuum Test Facility, and, in 1973, operations were converted to a Chemical and Metallographic Analysis Laboratory. Buildings 4062 and 4066 were non-nuclear support buildings for the ETEC program, serving as a non-nuclear reactor qualification test building (4062) and an instrument repair and calibration building (4066). All buildings at the site were demolished in 1999.

#### M.2.2.1.2 1998

Tank UT-70 was a fuel oil tank associated with an emergency generator in Building 4062. In 1998, the tank was removed, and soil sampling was conducted to determine potential soil impacts. No impacts to site soil were detected.

#### M.2.2.1.3 2000 through 2001

The Building 65 Metals Laboratory Clarifier Site soil, soil vapor, clarifier sludge, and sediments were initially investigated to characterize chemicals of potential concern (COPCs). Volatile organic compounds (VOCs) were detected in the site soil vapor, and mercury measuring greater than background was detected in downslope surface soil.

#### M.2.2.1.4 Post 2000

Characterization at Building 65 Metals Laboratory Clarifier Site was conducted during an RFI event, which included soil vapor and soil sampling at the south end of Building 4065, the former clarifier, and former UST UT-76 (former fuel oil tank located directly east of the clarifier).

### M.2.2.2 Site Inventories

Inventories of buildings, tanks, transformers, and chemicals used at the Building 65 Metals Laboratory Clarifier 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 M.2-1. The inventories are included in the following tables:

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

### M.2.3 Building 65 Metals Laboratory Clarifier Site Chemical Use Areas

Chemical Use Areas are locations where chemicals were documented to have been (or potentially have been) used, stored, spilled, discharged, and/or disposed of. Based on the review of historical documents, seven Chemical Use Areas were identified within the Building 65 Metals Laboratory Clarifier Site boundary. Chemicals that were potentially used or stored in these chemical use areas include VOCs, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals. Chemical Use Areas at the Building 65 Metals Laboratory Clarifier Site are shown in Figure M.2-1 and listed in detail in Table M.2-7.

### M.2.4 Site Conditions

This section provides summaries of site conditions near Building 65, including topography, geology, soil, groundwater, surface water, and biology.

#### M.2.4.1 General Conditions and Topography

The Building 65 Metals Laboratory Clarifier Site is located within the west-central portion of Area IV. The site is currently inactive, with no remaining structures. Current surface elevations at the Building 65 Metals Laboratory Clarifier Site are relatively flat at approximately 1800 feet mean sea level (msl) across the site. A summary site conceptual model is presented in Table M.2-8. Figure M.2-3B presents a cross-section developed for the Building 65 Metals Laboratory Clarifier Site (Surficial Cross Section V-V'), detailing topography, locations and depths of alluvium, and the most recent available groundwater elevations. The location of the cross-section is shown in Figure M.2-3A.

#### M.2.4.2 Geology

The Building 65 Metals Laboratory Clarifier Site is located north of the Coca Fault, near the Expandable Launch Vehicle (ELV) and Lower Burro Flats Members of the Upper Chatsworth Formation to the north of the fault (Dibblee, 1992; MWH, 2002 and 2007C).

Beds of the ELV and Lower Burro Flats Members generally strike N70°E and dip 25°NW. The ELV Member is predominantly composed of interbedded fine-grained sandstone, siltstone, and shale. The Lower Burro Flats Member is predominantly composed of medium- to fine-grained sandstone with significant 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 of the Group 5 RFI Report. Additional geologic information is presented in Appendix B of the Group 5 RFI Report.

#### M.2.4.3 Soil

Throughout most of the Building 65 Metals Laboratory Clarifier Site, soil depths vary, typically ranging from less than 4.5 feet to greater than 12 feet thick. A map depicting the distribution of alluvial soil within the Group 5 Reporting Area is provided in Figure 2-4 in the Group 5 RFI Report (Volume I). Soil in the undisturbed areas of the site consists of weathered Chatsworth formation materials, which are primarily fine-grained silty sands, silts, silts with sand, silty sands, sandy lean clays, clayey sands and poorly graded sands. Soil boring logs are included in Attachment M-2 to this appendix.

#### M.2.4.4 Groundwater

The groundwater system and monitoring network in RFI Group 5 is discussed in detail in Appendix B of the Group 5 RFI Report. In that appendix, Figure B-4 shows the locations of wells and piezometers that are used to monitor groundwater at and near Building 65. Figure M.2-1 shows locations of wells in and around the Building 65 Metals Laboratory Clarifier Site; no piezometers, shallow wells, or Chatsworth Formation wells are present within the site boundaries.

NSGW is likely vertically continuous with the CFOU groundwater in the Building 65 Metals Laboratory Clarifier 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. While there are no wells screened in the NSGW within the Building 65 Metals Laboratory Clarifier Site, data for nearby wells indicate that NSGW is encountered at an approximate depth of 19 feet below ground surface (bgs) (1782 msl) based on measurements taken south of Building 65 Metals Laboratory Clarifier Site at piezometer PZ-005 (located at the DOE Leach Fields 3 RFI Site) and that NSGW groundwater flows to the southeast at a gradient of approximately 0.025 foot/foot (ft/ft). The occurrence of NSGW in the Building 65 Metals Laboratory Clarifier Site area is shown in plan view in Figure B-7 in Appendix B of the Group 5 RFI Report. Further information related to NSGW at the Building 65 Metals Laboratory Clarifier Site is presented in Appendix B of the Group 5 RFI Report.

While there are no wells screened in the CFOU within the Building 65 Metals Laboratory Clarifier Site, data for nearby wells indicate that CFOU groundwater is located at depths ranging from 12 feet bgs (1797 feet msl) to 20 feet bgs (1787 feet msl) based on measurements taken northeast of Building 65 Metals Laboratory Clarifier Site at well RD-29 (located at the PDU RFI Site). Water level data from Chatsworth Formation wells suggest a SW-NE trending divide may occur within CFOU Groundwater in the vicinity of Building 4065. This results in CFOU Groundwater flow to the northwest within the Upper Burro Flats Member and to the southeast within the Lower Burro Flats member. The occurrence of CFOU Groundwater in the Building 65 Metals Laboratory Clarifier Site area is shown in plan view in Figure B-8 in Appendix B of the Group 5 RFI Report. Further information related to CFOU groundwater at the DOE LF3 RFI Site is presented in Appendix B of the Group 5 RFI Report.

#### M.2.4.5 Surface Water

Surface water flow at and in the vicinity of the Building 65 Metals Laboratory Clarifier Site is shown in Figure 2-7 of the Group 5 RFI Report (Volume I). Surface water may exist intermittently at the Building 65 Metals Laboratory Clarifier Site as the result of seasonal precipitation events. No surface waters or major storm drainages are present at site. Topography is nearly level onsite; therefore, stormwater runoff migrates via sheet flow generally to the south and east.

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

#### M.2.4.6 Biology

In April 2008, a reconnaissance-level biological survey was conducted at the Group 5 RFI Sites. Biological conditions at the SE Drum Yard, including habitat/vegetation types, 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, of the Group 5 RFI Report.



## M.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 Building 65 Metals Laboratory Clarifier 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 VOC migration from groundwater and subsurface soil to soil vapor, and soil vapor to indoor and ambient air
- Group 5 RFI Report (Volume III), Appendix B, Groundwater Characterization – Potential migration from soil to groundwater, and groundwater migration

### M.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). Based on the review of historical documents summarized in Section M.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 set out in the Group 5 DQOs as summarized in the Group 5 RFI Report, Section 4.0 (Volume 1).

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

- Additional information regarding site use and observed site conditions
- Site sampling results and data trends
- Knowledge of chemical properties (such as, mobility, volatility, 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 M.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).

### M.3.2 Sampling Scope

A total of 45 soil matrix samples and 8 soil vapor samples was collected to assess potential impacts associated with the Chemical Use Areas at the Building 65 Metals Laboratory Clarifier Site. Out of those samples, 34 soil matrix and 6 soil vapor were collected between March 2008 and April 2008. Sampling locations and analytical suites were based on sampling results from previous investigations, additional facility information obtained from historical records, site inspections and/or personnel interviews, and historical and/or aerial photographs. Sampling schedules are presented in Tables M.3-1A and M.3-1B. Sample locations are shown in Figure M.2-2.

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, assessment of the performance of each laboratory, and a qualitative review of the precision, accuracy, representativeness, reliability, and completeness parameters for the datasets collected for this RFI. A summary of the data quality evaluation is presented in Attachment M-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 Building 65 Metals Laboratory Clarifier Site are described by media in the subsections that follow.

This report presents results of media sampling conducted, if the media exists at the RFI site, during the RFI and previous investigations at Building 65 Metals Laboratory Clarifier Site, including the following:

- Soil vapor
- Soil matrix
- Groundwater
- Surface water

### M.3.3 Key Decision Points

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

Site-specific characterization decision points are described in Table M.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).

### M.3.4 Soil Matrix and Soil Vapor Findings

Results of soil and soil vapor sampling and characterization findings are summarized in Table M.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 characterization and assess whether further sampling is warranted.
3. For areas recommended for CMS, indicate that soil 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 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 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 Building 65 Metals Laboratory Clarifier Site is provided in Tables M.3-3A and M.3-3B.

#### M.3.4.1 Soil and Soil Vapor Data Presentation

The results by chemical group are summarized in Figures M.3-1 through M.3-4. Relevant site information, sampling rationale, analytical results, and evaluation of results are presented in Table M.3-2A. This table discusses the sampling approach for each Chemical Use Area and a brief summary of the sampling results by chemical group, including:

- Column 1 - Chemical use number.
- Column 2 - Chemical Use Area name.
- Column 3 - Chemical group sampled in a particular Chemical Use Area.
- Column 4 - Sampling scope and rationale for each chemical group in a particular Chemical Use Area.
- Column 5 - Abbreviated summary of sampling results for soil and soil vapor by each chemical group in a particular Chemical Use Area. (A more detailed sitewide summary is presented in Section M.3.4.2 below.) As appropriate, sample results are compared to established SSFL background concentrations (metals and dioxins only) and/or SSFL

risk-based screening levels (RBSLs).<sup>1</sup> The screening levels are also displayed in Tables M.3-3A and M.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 characterization is sufficient to estimate soil volumes (within a factor of 10) for areas that require further consideration in the CMS (if needed).

### M.3.4.2 Soil and Soil Vapor Data Summary

As detailed in Table M.3-2A, seven individual confirmed and potential Chemical Use Areas were investigated at the Building 65 Metals Laboratory Clarifier Site. A summary of the chemicals detected above screening criteria is provided below by chemical analytical group. Concentrations denoted with a “J” flag indicate the results are estimated below the method reporting limits.

#### M.3.4.2.1 Volatile Organic Compounds

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

Soil vapor sampling was attempted at one additional location (Figures M.2-2 and M.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.

- Toluene was detected above the Ecological RBSL of 0.084 micrograms per liter ( $\mu\text{g}/\text{L}$ ) in two samples collected from U5SV1202 at a depth of 3.5 to 4.5 feet bgs ( $0.21 \mu\text{g}/\text{L}$ ) (screening sample at Former UST UT-70) and U5SV1200 at a depth of 4 to 5 feet bgs ( $0.17 \mu\text{g}/\text{L}$ ) (screening sample at Building 4066). No VOCs were detected in soil samples collected at these locations.
- Benzene, ethylbenzene, tetrachloroethene (PCE), trichloroethene (TCE), and xylenes were detected at concentrations that did not exceed their respective RBSLs.

A total of 15 soil samples was collected at nine locations and analyzed for VOCs. Of the 15 samples, 5 samples had detectable levels of VOCs, and results are presented in Figures M.3-1B and M.3-7.

- Benzene was detected above the Residential RBSL of  $0.13 \mu\text{g}/\text{kg}$  in one sample collected from U5BS1201 at a depth of 0 to 1 foot bgs ( $0.6 \text{ J } \mu\text{g}/\text{kg}$ ) (screening sample location at Building 4062). Benzene was not detected in the split sample collected from 0 to 1 foot bgs nor was it detected in the deeper soil sample collected at this boring location (5 to 6

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<sup>1</sup>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.

feet bgs). In addition, benzene was not detected in soil vapor samples collected at this location.

- Acetone, methylene chloride, styrene, and PCE were detected at concentrations that did not exceed their respective RBSLs.

The VOC detections described above occurred at several single-point screening locations at the site. However, based on the generally low concentrations observed, further characterization is not recommended for VOCs in soil and soil vapor at the Building 65 Metals Laboratory Clarifier Site.

#### M.3.4.2.2 Semivolatile Organic Compounds

A total of 13 soil samples was collected at nine locations and analyzed for SVOCs. Of the 13 samples, 4 samples had detectable levels of SVOCs, and results are shown in Figures M.3-2 and M.3-8.

- Bis(2-ethylhexyl) phthalate and di-n-octyl phthalate were detected at concentrations less than their respective RBSLs. Further characterization of SVOCs in soil is not recommended at the Building 65 Metals Laboratory Clarifier Site.
- Out of the 13 samples collected, three had detectable levels of polynuclear aromatic hydrocarbons (PAHs).
  - 2-Methylnaphthalene, benzo(a) anthracene, benzo(b)fluoranthene, benzo(ghi)perylene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene were detected at concentrations that did not exceed their respective RBSLs.

Further characterization of PAHs in soil is not recommended at the Building 65 Metals Laboratory Clarifier Site.

#### M.3.4.2.3 TPH

A total of 17 soil samples was collected at 12 locations and analyzed for TPH. Of the 17 samples, 6 samples had detectable levels of TPH. TPH results are presented in Figures M.3-3 and M.3-8.

- Gasoline range hydrocarbons (C8-C11) were detected above the residential RBSL of 1.1 milligrams per kilogram (mg/kg) in two samples collected downslope from the Building 65 metals clarifier. At MCBS01, the concentration was 2.5 J mg/kg in the sample collected from 0 to 0.5 feet bgs. During a subsequent sampling event at this approximate location, no TPH was detected in a soil sample collected at 3.5 feet bgs (MCBS1404). At MCBS1007 (screening sample location at Building 4065), gasoline range hydrocarbons were detected in the soil sample collected at 5 to 6 feet bgs at (1.3 J mg/kg). However, no VOCs were detected in this soil sample. No soil vapor samples were able to be collected at this location due to low flow during sample collection attempts.
- Diesel range hydrocarbons (C14-C20) were detected above the residential RBSL of 1,400 mg/kg in the sample collected at 5 feet bgs from MCTS01S02 (1,500 mg/kg) at the former Building 65 clarifier location. However, no VOCs or SVOCs were detected at this location.

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

No additional characterization for TPH in soil is required at the Building 65 Metals Laboratory Clarifier Site.

#### M.3.4.2.4 Polychlorinated Biphenyls

Two soil samples were collected at two locations and analyzed for PCBs (see to Figure M.3-4). PCBs were not detected in either sample and further characterization for PCBs in soil is not recommended at the Building 65 Metals Laboratory Clarifier Site.

#### M.3.4.2.5 Metals/Inorganic Compounds

A total of 28 soil samples was collected at 19 locations and analyzed for metals. At least one or more metals were detected in all but two sampling locations, and results are shown in Figures M.3-5 and M.3-9.

- Concentrations of mercury, selenium, and zinc were detected above their respective background concentrations and Ecological RBSLs.
  - Mercury (background concentration of 0.09 mg/kg, Ecological RBSL of 0.1 mg/kg) was detected at concentrations ranging from 0.0042 J mg/kg to 2.2 J mg/kg. Mercury was detected above background and Ecological RBSLs in three samples collected from MCBS01 at a depth of 0 to 0.5 feet bgs (0.12 mg/kg), MCBS1004 at a depth of 0 to 1 foot bgs (0.137 mg/kg), and MCBS1005 at a depth of 0 to 1 foot bgs (2.2 mg/kg). All three exceedances occurred in surface soil samples downslope (east) from the former Building 65 metals clarifier. Mercury concentrations did not exceed background or the RBSLs in lateral step-out samples from these locations nor in the deeper samples collected at these locations. Therefore, further characterization of mercury in soil at the Building 65 Metals Laboratory Clarifier Site is not recommended.
  - Selenium (background concentration of 0.655 mg/kg, Ecological RBSL of 0.17 mg/kg) was detected at concentrations ranging from 0.4 J mg/kg to 1.1 mg/kg. Selenium was detected above background and Ecological RBSL in one sample collected from U5BS1201 at a depth of 5 to 6 feet bgs (1.1 mg/kg) (screening sample location collected at Building 4062). Selenium was not detected in the surface soil sample (0 to 1 foot bgs) or in the sample collected from 9 to 10 feet bgs at this location. Therefore, it is unlikely that the selenium observed at 5 feet bgs is indicative of a release at this location, and further characterization of this metal is not recommended.
  - Zinc (background of 110 mg/kg, Ecological RBSL of 21 mg/kg) was detected at concentrations ranging from 10.3 mg/kg to 283 J mg/kg. Zinc was detected above background and Ecological RBSL in one sample collected from MCBS1000 at a depth of 0 to 1 foot bgs (283 J mg/kg) (screening sample located in the southeast corner of former Building 4065). The zinc concentration in the deeper sample collected at this location (54.8 mg/kg) did not exceed background, indicating the extent of zinc above

background does not extend vertically. In addition, no elevated zinc concentrations were detected in the soil samples collected in the four borings adjacent to MCBS1000. Therefore, further characterization of zinc at the Building 65 Metals Laboratory Clarifier Site is not recommended.

- Metals detected above background (but below their respective RBSLs) include sodium. Background concentrations for metals are included in Table M.3-3A. Sodium was detected at concentrations ranging from 62.9 J mg/kg to 1,950 J mg/kg. RBSLs for sodium have not been established.
- Perchlorate was not found to have been previously used at the Building 65 Metals Laboratory Clarifier Site and was not included for analysis at any sampling locations.

#### M.3.4.2.6 Dioxins

Dioxins were not identified as COPCs for the Building 65 Metals Laboratory Clarifier Site. Therefore, no soil samples were analyzed for dioxins.

#### M.3.4.2.7 Energetics

One soil sample was collected and analyzed for energetics. No detectable levels of energetics were observed (refer to Figure M.3-6). Further characterization for energetics in soil is not recommended at the Building 65 Metals Laboratory Clarifier Site.

### M.3.5 Groundwater Findings

There are no monitoring wells installed in NSGW or the CFOU at the Building 65 Metals Laboratory Clarifier Site. It is possible that shallow groundwater at the Building 65 Metals Laboratory Clarifier Site has been impacted by the due to the site activities. Metals and TPH in particular for the compounds detected above RBSLs may be mobile enough in the subsurface to have impacted groundwater. However, because the concentrations are relatively low and the impacts in soil are not wide-spread, it is not likely that there was a release of sufficient magnitude to have impacted shallow groundwater. Potential impacts to NSGW and CFOU groundwater will be addressed in the site-wide groundwater RFI and subsequent CMS. The groundwater system and monitoring network in RFI Group 5 are discussed in detail in Appendix B of the Group 5 RFI Report.

### M.3.6 Surface Water Findings

Surface water may exist intermittently at the Pond Building 65 Metals Laboratory Clarifier Site primarily as a result of seasonal precipitation events. There have been no RFI and NPDES surface water samples collected at the site.

Soil within the site is not likely impacted by upgradient sites via surface water transport, since no sites are located upgradient of the Building 65 Metals Laboratory Clarifier Site. It may be possible for the near-surface soil to become mobilized during storm events and subsequently deposited at downstream sites, including DOE Leachfield 3, STL-IV, the drainage south of the Compound A Facility, and ultimately the R-2 Ponds. However, the relatively flat topography and lack of defined drainages, makes the movement of impacted

soil from the Building 65 Metals Laboratory Clarifier Site downgradient via surface water transport unlikely.

## M.4 Risk Assessment Findings

The objective of this risk assessment (RA) is to determine whether the Building 65 Metals Laboratory Clarifier Site could pose unacceptable risks that might require remedial action, or if this area is eligible for an NFA designation.

The following sections summarize the findings of the HRA and ERA performed for the Building 65 Metals Laboratory Clarifier. 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 A10, of the Group 5 RFI Report.

### M.4.1 Key Decision Points

Site-specific key decision points for the HRA and ERA are listed below and described more fully in Appendix A and Attachment A10 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 (soil 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.
  - 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 Building 65 Metals Laboratory Clarifier 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.

### M.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 Building 65 Metals Clarifier Site. A conceptual site model diagram for human health risk assessment is presented in Figure M.4-1, and a summary of COPCs and risk estimates for human health are presented in Table M.4-1 and Table M.4-2 respectively. Results of the risk characterization indicated the following:

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

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 Building 65 Metals Clarifier Site are presented in Table M.4-3.

### M.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 risk assessment is presented in Figure M.4-2, and a summary of chemicals of ecological concern (COECs) and ecological risk estimates is presented in Table M.4-4. Results of the risk characterization indicated the following:

- Soil – No COECs. None of the COECs exceeded the low or high toxicity reference value (TRV) under either the CTE or RME scenario.
- Soil Vapor – No COECs. No chemicals exceeded soil vapor TRVs. 1,1,2-Trichloroethane was the only chemical with estimated risks to burrowing small mammals. However, it was never detected and was evaluated at the sample quantification limit (SQL). There were no estimated risks from other similar VOCs, and it is most likely that 1,1,2-trichloroethane was not present at the SQL concentration.

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 Building 65 Metals Clarifier Site are presented in Table M.4-5.

#### M.4.4 Risk Assessment Conclusions for the Building 65 Metals Laboratory Clarifier Site

This section presents the overall conclusions for Building 65 Metals Laboratory Clarifier 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 to Building 65 Metals Laboratory Clarifier Site include the former clarifier site, two former USTs sites, and a former electrical substation location, as well as the former locations of Buildings 4062, 4065, and 4066 where chemical uses are known or suspected to have occurred.

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. Soil samples were collected and analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics. Data were considered adequate to evaluate potential risks. No COCs were identified in soil and soil vapor for human health. No COECs were identified in soil and soil vapor for ecological receptors.

NSGW was not evaluated for the Building 65 Metals Clarifier Site. Chatsworth groundwater will be addressed as part of the Chatsworth Formation OU.



## M.5 Building 65 Metals Laboratory Clarifier Site Action Recommendations

This section presents a summary of RFI reporting requirements as applicable to the Building 65 Metals Clarifier Site. Section M.5.1 describes the RFI reporting requirements, particularly with respect to the identification of areas recommended for further work, or “site action” recommendations. The process and criteria used for making site action recommendations are described in Section M.5.2. Site action recommendations for the Building 65 Metals Clarifier Site are summarized in Sections M.5.3, M.5.4, and M.5.5.

### M.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 (1) present findings regarding the above information, (2) describe completeness of the investigation, and (3) indicate if additional work is needed.

The Building 65 Metals Clarifier Site 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 M.3-2A and M.3-2B). Section F.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 Building 65 Metals Laboratory Clarifier Site (Section M.4 and Appendix A).
4. Identifying Building 65 Metals Laboratory Clarifier Site areas requiring further work , as appropriate (this section).

### M.5.2 Basis for Site Action Recommendations

In summary, site action recommendations included in the Building 65 Metals Clarifier Site Report identify areas for the following:

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

Site action recommendations are based on the characterization and risk assessment findings. Characterization findings provide definition of the nature and extent of site contaminants, based on chemical data and transport and fate evaluation. Risk assessments evaluate characterization data, estimate human health and ecological risks based on specified land use scenarios, and identify chemicals that drive or contribute to those risks.

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

### M.5.2.1 CMS and NFA Site Action Evaluation Process

CMS or NFA site action recommendations are based on a 4-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 USEPA or DTSC as guidance for site managers (DTSC, 1992; USEPA, 1992). The low end of the risk range (i.e.,  $1 \times 10^{-6}$ , 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  $1 \times 10^{-6}$  (cancer risks) or HI values are greater than 1 (noncancer and ecological risks), the RFI site’s 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 may affect the findings. For example, some chemicals are assumed to be present in soil based on TPH extrapolation factors (e.g., 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 may 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 M.5-1.

Two additional aspects of RFI reporting will serve to confirm and/or finalize the areas recommended in Group RFI Reports for evaluation in the CMS. The first is an ecological evaluation for large-home range receptors (e.g., mule deer and hawk). The second is a

groundwater evaluation that will be reported in the Site-Wide Groundwater Report. Updates to this report will be prepared as needed.

### M.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) soils
- Proximity of surficial impacts to an active surface water drainage pathway
- Moderate to steep topography
- Absence of containment features (e.g., surface coatings, 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 may 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).

### M.5.3 CMS Site Action Recommendations

Based on the findings presented in this RFI report, the entire Building 65 Metals Laboratory Clarifier Site is recommended for an NFA designation. No corrective measures studies are recommended for this site.

### M.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, and the results of human health and ecological risk assessments performed for the site, the entire Building 65 Metals Laboratory Clarifier Site is appropriate for an NFA designation. The sections below summarize the historical uses, the sampling data collected, and the results of the HRA and ERA for the site.

#### M.5.4.1 Historical Uses

CH2M HILL performed a detailed review of all available historic 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 Building 65 Metals Laboratory Clarifier Site. Available records do not

indicate that chemicals were used, stored, or released at locations outside the Chemical Use Areas identified during the review of historical records. The Chemical Use Areas were subject to site investigation, sample collection, and analysis. Consequently, all suspect areas of the Building 65 Metals Laboratory Clarifier Site were investigated and the findings presented and considered herein.

The area recommended for NFA includes the entire Building 65 Metals Laboratory Clarifier Site, which includes the following Chemical Use Areas:

- Chemical Use Area 1 - Building 4065 Metals Clarifier
- Chemical Use Area 2 - Building 4065
- Chemical Use Area 3 - Former UST UT-76
- Chemical Use Area 4 - Former UST UT-70
- Chemical Use Area 5 - Substation 4762
- Chemical Use Area 6 - Building 4066
- Chemical Use Area 7 - Building 4062

Available historical documentation indicates that operations at the Chemical Use Areas identified above might 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. Sampling data are summarized in the following section.

#### M.5.4.2 Sampling and Analysis Results

As presented in Section M.3, RFI sampling was performed at the former locations of the Building 65 metals clarifier location; Buildings 4062, 4065, 4066, and 4806; Substation 4762; and USTs UT-70 and UT-76. Soil and soil vapor samples were collected and analyzed for VOCs, and samples were collected and analyzed for SVOCs, petroleum hydrocarbons, metals, inorganics, PCBs, and energetics.

At the former clarifier location, an elevated diesel-range hydrocarbon concentration was reported during a previous investigation. However, subsequent sampling in the area indicated no elevated VOC concentrations in soil or soil vapor, and no elevated SVOC concentrations in soil. In addition, mercury was detected in surface soil samples collected downslope (east) of the former clarifier location at a concentration greater than background and the Ecological RBSL. However, subsequent sampling defined the mercury exceedances as being limited to a small surface soil area. In addition, none of the detected concentrations resulted in unacceptable human health or ecological risks.

Trace level VOC and gasoline-range hydrocarbon detections occurred at several single-point screening locations at the site. However, the concentrations were generally low and none of the detections resulted in unacceptable human health or ecological risks.

Therefore, although there is documentation of chemicals being used and/or stored in the buildings and process areas throughout the Building 65 Metals Laboratory Clarifier Site, there are no indications of significant impacts from previous site activities.

#### **M.5.4.3 Risk Assessment**

Finally, the estimated lifetime cancer risk (ELCR) and hazard index (HI) values for all human exposure scenarios are less than  $1 \times 10^{-6}$  and 1, respectively. Ecological hazard indexes are less than 1 for all endpoint species evaluated. Based on these results, an NFA designation is appropriate for the entire Building 65 Metals Laboratory Clarifier Site.

#### **M.5.5 Source Area Stabilization Site Action Recommendations**

Due to the lack of defined drainages, it is not likely that impacted soil at the Building 65 Metals Laboratory Clarifier Site would become mobilized in a storm event. Also, the near-surface soil that could possibly be mobilized in a large storm event does not pose a significant threat to downstream receptors. Therefore, stabilization measures are recommended for the Building 65 Metals Laboratory Clarifier Site.



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**Tables**

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**Table M.2-1**  
**Building Inventory**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Building Number	Start (Year)	End (Year)	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
4062	1963	1999	<p>Non-nuclear support building for the ETEC program, serving as a storage facility for instrument calibration.</p> <p>Non-Nuclear Reactor Qualification Test Building. Provides for environmental testing, acceptance testing, and life testing of reactor sub-assemblies, components, and radiation shields. Four environmental vacuum chambers with vacuum pumping equipment below the operating floor provide simulated space environment. An instrumentation room for test control and recording instruments and a test assembly area complete the building.</p>	7		Sapere, 2005; Atomics International, 1963
4065	1963	1999	<p>6,300 square foot building constructed in 1963. From 1963-1972, used as a Vacuum Test Facility (Sapere, 2005). No chemical use reported (MWH, 2003 &amp; Hardy, 2002).</p> <p>After 1973, used as Chemical and Metallographic Analysis Laboratory. Metals preparation and analysis occurred under large hoods. Disposed fluids used under hoods piped to the 3-stage clarifier (Bldg 65 clarifier) via below grade pipes in a concrete trench.* Building demolished in 1999.</p> <p>Chemicals used post-1973 consisted of compressed gases, solvents (including 1,1,1-TCA and TCE), acids, bases, and metals. Per Nelson, 1999 (MWH RFI Report), only small quantities of solvents used in operations.</p> <p>Also, per HDMS, kerosene (for metallographic mounts) and acetone (other work) have been used and emptied into the drains.</p>	2		Ogden, 2000; Sapere, 2005; MWH, 2003; Rockwell International, 1989a; Rockwell International, 1989b
4066	1963	1999	<p>Instrument Repair and Calibration Building (Instrument Lab). Used for calibrating and testing non-radiological equipment.</p> <p>Available records do not specify chemical use in the building. However, small quantities of hazardous substances may have been used. In March 1989, an "unknown quart of liquid" was found at the building; no release was reported. On September 3, 1991, an emergency response to a battery acid leak at the building was reported. A battery was reportedly overcharged and overflowed. No information was available regarding the specific location or estimated quantity involved (likely a small volume given the document indicates a single battery was involved). Cooling tower located at Building 4065.</p>	6		Sapere, 2005; Rockwell International, 1989c; SSFL Control Center, 1991; Rockwell International, 1990
4806	1962	Unknown	Time Clock for personnel	NA	No chemical uses based on available information on	Sapere, 2005

**Table M.2-2  
Tank Inventory  
Building 65 Metals Laboratory Clarifier RFI Site**

Tank ID	Location	Size (gallons)	Contents	Use Period	Use Status	Regulatory Closure Status	Additional Information	Chemical Use Area Number	Comments	Reference
<b>Aboveground Tanks</b>										
Unknown #1	West of Building 4062	1,000	Liquid Nitrogen	Unknown	Inactive	Regulated under Corrective Action	Carbon Steel Tank	7		Rockwell International, 1992.
Unknown #2	West of Building 4062	550	Water	Unknown	Inactive	Regulated under Corrective Action	Carbon Steel Tank	7		Rockwell International, 1992.
Unknown #3	West of Building 4062	550	Water	Unknown	Inactive	Regulated under Corrective Action	Carbon Steel Tank	7		Rockwell International, 1992.
<b>Underground Tanks</b>										
UT-76	SE corner of Building 4065 (approx. 25 feet east of Bldg 4065 clarifier)	285	Fuel oil	Possibly installed in 1974; removal date unknown.	Removed	Regulated under Corrective Action	No HDMS records on UT-76 (except 2003 Draft RFI Report). Per MWH, 2003: UT-76 removal activities are not documented in facility records. The UST was likely removed in 1974 when the clarifier was installed during the conversion of Bldg 65 to a metals lab. The UST fueled the emergency generator for Bldg. 65.	3		MWH, 2003.
UT-70	Approx. 180 feet northeast of Bldg 4065 clarifier; located adjacent to and formerly associated with Building 4062.	2500	Fuel oil	Installed in early 1960s; removal date unknown	Removed	Regulated under Corrective Action	Identified from Rocketdyne historical records. Stored fuel oil for use in the Bldg 62 generator. Installed in the early 1960s. Based on site conditions (i.e., presence of an asphalt patch in the presumed UST location and preliminary utility survey results, it was suspected that the tank had been removed. Based on geophysical surveys, the tank had been previously removed and fill appeared to be present onsite; estimated fill depth of 10 feet bgs.	4	Investigation Report recommended for no further action. Available records do not indicate status of regulatory site closure.	Ogden, 1998.

Table M.2-3  
 Transformer Inventory  
 Building 65 Metals Laboratory Clarifier RFI Site

Transformer/ Substation Number	Location	Use Period	Use Status	Description	Chemical Use Area Number	Comments	Reference
4762	Approx. 90 feet east of Bldg 4065 clarifier	Unknown	Removed	Former electrical substation. 1000 KVA transformer with 762 kg of 285 ppm PCB liquid	5		Sapere, 2005; Rockwell International, 1985.

**Table M.2-4  
Inventory of Other Site Features  
Building 65 Metals Laboratory Clarifier RFI Site**

Feature ID	Location	Use Period	Use Status	Process/Chemical Use	Chemical Use Area Number	Comments	Reference
Bldg 4065 Metals Clarifier	Formerly located at the southeast corner of Bldg 65.	1974 to 1990s	Removed in 2000	<p>3-stage clarifier: 12' long x 4' wide x 6' deep.</p> <p>Clarifier installation date unknown but likely correlates with conversion of Bldg 65 use in 1974.</p> <p>Received wastes accumulated from sinks and equipment drain lines in Bldg 65.</p> <p>Chemicals received from Bldg 65 consisted of solvents (including 1,1,1-TCA and TCE), acids, bases, metals, and petroleum hydrocarbons (kerosene).</p>	1	Clarifier effluent discharged via underground pipe to the Area III Sewage Treatment Plant.	MWH, 2003; Ogden, 2000; Sapere, 2005; Nelson, 1999; Rockwell International, 1989a; Rockwell International, 1989b.

**Table M.2-5**  
**Spill Inventory**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Date	Building/Feature	Chemical Spilled	Amount (gallons)	Comments	References
11/8/82	Building 65 Metals Laboratory Clarifier	Dichromate and Chromium	>350	On November 8, 1982 the D/544 Process Clarifier had a high chromium concentration of 23 mg/L. This was caused by two events: 1) a leak from tank #8 that caused 350 gallons of dichromate to spill into the sanitary sewer and 2) a hose was left on and water was allowed to flow into the chromium scrubber sump, which overflowed and drained into the sanitary sewer.	Mogg, 1982.
7/27/82	Building 65 Metals Laboratory Clarifier	Chromium	3	On July 27, 1982, while replacing a pipe on tank #16, 10 gallons of chromic acid spilled out of the tank and into a berm. Approximately 3 gallons spilled out of the berm and flowed to the clarifier.	Mogg, 1982.
9/6/83	Building 65 Metals Laboratory Clarifier	Nickel	Unknown	The filter pump on the nickel strike tank #19 leaked nickel solution into the area that drains into the chemical holding pit at P-18. In addition to this, within the containment structures separating the chemical holding pit drainage and the clarifier, a leak was present which allowed the nickel to be discharged into the clarifier.	Mogg, 1983.
5/11/83	Building 65 Metals Laboratory Clarifier	Chromium	83	Water was added to cool the chromic acid solution in tank no. 13. Air agitation was then turned on, but with the high liquid level in the tank, 10% of the solution overflowed and approximately 43 gallons spilled into the clarifier and 40 gallons spilled into the scrubber sump.	Mogg, 1983.
7/18/90	4065	Unknown	Unknown	Protective services responded to a burning ballast and dripping liquid at Building 065 on 7/18/1990. The building was evacuated.	SSFL Control Center, 1990.
April 1992	4066	PCB	Unknown	A fluorescent light ballast ruptured and contaminated approximately 60 square feet with PCB fluids. The floor and impervious surfaces were decontaminated.	Rockwell International, 1992.
9/3/91	4066	Battery Acid	Unknown	Protective Services responded to a battery acid leak at Building 66. Battery overcharged and overflowed.	SSFL Control Center, 1991.

**Table M.2-6**  
**Site History - Investigation**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Chemical Use Area Number	Chemical Use Area Name	Date	Purpose	COPCs Analyzed*	COPCs Reported*	Comments	Reference
1	Bldg 4065 Clarifier	Jan 2000 to Feb 2001	RFI Sampling: Clarifier sludge (VOCs, SVOCs, metals, TPH, PCBs) and liquid samples (VOCs, TPH, metals)  Soil vapor: 1 location near inlet to clarifier (SE corner of Bldg 4065) per DTSC request  Soil: Beneath clarifier (VOCs, SVOCs, metals, TPH); Energetics also analyzed at 1 location (8'), but not in RFI Report.  Sediment: downslope of clarifier/UT-76 (metals, TPH); SVOCs and propellants also analyzed, but not in RFA Report.	VOCs SVOCs TPH metals PCBs	Clarifier sludge: VOCs: TCE, 1,1-DCA, Vinyl Chloride Metals: Copper, Chromium, Silver, Mercury TPH-diesel and lube oil range=1400-1600 mg/kg (Note: these samples are for interior clarifier sludge and are not representative of onsite soil conditions)  Clarifier liquid: VOCs, TPH, metals detected at low concentrations  Soil vapor: TCE=1 ug/L @ 10'; Freon-113=3.1 ug/L @ 5'  Soil-Clarifier: VOCs/SVOCs = ND metals<background TPH-d up to 1500 mg/kg but attributed to UT-76 (described below).  Soil-Downslope: TPH<100 mg/kg Mercury>background & Eco RBSL	MWH, 2003; MWH, 2004.	Sampling approach based on DTSC site reconnaissance on Jan 20, 2000.  2003 Draft RFI Report Risk Assessment Results:  HHRA: HI <1 ELCR<1x10-6 (w/o gw) ELCR<10-5 (w/gw)  ECO: HI<1 except potential deer mouse burrow inhalation issue associated with PCE in near-surface groundwater.
3	UT-76	Unknown (post-2000)	RFI Sampling:  Soil-Tank: Sampled in trench at former UT-76 location to characterize soil with TPH impacts (TPH); downslope of clarifier/UT-76 (metals, TPH); SVOCs and propellants also analyzed, but not in RFI Report.	TPH metals SVOCs propellants	Soil-Tank: TPH ND at locations outside of stained-soil areas (delineation samples).  VOCs/SVOCs = ND metals<background TPH-d up to 1500 mg/kg (as described above for clarifier).  Soil-Downslope (same sample location as described above for clarifier): TPH<100 mg/kg Mercury>background & Eco RBSL  Propellants=ND SVOCs = ND	MWH, 2003	Elevated TPH-d concentrations indicate a potential ongoing threat to groundwater.
4	UT-70	Jan-98	Post-UST removal investigation to support site closure; no previous sampling performed.  Two direct push borings to 11 feet bgs.	TPH by 8015 (gasoline, kerosene, diesel, oil components)  VOCs (8021)	Non-Detect for TPH and VOCs	Ogden, 1998	Site recommended for no further action.
5	Substation 4762	Aug-04	Transformer investigation  Composite soil samples collected at 2 locations adjacent to substation (0.5 to 1.5 feet bgs).	PCBs (8081) inorganics	Non-Detect for PCBs. pH comparable to background.	MWH, 2004	No further action appears warranted: * PCB detection limits slightly exceed SRAM standard, but are comparable. * Sampling limited to 0.5-1.5 feet bgs, but considered to be representative of site conditions and no deeper sampling nor additional samples appear warranted.

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

Table M.2-7  
 Chemical Use Summary  
 Building 65 Metals Laboratory Clarifier 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 <sup>1</sup>	SVOCs	VOCs, SVOCs (Hydrazines, Formaldehyde, NDMA, UDMH, and MMH)	SVOCs, TPH, PCBs, Metals	Metals, pH	TPH, Metals, VOCs, SVOCs, PCBs, Dioxins <sup>2</sup>	Energetics, Metals	PCBs		Fluoride, Chloride, Nitrate, Sulfate, Bromide	Perchlorate	Dioxins, Furans	pH
1	Building 4065 Metals Clarifier	Solvents, metals, acids, bases, kerosene.	X	X				X							X	
2	Building 4065	Solvents, metals, acids, bases, kerosene.	X	X				X							X	
3	UT-76	Fuel oil		X												
4	UT-70	Fuel oil		X												
5	Substation 4762	PCBs								X						
6	Building 4066	Unknown chemicals, battery acid release	X				X	X								
7	Building 4062	Unknown chemicals	X				X	X								

Notes:

- VOCs are a COPCs for TPH-gasoline.
- SVOCs and dioxins were evaluated at COPCs if burned materials were observed. PCBs were evaluated as COPCs if elevated concentrations of lubricant oil-range TPH were detected.

Table M.2-8  
 Conceptual Site Model  
 Building 65 Metals Laboratory Clarifier 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 (ft/ft)	Surface Water Present? (Yes/No)	Surface Water Flow Information	Other Information?	Reference
Building 65 Metals Laboratory Clarifier Site	1800	less than 4.5 to 12	1790	19 (Piezometer PZ-005 south of site)	0.025/ southeast	12 to 20 (Well RD-29 northeast of site)	Northwest and Southeast (refer to comments)	No	No surface waters or major storm drainages present at site.  Topography is nearly level onsite and, therefore, stormwater runoff would migrate via sheet flow to the south and east.	Near-surface groundwater is likely vertically continuous with CF groundwater in the Bldg 65 Metals Clarifier area. Water level data from CF wells suggest a SW-NE trending divide may occur within CF groundwater in the vicinity of Bldg 4065. This results in CF groundwater flow to the northwest within the Upper Burro Flats Member and southeast within the Lower Burro Flats member.	MWH, 2003; Ogden, 2000.

Table M.3-1A  
 Sampling Summary for Soil  
 Building 65 Metals Laboratory Clarifier 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
B6BS01	Soil Boring		1/22/1998	9.5	9.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil							X
B6BS01	Soil Boring	RS119	1/22/1998	9.5	9.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X				
B6BS01	Soil Boring		1/22/1998	11	11	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil							X
B6BS01	Soil Boring	RS120	1/22/1998	11	11	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X				
B6BS02	Soil Boring		1/22/1998	8.5	8.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil							X
B6BS02	Soil Boring	RS121	1/22/1998	8.5	8.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X				
MCTS01S01	Trench	RX062	5/26/2000	8	8	Primary Sample	In Place	AMEC	Soil	X		X	X		X	X
MCTS01S02	Trench	RX063	5/26/2000	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X				
MCTS02	Grab Sample	RJ671	10/12/2000	5.5	6	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X					
MCTS03	Grab Sample	RJ672	10/12/2000	6.5	7	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X					
MCTS04	Grab Sample	RJ673	10/12/2000	4	4.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X					
MCBS01	Soil Boring	RJ973	2/2/2001	0	0.5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil		X	X	X		X	
XFBS24	Soil Boring	WD097	8/25/2004	0.5	1.5	Composite Sample	In Place	MWH	Soil			X		X		
XFBS25	Soil Boring	WD101	8/25/2004	0.5	1.5	Composite Sample	In Place	MWH	Soil			X		X		
MCBS1007	Soil Boring	MCBS1007S01	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1007	Soil Boring	MCBS1007S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1000	Soil Boring		3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
MCBS1000	Soil Boring	MCBS1000S01	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1000	Soil Boring		3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
MCBS1000	Soil Boring	MCBS1000S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1005	Soil Boring	MCBS1005S01	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1005	Soil Boring	MCBS1005S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1003	Soil Boring	MCBS1003S01	3/28/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1003	Soil Boring	MCBS1003S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1004	Soil Boring	MCBS1004D01	3/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
MCBS1004	Soil Boring	MCBS1004S01	3/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
MCBS1004	Soil Boring	MCBS1004S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1001	Soil Boring	MCBS1001D01	3/28/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
MCBS1001	Soil Boring	MCBS1001S01	3/28/2008	5	6	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
MCBS1002	Soil Boring	MCBS1002S01	3/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
MCBS1002	Soil Boring	MCBS1002X01	3/28/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
MCBS1002	Soil Boring	MCBS1002S02	3/28/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1202	Soil Boring	U5BS1202S01	4/1/2008	3.5	4.5	Primary Sample	In Place	CH2M HILL	Soil						X	
U5BS1201	Soil Boring		4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
U5BS1201	Soil Boring	U5BS1201S01	4/1/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1201	Soil Boring		4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1201	Soil Boring	U5BS1201S02	4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1201	Soil Boring	U5BS1201S03	4/1/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X	X			
U5BS1200	Soil Boring		4/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1200	Soil Boring	U5BS1200S01	4/1/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
U5BS1200	Soil Boring		4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1200	Soil Boring	U5BS1200S02	4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1006	Soil Boring	MCBS1006S01	4/1/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X			X	
MCBS1006A	Soil Boring		5/2/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
MCBS1006A	Soil Boring	MCBS1006AS01	5/2/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
MCBS1006A	Soil Boring		5/2/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil							X
MCBS1006A	Soil Boring	MCBS1006AS02	5/2/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil			X				
MCBS1405	Soil Boring	MCBS1405S01	5/19/2008	0.5	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1404	Soil Boring	MCBS1404S01	5/19/2008	0	0.5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
MCBS1404	Soil Boring	MCBS1404X01	5/19/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X	X			
MCBS1404	Soil Boring	MCBS1404S15	5/19/2008	2.5	3.5	Primary Sample	In Place	CH2M HILL	Soil		X	X	X		X	
MCBS1403	Soil Boring	MCBS1403S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1402	Soil Boring	MCBS1402S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1400	Soil Boring	MCBS1400S01	5/19/2008	0	1	Primary Sample	In Place	CH2M HILL	Soil			X	X			
MCBS1401	Soil Boring	MCBS1401S01	5/20/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil				X			
MCBS1007A	Soil Boring		5/20/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil							X
MCBS1007A	Soil Boring	MCBS1007AD01	5/20/2008	0	1	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil			X				
MCBS1007A	Soil Boring		5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
MCBS1007A	Soil Boring	MCBS1007AS02	5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1202A	Soil Boring		5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil							X
U5BS1202A	Soil Boring	U5BS1202AS01	5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil			X				
U5BS1406	Soil Boring	U5BS1406S01	5/20/2008	5.5	6	Primary Sample	In Place	CH2M HILL	Soil				X			
U5BS1407	Soil Boring	U5BS1407S01	5/20/2008	5	6	Primary Sample	In Place	CH2M HILL	Soil				X			

**Table M.3-1B**  
**Sampling Summary for Soil Vapor**  
**Building 65 Metals Laboratory Clarifier 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
MCSV01	Soil Vapor Sample		8/1/2000	5	5	Primary Sample	In Place	OGDEN Environmental and Energy Services	Soil Vapor	X
MCSV01	Soil Vapor Sample		12/19/2000	10	10	Primary Sample	In Place	AMEC	Soil Vapor	X
MCSV1000	Soil Vapor Sample		4/8/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1200	Soil Vapor Sample		4/8/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
U5SV1200	Soil Vapor Sample		4/29/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1200	Soil Vapor Sample	U5SV1200D01	4/8/2008	4	5	MULTIPLE SAMPLE TYPES	In Place	CH2M HILL	Soil Vapor	X
U5SV1201	Soil Vapor Sample		4/8/2008	4	5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1201	Soil Vapor Sample		4/8/2008	9	10	Primary Sample	In Place	CH2M HILL	Soil Vapor	X
U5SV1202	Soil Vapor Sample		4/8/2008	3.5	4.5	Primary Sample	In Place	CH2M HILL	Soil Vapor	X

**Table M.3-2  
Evaluation of Soil and Soil Vapor Sampling Results  
Building 65 Metals Laboratory Clarifier RFI Site**

Chemical Use Area Number	Chemical Use Area Name (see Section 2 text and tables for Site History)	Potential Chemicals Used/Stored	Sampling Scope and Rationale (see Figure M.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 M.5-1 for CMS area)
1	Building 4065 Metals Laboratory Clarifier	VOCs	Former Building 4065 Metals Laboratory Clarifier received wastewater generated in Building 4065, which possibly contained VOCs. Screened for potential VOCs in and around the former clarifier.  Soil Vapor: No soil vapor samples were collected for CUA.  Soil Matrix: A soil sample was collected at one (1) trench location.	<u>Soil Matrix:</u> No VOCs were detected in any of the representative soil samples.  Discussion of results is presented in M.3.4.2.1 and on Figures M.3-1B and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	Wastewater from Building 4065 could have contained SVOCs. Screened for potential SVOCs in around the former clarifier.  Soil Samples were collected at three (3) locations.	SVOCs were detected in one representative soil sample but did not exceed their respective RBSLs.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		TPHs	Chemical uses at Building 4065 included kerosene. Wastewater from Building 4065 possibly contained TPH. Screened for potential TPHs in and around the former clarifier.  Samples were collected from three (3) locations.	TPHs were detected above their respective Residential RBSLs in two samples.  MCBS01 at 0-0.5 ft bgs [Gasoline range hydrocarbons (C8-C11)] MCTS01S02 at 5ft bgs [Diesel range hydrocarbons (C14-C20)]  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		Metals / Inorganics	Chemical uses at Building 4065 included metals. Wastewater received at the clarifier could have contained metals. Screened for potential metals in and around the former clarifier.  Soil samples were collected at 11 locations.	Metals were detected above background and/or Ecological RBSL or both in the following three (3) samples.  MCBS1004 at 0-1 ft bgs (Mercury) MCBS1005 at 0-1 ft bgs (Mercury) MCBS01 at 0-0.5 ft bgs (Mercury, sodium)  Discussion of results is presented M.3.4.2.5 and Figures M.3-5 and M.3-9.	<b>Yes.</b>  The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		Energetics	Screened for potential energetics in and around the former clarifier.  Soil samples were collected at one (1) trench location.	Energetics were not detected in any of the samples collected.  Discussion of results is presented in M.3.4.2.7 and Figure M.3-6.	<b>Yes.</b>  The extent of energetics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>

**Table M.3-2  
Evaluation of Soil and Soil Vapor Sampling Results  
Building 65 Metals Laboratory Clarifier RFI Site**

Chemical Use Area Number	Chemical Use Area Name (see Section 2 text and tables for Site History)	Potential Chemicals Used/Stored	Sampling Scope and Rationale (see Figure M.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 M.5-1 for CMS area)
2	Building 4065	VOCs	Chemical uses at former Building 4065 included VOCs. Screened for potential VOCs in and around the former building.  Soil Vapor: Soil vapor samples were collected from one (1) location.  Soil Matrix: Soil samples were collected from two (2) locations.	<u>Soil Vapor:</u> VOCs were detected in one soil vapor sample but concentrations did not exceed their respective RBSLs.  <u>Soil Matrix:</u> VOCs were detected in two soil samples but did not exceed their respective RBSLs.  Discussion of results is presented in M.3.4.2.1 and Figures M.3-1A, M.3-1B, and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	Chemical uses at former Building 4065 included SVOCs. Screened for potential SVOCs in and around the former building.  Soil Samples collected at two (2) locations.	SVOCs were detected in two soil samples but did not exceed their respective RBSLs.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		TPHs	Chemical uses at former Building 4065 included kerosene. Screened for potential TPH in and around the former building.  Samples collected from two (2) locations.	Gasoline range hydrocarbon (C8-C11) were detected above the residential RBSL in one sample.  MCBS1007 at 5-6 ft. bgs  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  TPHs were detected above RBSLs. However, sampling data indicate the extent of the impacts are defined and no further characterization is recommended.	<b>N/A</b>
		Metals / Inorganics	Chemical uses at this former building included metals. Screened for potential metals in and around former building.  Samples collected from four (4) locations.	Metals were detected above background and/or Ecological RBSLs in two samples.  MCBS1000 at 0-1 ft. bgs (Zinc, Sodium) MCBS1000 at 5-6 ft. bgs (Sodium) MCBS1007 at 0-1 ft. bgs and MCBS1007 at 5-6 ft. bgs (Sodium)  Discussion of results is presented M.3.4.2.5 and Figures M.3-5 and M.3-9.	<b>Yes.</b>  The extent of metals impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
3	UT-76	VOCs	Screened for potential VOCs in tank area.  <u>Soil Vapor:</u> Samples collected from one (1) location.  <u>Soil Matrix:</u> VOC samples collected at one (1) location.	<u>Soil Vapor:</u> VOCs were detected at one soil vapor sample location but were below their respective RBSLs.  <u>Soil Matrix:</u> VOCs were detected at one soil sample location but were below their respective RBSLs.  Discussion of results is presented in M.3.4.2.1 and Figures M.3-1A, M.3-1B, and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	SVOCs were screened to evaluate for potential presence.  Soil Samples collected from one (1) location.	No SVOCs were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>

**Table M.3-2  
Evaluation of Soil and Soil Vapor Sampling Results  
Building 65 Metals Laboratory Clarifier RFI Site**

<b>Chemical Use Area Number</b>	<b>Chemical Use Area Name</b> (see Section 2 text and tables for Site History)	<b>Potential Chemicals Used/Stored</b>	<b>Sampling Scope and Rationale</b> (see Figure M.2-2 for sampling locations)	<b>Sampling Results</b> Chemical Concentrations detected greater than background and/or risk screening levels?	<b>Chemical Use Area sufficiently evaluated for risk assessment?</b>	<b>Is delineation sufficient to estimate soil volume in CMS?</b> (see Figure M.5-1 for CMS area)
3	UT-76	TPHs	Screened for potential TPH presence in tank area.  Samples collected from three (3) locations.	No TPH concentrations were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
4	UT-70	VOCs	Screened for potential VOCs in tank area.  <u>Soil Vapor:</u> Samples collected from one (1) location.  <u>Soil Matrix:</u> VOC samples collected from three (3) locations.	<u>Soil Vapor:</u> Toluene was detected above Ecological RBSL in one soil vapor sample.  U5SV1202 at 3.5-4.5 ft. bgs  <u>Soil Matrix:</u> VOCs were not detected in soil samples collected.  Discussion of results is presented in M.3.4.2.1 and Figures M.3-1A, M.3-1B and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	Screened for potential SVOCs in tank area.  Samples collected from one (1) location.	No SVOC concentrations were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		TPHs	Screened for potential TPHs in tank area.  Samples collected from two (2) locations.	TPH was not detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
5	Substation 4762	PCBs	Screened for potential PCBs in and around former substation.  Samples collected from two (2) locations.	No PCB concentrations were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.4 and Figure M.3-4.	<b>Yes.</b>  The extent of PCB impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
6	Building 4066	VOCs	Screened for potential VOCs in and around former building.  Soil Vapor: Samples collected from one (1) location.  Soil Matrix: VOC samples collected from one (1) location.	<u>Soil Vapor:</u> Toluene was detected above the Ecological RBSL in the one soil vapor sample.  U5SV1200 at 4-5 ft. bgs  <u>Soil Matrix:</u> VOCs were not detected from samples collected.  Discussion of results is presented in M.3.4.2.1 and Figures M.3-1B and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	Screened for potential SVOCs in and around former building.  Samples collected from one (1) location.	SVOC concentrations that were detected did not exceed their respective RBSLs.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>

**Table M.3-2  
Evaluation of Soil and Soil Vapor Sampling Results  
Building 65 Metals Laboratory Clarifier RFI Site**

<b>Chemical Use Area Number</b>	<b>Chemical Use Area Name</b> (see Section 2 text and tables for Site History)	<b>Potential Chemicals Used/Stored</b>	<b>Sampling Scope and Rationale</b> (see Figure M.2-2 for sampling locations)	<b>Sampling Results</b> Chemical Concentrations detected greater than background and/or risk screening levels?	<b>Chemical Use Area sufficiently evaluated for risk assessment?</b>	<b>Is delineation sufficient to estimate soil volume in CMS?</b> (see Figure M.5-1 for CMS area)
6	Building 4066	TPHs	Screened for potential TPHs in and around former building.  Samples collected in one (1) location.	No TPH concentrations were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		Metals / Inorganics	Screened for potential metals in and around former building.  Samples collected in one (1) location.	Metals concentrations detected in soil did not exceed their respective RBSLs or Site Background concentrations.  Discussion of results is presented M.3.4.2.5 and Figures M.3-5 and M.3-9.	<b>Yes.</b>  The extent of metals/inorganics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
7	Building 4062	VOCs	Screened for potential VOCs in and around former building.  Soil Vapor: Samples collected in one location.  Soil Matrix: VOC samples collected from one location.	<u>Soil Vapor</u> : VOCs were detected but did not exceed their respective RBSLs.  <u>Soil Matrix</u> : Benzene was detected at concentrations above the Residential RBSL in one sample.  U5BS1201 at 0-1 ft bgs  Discussion of results is presented in M.3.4.2.1 and Figures M.3-1B and M.3-7.	<b>Yes.</b>  The extent of VOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		SVOCs	Screened for potential SVOCs in and around former building.  Samples collected in one (1) location.	No SVOCs were detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.2 and Figures M.3-2 and M.3-8.	<b>Yes.</b>  The extent of SVOC impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		TPHs	Screened for potential TPHs in and around former building.  Samples collected in one (1) location.	TPH was not detected in the soil samples collected.  Discussion of results is presented in M.3.4.2.3 and Figures M.3-3 and M.3-8.	<b>Yes.</b>  The extent of TPH impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>
		Metals / Inorganics	Screened for potential Metals in and around former building.  Samples collected in three (3) locations.	Selenium was detected above Background and Ecological RBSL in one sample.  U5BS1201 at 5-6 ft bgs  Discussion of results is presented M.3.4.2.5 and Figures M.3-5 and M.3-9.	<b>Yes.</b>  The extent of metals/inorganics impacts is adequately defined by representative sampling locations. Characterization is sufficient for risk assessment.	<b>N/A</b>

**Table M.3-3A**  
**Data Screening and Statistical Summary for Soil**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Constituent	Units	Screening Levels			Detect Data Summary						
		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
<b>Energetics</b>											
2,4-Dinitrotoluene	mg/kg		0.43		1						
2,6-Dinitrotoluene	mg/kg		1.71		1						
Nitrobenzene	mg/kg	29	2		1						
<b>Hydrocarbons</b>											
Kerosene Range Hydrocarbons (C12-C14)	mg/kg	1400			9						
Diesel Range Hydrocarbons (C14-C20)	mg/kg	1400			8	1	1500	1500	1		
Diesel Range Hydrocarbons (C15-C20)	mg/kg	1400			9	1	1.55	1.55			
Lubricating Oil Range Hydrocarbons (C20-C30)	mg/kg	1400			8	1	23	23			
Lubricating Oil Range Hydrocarbons (C21-C30)	mg/kg	1400			9	4	2.81	18.1			
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			9	1	1.3	1.3	1		
Gasoline Range Hydrocarbons (C8-C11)	mg/kg	1.1			8	1	2.5	2.5	1		
Kerosene Range Organics (C11-C14)	mg/kg	1400			8						
<b>Inorganics</b>											
% Solids	%				3	3	87.6	96			
Moisture	%				29	29	3.07	15.3			
pH	pH Units				5	5	7.36	8.94			
Total Solids	%				10	10	86	98			
<b>Metals</b>											
Aluminum	mg/kg	75000	12	20000	11	11	3140	18500		11	
Antimony	mg/kg	30	0.095	8.7	11	1	0.38	0.38		1	
Arsenic	mg/kg	0.095	1.9	15	11	11	1.7	7.1	11	10	
Barium	mg/kg	15000	15	140	11	11	25.9	121		11	
Beryllium	mg/kg	150	5	1.1	11	11	0.097	0.96			
Boron	mg/kg	15000	6.76	9.7	11	7	1.4	9.2		1	
Cadmium	mg/kg	39	0.0045	1	11	9	0.093	0.28		9	
Calcium	mg/kg				1	1	2130	2130			
Chromium	mg/kg	3400	930	36.8	11	11	11.4	23.9			
Cobalt	mg/kg	1500	8.9	21	11	11	2	9.7		1	
Copper	mg/kg	3000	1.1	29	11	11	2.7	10.2		11	
Iron	mg/kg			28000	1	1	13300	13300			
Lead	mg/kg	150	0.013	34	11	11	1.1	16.9		11	
Lithium	mg/kg	1522		37	9	9	2	31.2			
Magnesium	mg/kg				1	1	2730	2730			
Manganese	mg/kg	1800	59	495	1	1	212	212		1	
Mercury	mg/kg	23	0.1	0.09	24	23	0.0042	2.2		3	3
Molybdenum	mg/kg	380	0.11	5.3	11	9	0.16	1.2		9	
Nickel	mg/kg	1500	0.1	29	11	11	5.8	14.6		11	
Potassium	mg/kg			6400	10	10	537	2790			
Selenium	mg/kg	380	0.17	0.655	14	2	0.4	1.1		2	1
Silver	mg/kg	380	0.54	0.79	11	1	0.023	0.023			
Sodium	mg/kg			110	10	5	163	564			5
Thallium	mg/kg	6.1	2.9	0.46	11	6	0.24	0.31			
Vanadium	mg/kg	76	1.5	62	11	11	12.4	49.7		11	
Zinc	mg/kg	23000	21	110	13	13	10.3	283		11	1
Zirconium	mg/kg			8.6	9	9	1.9	2.9			
<b>PCBs</b>											
Aroclor 1016	mg/kg	3.9	1.6		2						
Aroclor 1221	mg/kg	0.35	1.6		2						
Aroclor 1232	mg/kg	0.35	0.077		2						
Aroclor 1242	mg/kg	0.35	0.079		2						

**Table M.3-3A**  
**Data Screening and Statistical Summary for Soil**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Constituent	Units	Screening Levels			Detect Data Summary						
		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
Aroclor 1248	mg/kg	0.35	0.0114		2						
Aroclor 1254	mg/kg	0.35	0.077		2						
Aroclor 1260	mg/kg	0.35	0.077		2						
<b>SVOC</b>											
1-Methyl naphthalene	mg/kg	230			11						
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		13	1	0.00448	0.00448			
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		13						
Acenaphthylene	mg/kg	1700	370		13						
Anthracene	mg/kg	17000	2.4		13						
Benzo(a)anthracene	mg/kg	0.6	5.6		13	1	0.029	0.029			
Benzo(a)pyrene	mg/kg	0.06	5.6		13						
Benzo(b)fluoranthene	mg/kg	0.6	5.6		13	1	0.00589	0.00589			
Benzo(ghi)perylene	mg/kg		6.4		13	1	0.0131	0.0131			
Benzo(k)fluoranthene	mg/kg	0.6	5.8		13						
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		11	1	0.00846	0.00846			
Butyl benzyl phthalate	mg/kg	11000	340		11						
Chrysene	mg/kg	6	2.4		13						
Dibenzo(a,h)anthracene	mg/kg	0.17	5.6		13						
Dibenzofuran	mg/kg	110	62		1						
Diethyl phthalate	mg/kg	46000	6940		11						
Dimethyl phthalate	mg/kg	570000	4.4		12						
Di-n-butyl phthalate	mg/kg	5700	0.49		11						
Di-n-octyl phthalate	mg/kg	2300	39		12	1	0.0132	0.0132			
Fluoranthene	mg/kg	2300	38		13	1	0.00756	0.00756			
Fluorene	mg/kg	2300	1.6		13						
Hexachlorobenzene	mg/kg	0.4	0.34		1						
Hexachlorocyclopentadiene	mg/kg	340	13		1						
Hexachloroethane	mg/kg	18	2.1		1						
Indeno(1,2,3-cd)pyrene	mg/kg	0.6	5.8		13						
Isophorone	mg/kg	750	320		1						
Naphthalene	mg/kg	6	210		13	1	0.00044	0.00044			
n-Nitrosodimethylamine	mg/kg	0.045	20		12						

**Table M.3-3A**  
**Data Screening and Statistical Summary for Soil**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Constituent	Units	Screening Levels			Detect Data Summary						
		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
n-Nitrosodi-n-propylamine	mg/kg	0.1	28		1						
n-Nitrosodiphenylamine	mg/kg	80	20		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		13	1	0.0074	0.0074			
Phenol	mg/kg	18000	5		1						
p-Nitroaniline	mg/kg		3.3		1						
Pyrene	mg/kg	1700	18		13	1	0.0213	0.0213			
<b>VOC</b>											
1,1,1,2-Tetrachloroethane	mg/kg	0.00025	76		14						
1,1,1-Trichloroethane	mg/kg	0.49	4300		14						
1,1,2,2-Tetrachloroethane	mg/kg	0.0014	6		14						
1,1,2-Trichloro-1,2,2-trifluoroethane	mg/kg	16	583		14						
1,1,2-Trichloroethane	mg/kg	0.0012	8.3		14						
1,1-Dichloroethane	mg/kg	0.0016	210		14						
1,1-Dichloroethene	mg/kg	0.023	10.7		14						
1,1-Dichloropropene	mg/kg		22		11						
1,2,3-Trichlorobenzene	mg/kg	0.124604521	20		11						
1,2,3-Trichloropropane	mg/kg	0.000051	12		11						
1,2,4-Trichlorobenzene	mg/kg	0.124604521	20		12						
1,2,4-Trimethylbenzene	mg/kg	0.035	64		14						
1,2-Dibromo-3-chloropropane	mg/kg	0.029	22		14						
1,2-Dibromoethane	mg/kg		25		11						
1,2-Dichlorobenzene	mg/kg	1.8	370		15						
1,2-Dichloroethane	mg/kg	0.0005	76		14						
1,2-Dichloropropane	mg/kg		250		14						
1,3,5-Trimethylbenzene	mg/kg	0.036	64		14						
1,3-Dichlorobenzene	mg/kg	1.7	160		15						
1,3-Dichloropropane	mg/kg		22		11						
1,4-Dichlorobenzene	mg/kg	0.01	20		15						
2-Chloro-1,1,1-trifluoroethane	mg/kg				6						
2-Chloroethylvinyl ether	mg/kg	9.56905E-06	0.73		14						
2-Hexanone	mg/kg		1220		11						
Acetone	mg/kg	51	43		12	1	0.010705	0.010705			
Benzene	mg/kg	0.00013	110		14	1	0.0006	0.0006	1		
Bromobenzene	mg/kg		110		11						
Bromochloromethane	mg/kg		25		11						
Bromodichloromethane	mg/kg	0.00031	15		14						
Bromoform	mg/kg		38		14						
Bromomethane	mg/kg		25		14						
Carbon Tetrachloride	mg/kg	0.000042	1.5		14						
Chlorobenzene	mg/kg	0.097	40		14						
Chloroethane	mg/kg		190		14						
Chloroform	mg/kg	0.00077	11		14						
Chloromethane	mg/kg		25		14						
Chlorotrifluoroethylene	mg/kg		10.7		6						
cis-1,2-Dichloroethene	mg/kg	0.014	68		14						
cis-1,3-Dichloropropene	mg/kg		22		14						

**Table M.3-3A**  
**Data Screening and Statistical Summary for Soil**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Constituent	Units	Screening Levels			Detect Data Summary						
		Residential RBSL	Ecological RBSL	Background	Number of Samples	Number of Detects	Minimum Detected Value	Maximum Detected Value	Number of Detects > Residential RBSL	Number of Detects > Ecological RBSL	Number of Detects > Background SL
Cumene	mg/kg	0.382558451	210		11						
Dibromochloromethane	mg/kg		46		11						
Dibromomethane	mg/kg		25		11						
Dichlorodifluoromethane	mg/kg	0.015	64		14						
Ethylbenzene	mg/kg	1.2	210		14						
Hexachlorobutadiene	mg/kg	9.2	0.85		12						
Methyl ethyl ketone	mg/kg	62	2540		14						
Methyl isobutyl ketone (MIBK)	mg/kg	19.63756975	2540		11						
Methyl tert-butyl ether	mg/kg		120		11						
Methylene chloride	mg/kg	0.004	25		14	1	0.0014	0.0014			
m-Xylene & p-Xylene	mg/kg	0.15	64		14						
n-Butylbenzene	mg/kg		210		11						
n-Propylbenzene	mg/kg	0.203267508	210		11						
o-Chlorotoluene	mg/kg	1222.098214	160		11						
o-Xylene	mg/kg	0.19	64		14						
p-Chlorotoluene	mg/kg	1222.098214	160		11						
p-Cymene	mg/kg		64		11						
sec-Butylbenzene	mg/kg	76.76404578	210		11						
sec-Dichloropropane	mg/kg		22		11						
Styrene	mg/kg	7.2	427		11	3	0.000175	0.000281			
tert-Butylbenzene	mg/kg		210		11						
Tetrachloroethene	mg/kg	0.00043	6		14	1	0.000247	0.000247			
Toluene	mg/kg	0.3	3.4		14						
trans-1,2-Dichloroethene	mg/kg	0.016	970		14						
trans-1,3-Dichloropropene	mg/kg		4.4		14						
Trichloroethene	mg/kg	0.0022	3		14						
Trichlorofluoromethane	mg/kg	0.11	300		14						
Vinyl chloride	mg/kg	0.0000096	0.73		14						
Xylenes, Total	mg/kg	0.15	64		14						

**Table M.3-3B**  
**Data Screening and Statistical Summary for Soil Vapor**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Constituent	Units	Screening Levels		Detect Data Summary					
		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
<b>VOC</b>									
1,1,1,2-Tetrachloroethane	ug/L	0.048		8					
1,1,1-Trichloroethane	ug/L	640	38	8					
1,1,2,2-Tetrachloroethane	ug/L	0.048		8					
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	8800	91	8					
1,1,2-Trichloroethane	ug/L	0.17	0.057	8					
1,1-Dichloroethane	ug/L	1.7	36	8					
1,1-Dichloroethene	ug/L	58	0.6	8					
1,2-Dichloroethane	ug/L	0.13	42	8					
Benzene	ug/L	0.095	0.57	8	2	0.0415	0.053		
Carbon Tetrachloride	ug/L	0.063	0.63	8					
Chloroethane	ug/L		992	8					
Chloroform	ug/L	0.5	0.24	8					
cis-1,2-Dichloroethene	ug/L	10	1.9	8					
Dichlorodifluoromethane	ug/L	58	91	8					
Ethylbenzene	ug/L	290	23	8	2	0.05	0.055		
Methylene chloride	ug/L	2.7	0.87	8					
m-Xylene & p-Xylene	ug/L		16	8	2	0.16	0.175		
o-Xylene	ug/L	29	16	8	1	0.055	0.055		
Tetrachloroethene	ug/L	0.45232	24	8	1	0.06	0.06		
Toluene	ug/L	110	0.084	8	2	0.17	0.21		2
trans-1,2-Dichloroethene	ug/L	20	1.9	8					
Trichloroethene	ug/L	1.4	6.4	8	1	1	1		
Trichlorofluoromethane	ug/L	200	90.9	8	1	1	1		
Vinyl chloride	ug/L	0.035	0.56	8					
Xylenes, Total	ug/L		16	8	2	0.16	0.23		

**Table M.4-1**  
**Chemicals of Potential Concern for Human Health**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-2	2-Methylnaphthalene		Y	
Soil	0-2	Acetone		Y	
Soil	0-2	Aluminum	N	N	Below Background
Soil	0-2	Antimony	N	N	Below Background
Soil	0-2	Arsenic	N	N	Below Background
Soil	0-2	Barium	Y	Y	
Soil	0-2	Benzene		Y	
Soil	0-2	Benzo(a)anthracene		Y	
Soil	0-2	Benzo(b)fluoranthene		Y	
Soil	0-2	Benzo(ghi)perylene		Y	
Soil	0-2	Beryllium	N	N	Below Background
Soil	0-2	bis(2-Ethylhexyl) phthalate		Y	
Soil	0-2	Boron	N	N	Below Background
Soil	0-2	Cadmium	N	N	Below Background
Soil	0-2	Chromium	N	N	Below Background
Soil	0-2	Cobalt	N	N	Below Background
Soil	0-2	Copper	N	N	Below Background
Soil	0-2	Lubricating Oil Range Hydrocarbons (C20-		N	See BTEX, PAHs
Soil	0-2	Lubricating Oil Range Hydrocarbons (C21-		N	See BTEX, PAHs
Soil	0-2	Di-n-octyl phthalate		Y	
Soil	0-2	Fluoranthene		Y	
Soil	0-2	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-2	Iron	N	N	Below Background
Soil	0-2	Lead	N	N	Below Background
Soil	0-2	Lithium	N	N	Below Background
Soil	0-2	Manganese	N	N	Below Background
Soil	0-2	Mercury	N	N	Below Background
Soil	0-2	Molybdenum	N	N	Below Background
Soil	0-2	Nickel	N	N	Below Background
Soil	0-2	Phenanthrene		Y	
Soil	0-2	Pyrene		Y	
Soil	0-2	Styrene		Y	
Soil	0-2	Tetrachloroethene		Y	
Soil	0-2	Thallium	N	N	Below Background
Soil	0-2	Vanadium	N	N	Below Background
Soil	0-2	Zinc	N	N	Below Background
Soil	0-2	Zirconium	N	N	Below Background
Soil	0-10	2-Methylnaphthalene		Y	
Soil	0-10	Acetone		Y	
Soil	0-10	Aluminum	N	N	Below Background
Soil	0-10	Antimony	N	N	Below Background
Soil	0-10	Arsenic	N	N	Below Background
Soil	0-10	Barium	Y	Y	
Soil	0-10	Benzene		Y	
Soil	0-10	Benzo(a)anthracene		Y	
Soil	0-10	Benzo(b)fluoranthene		Y	
Soil	0-10	Benzo(ghi)perylene		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	Cadmium	N	N	Below Background
Soil	0-10	Chromium	N	N	Below Background
Soil	0-10	Cobalt	N	N	Below Background
Soil	0-10	Copper	N	N	Below Background
Soil	0-10	Diesel Range Hydrocarbons (C14-C20)		N	See BTEX, PAHs
Soil	0-10	Diesel Range Hydrocarbons (C15-C20)		N	See BTEX, PAHs

**Table M.4-1**  
**Chemicals of Potential Concern for Human Health**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Medium	Depth (ft.)	Chemical	Exceeds Background? (Y/N)	Selected as COPC?	Reason for Exclusion
Soil	0-10	Lubricating Oil Range Hydrocarbons (C20-		N	See BTEX, PAHs
Soil	0-10	Lubricating Oil Range Hydrocarbons (C21-		N	See BTEX, PAHs
Soil	0-10	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
Soil	0-10	Di-n-octyl phthalate		Y	
Soil	0-10	Fluoranthene		Y	
Soil	0-10	Gasoline Range Hydrocarbons (C8-C11)		N	See BTEX, PAHs
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	Methylene chloride		Y	
Soil	0-10	Molybdenum	N	N	Below Background
Soil	0-10	Naphthalene		Y	
Soil	0-10	Nickel	N	N	Below Background
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	Tetrachloroethene		Y	
Soil	0-10	Thallium	N	N	Below Background
Soil	0-10	Vanadium	N	N	Below Background
Soil	0-10	Zinc	N	N	Below Background
Soil	0-10	Zirconium	N	N	Below Background
Soil Vapor	0-10	Benzene		Y	
Soil Vapor	0-10	Ethylbenzene		Y	
Soil Vapor	0-10	m-Xylene & p-Xylene		N	Total Xylene Used
Soil Vapor	0-10	o-Xylene		N	Total Xylene Used
Soil Vapor	0-10	Tetrachloroethene		Y	
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	-	No analyses			

**Table M.4-2**  
**Human Health Risk Estimates<sup>1</sup>**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Receptor	Soil Media <sup>2</sup>				Groundwater <sup>3</sup>				Total for Site Media <sup>4</sup>											
	HI Range		CD <sup>5</sup>	Risk Range	CD	HI Range		CD	Risk Range	CD	HI Range		CD	Risk Range	CD					
Future Adult Recreator	0.0000002	-	0.000004		1E-10	-	2E-08		NA	-	NA		<0.01	-	<0.01		2E-10	-	2E-8	
Future Child Recreator	0.000005	-	0.00002		2E-09	-	2E-08		NA	-	NA		<0.01	-	<0.01		2E-09	-	2E-08	
Future Adult Resident	0.0003	-	0.0009		2E-09	-	3E-08		NA	-	NA		0.004	-	0.02		1E-07	-	7E-07	
Future Child Resident	0.003	-	0.008		1E-08	-	6E-08		NA	-	NA		0.02	-	0.06		4E-07	-	6E-07	

Notes:

1. Risk estimates shown are a sum of all exposure pathways per media; the range reported is for the central tendency and reasonable maximum exposures, respectively.
2. Soil media risk estimates are a sum of all direct exposure routes, including incidental ingestion, dermal contact, and dust inhalation.
3. Groundwater media risk estimates are for domestic use of shallow groundwater.
4. Includes combined exposure from 1) direct contact with soil, 2) inhalation of indoor and ambient air vapors originating from soil gas, subsurface soil, and groundwater, and 3) domestic use of shallow groundwater.
5. Chemical risk drivers are those COPCs detected onsite with an HI > 1 or risk > 1x10<sup>-6</sup>. Only major risk contributors listed if cumulative HI >> 1 or cancer risk >> 1x10<sup>-6</sup>.

CD = Chemical risk driver

COPC = Chemical of potential concern

HI = Hazard index

NA = Not Applicable

**Table M.4-3**  
**Human Health Risk Assessment Uncertainty Analysis**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
COPC Selection	Barium was selected as a COPC since it could not be demonstrated to be consistent with background concentrations through the Wilcoxon Rank Sum test. The site data set was small, introducing uncertainty into the comparisons.	Low	Conservative
	Benzene, ethylbenzene, toluene, total xylenes, PCE, TCE, and trichlorofluoromethane were selected as soil vapor COPCs since they were directly detected in soil vapor. Acetone, methylene chloride, naphthalene, and styrene were also selected as soil vapor COPCs because they were detected in soil but not analyzed for in soil vapor.	Moderate	Conservative
	Gasoline and diesel range hydrocarbons were not selected as COPCs since TPH-related constituents (BTEX and PAHs) were analyzed for.	Low	Realistic
Exposure Pathways	Risks associated with drinking of groundwater are not realistic because the groundwater beneath the SSFL is not currently used as a drinking water source and the presence of the contamination will likely require a restriction on its future use as well.	High	Conservative
	Future land use of the site is currently undecided but may be recreational, which has lower risks than for urban residential. If land use is assumed agricultural, risk estimates may be higher.	Moderate	Uncertain
	Risk estimates for fruit and vegetable consumption are based on conservative models that are based on associations with physical-chemical properties, such as Koc.	Moderate	Conservative
EPC Calculations	EPCs are based on some data that are over 10 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 concentrations for acetone, methylene chloride, naphthalene, and styrene are estimated using soil to soil vapor partitioning extrapolations, introducing some degree of uncertainty.	Moderate	Conservative
	The 95% UCL concentration of some chemicals is greater than the maximum concentration, therefore the maximum was used as the EPC. This is considered to be a likely overestimation of the representative EPC because samples were collected in areas with the highest likelihood to detect the highest concentrations at the site.	Moderate	Conservative
	The maximum detected concentration of each COPC detected in groundwater was used as the EPC.	Moderate	Conservative
	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

**Table M.4-3**  
**Human Health Risk Assessment Uncertainty Analysis**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
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 than corresponding factors derived by USEPA (e.g. arsenic, PCBs)	Moderate	Conservative
	Cancer slope factors derived from animal studies are the upper-bound maximum likelihood estimates based on a linear dose-response curve, and therefore, overstate carcinogenic potency.	Moderate	Conservative
Reference Dose	No dermal toxicity values are available, oral toxicity factors are used for the dermal route.	Moderate	Conservative
	High degree of uncertainty in extrapolation of dose-response data from laboratory animals to humans.	High	Conservative

Notes:

- BTEX - benzene, toluene, ethylbenzene, and xylenes
- COPC - chemical of potential concern
- EPC - exposure point concentration
- Koc - Organic carbon partition coefficient
- OEHHA - Office of Environmental Health Hazard Assessment
- PAH - polycyclic aromatic hydrocarbon
- TPH - total petroleum hydrocarbons
- UCL - upper confidence limit
- USEPA - United States Environmental Protection Agency

**Table M.4-4**  
**Chemicals of Ecological Concern - Soil Vapor**  
**Building 65 Metals Laboratory Clarifier 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

TRV - toxicity reference value

**Table M.4-5**  
**Ecological Risk Assessment Uncertainty Analysis**  
**Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
<b>Problem Formulation</b>			
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	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	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	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	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
<b>Analysis</b>			

**Table M.4-5  
Ecological Risk Assessment Uncertainty Analysis  
Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
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
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, <del>may be either higher or lower than values estimated in the</del> Bioavailability of CPECs was assumed to be 100 percent. This likely overestimates risk to receptors at the site.	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 <del>samples were collected in areas likely to have the highest</del>	Moderate	Over-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

**Table M.4-5  
Ecological Risk Assessment Uncertainty Analysis  
Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
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
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	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
<b>Risk Characterization</b>			
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	Moderate	Under-estimation of exposure/risk

**Table M.4-5  
Ecological Risk Assessment Uncertainty Analysis  
Building 65 Metals Laboratory Clarifier RFI Site**

Assessment Element	Uncertainty	Magnitude of Impact	Direction of Impact
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
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	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 M.5-1  
Surficial Media Site Action Recommendations  
Building 65 Metals Laboratory Clarifier 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 4065 Metals Clarifier	NFA	No HRA COCs identified	No HRA COCs identified	<b>Soil Results</b>		
2	Building 4065	NFA			Any HQ>1?		
3	UT-76	NFA			None		
4	UT-70	NFA			COEC		
5	Substation 4762	NFA			Rationale		
6	Building 4066	NFA			ERA-2		
7	Building 4062	NFA			<b>Soil Vapor Results</b>		
			Any HQ>1?				
			1,1,2-Trichloroethane				
			COEC				
			Rationale				
			ERA-1				

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<sup>-6</sup> or hazard index > 1) and/or significant risk contributors.

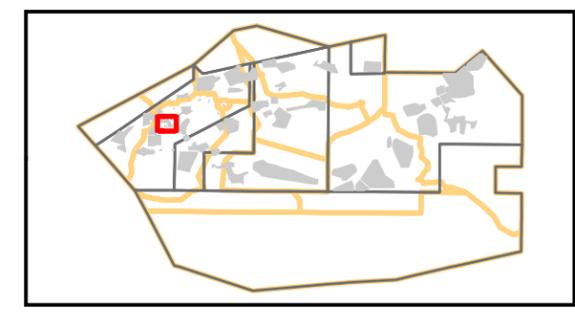
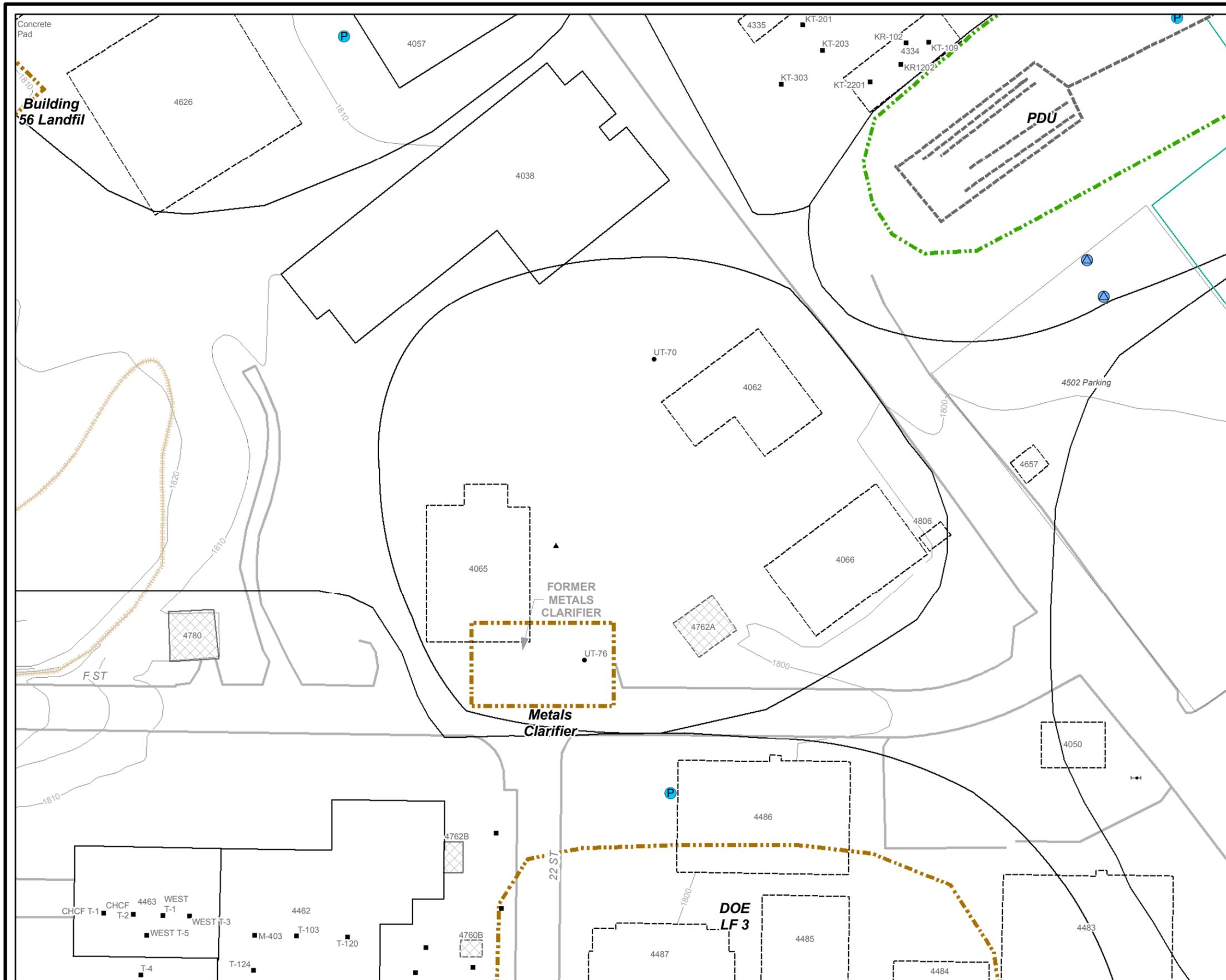
ERA-1 Analyte was not detected in either soil or soil vapor. It was retained for risk calculations because SQL> ESL. Estimated risk is Low. Actual presence is uncertain.

ERA-2 No chemicals of potential ecological concern exceeded Low or High TRVs under either the CTE or RME scenarios.

**Figures**

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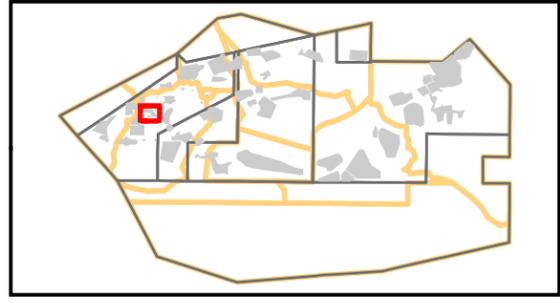
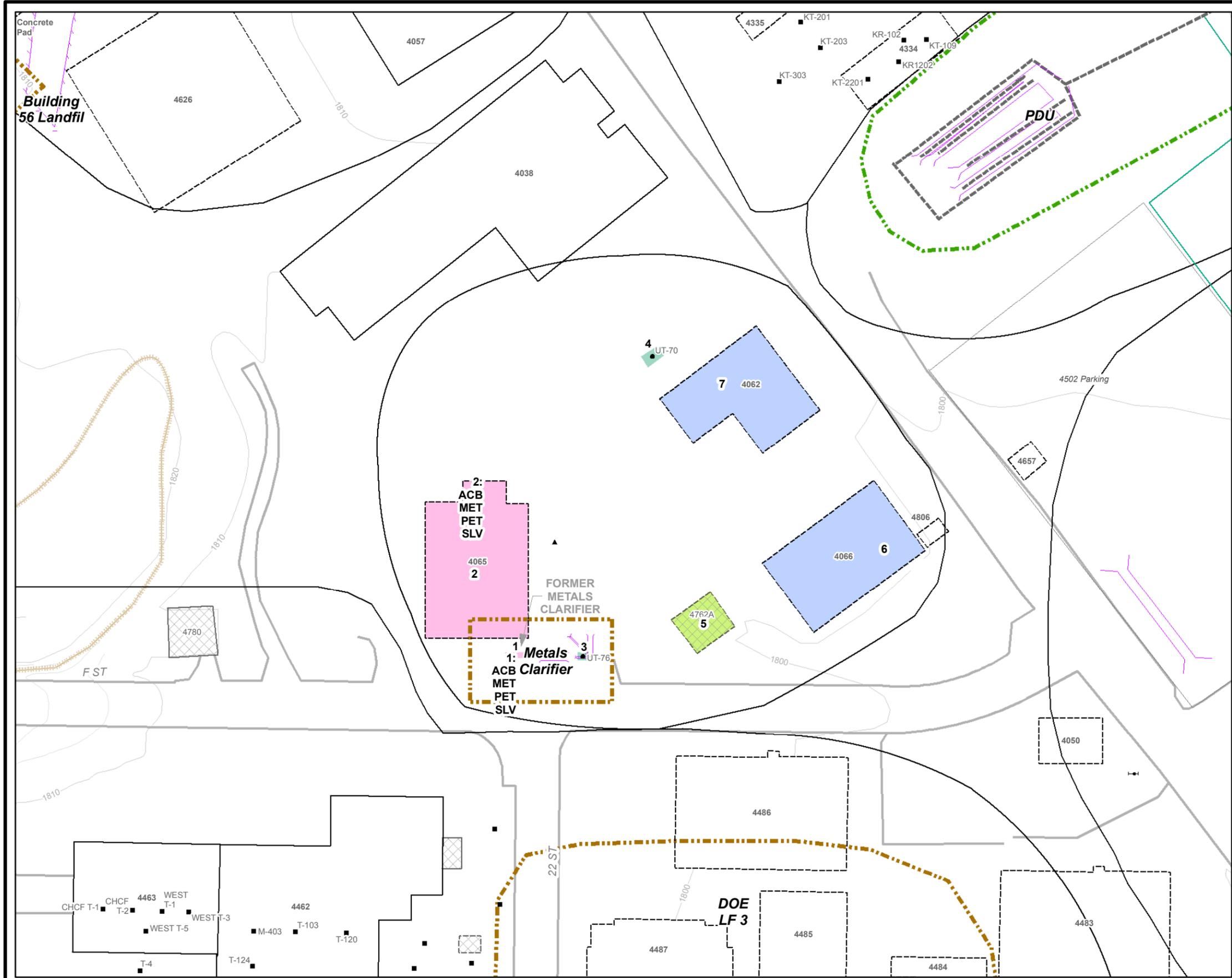




**Basemap Legend**

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

**Site Location**  
**Building 65 Metals Laboratory**  
**Clarifier RFI Site**



**Chemical Use**

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

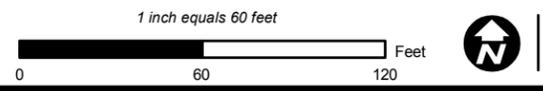
**Multiple Use Key**

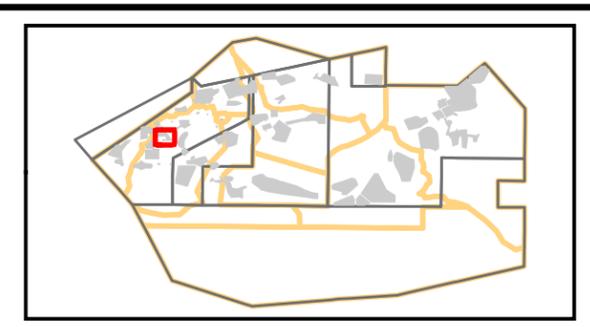
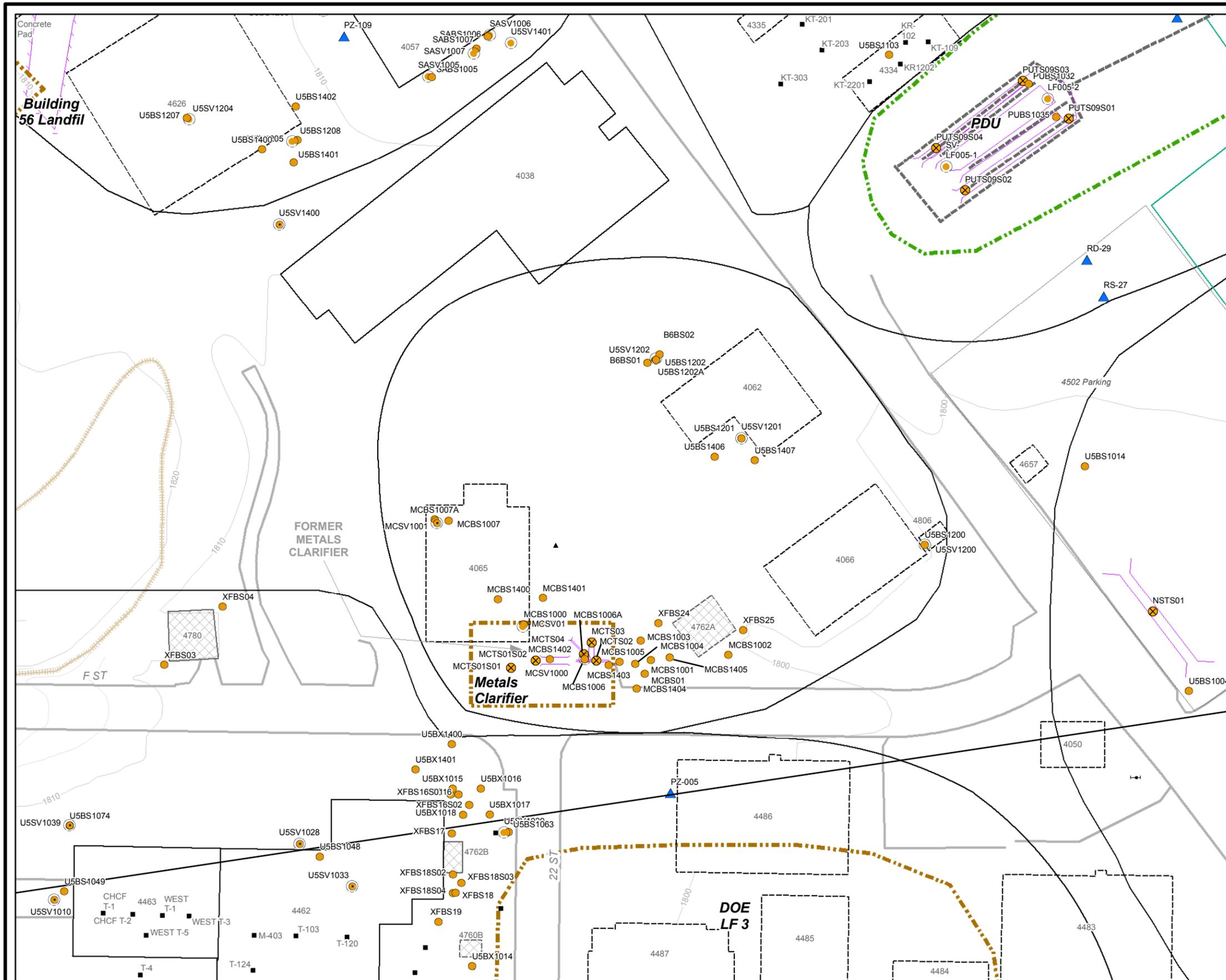
- |                              |   |
|------------------------------|---|
| ACB - Acids and Bases        | MET - Metals                            |
| ASB - Asbestos               | NMIC - Non-metal Inorganic Constituents |
| DEB - Debris                 | OPCB - Oil/PCBs                         |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

**Basemap Legend**

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

**Chemical Use Areas  
Building 65 Metals Laboratory  
Clarifier RFI Site**





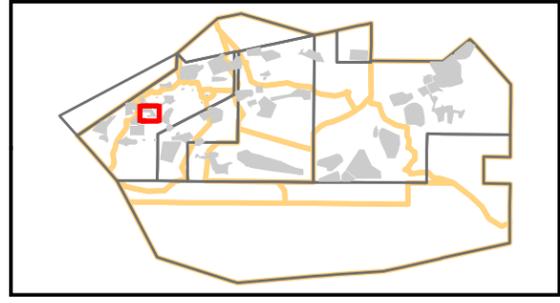
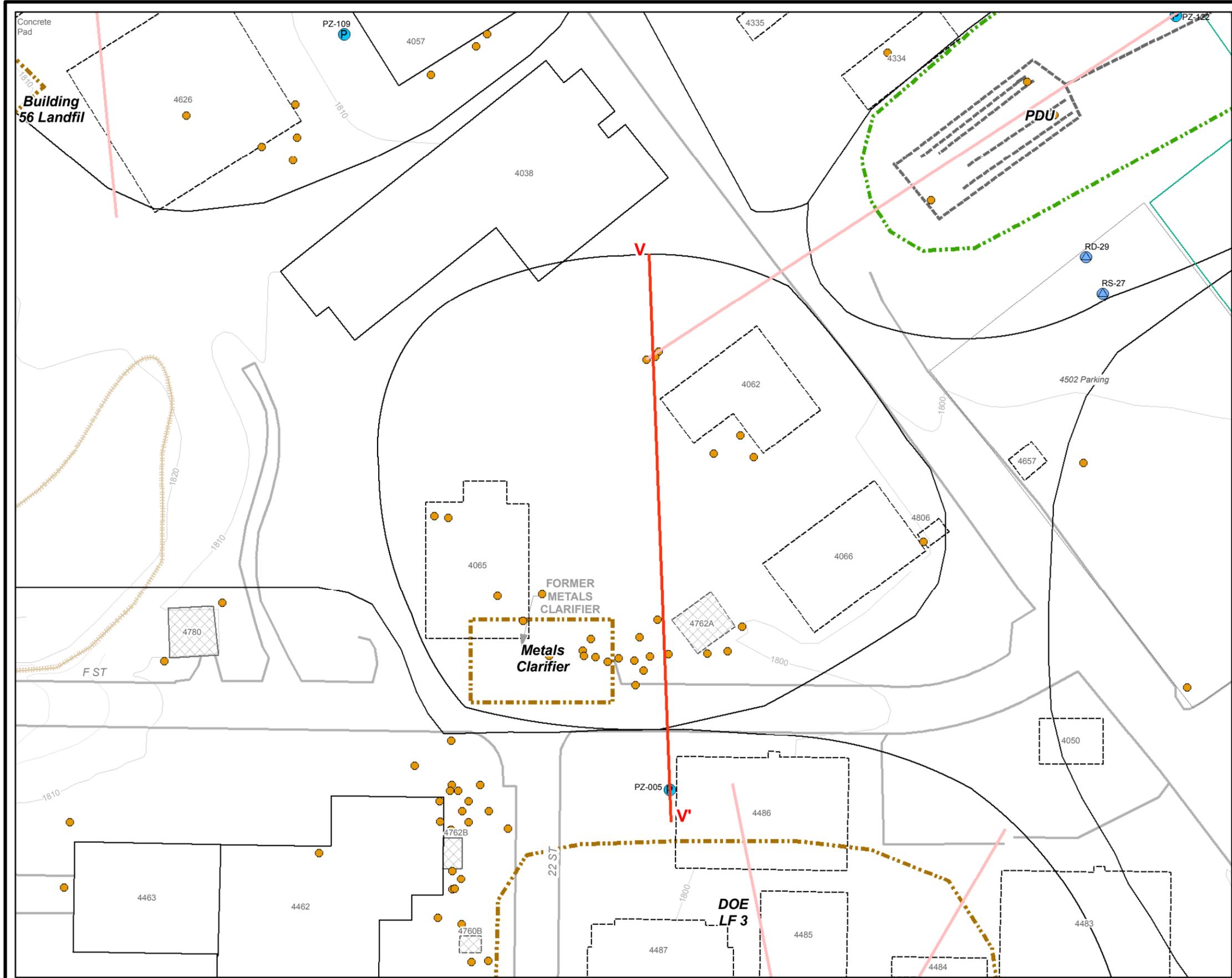
### Sample Type

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

### Basemap Legend

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

**Sample Locations  
Building 65 Metals Laboratory  
Clarifier RFI Site**

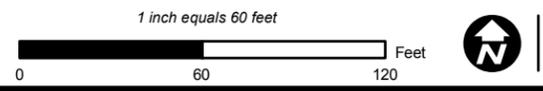


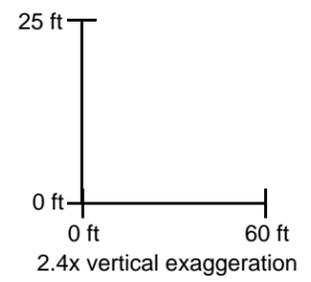
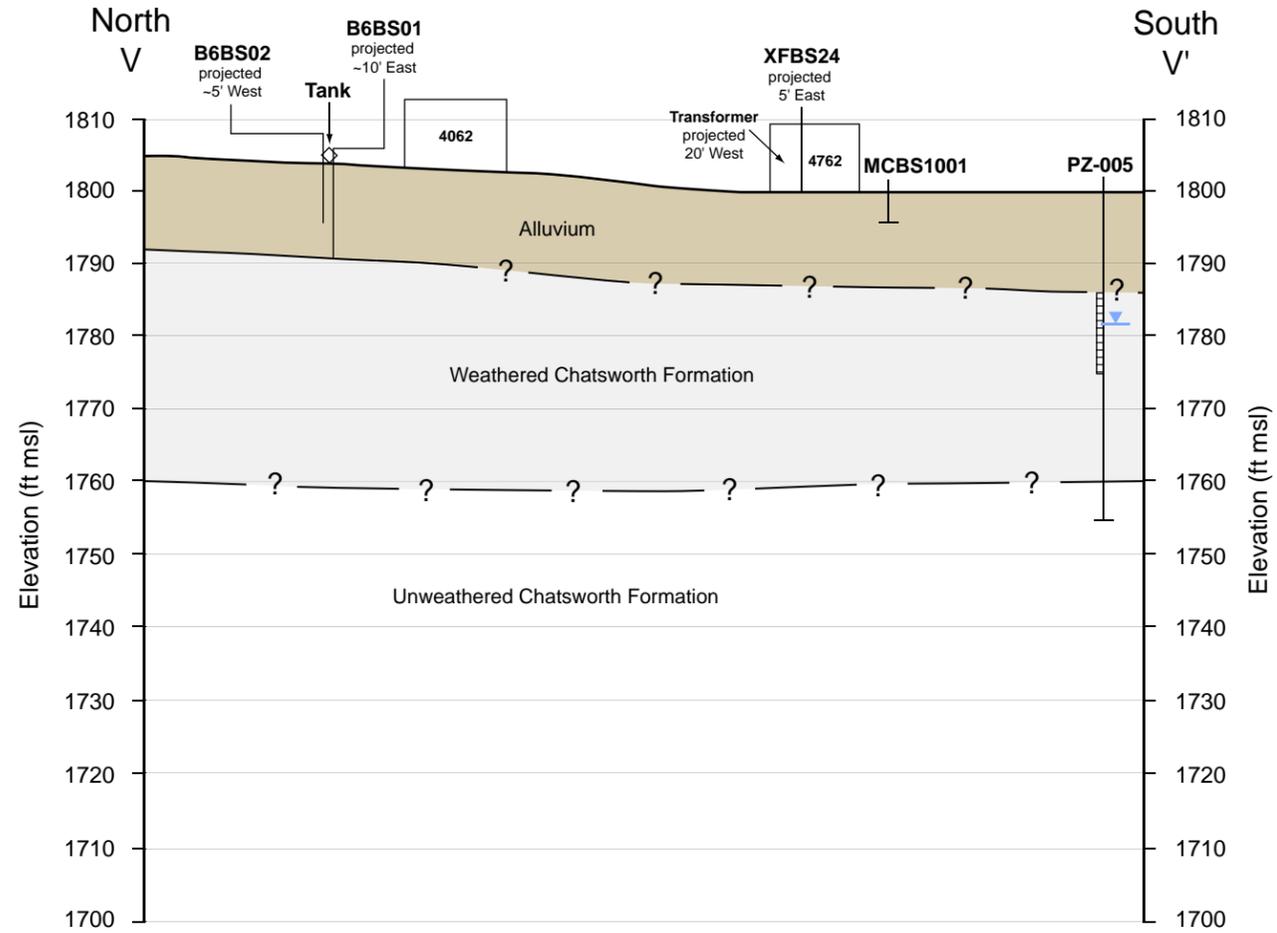
— Cross-section Line

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

**Building 65 Metals Laboratory Clarifier Cross Section Location V-V'**





**LEGEND**

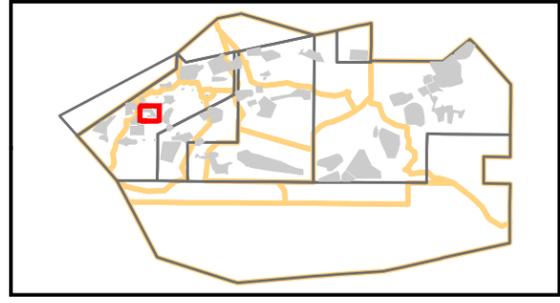
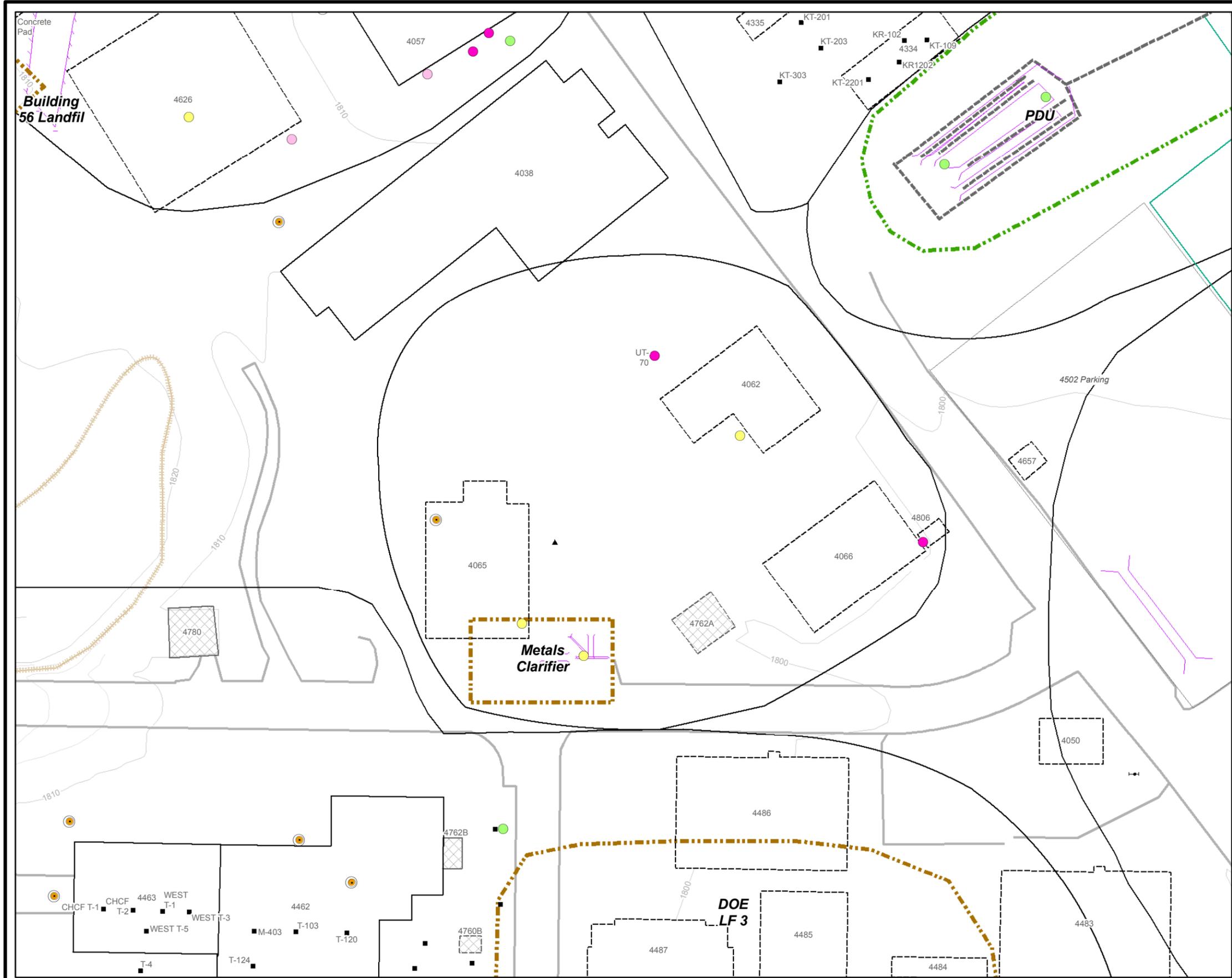
- Screen interval for monitoring well or piezometer
- Alluvium
- Weathered Chatsworth Formation
- Unweathered Chatsworth Formation
- Current or former building location
- Near-Surface Groundwater Elevation

**NOTES:**

ft msl = feet above mean sea level

FIGURE M.2-3A  
 Surficial Cross Section V-V'  
 Building 65 Metals Laboratory Clarifier  
 Santa Susana Field Laboratory  
**CH2MHILL**





**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

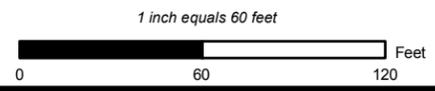
**Basemap Legend**

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

**VOCs in Soil Vapor  
Building 65 Metals Laboratory  
Clarifier RFI Site**

Date: September 16, 2008

**WORKING DRAFT**

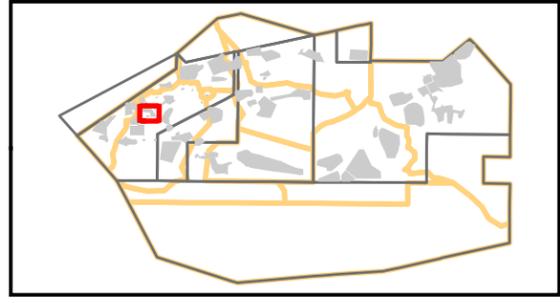


**SANTA SUSANA FIELD LABORATORY**



**Figure  
M.3-1A**

\\\_RFI\_05\RFI\_Report\CDot\_BL\_PLTSL\RFI\Grp5\_CD\Dot\VOCs\SVpr\_BL\_PLTSL.mxd



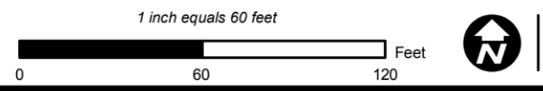
**VOCs in Soil**

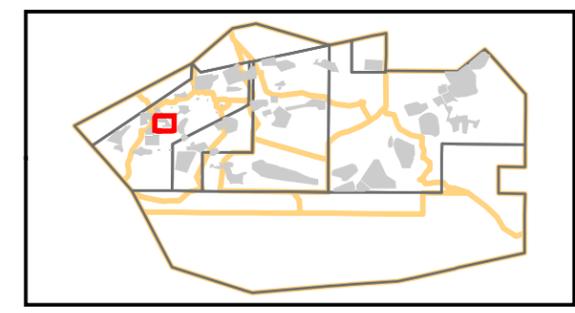
- Exceeds Residential RBSL + Eco RBSL
- Exceeds Residential RBSL
- Detect, Below All Screening Levels
- Non-detect

**Basemap Legend**

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

**VOCs in Soil  
Building 65 Metals Laboratory  
Clarifier RFI Site**





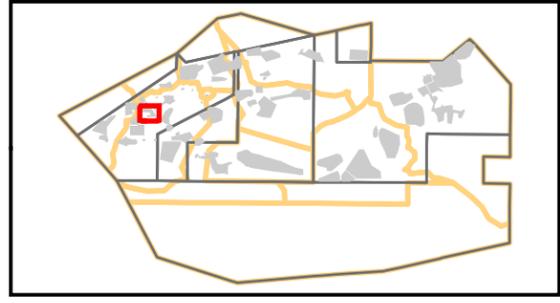
**SVOCs in Soil**

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

**Basemap Legend**

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

**SVOCs in Soil  
Building 65 Metals Laboratory  
Clarifier RFI Site**



**TPH in Soil**

- Exceeds Residential RBSL
- Detect, Below Residential RBSL
- Non-detect

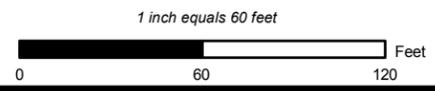
**Basemap Legend**

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

**TPH in Soil  
Building 65 Metals Laboratory  
Clarifier RFI Site**

Date: September 16, 2008

**WORKING DRAFT**

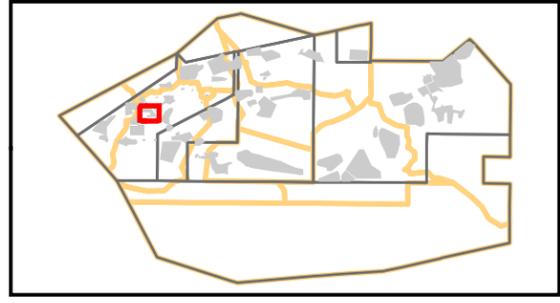
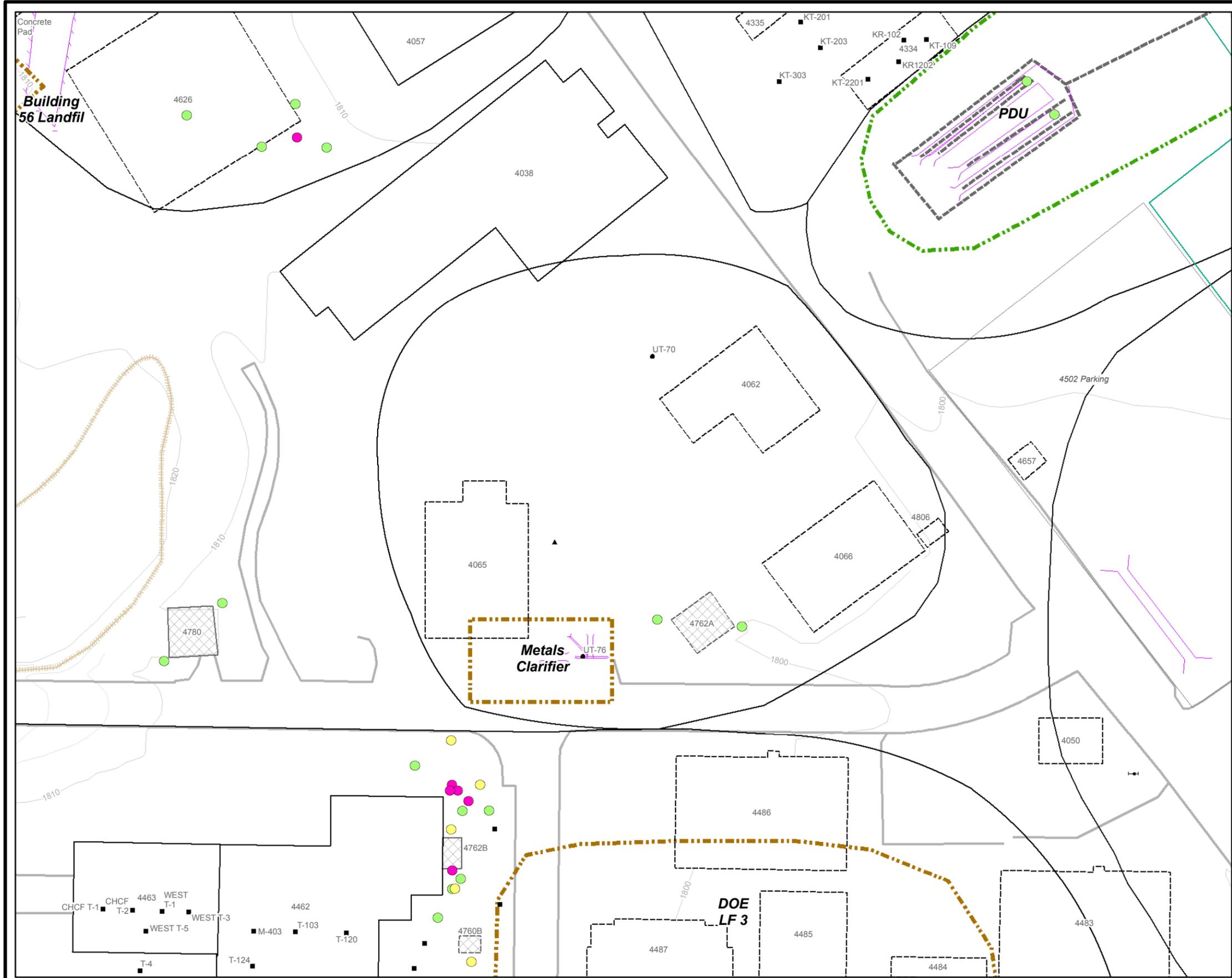


**SANTA SUSANA FIELD LABORATORY**



**Figure  
M.3-3**

\\\_RFI\_05\RFI\_Report\CDot\_BL\_PLTS\RFI\Grp5\_CD\TPHSoil\_BL\_PLTS.mxd



**PCBs in Soil**

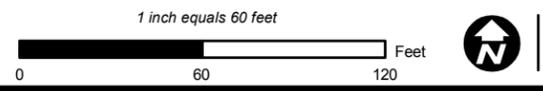
- Exceeds Residential RBSL + Eco RBSL
- Exceeds Eco RBSL
- Detect, Below All Screening Levels
- Non-detect

**Basemap Legend**

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

**PCBs in Soil  
Building 65 Metals Laboratory  
Clarifier RFI Site**

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

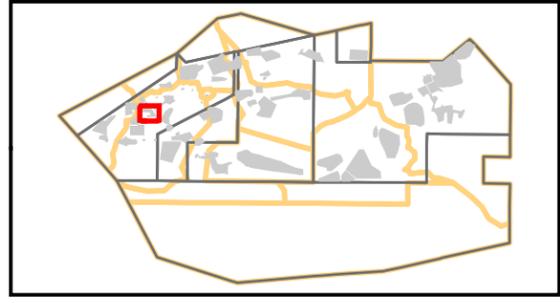


**SANTA SUSANA FIELD LABORATORY**



**Figure  
M.3-4**

\\\_RFI\_05\RFI\_Report\CDot\_BL\_PLTS\RFI\Grp5\_CD\DotPCBsSoil\_BL\_PLTS.mxd



**Metals in Soil**

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

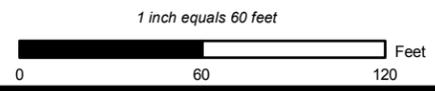
**Basemap Legend**

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

**Metals in Soil  
Metals Clarifier RFI Site**

Date: September 11, 2008

**WORKING DRAFT**

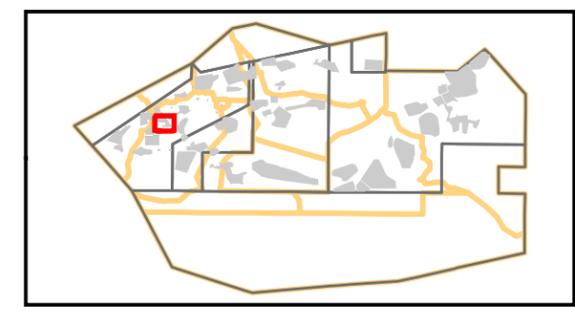
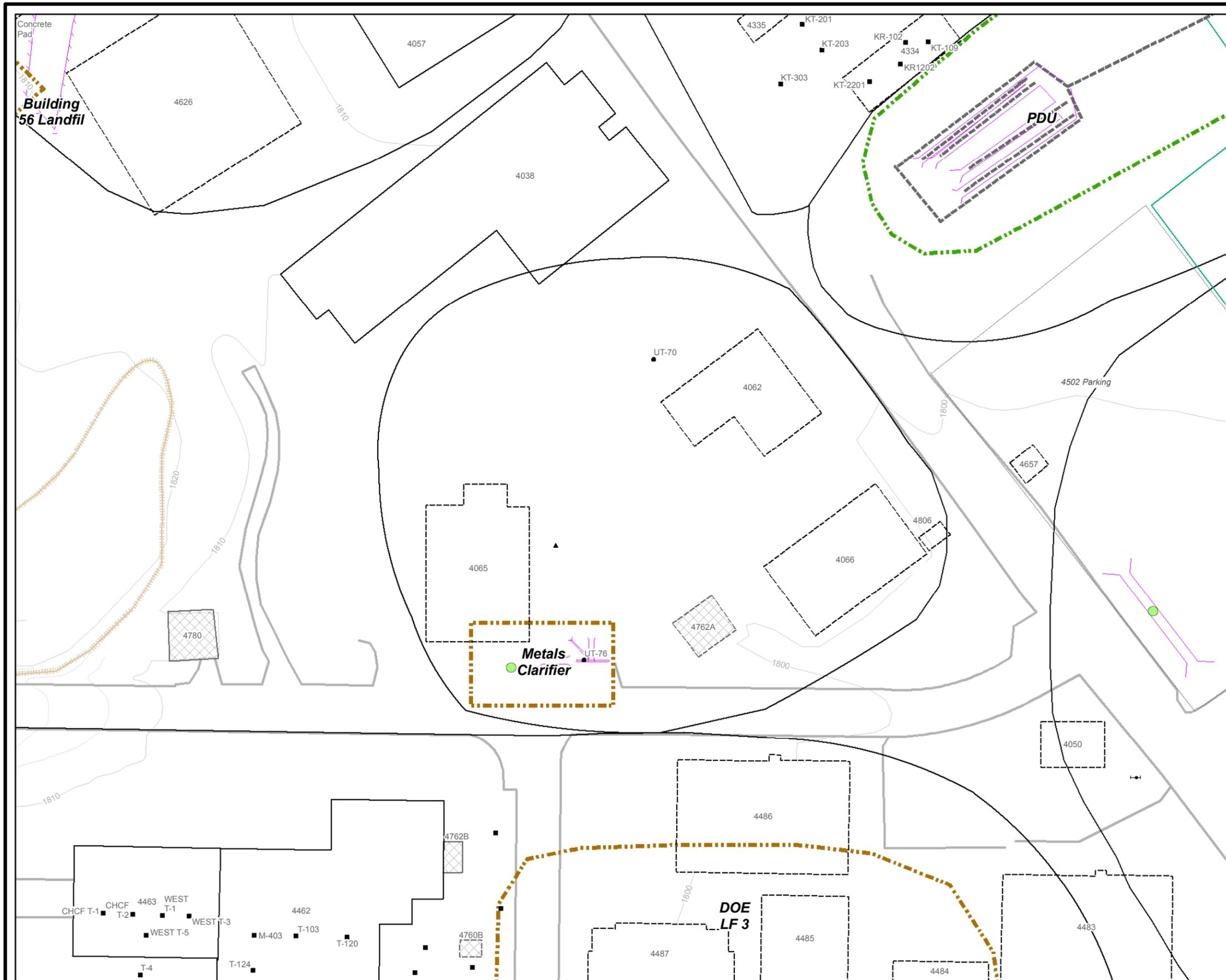


**SANTA SUSANA FIELD LABORATORY**



**Figure  
M.3-5**

\\\_RFI\_05\RFI\_Report\CDot\_BL\_PLTS\RFI\Grp5\_CD\DotMtlSoil\_BL\_PLTS.mxd



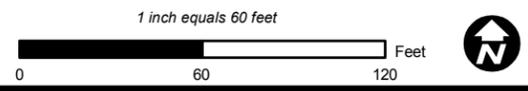
**Energetics in Soil**

- 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  
Metals Clarifier RFI Site**





### Soil Sample Locations

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

### Data Box Information

Sample Location ID	1.00 Primary Date	Depth in Feet Sample Type Unique Sample Identifier
BBS01	7/10/2005	

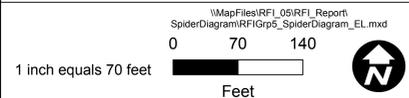
12.05	Non-Detect with sample concentration shown
<0.06	Non-Detect with lab detection limit shown
J	Analyte positively identified; Associated numerical value is considered estimated
NA and [ ]	Analysis not conducted
[ ]	If more than one result per sample depth, the maximum is presented, with number of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

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



MCBS017	Primary MCS01701	Primary MCS01702
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	4.4 J	1.7
1,1-Dichloroethane	2.6	<0.7
Benzofluoranthene	1.1	<0.2
Benzo[a]anthracene	13.1 J	<0.7
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	7.8 J	<0.7
Fluoranthene	2.4 J	<0.7
Naphthalene	2.3 J	<0.7
Phenanthrene	2.3 J	<0.7
Pyrene	-	-

MCBS003	Primary MCS00301	Primary MCS00302
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.38	1.52 J
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS002	Primary MCS00201	Primary MCS00202
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS001	Primary MCS00101	Primary MCS00102
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS005	Primary MCS00501	Primary MCS00502
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS01	Primary MCS0101	Primary MCS0102
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS03	Primary MCS0301	Primary MCS0302
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS04	Primary MCS0401	Primary MCS0402
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

MCBS02	Primary MCS0201	Primary MCS0202
Hydrocarbons (NA)	-	-
Lead Range Organics (C6-C20)	-	-
Lead Range Organics (C21-C50)	-	-
Lead Range Organics (C51-C100)	-	-
Lead Range Organics (C101-C150)	-	-
Lead Range Organics (C151-C200)	-	-
SVOC (ppb)	1.1	1.1
1,1-Dichloroethane	0.9	<0.8
Benzofluoranthene	6.9 J	<0.2
Benzo[a]anthracene	1.1	<0.2
Benzo[b]fluoranthene	1.1	<0.2
Benzo[k]fluoranthene	1.1	<0.2
Di-nonyl phthalate	1.1	<0.2
Fluoranthene	1.1	<0.2
Naphthalene	1.1	<0.2
Phenanthrene	1.1	<0.2
Pyrene	-	-

USBS101	Primary USBS10101	Primary USBS10102	Primary USBS10103	Primary USBS10104
Hydrocarbons (NA)	-	-	-	-
Lead Range Organics (C6-C20)	-	-	-	-
Lead Range Organics (C21-C50)	-	-	-	-
Lead Range Organics (C51-C100)	-	-	-	-
Lead Range Organics (C101-C150)	-	-	-	-
Lead Range Organics (C151-C200)	-	-	-	-
SVOC (ppb)	1.1	1.1	1.1	1.1
1,1-Dichloroethane	0.9	<0.8	<0.8	<0.8
Benzofluoranthene	6.9 J	<0.2	<0.2	<0.2
Benzo[a]anthracene	1.1	<0.2	<0.2	<0.2
Benzo[b]fluoranthene	1.1	<0.2	<0.2	<0.2
Benzo[k]fluoranthene	1.1	<0.2	<0.2	<0.2
Di-nonyl phthalate	1.1	<0.2	<0.2	<0.2
Fluoranthene	1.1	<0.2	<0.2	<0.2
Naphthalene	1.1	<0.2	<0.2	<0.2
Phenanthrene	1.1	<0.2	<0.2	<0.2
Pyrene	-	-	-	-

USBS102	Primary USBS10201	Primary USBS10202	Primary USBS10203	Primary USBS10204
Hydrocarbons (NA)	-	-	-	-
Lead Range Organics (C6-C20)	-	-	-	-
Lead Range Organics (C21-C50)	-	-	-	-
Lead Range Organics (C51-C100)	-	-	-	-
Lead Range Organics (C101-C150)	-	-	-	-
Lead Range Organics (C151-C200)	-	-	-	-
SVOC (ppb)	1.1	1.1	1.1	1.1
1,1-Dichloroethane	0.9	<0.8	<0.8	<0.8
Benzofluoranthene	6.9 J	<0.2	<0.2	<0.2
Benzo[a]anthracene	1.1	<0.2	<0.2	<0.2
Benzo[b]fluoranthene	1.1	<0.2	<0.2	<0.2
Benzo[k]fluoranthene	1.1	<0.2	<0.2	<0.2
Di-nonyl phthalate	1.1	<0.2	<0.2	<0.2
Fluoranthene	1.1	<0.2	<0.2	<0.2
Naphthalene	1.1	<0.2	<0.2	<0.2
Phenanthrene	1.1	<0.2	<0.2	<0.2
Pyrene	-	-	-	-

MCBS104	Primary MCS10401	Primary MCS10402	Primary MCS10403	Primary MCS10404
Hydrocarbons (NA)	-	-	-	-
Lead Range Organics (C6-C20)	-	-	-	-
Lead Range Organics (C21-C50)	-	-	-	-
Lead Range Organics (C51-C100)	-	-	-	-
Lead Range Organics (C101-C150)	-	-	-	-
Lead Range Organics (C151-C200)	-	-	-	-
SVOC (ppb)	1.1	1.1	1.1	1.1
1,1-Dichloroethane	0.9	<0.8	<0.8	<0.8
Benzofluoranthene	6.9 J	<0.2	<0.2	<0.2
Benzo[a]anthracene	1.1	<0.2	<0.2	<0.2
Benzo[b]fluoranthene	1.1	<0.2	<0.2	<0.2
Benzo[k]fluoranthene	1.1	<0.2	<0.2	<0.2
Di-nonyl phthalate	1.1	<0.2	<0.2	<0.2
Fluoranthene	1.1	<0.2	<0.2	<0.2
Naphthalene	1.1	<0.2	<0.2	<0.2
Phenanthrene	1.1	<0.2	<0.2	<0.2
Pyrene	-	-	-	-



# SANTA SUSANA FIELD LABORATORY

### 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: **99BS01**

1.00 Depth in Feet

Primary Sample Type: **99BS0101**

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 brackets.

Detect	Non-Detect	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)

[Light Blue Box]	= 2008 Data
[Dark Blue Box]	= Pre-2008 Data

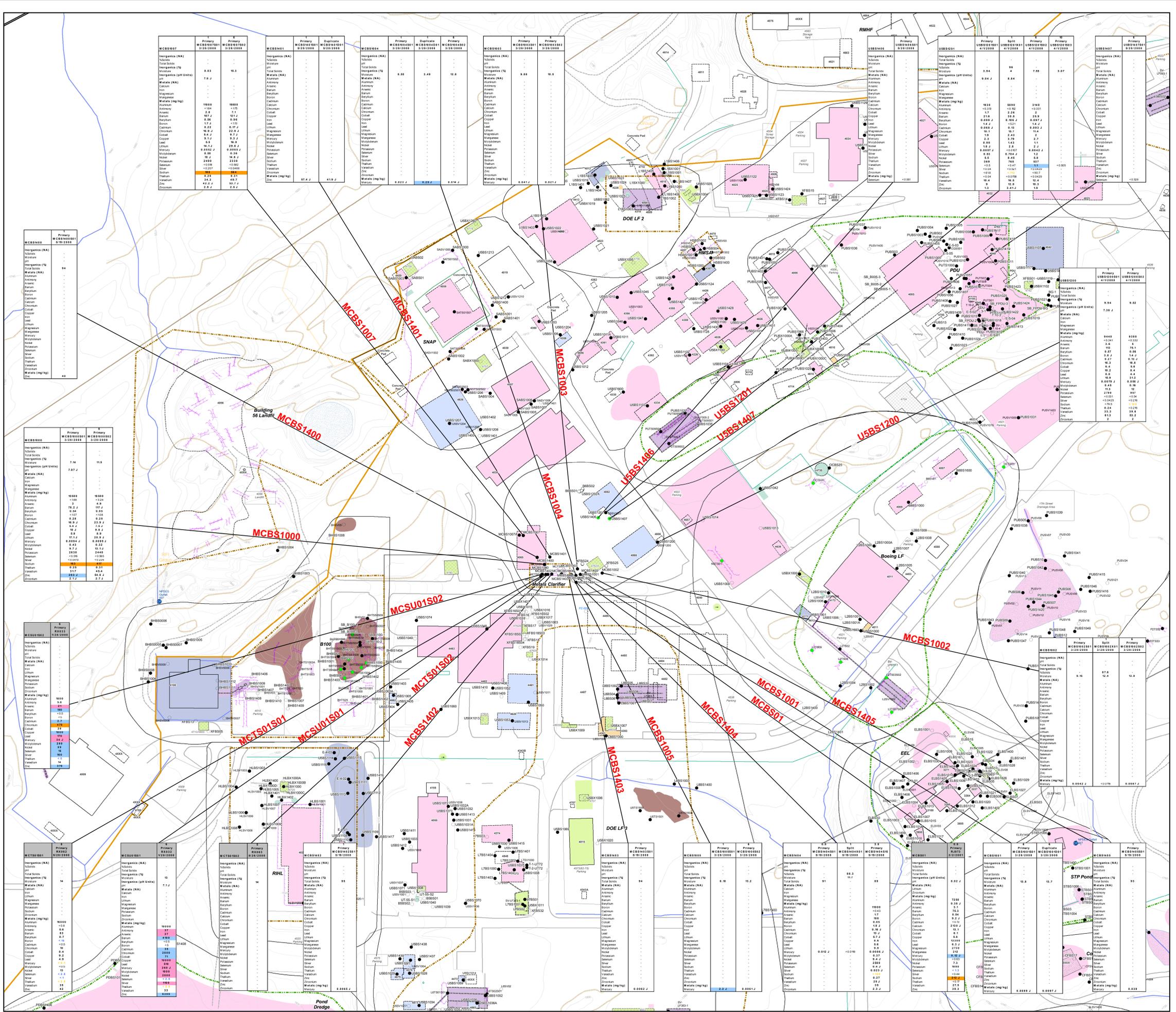
### Basemap Legend

- 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\RFI05\_SpiderDiagram\_EL.mxd

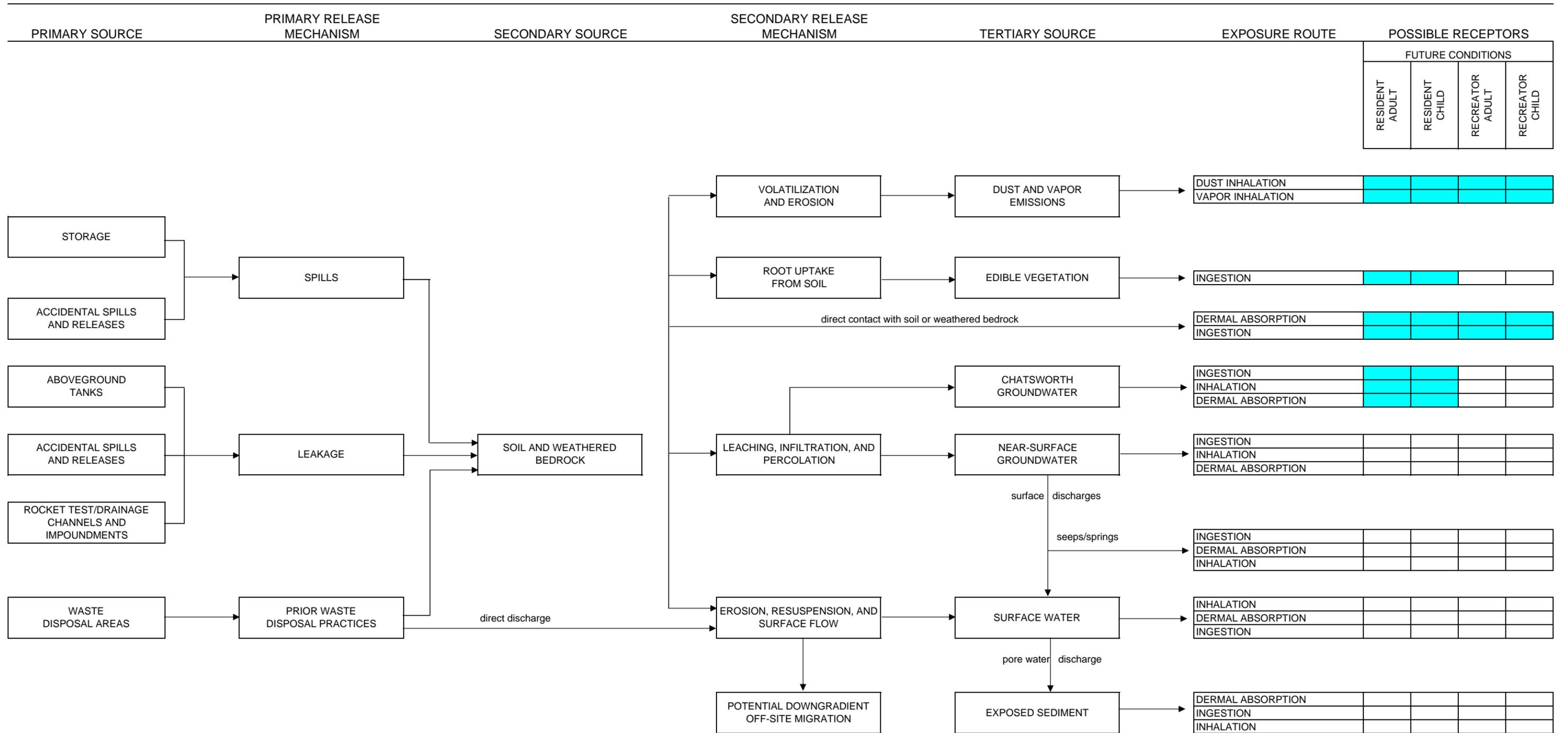
0 70 140 Feet

1 inch equals 70 feet



# SANTA SUSANA FIELD LABORATORY

**Figure M.4-1**  
**Human Health Risk Assessment Conceptual Site Model**  
**Building 65 Metals Lab Clarifier 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



**Attachments**

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