The Boeing Company
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
Canoga Park, CA 91304-1148

Via FedEx

January 14, 2014
In reply refer to SHEA-114367

Mr. Sam Unger
Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Dear Mr. Unger:

Subject: Interim Source Removal Action (ISRA) Phase III Implementation Report – 2011-2013 Activities performed in compliance with the Final ISRA Work Plan and the 2010 Addendum to the Final ISRA Work Plan Submitted in Response to California Water Code §13304 Order (NPDES NO. CA0001309, CI NO. 6027, SCP NO. 1111, Site ID No. 2040109)

Per the above referenced order dated December 3, 2008, The Boeing Company (Boeing), on behalf of Boeing and the National Aeronautics and Space Administration (NASA), hereby submits the attached ISRA Phase III Implementation Report – 2011-2013 Activities. This report represents the final ISRA implementation report. Performance monitoring at Phase III ISRA areas is currently being performed with results and recommendations being presented in annual rainy season summary reports. The attached report will be posted within the next 10 days on the Boeing External website at the following address:
http://www.boeing.com/aboutus/environment/santa_susana/isra.html

If there are any questions, please contact Mr. Art Lenox at (818) 466-8795.

Sincerely,

Paul Costa
Environmental Operations and Compliance Manager
Santa Susana Field Laboratory

Enclosures: ISRA Phase III Implementation Report – 2011-2013 Activities

Cc: Ms. Cassandra Owens, RWQCB, e-copy only
Mr. Peter Raftery, RWQCB, e-copy only
Mr. Mazhar Ali, RWQCB, e-copy only
Mr. Mark Malinowski, DTSC, e-copy only
Mr. Buck King, DTSC, e-copy only
Mr. Jon Jones, Surface Water Expert Panel, e-copy only
Dr. Mike Josselyn, Surface Water Expert Panel, e-copy only
Dr. Bob Gearheart, Surface Water Expert Panel, e-copy only
Mr. Allen Elliott, NASA, e-copy only
Mr. Pete Zorba, NASA, e-copy only
Randy Dean, CH2M HILL, e-copy only

# INTERIM SOURCE REMOVAL ACTION (ISRA)
# PHASE III IMPLEMENTATION REPORT – 2011-2013 ACTIVITIES
# SANTA SUSANA FIELD LABORATORY
# VENTURA COUNTY, CALIFORNIA

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**January 2014**

**Prepared For:**

**The Boeing Company**

**and**

**The National Aeronautics and Space Administration**

**Prepared By:**

**MWH**
**618 Michillinda Avenue**
**Suite 200**
**Arcadia, California 91007**

**Alex Fischl, P.M.P.**
**Project Manager**

**Andrew Payne, P.G. 8465**
**Project Geologist**

**Allison M. Ruotolo-Lo, P.G. 9105**
**Project Geologist**

PROFESSIONAL GEOLOGIST
ANDREW PAYNE
No. 8465
exp 9/2015
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
ALLISON MARGARET RUOTOLO-LO
No. 9105
Exp. 7/2014
STATE OF CALIFORNIA

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AILF | Area I Landfill |
| A2LF | Area II Landfill |
| ACM | asbestos-containing material |
| AOC | Administrative Order on Consent |
| Boeing | The Boeing Company |
| BMP | Best Management Practices |
| Cal Vada | Cal Vada Surveying, Inc. |
| CAO | Cleanup and Abatement Order |
| CCR | California Code of Regulations |
| CDFG | California Department of Fish and Game |
| COC | constituents of concern |
| CWA | Clean Water Act |
| cy | cubic yards |
| DTSC | Department of Toxic Substances Control |
| DOE | United States Department of Energy |
| Expert Panel | Surface Water Expert Panel |
| Geosyntec | Geosyntec Consultants |
| H&A | Haley and Aldrich, Inc. |
| HSP | health and safety plan |
| ISRA | interim source removal action |
| LOX | Liquid Oxygen |
| LUT | Look-Up Table |
| MRCA | Mountains Recreation Conservancy Authority |
| MWH | MWH Americas, Inc. |
| NASA | National Aeronautics and Space Administration |
| NPDES | National Pollutant Discharge Elimination System |
| NWP | Nationwide Permit |
| Padre | Padre Associates, Inc. |
| PCB | polychlorinated biphenyl |
| PEA | Preliminary Evaluation Area |
| NPDES | National Pollutant Discharge Elimination System |

## ABBREVIATIONS AND ACRONYMS (Continued)

| | |
|---|---|
| NWP | Nationwide Permit |
| Padre | Padre Associates, Inc. |
| PCB | polychlorinated biphenyl |
| PEA | Preliminary Evaluation Area |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| RMMP | Restoration, Mitigation, and Monitoring Plan |
| RWQCB | Los Angeles Regional Water Quality Control Board |
| SAA | Streambed Alteration Agreement |
| Sage | Sage Consultants, Inc. |
| Santa Susana Site | Santa Susana Field Laboratory |
| SHPO | State Historic Preservation Office |
| SMP | soil management plan |
| SRG | soil remediation goal |
| SWMM | Storm Water Management Model |
| SWPPP | Storm Water Pollution Prevention Plan |
| USACE | U.S. Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| W and S | W and S Consultants |
| WDR | Waste Discharge Requirement |

# EXECUTIVE SUMMARY

This Interim Source Removal Action (ISRA) Phase III Implementation Report summarizes the ISRA activities performed between 2011 and 2013 at the Santa Susana Field Laboratory (Santa Susana Site) and represents the final ISRA implementation report. ISRA Phase I and II implementation activities were completed in 2009 and 2010, respectively, and the activities performed are described in summary reports (MWH, 2010a and 2011a, and Boeing, 2011b). The Santa Susana Site is located approximately 29 miles northwest of downtown Los Angeles, California, in the southeast corner of Ventura County. Surface water discharges from the Santa Susana Site are exclusively the result of stormwater runoff and are intermittent following rain events. Stormwater discharges are monitored according to its National Pollution Discharge Elimination System (NPDES) Permit, NPDES No. CA001309.

## ISRA CAO

In response to exceedances of NPDES permit limits and benchmarks at Outfalls 008 and 009, the Los Angeles Regional Water Quality Control Board (RWQCB) issued a California Water Code Section 13304 Cleanup and Abatement Order (CAO) to Boeing on December 3, 2008 (RWQCB, 2008). The CAO included provisions for Boeing to communicate and work cooperatively with NASA for ISRAs necessary on NASA property (Item 6 of the CAO). The objective of the CAO is to improve surface water quality within the Outfalls 008 and 009 watersheds by requiring the identification and evaluation of areas of contaminated soil containing the constituents of concern (COCs) that may have contributed to exceedances of NPDES permit limits and benchmarks in stormwater, and implementation of an appropriate source removal alternative (e.g., excavation and offsite disposal or constructing diversion and collection structures).

## ISRA ACTIVITIES

ISRA activities were implemented in three phases between 2009 and 2013 and included conducting remedial actions at 36 ISRA areas[1] identified using the RWQCB-approved approach

[1] As described in Section 2.1, agencies agreed that remedial activities at eight of the ISRA areas would be performed as part of the cleanup activities overseen by the DTSC pursuant to the 2007 Consent Order (Boeing areas) and the NASA AOC (NASA areas).

presented in the Final ISRA Work Plan (MWH, 2009b) and summarized in Section 1.1.3. ISRA Phase I and II implementation activities were completed in 2009 and 2010, respectively, and ISRA Phase III implementation activities were completed between 2011 and 2013. Confirmation sampling and analysis results demonstrate that the soil remaining in place at the Phase I, II, and III ISRA areas contains ISRA COCs at concentrations that are below or consistent with the ISRA SRGs, or additional excavation is limited by the presence of a plant species (e.g., Coastal Live Oak), active utilities, or infrastructure (e.g., roads). A total of approximately 26,664 cy (*ex situ*) of soil was removed from 36 ISRA areas during the three phases of implementation. The table below summarizes the soil removed during each ISRA phase.

| ISRA Phase | Outfall 008 | | Outfall 009 | | TOTAL | |
|---|---|---|---|---|---|---|
| | **ISRA Areas** | **Volume (cy, *ex situ*)** | **ISRA Areas** | **Volume (cy, *ex situ*)** | **ISRA Areas** | **Volume (cy, *ex situ*)** |
| **Phase I (2009)** | 10 | 5,282 | 2 | 180 | 12 | 5,462 |
| **Phase II (2010)** | - - | - - | 11 | 7,475 | 11 | 7,475 |
| **Phase III (2011-2013)** | - - | - - | 13 | 12,727 | 13 | 12,727 |
| ***TOTAL*** | ***10*** | ***5,282*** | ***26*** | ***20,382*** | ***36*** | ***26,664*** |

Restoration activities at Phase I, II, III ISRA areas included backfilling excavations using a local soil borrow source and/or gravel, re-contouring using adjacent soils, and/or installing erosion control BMPs, including re-vegetation of the areas. In addition, several erosion and sediment controls, and stormwater treatment BMPs have been installed throughout the Outfalls 008 and 009 watersheds to improve surface water quality (e.g., Lower Parking Lot Biofilter and Sediment Basin, B-1 Sediment Basin and B-1 Media Filter, and ELV Channel BMP).

## PERFORMANCE MONITORING

Performance monitoring at Phase I and II ISRA areas was performed for two or three rainy seasons prior to being discontinued following the 2011/2012 rainy season because sufficient data had been collected to show a general decrease in downstream results compared to upstream results (MWH *et al.*, 2012). Monitoring at Phase III ISRA areas is currently in progress, and

results and recommendations from the 2013/2014 rainy season will be presented in the annual report.

## CONCLUSION

The ISRA remedial actions implemented by Boeing and NASA between 2009 and 2013 have met the objective of the CAO. Additionally, performance monitoring results collected to date indicate that ISRA activities have successfully reduced the contribution of ISRA COCs to surface water runoff. The surface water up- and downstream of Phase III ISRA areas will continue to be monitored and sampled for at least two years, with results and recommendations presented in annual rainy season summary reports for Outfalls 008 and 009.

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# 1.0 INTRODUCTION

This Interim Source Removal Action (ISRA) Phase III Implementation Report summarizes the ISRA activities performed between 2011 and 2013 at the Santa Susana Field Laboratory (Santa Susana Site) and represents the final ISRA implementation report. ISRA implementation activities were conducted by MWH Americas, Inc. (MWH) and CH2M HILL on behalf of The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA) pursuant to a California Water Code Section 13304 Cleanup and Abatement Order (CAO) issued by the Los Angeles Regional Water Quality Control Board (RWQCB) dated December 3, 2008 (RWQCB, 2008). The CAO was issued by the RWQCB to achieve compliance with the Waste Discharge Requirements (WDRs) for Outfalls 008 and 009 established in its National Pollution Discharge Elimination System (NPDES) Permit, NPDES No. CA001309. The CAO was issued to Boeing, and included provisions for Boeing to communicate and work cooperatively with NASA for ISRAs necessary on NASA property (Item 6 of the CAO). This communication and coordination is represented in this report, as well as in previous ISRA work plans and reports.

The ISRA project was conducted in accordance with the Preliminary ISRA Work Plan (MWH, 2009a), the Final ISRA Work Plan (MWH, 2009b), the 2010 ISRA Work Plan Addendum (MWH, 2010b), supplemental plans, and applicable regulations, and was performed in phases to allow completion of ongoing work within the Outfall 009 watershed (Northern Drainage cleanup and stormwater maintenance activities), and to accommodate federal funding schedules for work performed on NASA property. ISRA Phase I and II implementation activities were completed in 2009 and 2010, respectively, and the activities performed are described in summary reports (MWH, 2010a and 2011a, and Boeing, 2011b). ISRA Phase III implementation activities were completed between 2011 and 2013 and the activities performed are described in this report. This and prior implementation reports serve as fulfillment of Item 4 of the CAO, which requires that a report be submitted to the RWQCB documenting compliance with the CAO.

## 1.1 PROJECT BACKGROUND

The Santa Susana Site is located approximately 29 miles northwest of downtown Los Angeles, California, in the southeast corner of Ventura County. Figure 1-1 shows the geographic location and property boundaries of the site, as well as surrounding communities. Surface water discharges from the Santa Susana Site are exclusively the result of stormwater runoff and are intermittent following rain events. Stormwater discharges are monitored according to the NPDES Permit. The 16 outfall locations are shown on Figure 1-2, and a detailed view of the Outfalls 008 and 009 watersheds, the subject outfalls of the CAO, is shown in Figure 1-3. The NPDES Permit established monitoring at Outfalls 008 and 009 in August 2004 and NPDES permit limits were first established for Outfalls 008 and 009 in 2005-2006.

Pursuant to the NPDES Permit, a Best Management Practices (BMP) Plan describing the process for improving stormwater runoff quality and minimizing NPDES Permit exceedances in the Outfalls 008 and 009 watersheds at the Santa Susana Site was prepared in October 2010 (MWH *et al.,* 2010). The BMP Plan presents the refined strategy for the subject outfall drainages based on ongoing source removal actions (e.g., ISRAs and demolition activities), and recently obtained data and information (e.g., NPDES data, performance monitoring data, dioxins and metals stormwater background studies). The refined strategy is to target stormwater BMPs at locations where either existing data and/or new data generated as part of the BMP monitoring program indicate that BMPs may be required, while considering the list of guiding principles established by the Santa Susana Site Surface Water Expert Panel (Expert Panel). As part of the BMP monitoring program, an approach was developed by the Expert Panel for ranking the potential BMP sites to prioritize the locations based on water quality considerations (Expert Panel, 2011). The BMP site ranking and selection process is planned to occur on a yearly basis through the end of the BMP Plan coverage period, currently scheduled for 2014. Annual rainy season reports (MWH *et al.*, 2011, 2012, 2013) have been prepared that present the results and recommendations of the BMP Monitoring Program, and summarize BMP activities that are planned, are underway, or have been completed in the Outfalls 008 and 009 watersheds. Subsequent to submittal of the annual rainy season reports, annual BMP Plan addenda have been prepared (Geosyntec Consultants [Geosyntec] and Expert Panel, 2011, 2012, and 2013). The

BMP Plan addenda provide additional detail on the BMP recommendations presented in the annual reports.

### 1.1.1 Santa Susana Site Environmental Programs

The Santa Susana Site is currently undergoing investigation and closure under the oversight of the Department of Toxic Substances Control (DTSC). Soil investigation and closure activities are being performed pursuant to the 2007 Consent Order within Administrative Areas I, III, and the Southern Undeveloped Land by Boeing. Soil investigation and closure activities are being performed within Area IV and the Northern Undeveloped Land by the United States Department of Energy (DOE) and within the federally-owned parcel of Administrative Area I and Administrative Area II by NASA pursuant to their respective 2010 Administrative Orders on Consent (AOCs). Boeing, NASA, and DOE are conducting groundwater investigation and closure in their respective areas pursuant to the 2007 Consent Order.

In addition, removal of debris and contaminated soils from the Northern Drainage, within the Outfall 009 watershed, has been completed pursuant to an Imminent and Substantial Endangerment Determination and Order and Remedial Action Order issued by DTSC and a CAO issued by the RWQCB. Following this removal activity, a Restoration, Mitigation, and Monitoring Plan (RMMP; Haley and Aldrich, Inc. [H&A], 2011) was developed, with the support of the Expert Panel, and construction of the BMPs for channel stabilization measures was completed in November 2012. Additionally, the ongoing maintenance work related to the former Rocketdyne-Atomics International Rifle and Pistol Club shooting range on the Mountains Recreation Conservancy Authority (MRCA) property will continue under DTSC oversight.

### 1.1.2 ISRA CAO

In response to exceedances of NPDES permit limits and benchmarks at Outfalls 008 and 009, the RWQCB issued a CAO to Boeing on December 3, 2008 (RWQCB, 2008). The objective of the CAO is to improve surface water quality within the Outfalls 008 and 009 watersheds by requiring the identification and evaluation of areas of contaminated soil containing the constituents of concern (COCs) that may have contributed to exceedances of NPDES permit limits and benchmarks in stormwater, and implementation of an appropriate source removal alternative (e.g., excavation and offsite disposal or constructing diversion and collection

structures). The CAO also requires that methods be used that minimize impacts to the streambed adjacent to habitat during cleanup activities, protect the water quality during and after cleanup activities, and restore the streambed and surrounding upland habitat following cleanup activities.

ISRA COCs for surface water at Outfalls 008 and 009 were determined by surface water samples collected for monitoring or compliance under the NPDES Permit at those outfalls. Based on an evaluation of all stormwater samples collected at Outfalls 008 and 009 since August 2004, including sample data collected for monitoring before the NPDES permit limits/benchmarks were established, the following COCs have been identified for each of the outfalls: copper, lead, and dioxins at Outfall 008, and cadmium, copper, lead, mercury, and dioxins at Outfall 009.

The sources of COCs within the Outfall 008 watershed are the responsibility of Boeing because the Outfall 008 watershed is entirely on property owned by Boeing. However, because the Outfall 009 watershed includes property owned by Boeing as well as property owned by the federal government and administered by NASA, Boeing and NASA are responsible for addressing the sources of COCs on their respective properties.

### 1.1.3 ISRA Project Approach

The ISRA project approach to meet the objectives of the CAO was presented in detail in the Final ISRA Work Plan (MWH, 2009b). The approach included:

(1) Compiling the previously existing data set of soil and sediment samples for the Outfalls 008 and Outfall 009 watersheds;

(2) Identifying potential source areas of ISRA COCs and designating them as Preliminary ISRA Evaluation Areas (ISRA PEAs). ISRA PEAs represent areas in which samples from the previously existing data set contain concentrations of the ISRA COCs exceeding DTSC-approved background comparison concentrations (MWH, 2005);

(3) Performing additional soil sampling to fill data gaps and delineate the lateral and vertical extents of the source areas, producing refined ISRA PEAs;

(4) Evaluating each refined ISRA PEA, based on criteria including sampling results, soil type, site geomorphology, and type of vegetation, to highlight which areas were likely to be contributing ISRA COCs to surface water and should be identified as an ISRA area requiring remediation; and

(5) Performing a remedial alternatives analysis to select an appropriate source removal alternative (e.g., excavation and offsite disposal or constructing diversion and collection structures), and developing soil remediation goals (SRGs[2]) for each proposed ISRA area.

The ISRA approach presented in the Final ISRA Work Plan also specifies that where Resource Conservation and Recovery Act (RCRA) risk drivers are co-located with ISRA areas, the RCRA risk drivers will be considered in ISRA activities (MWH, 2009b). RCRA risk drivers are those chemicals that significantly contribute to unacceptable human risks and ecological risks, as presented in the RCRA Facility Investigation (RFI) Group reports.

Following ISRA implementation, effectiveness of the soil source removal in meeting NPDES benchmark limits will be evaluated by the results of surface water samples collected at Outfalls 008 and 009. In addition, performance monitoring is proposed to be performed at each ISRA area for a minimum of 2 years. Performance monitoring involves the collection of stormwater samples both up- and downstream of each completed ISRA area to obtain water quality performance data to assess the contribution of COCs to stormwater within the Outfalls 008 and 009 watersheds following completion of remedial activities.

## 1.2 ISRA ACTIVITIES

ISRA activities were implemented in three phases between 2009 and 2013 and included conducting remedial actions at 36 ISRA areas. The locations of the ISRA areas, in addition to shallow soil sample results for ISRA COCs prior to Phase III ISRA implementation, are shown on Figures 1-4 through 1-6. A summary of the activities completed during each phase of ISRA is provided below.

### 1.2.1 Phase I Scope

ISRA remedial activities performed in 2009 are considered to be Phase I implementation activities and, pursuant to Item 4 of the RWQCB CAO, a Phase I Implementation Report was prepared and submitted to the RWQCB on April 1, 2010 (MWH, 2010a). Phase I activities consisted of soil sampling to refine ISRA PEAs, ISRA area identification, remedial alternatives

[2] The SRGs established for the ISRA project are consistent with or near the DTSC-approved soil background concentrations presented in the 2005 Soil Background Report (MWH, 2005), as described in the ISRA Final Work Plan (MWH, 2009b). The SRG for dioxins is slightly higher than current background levels (approximately 3 times the background concentration) because the Outfalls 008 and 009 watersheds were extensively burned during the 2005 Topanga Fire, resulting in dioxin-containing ash and burned debris being deposited throughout the area.

evaluation, surveying, permitting, supplemental work plan preparation, sampling to characterize soil for waste disposal purposes, sampling to characterize soil for use as backfill during restoration, and remedial activities. ISRA remedial activities during 2009 consisted of excavation and site restoration at ten ISRA areas in the Outfall 008 watershed (CYN-1, DRG-1, HVS-1, HVS-2A, HVS-2B-1, HVS-2B-2, HVS-2C, HVS-2D, HVS-3, and HVS-4) and at two ISRA areas in the Outfall 009 watershed (A2LF-1 and A2LF-3). The locations of these ISRA areas and shallow soil sample results for ISRA COCs after completion of the ISRA activities are shown on Figures 1-4 and 1-6.

A total of approximately 5,200 cubic yards (cy) (*ex situ*) of soil was removed from Outfall 008 ISRA area excavations, and approximately 180 cy (*ex situ*) of soil was removed from Outfall 009 ISRA area excavations. In addition, an abandoned natural gas pipeline segment adjacent to ISRA area HVS-2A and a septic tank within ISRA area HVS-3 were removed under DTSC, RWQCB, and Ventura County oversight. Excavation footprints were re-contoured to follow previous surface water runoff patterns, hydroseeded with seed and wood fiber mulch, and, in appropriate areas, revegetated with additional plants specifically grown for use along drainage swales to provide additional stabilization.

Performance monitoring was conducted at Phase I ISRA areas during the 2009/2010, 2010/2011, 2011/2012 rainy seasons to assess the contribution of ISRA COCs to surface water runoff following completion of remedial activities. With concurrence from the RWQCB, performance monitoring was discontinued at Phase I ISRA areas following the 2011/2012 rainy season because sufficient data had been collected to show a general decrease in downstream concentrations of ISRA COCs, as compared to upstream concentrations (MWH *et al.*, 2012).

### 1.2.2 Phase II Scope

ISRA remedial activities performed in 2010 are considered to be Phase II implementation activities and, pursuant to Item 4 of the RWQCB CAO, a Phase II Implementation Report was prepared and submitted to the RWQCB on April 29, 2011 (MWH, 2011a and Boeing, 2011b). Phase II activities consisted of soil sampling to refine ISRA PEAs, ISRA area identification, remedial alternatives evaluation, surveying, permitting, supplemental work plan preparation, sampling to characterize soil for waste disposal purposes, sampling to characterize soil for use as

backfill during restoration, and remedial activities. ISRA remedial activities during 2010 consisted of excavation and site restoration at 11 ISRA areas in the Outfall 009 watershed (AP/STP-1A, AP/STP-1D, AP/STP-1F, B1-1A, B1-1B, B1-1C, B1-1D, B1-2, CTLI-1A, CTLI-1B, and IEL-1). The locations of these ISRA areas and shallow soil sample results for ISRA COCs after completion of the ISRA activities are shown on Figures 1-5 and 1-6.

A total of approximately 7,500 cy (*ex situ*) of soil was removed from Outfall 009 Phase II ISRA area excavations. In addition, buried pipelines encountered during excavation activities at ISRA areas AP/STP-1A, B1-2, and CTLI-1A were removed under DTSC and RWQCB oversight. Excavation footprints were re-contoured to follow previous surface water runoff patterns and hydroseeded with seed and wood mulch. In addition, a sediment basin was installed within ISRA area B1-2 for sediment control.

Performance monitoring was conducted at Phase II ISRA areas during the 2010/2011 and 2011/2012 rainy seasons to assess the contribution of ISRA COCs to surface water runoff following completion of remedial activities. With concurrence from the RWQCB, performance monitoring was discontinued at Phase II ISRA areas following the 2011/2012 rainy season because sufficient data had been collected to show a general decrease in downstream concentrations of ISRA COCs, as compared to upstream concentrations (MWH *et al.*, 2012).

### 1.2.3 Phase III Scope

ISRA remedial activities performed between 2011 and 2013 are considered to be Phase III implementation activities and are described in this implementation report prepared pursuant to Item 4 of the RWQCB CAO. Phase III activities consisted of soil sampling to refine ISRA areas, surveying, permitting, supplemental work plan preparation, sampling to characterize soil for waste disposal purposes, and remedial activities. ISRA remedial activities between 2011 and 2013 consisted of excavation and site restoration at 13 ISRA areas in the Outfall 009 watershed (AP/STP-1B, AP/STP-1C-1, AP/STP-1C-2, AP/STP-1E-1, AP/STP-1E-2, AP/STP-1E-3, ELV-1C, ELV-1D, IEL-2, IEL-3, LOX-1B-1, LOX-1B-2, and LOX-1B-3). The locations of these ISRA areas and shallow soil sample results for ISRA COCs prior to Phase III ISRA implementation are shown on Figures 1-5 and 1-6. The remainder of this report describes the

preparatory and remedial activities performed as part of Phase III ISRA implementation, and the performance monitoring activities for Phase III ISRA areas.

### 1.2.4 Agency and Public Involvement

The RWQCB provides primary regulatory oversight of the ISRA project. In addition to the RWQCB, all Phase III ISRA activities were closely overseen by DTSC, and grading activities on Boeing property were permitted and overseen by Ventura County[3]. Below are additional details of how each agency was involved with the Phase III activities.

- Teleconferences were held on a weekly basis through June 29, 2011, on a bi-weekly basis from July 2011 through September 2013, and on an as-needed basis following September 2013 to provide updates on project activities and schedule. Teleconferences were attended by Boeing, NASA, RWQCB, DTSC, Ventura County, and the Expert Panel.
- Monthly and quarterly ISRA progress reports were submitted to the RWQCB describing Phase III ISRA activities.
- During Phase III ISRA field preparation and implementation (May 2011 – October 2013), the RWQCB conducted 12 site visits and DTSC conducted 3 site visits.
- The RWQCB collected and analyzed 72 split samples of excavation confirmation soil samples at Phase III ISRA areas.
- Excavation confirmation soil sampling results for each ISRA area were reviewed with the RWQCB and DTSC on teleconferences and agreement that excavation activities were complete was received from the RWQCB and DTSC prior to excavation backfill and restoration of each ISRA area.
- Boeing and NASA hosted a tour for RWQCB board members and staff on October 6, 2011.

Public participation during Phase III ISRA activities included attending the Expert Panel public meetings on August 25, 2011 and March 20, 2013. In addition, ISRA documents were made available to the public on the Boeing external web site, on a page dedicated to ISRA, within 10 working days of submittal to the RWQCB, at the following web address: http://www.boeing.com/aboutus/environment/santa_susana/isra.html.

[3] Grading activities on federal property are not subject to Ventura County requirements.

## 1.3 REPORT CONTENT

This report includes the following four sections and 10 appendices:

- Section 1 presents project background information, describes the scope and objectives of the Phase III ISRA implementation activities, and describes the involvement of regulatory agencies and the public.
- Section 2 describes the preparation activities that were undertaken to support Phase III ISRA implementation, including Phase III ISRA Area Evaluation, updates to supplemental plans, permitting activities, waste characterization sampling, and site surveys and site preparation activities.
- Section 3 presents the results of the Phase III ISRA implementation activities, including excavation, confirmation sampling, soil management and disposal, Storm Water Pollution Prevention Plan (SWPPP) implementation, site restoration, and surveying. It also describes the performance monitoring plan for Phase III ISRA areas.
- Section 4 presents a summary of the work performed and conclusions.
- Appendix A provides copies of correspondence regarding Phase III ISRA activities.
- Appendix B provides waste certification documents for Phase III ISRA areas.
- Appendix C provides laboratory and data validation reports for soil samples collected during Phase III ISRA implementation.
- Appendix D provides biological monitoring reports, survey notes, and correspondences prepared by Padre Associates, Inc. (Padre) for Phase III ISRA implementation activities.
- Appendix E presents maps and tables showing pre-excavation and confirmation soil sampling results, and excavation boundaries for Phase III ISRA areas.
- Appendix F provides boring logs and trench logs for work conducted during Phase III ISRA implementation.
- Appendix G provides photographs of ISRA Phase III implementation activities.
- Appendix H provides building feature description logs and building feature removal logs for pipelines and other features encountered during Phase III implementation.
- Appendix I provides offsite disposal records for soils excavated during Phase III implementation.
- Appendix J presents ground-based topographic and post-excavation boundary surveys of Phase III ISRA areas.

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# 2.0 PHASE III PREPARATION ACTIVITIES

This section describes the preparation activities undertaken to support Phase III ISRA implementation. Preparation activities included ISRA area evaluation, supplemental plan preparation, obtaining necessary permits, soil waste characterization sampling, development of soil waste profiles, and conducting site surveys and other site preparation activities.

## 2.1 PHASE III ISRA AREA EVALUATION

A total of 21 ISRA areas remained following Phase II Implementation (AILF-1, AILF-2, A2LF-2A, A2LF-2B, AP/STP-1B, AP/STP-1C-1, AP/STP-1C-2, APSTP-1E-1, AP/STP-1E-2, AP/STP-1E-3, ELV-1C, ELV-1D, IEL-2, IEL-3, LOX-1A, LOX-1B-1, LOX-1B-2, LOX-1B-3, LOX-1B-4, LOX-1C, and LOX-1D). These ISRA areas, which are located within the Outfall 009 watershed, are shown on Figures 1-5 and 1-6. These figures also present shallow soil sample results for ISRA COCs prior to Phase III ISRA implementation.

Following further evaluation of the remaining ISRA areas, it was decided remedial activities at eight of the ISRA areas (AILF-1, AILF-2, A2LF-2A, A2LF-2B, LOX-1A, LOX-1B-4, LOX-1C, and LOX-1D) would be performed as part of the cleanup activities overseen by the DTSC pursuant to the 2007 Consent Order (Boeing areas) and the NASA AOC (NASA areas). The rationale for this decision at the Area I Landfill (AILF), ISRA areas AILF-1 and AILF-2, and the Area II Landfill (A2LF), ISRA areas A2LF-2A and A2LF-2B, is that predicted surface water runoff volumes and flow rates are low based on the site Storm Water Management Model (SWMM) and field observations, and surface water sampling results downstream of the landfills are generally below NPDES permit limits. In addition, the landfills have steep slopes that are currently well vegetated and stabilization after remedial activities would be difficult. Also, runoff from the AILF has been significantly reduced by removing the B1324 asphalt parking lot, and BMPs are present between the AILF and the Northern Drainage. The rationale for this decision at four ISRA areas near the former Liquid Oxygen (LOX) Plant (LOX-1A, LOX-1B-4, LOX-1C, and LOX-1D) is that the primary COC is copper and/or cadmium, both of which have not been detected in any Outfall 009 NPDES permit samples since 2006. However, the need for additional controls at these areas and the plan to integrate the remediation work into the

DTSC-directed cleanup programs will be reevaluated based on the results from continued surface water monitoring efforts under the BMP and NPDES programs, and with the continued input of the Expert Panel.

The plan described above was reviewed with the RWQCB, the DTSC, and the Expert Panel during teleconferences and all attendees concurred. Documentation of the agreements are included in Appendix A and a summary of the approach is also included in the 2012/2013 Rainy Season Summary Report (MWH *et al.*, 2013). All remaining ISRA areas have been addressed during Phase III implementation activities.

## 2.2 UPDATES TO SUPPLEMENTAL PLANS

Several planning documents were prepared for ISRA implementation, including site-specific health and safety plans (HSPs), SWPPPs, soil management plans (SMPs), and transportation plans. As necessary, updates to these supplemental plans were prepared to support Phase III ISRA implementation. The supplemental plan updates were submitted to the RWQCB and DTSC prior to the commencement of applicable Phase III activities and were made available to the public on the Boeing external web site. A list of the documents is provided below.

- SWPPP, ISRA, Rev. 3 (MWH, 2011b).
- Update to the Characterization, Management, and Disposal Plan for Soils Excavated from ISRA Area ELV-1C (NASA, 2011); DTSC indicated approval of the updated ELV Soil Management Plan in a letter dated November 10, 2011 (DTSC, 2011) and prepared a subsequent letter on the topic dated August 23, 2012 (DTSC, 2012).
- Revision of Traffic Control Procedures for Soils Removed during ISRA (Boeing, 2011a).
- Homogenization of Soil Samples Collected as part of the ISRA Program (Boeing, 2012a).
- Addition of Sunshine Canyon Landfill as a Disposal Option for Non-Hazardous Soils Removed during ISRA (Boeing, 2012b).
- Addition of Energy Solutions Clive Disposal Site as a Disposal Option for Soils with Radionuclides above the DTSC Look-Up Table (LUT) Values Removed during ISRA (Boeing, 2013a).
- Revision of Offhaul Schedule for Soils Removed during ISRA (Boeing, 2013b); RWQCB indicated approval of the revision in an email dated July 31, 2013.

## 2.3 PERMITTING ACTIVITIES

Permitting activities were conducted prior to commencing Phase III implementation activities, as required by Item 7 of the CAO. All necessary permits were obtained prior to beginning remediation activities and included the following:

- Clean Water Act (CWA) Section 404, Nationwide Permit (NWP) 38 (Cleanup of Hazardous and Toxic Waste), from the U.S. Army Corps of Engineers (USACE), for activities performed at Phase III ISRA area AP/STP-1E (other remaining ISRA areas were evaluated and determined to be outside USACE geographic jurisdiction);
- CWA Section 401 Notification to RWQCB for Phase III ISRA areas was submitted prior to commencing field work (CWA Section 404 NWP 38 is a CWA Section 401 Certified permit);
- Determination that Phase III activities were covered under an existing Amendment to Streambed Alteration Agreement (SAA) No. 1600-2003-5052-R5 with the California Department of Fish and Game (CDFG); and
- Grading permit from Ventura County for Phase III ISRA areas located on non-Federal property.

Correspondences relevant to these permits were included in the Phase II implementation report (MWH, 2011a).

## 2.4 WASTE CHARACTERIZATION SAMPLING

The guidelines presented in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", U.S. Environmental Protection Agency (USEPA) publication SW-846, were followed to characterize soil removed from the ISRA excavations for disposal purposes, as described in the ISRA SMPs (MWH, 2009d and 2010d). To facilitate this, *in situ* waste characterization soil samples were collected from Phase III ISRA areas prior to beginning remedial activities. The number of waste characterization samples required for each ISRA area was determined based on estimated contaminant presence, excavation area, excavation footprint shape, and projected volume of material to be removed. *In situ* waste characterization samples were collected from random locations within each ISRA area, with sample locations determined by randomly-generated coordinates within the ISRA area boundary.

The analytical suite for waste characterization samples was determined based on documented historical information and analytical data, including data from RFI and ISRA data gap sampling.

In addition, waste characterization samples were analyzed for radiological constituents. Boeing staff evaluated the waste characterization sample results and prepared waste certifications that presented the classification of the soil for offsite disposal purposes. Separate waste certifications were prepared documenting the classification of soils based on chemical sample results and radiological sample results. Waste certifications for Phase III ISRA areas are included in Appendix B, and laboratory reports for waste characterization samples are included in Appendix C. Additionally, sample locations and results for waste characterization samples are included in pre-excavation tables and figures in Appendix E. Phase III soils were characterized as non-hazardous or hazardous, pursuant to Title 22 of the California Code of Regulations (CCR), and either below or above the DTSC Draft Provisional Radiological LUT values. The classification of soils excavated from each ISRA area is listed in Table 3-1.

## 2.5 SITE SURVEYS AND SITE PREPARATION ACTIVITIES

A list of the site surveys and site preparation activities conducted prior to the Phase III ISRA implementation is provided below.

- Biological surveys of Phase III ISRA areas were conducted by Padre. The biological surveys were performed to identify the presence of sensitive species and to help prepare potential relocation and/or mitigation options, and to ensure compliance with the CDFG SAA. Documents summarizing the findings of the biological surveys are included in Appendix D.
- Archaeological assessment of Phase III ISRA areas on Boeing property was conducted by W and S Consultants (W and S) to identify the potential for adverse impacts to cultural resources. The results were presented in a summary report (W and S, 2009).
- Archaeological assessment of Phase III ISRA areas on NASA property was conducted by CH2M HILL to identify the potential for adverse impacts to cultural resources. The archaeological survey report was provided to the California State Historic Preservation Office (SHPO); NASA received concurrence from California SHPO on August 3, 2009 and submitted the report to the South Central Coastal Information Center, California State University, Fullerton.
- Pre-excavation aerial topographic survey of the entire Outfall 009 watershed was conducted by Sage Consultants, Inc. (Sage) in 2010. The pre-excavation topographic survey drawings were included in the Phase II implementation report (MWH, 2011a and Boeing, 2011b). Pre-excavation topographic contours from this survey are shown on Figures 1-5 and 1-6, and pre-excavation figures in Appendix E.
- Stormwater BMP installation, per the SWPPP, was performed at Phase III ISRA areas prior to implementation.

- Underground utility surveys were performed at Phase III ISRA areas prior to implementation.
- Vegetation clearance was performed at Phase III ISRA areas prior to implementation.

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# 3.0 PHASE III REMEDIAL ACTION IMPLEMENTATION SUMMARY

During Phase III implementation, remedial actions were conducted at 13 ISRA areas within the Outfall 009 watershed, including AP/STP-1B, AP/STP-1C-1, AP/STP-1C-2, AP/STP-1E-1, AP/STP-1E-2, AP/STP-1E-3, ELV-1C, ELV-1D, IEL-2, IEL-3, LOX-1B-1, LOX-1B-2, and LOX-1B-3. The locations and planned boundaries of these ISRA areas are shown on Figures 1-5 and 1-6. The selected remedial alternative for each of these ISRA areas was excavation and offsite disposal. Remedial actions consisted of soil excavation, confirmation sampling, soil management and disposal, SWPPP implementation, site restoration, surveying, and performance monitoring. These activities are described in more detail below.

## 3.1 EXCAVATION SUMMARY

Excavations were conducted at Outfall 009 Phase III ISRA areas, with work practices in accordance with the ISRA supporting plans (HSPs, SWPPPs, SMPs, and transportation plans) and updates to these plans. The total volume of soil excavated from Phase III ISRA areas was approximately 12,700 cy (*ex situ*). Excavation activities began on May 2, 2011 and were completed on October 31, 2013. Contractors conducting the remedial activities were M P Environmental Services, Inc. at IEL, ELV, and Ash Pile ISRA areas and Recon at LOX ISRA areas (heavy equipment operation), JHA Environmental, Inc. (geologic logging and sample collection), and MWH (field oversight). Equipment used during excavations included excavators, loaders, water trucks, haul trucks, and vacuum trucks. A summary of the excavation details for each ISRA area, including the ISRA COCs and co-located RCRA risk drivers, planned and actual excavation surface areas and volumes, backfill volumes, excavation depths, numbers of waste characterization and confirmation samples collected, numbers of RWQCB split samples collected, and soil waste classifications, is provided in Table 3-1. Trench logs for the excavations are included in Appendix F. Photographs of ISRA Phase III excavation activities are included in Appendix G.

During excavation activities, debris was encountered within ISRA areas AP/STP-1B, AP/STP-1C-2, and LOX-1B-1. Details of the debris are provided below.

- Within ISRA area AP/STP-1B was a small soil debris pile (CH2-G2-1071) which was documented during the 2009 waste debris survey (CH2M HILL and MWH, 2009). This soil debris pile measured approximately 6 feet x 7 feet x 3 feet and comprised soil intermixed with small pieces of concrete and metal debris. This debris pile was characterized for waste disposal purposes and excavated during ISRA activities.
- Within ISRA area AP/STP-1C-2 some white plaster-like material was encountered during excavation in an area measuring approximately 15 feet x 20 feet and was less than 6 inches thick. A sample of the material was collected by Pacific H&S for analysis of asbestos-containing material (ACM). Results show this material was not ACM and this material was removed and disposed of during ISRA activities.
- Within ISRA area LOX-1B-1 were multiple small debris piles believed to be related to demolition of the LOX Plant. The debris consisted of soil intermixed with sandstone, broken up asphalt, small pieces of concrete, and small amounts of vegetation and metal. The debris piles were consolidated into a stockpile measuring approximately 45 feet x 60 feet x 8 feet. This debris pile was characterized for waste disposal purposes and excavated during ISRA activities.

Subsurface features, primarily pipelines/conduits, were encountered during excavation activities at ISRA areas AP/STP-1C-2, ELV-1C, ELV-1D, IEL-2, IEL-3, and LOX-1B-3. These features were documented and, in general, the portions of the features within the excavation boundary were removed under RWQCB and DTSC oversight. If pipelines contained black mastic wrapping on the exteriors, a sample of the wrapping was collected and analyzed for polychlorinated biphenyls (PCBs) and/or asbestos for waste disposal purposes. Appendix H includes building feature documentation logs and building feature removal logs describing the features observed and removed. Management and disposal of the subsurface features were performed under the Santa Susana Site Environmental program; therefore the offsite disposal records for these materials are not included in this report. A summary of the features encountered in each ISRA area is provided below.

- Near ISRA area AP/STP-1C-1 a subsurface feature was investigated in 2012 during ISRA activities, but not removed. A letter prepared by NASA notifying DTSC of the planned investigation is included in Appendix A. Based on the observations during the investigation, the feature is believed to be an underground tank associated with the Ash Pile septic/sewer system (note a building feature description log was not prepared for this feature).
- Within ISRA area AP/STP-1C-2, a subsurface 1-inch diameter pipeline was observed and removed during excavation activities. The pipeline did not have mastic wrapping.
- Within ISRA area ELV-1C, two stormwater drains, a storm drain inlet structure and associated piping, a sewer pipeline, and a valve and associated metal piping were observed during excavation activities. All features were left in place with the exception

of piping associated with the storm drain inlet structure which was removed during excavation activities. No soil staining or odors were observed and the pipelines did not have mastic wrapping.

- Within ISRA area ELV-1D, two drain pipes and two vertical pipes with lids were observed and removed during excavation activities. Soil discoloration was observed during removal of one of the drain pipes, but no odors were observed. The discolored soil was removed during ISRA excavation activities. The pipelines did not have mastic wrapping.
- Within ISRA area IEL-2, a subsurface feature was uncovered and subsequently removed in the southern portion of the excavation area. The feature was a vertical, open-ended clay pipe filled with pea gravel. No odors or soil staining was observed. An email prepared by Boeing notifying RWQCB and DTSC of the feature is included in Appendix A.
- Within ISRA area IEL-2, three metal pipelines and four clay pipelines, one of which had wrapping, were observed and removed during excavation activities. The pipe wrapping was sampled by Pacific H&S for analysis of ACM. Results show this material was not ACM.
- Within ISRA area IEL-3, six subsurface pipelines were observed and removed during excavation activities. The pipelines did not have mastic wrapping.
- Within ISRA area LOX-1B-1, one subsurface pipeline was observed and removed within the excavation floor. The pipelines did not have mastic wrapping. A small volume of water with hydrocarbons was removed from the pipeline and disposed during ISRA activities.
- Within ISRA area LOX-1B-2, one subsurface pipeline was observed and removed within the excavation floor. The pipeline did not have mastic wrapping.
- Within ISRA area LOX-1B-3, several subsurface features were observed during excavation activities, including electrical pipes/conduits, water pipelines, a sewer pipeline, a high pressure pipeline, risers (stick-up valves), a mastic-wrapped pipeline, a storm drain grate, and pipelines with unknown contents. Of these features, a water line, two risers (stick-up valves), and the pipe with wrapping were removed during excavation activities. The pipe wrapping was sampled and was found to not contain ACM. In addition, an inert white material was found with a piece of ceramic piping measuring approximately 4-inches in diameter and was tested by Pacific H&S for ACM. The material was found to not contain ACM and was removed during excavation activities.

## 3.2 CONFIRMATION SAMPLING

After the planned excavations were completed, confirmation soil samples were collected from the sidewalls and floors of the excavations to confirm that SRGs were met. Confirmation sample frequencies were generally consistent with those specified in the Final ISRA Work Plan (MWH, 2009b). With the concurrence of the RWQCB and the DTSC, lower sample frequencies

were applied to larger ISRA areas. Correspondences from the RWQCB and the DTSC related to confirmation sample frequency are included in Appendix A. RFI and data gap samples located on the sidewalls of planned excavations were used for confirmation sample purposes, with the approval of the RWQCB. The number of confirmation samples collected at each ISRA area is provided in Table 3-1, confirmation sample locations are shown in Appendix E figures[4], confirmation sample results are listed in Appendix E tables, and confirmation sample boring logs are included in Appendix F. Laboratory and data validation reports are included in Appendix C.

Confirmation sample results for each ISRA area were reviewed with RWQCB and DTSC prior to backfill or re-contouring and site restoration. In general, soil associated with confirmation samples with results exceeding SRGs was subsequently removed and, if the additional excavation did not contact bedrock, additional confirmation samples were collected. The remediation status of these confirmation samples are listed as "Excavated" in Appendix E tables. With the concurrence of the RWQCB and the DTSC, soil associated with select confirmation samples with results exceeding SRGs was left in place. Correspondences from RWQCB related to confirmation sample results and completion of excavations is included in Appendix A. The rationales for leaving confirmation samples in place with results exceeding 2 times the SRGs are provided below.

- AP/STP-1C-1: Two floor confirmation samples (APET0968 and APET0972) were agreed to be left in place due to samples being located 3 feet below original grade where runoff will collect (no backfill performed), little to no surface water runoff observed from the AP/STP ISRA areas during rain events, and future remediation work within the ISRA area will be performed under the AOC.
- AP/STP-1C-2: Four floor confirmation samples (APET0814, APET0819, APET0822, and APET0823) were agreed to be left in place due to samples being located beneath Coast Live Oak trees, a Ventura County protected tree species, where additional excavation would expose roots and potentially cause instability of the trees. The recommendation of the project biologist to not excavate additional soil at this location is included in Appendix D.
- ELV-1C: Four sidewall confirmation samples (EVET0002, EVET0007, EVET0019, and EVET0024) were agreed to be left in place due to being located along the asphalt parking area and/or an active water pipeline, where additional excavation would compromise the features.

[4] RWQCB split sample results are not shown on figures because the data was not validated.

- ELV-1C: Two floor confirmation samples (EVET0017 and EVET0023) were agreed to be left in place due to both locations having multiple samples collected (primary, duplicates, and/or splits) and one or more of the sample results was below the SRG. At location EVET0023, the primary sample result was significantly above the SRG for dioxins and the internal split sample was below the SRG for dioxins, so the location was resampled and the resample result was below the SRG. Therefore, the primary sample is considered anomalous and not shown on the confirmation figure.
- IEL-2: One sidewall confirmation sample (ILET0113) was agreed to be left in place due to being located along the asphalt walkway around the fire station, where additional excavation would compromise the feature.
- IEL-2: Three floor confirmation soil samples (ILET0106, ILET0109, and ILET0114) were agreed to be left in place due to samples being located 6 feet bgs after backfilling the excavation and therefore would have minimal to no effect on surface water, and the data will be evaluated under the 2007 Consent Order.
- LOX-1B-3: Three floor confirmation samples (LXET0216, LXET0218, and LXET0228) were agreed to be left in place due to sample results exceeding the copper SRG and copper has not been detected in any Outfall 009 NPDES permit samples since 2006. Additionally, samples are located 2 feet below original grade where runoff will collect (no backfill performed) and future remediation work within the ISRA area will be performed under the AOC.
- LOX-1B-3: One sidewall confirmation sample (LXET0202) was agreed to be left in place due to having two samples collected at the location (primary and duplicate) and one of the results was equivalent to the SRG.

All completed ISRA areas and shallow soil sample results for ISRA COCs after completion of the ISRA activities are shown on Figures 3-1 and 3-2. Confirmation sample result tables and location figures for each Phase III ISRA area are included in Appendix E.

## 3.3 SOIL MANAGEMENT AND DISPOSAL

Soil management and disposal was conducted as specified in the ISRA Transportation and Soil Management Plans and updates to these plans (MWH, 2009c, 2009d, 2010c, 2010d; NASA, 2011; and Boeing, 2011a, 2012b, 2013a, 2013b). Excavated soil classified as non-hazardous with radionuclides below LUT values was temporarily stockpiled onsite prior to being loaded into haul trucks for offsite disposal. Excavated soils classified as hazardous with radionuclides below LUT values were loaded directly into lined and covered haul trucks for offsite disposal or lined and covered roll-off bins and transported to the Boeing waste yard or to the Helipad for subsequent shipment to the offsite disposal facility. Excavated soils classified as non-hazardous or hazardous with radionuclides above LUT values were loaded directly into double lined 5 cy

soft-sided containers that meet applicable regulations and transported to the Helipad prior to offsite disposal. The classification of soils excavated from each ISRA area is listed in Table 3-1.

Soils classified as non-hazardous with radionuclides below LUT values were transported to Lancaster Recycle and Disposal Facility in Lancaster, California for disposal. Soils classified as hazardous with radionuclides below LUT values were transported to Clean Harbors Buttonwillow Landfill in Buttonwillow, California or Clean Harbors Aragonite Incineration Facility in Aragonite, Utah for disposal. Soils classified as non-hazardous or hazardous with radionuclides above LUT values were transported to Energy Solutions Clive Disposal Site in Clive, Utah for disposal. Offsite disposal of waste soils was completed on November 22, 2013. Offsite disposal records, including a summary table and waste manifests, are provided in Appendix I.

## 3.4 SWPPP IMPLEMENTATION

Erosion control BMPs were installed at the Phase III ISRA areas prior to the start of remediation activities, per the ISRA SWPPP (MWH, 2011b). Additionally, quarterly BMP inspections were conducted during the non-rainy season, and weekly or rain event BMP inspections were conducted during the rainy season. BMP conditions were documented during inspections, and BMP repairs and maintenance were performed on an ongoing basis. In anticipation of and prior to rain events, all in-progress ISRA area excavations were covered with plastic tarps and secured with sandbags to prevent soil erosion. BMP inspections were conducted prior to each rain event, daily during the rain events, and after each rain event. Based on observations during the BMP inspections, no SWPPP surface water samples were collected. During and following these rain events, BMPs were repaired or replaced as necessary.

## 3.5 SITE RESTORATION

Restoration of each Phase III ISRA area was performed after RWQCB concurred that the excavation was complete. Site restoration was conducted as the ISRA areas were completed and consisted of excavation backfill, excavation re-contouring, and/or installation of erosion control BMPs. Restoration activities at ISRA area IEL-2 were performed in May 2011 and involved placing a plastic liner on the excavation floor, backfilling the excavation with clean fill gravel to

a depth of 2 feet bgs, placing a liner on top of the gravel, and backfilling the remainder of the excavation to original grade with soil from the local IEL-2 soil borrow area. Restoration activities at ISRA area IEL-3 were performed in February 2013 and involved backfilling the excavation to original grade with gravel. Restoration activities at ISRA areas on NASA property (AP/STP, ELV, and LOX) were completed in March 2013 (AP/STP ISRA areas) and November 2013 (ELV, LOX, and additional portions of AP/STP ISRA areas) and involved re-contouring using adjacent soils. In addition, erosion and sediment control BMPs, including fiber rolls, hay bales, silt fences, and hydroseed mulch, were also installed on and near the restored excavations. Photographs of Phase III ISRA areas after site restoration are included in Appendix G. The estimated backfill volume for each ISRA area is listed in Table 3-1.

In addition, multiple erosion and sediment controls, and stormwater treatment BMPs have been installed throughout the Outfalls 008 and 009 watersheds to improve surface water quality. The locations of recent BMP installations (2010 through 2013) are shown on Figures 3-3 through 3-9. A list of the primary BMP installations is provided below:

- Outfall 008 BMP Improvements (Figure 3-3),
- B-1 Sediment Basin and B-1 Media Filter (Figure 3-4),
- Lower Parking Lot Biofilter and Sediment Basin (Figure 3-4),
- Northern Drainage RMMP (Figures 3-4 through 3-8),
- Site Restoration, including demolition of B1300, the B1324 Parking Lot, and a portion of the Lower Parking Lot (Figures 3-4 and 3-5),
- CM-9 Area BMP Improvements (Figure 3-5),
- LOX Area BMPs (Figure 3-7),
- Helipad Area BMPs (Figure 3-9), and
- ELV Channel BMP (Figure 3-9).

In addition, planning of a BMP is in progress that will consist of a series of vegetated shallow detention basins in the vicinity of Building 1436. A detailed description of these BMPs can be found in the annual rainy season reports and BMP Plan Addenda (MWH *et al.*, 2011, 2012, 2013; Geosyntec and Expert Panel, 2011, 2012, 2013).

## 3.6 SURVEYING AND MONITORING

Surveying of the Phase III ISRA areas was conducted by a licensed surveyor to document the work performed. Two ground-based topographic surveys of ISRA area IEL-2 were conducted by Sage, including after excavation and after site restoration. The excavation boundary and a cross section through the excavation of IEL-3 were surveyed by Cal Vada Surveying, Inc. (Cal Vada). The excavation boundaries of AP/STP, ELV, and LOX ISRA areas were surveyed by Cal Vada. The survey drawings provided by Sage and Cal Vada are included in Appendix J. These surveys were used to develop the actual excavation boundaries shown on Figures 3-1 and 3-2, and the figures included in Appendix E. In addition, the surveys of ISRA areas on Boeing property (IEL-2 and IEL-3) were used to prepare the record drawings necessary to close-out the ISRA grading permit. The record drawings were submitted to Ventura County in August 2013.

Biological and cultural monitoring was conducted throughout Phase III excavation activities. Biological monitoring was performed by Padre and copies of reports, survey notes, and correspondences related to biological monitoring are provided in Appendix D. Native American monitoring was performed by R Indigenous Consultants Tribal Monitoring at AP/STP, ELV, and LOX ISRA areas. No cultural materials were observed during ISRA activities.

## 3.7 ISRA PERFORMANCE MONITORING

The 2013/2014 rainy season represents the fifth year of ISRA performance monitoring. The results and recommendations from previous rainy seasons are presented in annual reports (MWH, 2010f; MWH *et al.*, 2011, 2012, 2013). Monitoring of Phase I and II ISRA areas was discontinued following the 2011/2012 rainy season because sufficient data had been collected to show a general decrease in downstream results compared to upstream results (MWH *et al.*, 2012). Monitoring at completed Phase III ISRA areas began at IEL-2 during the 2011/2012 rainy season, at IEL-3 and AP/STP ISRA areas during the 2012/2013 rainy season, and at LOX and ELV ISRA areas during the 2013/2014 rainy season. ISRA performance monitoring at Phase III ISRA areas is currently in progress and being performed per the 2013/2014 rainy season sampling and analysis plan (MWH, 2013). The results of surface water samples collected within the Outfalls 008 and 009 watersheds during the 2013/2014 rainy season, including ISRA performance monitoring samples, BMP monitoring samples, and NPDES samples, will be

presented in the annual report. The report, which is co-authored by the Expert Panel, will also include recommendations for future sampling and improving surface water quality within the Outfalls 008 and 009 watersheds.

# 4.0 SUMMARY AND CONCLUSIONS

A summary of the three phases of ISRA remedial activities completed between 2009 and 2013 and the conclusions following Phase III ISRA implementation are provided below.

## 4.1 ISRA PROJECT SUMMARY

A total of approximately 26,700 cy (*ex situ*) of soil was removed from 36 ISRA areas during the three phases of implementation. The table below summarizes the soil removed during each ISRA phase.

| ISRA Phase | Outfall 008 | | Outfall 009 | | TOTAL | |
|---|---|---|---|---|---|---|
| | ISRA Areas | Volume (cy, *ex situ*) | ISRA Areas | Volume (cy, *ex situ*) | ISRA Areas | Volume (cy, *ex situ*) |
| **Phase I (2009)** | 10 | 5,282 | 2 | 180 | 12 | 5,462 |
| **Phase II (2010)** | - - | - - | 11 | 7,475 | 11 | 7,475 |
| **Phase III (2011-2013)** | - - | - - | 13 | 12,727 | 13 | 12,727 |
| ***TOTAL*** | ***10*** | ***5,282*** | ***26*** | ***20,382*** | ***36*** | ***26,664*** |

Confirmation sampling and analysis results demonstrate that the soil remaining in place at the Phase I, II, and III ISRA areas contains ISRA COCs at concentrations that are below or consistent with the ISRA SRGs, or additional excavation is limited by the presence of a plant species (e.g., Coastal Live Oak), active utilities, or infrastructure (e.g., roads). The RWQCB and DTSC reviewed the confirmation sampling data and agreed that the soil removal actions at the 36 ISRA areas were complete prior to the performing restoration activities. All completed ISRA areas and shallow soil sample results for ISRA COCs after completion of the ISRA activities are shown on Figures 3-1 and 3-2.

Restoration activities at Phase I, II, III ISRA areas included backfilling excavations using a local soil borrow source and/or gravel, re-contouring using adjacent soils, and/or installing erosion control BMPs, including re-vegetation of the areas. In addition, several erosion and sediment controls, and stormwater treatment BMPs have been installed throughout the Outfalls 008 and 009 watersheds to improve surface water quality (e.g., Lower Parking Lot Biofilter and Sediment

Basin, B-1 Sediment Basin and B-1 Media Filter, and ELV Channel BMP). The locations of the erosion and sediment controls, and treatment BMPs are shown on Figures 3-3 through 3-9.

Performance monitoring at Phase I and II ISRA areas was performed for two or three rainy seasons prior to being discontinued following the 2011/2012 rainy season because sufficient data had been collected to show a general decrease in downstream results compared to upstream results (MWH *et al.*, 2012). Monitoring at Phase III ISRA areas is currently in progress, and results and recommendations from the 2013/2014 rainy season will be presented in the annual report.

## 4.2 CONCLUSION

The ISRA remedial actions implemented by Boeing and NASA between 2009 and 2013 have met the objective of the CAO, which is to improve surface water quality within the Outfalls 008 and 009 watersheds through the identification and evaluation of areas of contaminated soil containing the COCs that may have contributed to exceedances of NPDES permit limits and benchmarks in stormwater, and implementation of an appropriate source removal alternative (e.g., excavation and offsite disposal or constructing diversion and collection structures). Remedial actions were performed at the ISRA areas[5] identified using the RWQCB-approved approach presented in the Final ISRA Work Plan (MWH, 2009b) and summarized in Section 1.1.3. Additionally, performance monitoring results collected to date indicate that ISRA activities have successfully reduced the contribution of ISRA COCs to surface water runoff. The surface water up- and downstream of Phase III ISRA areas will continue to be monitored and sampled for at least two years, with results and recommendations presented in annual rainy season summary reports for Outfalls 008 and 009.

[5] As described in Section 2.1, agencies agreed that remedial activities at eight of the ISRA areas would be performed as part of the cleanup activities overseen by the DTSC pursuant to the 2007 Consent Order (Boeing areas) and the NASA AOC (NASA areas).

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# TABLES

**TABLE 3-1**
**Phase III ISRA Area Excavation Summary**
**(Page 1 of 1)**

| Area | ISRA COCs[a] | Collocated RCRA Risk Drivers[b] | Planned Excavation Graded Area[c] (acres) | Planned Ex Situ Excavation Volume[d] (cubic yards) | Actual Excavation Surface Area[e] (acres) | Actual In Situ Excavation Volume[f] (cubic yards) | Actual Ex Situ Excavation Volume[g] (cubic yards) | In Situ Backfill Volume[h] (cubic yards) | Maximum Depth[i] (feet) | Average Depth[i] (feet) | Number of Waste Characterization Soil Samples[j] | Total Number of Confirmation Soil Samples[k] | Number of Sidewall Soil Samples[l] | Number of Floor Soil Samples[m] | Number of RWQCB Split Soil Samples[n] | Waste Classification[o] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AP/STP-1B** | Dioxins, Cd, Cu, Pb, Hg | None | 0.41 | 1296 | 0.46 | 2679 | 3482 | 0 | 3.0 | 1.5 | 13 | 48 | 10 | 38 | 8 | Non-Haz w/ Rads <LUT |
| **AP/STP-1C-1** | Dioxins, Cd, Cu, Pb, Hg | None | 0.86 | 2705 | 0.79 | | | 0 | 4.0 | 1.5 | 33 | 106 | 27 | 79 | 13 | Non-Haz w/ Rads <LUT, Non-Haz w/ Rads >LUT |
| **AP/STP-1C-2** | Dioxins, Cd, Cu, Pb | None | 0.22 | 682 | 0.26 | | | 0 | 3.0 | 1.2 | 25 | 34 | 8 | 26 | 6 | Non-Haz w/ Rads <LUT |
| **AP/STP-1E-1** | Dioxins | None | 0.03 | 61 | 0.04 | | | 0 | 2.0 | 1.1 | 4 | 8 | 3 | 5 | 5 | Non-Haz w/ Rads <LUT |
| **AP/STP-1E-2** | Dioxins | None | 0.09 | 198 | 0.13 | | | 0 | 4.0 | 1.1 | 5 | 22 | 8 | 14 | 6 | Non-Haz w/ Rads <LUT |
| **AP/STP-1E-3** | Dioxins | None | 0.01 | 30 | 0.01 | | | 0 | 1.0 | 1.0 | 4 | 4 | 2 | 2 | 2 | Non-Haz w/ Rads <LUT |
| **ELV-1C** | Dioxins, Cd, Cu, Pb, Hg | None | 0.24 | 999 | 0.29 | 831 | 1081 | 0 | 4.0 | 2.0 | 33 | 34 | 11 | 23 | 10 | Non-Haz and Haz w/ Rads <LUT Non-Haz and Haz w/ Rads >LUT |
| **ELV-1D** | Dioxins, Cd, Cu, Pb, Hg | TCE | 0.05 | 428 | 0.05 | 243 | 316 | 0 | 9.0 | 3.0 | 17 | 4 | 4 | 0 | 0 | Haz w/ Rads <LUT, Haz w/ Rads >LUT |
| **IEL-2** | Cd, Pb, Hg | Mo, VOCs, PCBs | 0.11 | 786 | 0.12 | 808 | 1050 | 424 | 9.5 | 4.5 | 8 | 26 | 10 | 16 | 7 | Haz w/ Rads <LUT |
| **IEL-3** | Cd, Cu, Pb, Hg | As, Ag | 0.10 | 400 | 0.11 | 280 | 364 | 280 | 3.5 | 1.5 | 30 | 27 | 20 | 7 | 4 | Non-Haz w/ Rads <LUT |
| **LOX-1B-1** | Dioxins, Cu, Pb | TCE | 0.13 | 269 | 0.13 | 4949 | 6434 | 0 | 1.0 | 1.0 | 7 | 21 | 12 | 9 | 2 | Non-Haz w/ Rads <LUT |
| **LOX-1B-2** | Dioxins, Cu, Pb, Hg | TCE | 0.22 | 902 | 0.25 | | | 0 | 2.0 | 2.0 | 8 | 30 | 12 | 18 | 3 | Non-Haz and Haz w/ Rads <LUT |
| **LOX-1B-3** | Dioxins, Cd, Cu, Pb, Hg | TCE | 1.19 | 4988 | 1.20 | | | 0 | 3.0 | 2.2 | 48 | 49 | 24 | 25 | 6 | Non-Haz and Haz w/ Rads <LUT, Non-Haz/ Rads >LUT |

**Notes:**

[a] ISRA COCs are those constituents in surface water that have resulted in exceedances of NPDES permit limits and benchmark limits at Outfall 009 since August 2004, including sample data collected for monitoring before the NPDES permit limits/benchmarks were established in 2006 for Outfall 009 (cadmium, copper, lead, mercury, dioxins). Listed ISRA COCs are those present at each ISRA area in soil samples above the Soil Remediation Goal.

[b] Collocated RCRA risk drivers are those constituents detected in soil samples at each ISRA area that contribute to unacceptable human risks and ecological risks within the Outfall 008 and 009 watersheds, as presented in the RFI Group reports.

[c] Planned graded area of each excavation, calculated from the final planned excavation boundaries.

[d] Planned volume of each excavation, calculated by multiplying the planned excavation graded area by the planned average excavation depth.

[e] Actual surface area of each excavation, calculated from the actual excavation boundaries identified in the post-excavation survey (topographic survey sheets provided in Appendix C).

[f] Actual in situ volume of each excavation, calculated by dividing the ex situ volume by an expansion factor of 1.3 (note G explains source of ex situ volume estimate for these ISRA areas).

[g] Actual ex situ volume of each excavation, developed using shipping weights from waste manifests and converting the tonage to cubic yards using the assumption that 1 cubic yard of soil weighs 2,430 pounds.

[h] In situ volume of backfill material for each excavation, calculated from known volumes of backfill gravel and soil from the IEL soil borrow area for ISRA area IEL-2 and from known volume of backfill gravel for ISRA area IEL-3. The Ash Pile, ELV, and LOX ISRA areas (AP/STP_1B, AP/STP-1C-1, AP/STP-1C-2, AP/STP-1E-1, AP/STP-1E-2, AP/STP-1E-3, ELV-1C, ELV-1D, LOX-1B-1, LOX-1B-2, and LOX-1B-3) were re-contoured without backfill; at LOX and ELV isolated potholes were backfilled with a minimal amount of clean gravel for health and safety purposes.

[i] Approximate maximum and average depths of each excavation, estimated based on field observations and trench logs.

[j] Number of soil samples locations collected within the boundaries of each excavation, for purposes of characterizing soil for disposal. Resamples do not contribute to this total.

[k] Total number of primary soil samples collected from floor and sidewall of excavation, for purposes of confirming that Soil Remediation Goals for ISRA COCs had been met. Field duplicates, laboratory split samples, and RWQCB split samples do not contribute to this total.

[l] Number of confirmation soil samples collected from the sidewall of the excavation; includes samples collected prior to ISRA implementation that are located on excavation sidewalls. Field duplicates, laboratory split samples, and RWQCB split samples do not contribute to this total.

[m] Number of confirmation soil samples collected from the floor of the excavation. Field duplicates, laboratory split samples, and RWQCB split samples do not contribute to this total.

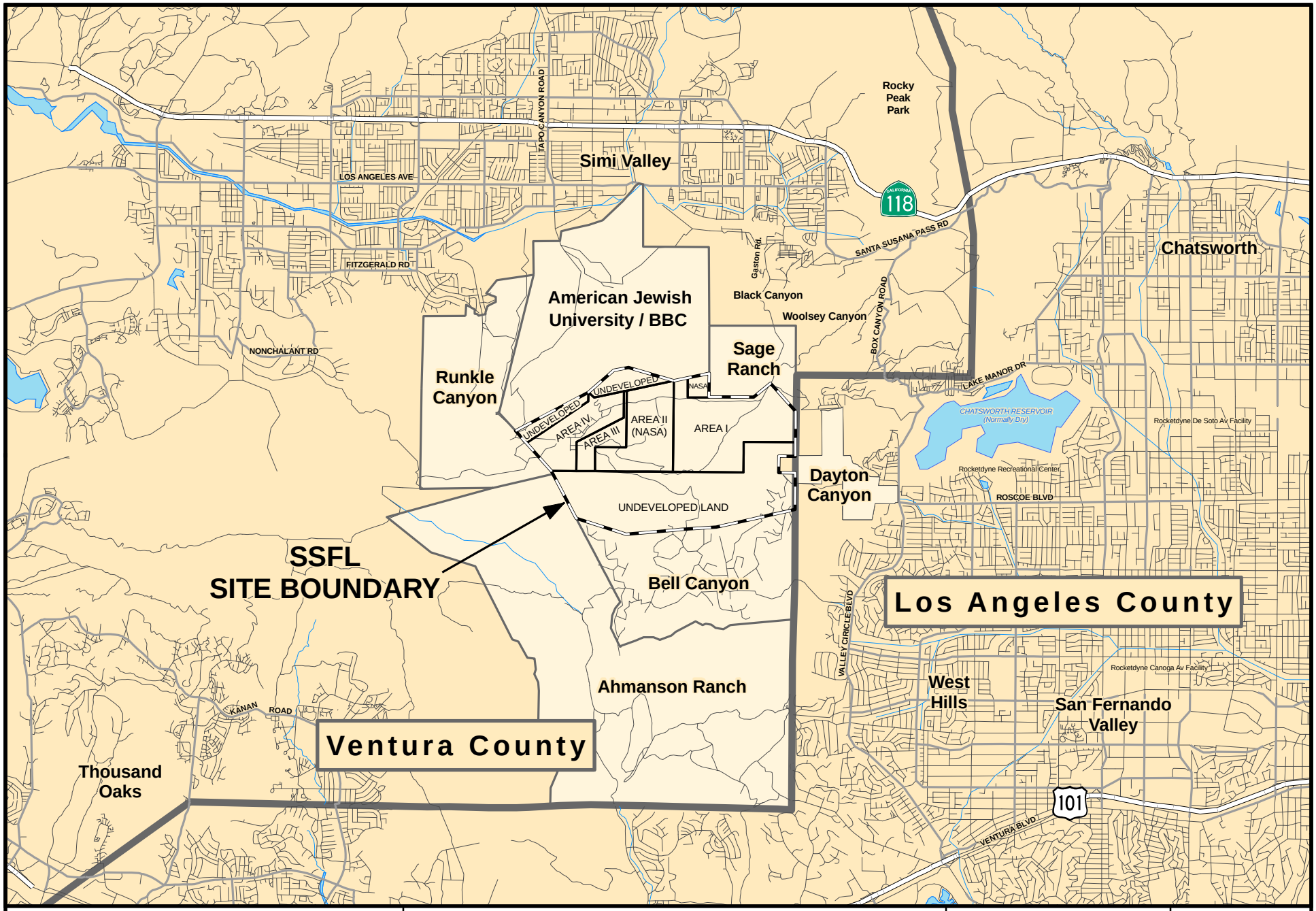
[n] Number of confirmation soil samples of which RWQCB collected split samples for analysis at a separate laboratory.

[o] Soils were classified as non-hazardous or hazardous pursuant to Title 22 of the CCR and either containing radionuclides below or above DTSC Draft Provisional Radiological LUT values based on results of waste characterization samples. Waste certifications are provided in Appendix B.

**Acronyms:**

Ag - silver
As - arsenic
CCR - California Code of Regulations
Cd - cadmium
COC - constituent of concern
Cu - copper
DTSC - Department of Toxic Substances Control
Hg - mercury
ISRA - Interim Source Removal Action
LUT - Look-up Table
Mo - molybdenum
NPDES - National Pollutant Discharge Elimination System
Pb - lead
PCB - polychlorinated biphenyl
RCRA - Resource Conservation and Recovery Act
RFI - RCRA Facility Investigation
RWQCB - Los Angeles Regional Water Quality Control Board
TCE - trichloroethylene
VOCs - volatile organic compounds

# FIGURES




1 inch equals 1.5 miles

0 1.5 3 Miles

# SANTA SUSANA FIELD LABORATORY

Document: Offsite-Report-Regional_Map.mxd

Date: Dec 10, 2007

## Regional Map

**FIGURE 1-1**

DRAINAGE TO MEIER CANYON

DRAINAGE TO ARROYO SIMI

UNDEVELOPED LAND

NASA PROPERTY AREA I

UNDEVELOPED LAND

Silvernale Pond

R-1 Pond

Skyline Water Tanks

R-2B Pond

R-2A Pond

GETS

Perimeter Pond

AREA IV

AREA III

AREA II (NASA)

AREA I

DRAINAGE TO DAYTON CANYON

UNDEVELOPED LAND

GETS Discharge Location

DRAINAGE TO BELL CANYON

0 500 1,000 2,000 Feet

MAP COORDINATES IN STATE PLANE, NAD 27, ZONE V

**Legend**

- NPDES Outfalls (RWQCB Primary Oversight Authority)
- Historical NPDES Outfalls
- Groundwater Extraction Treatment System (GETS)
- Effluent Pathways
- Surface Water Drainage Divide
- Natural Drainage
- Concrete Lined Drainage
- Graded Drainage
- Surface Water Reclamation Ponds

**Base Map Legend**

- SSFL Property Boundary
- Administrative Area Boundary
- Ground Elevation Contours
- Drainage Pathways
- A/C Curbing
- Dirt Road
- Existing Building or Structure

# Site Map with Outfall Locations and Storm Water Drainage Systems

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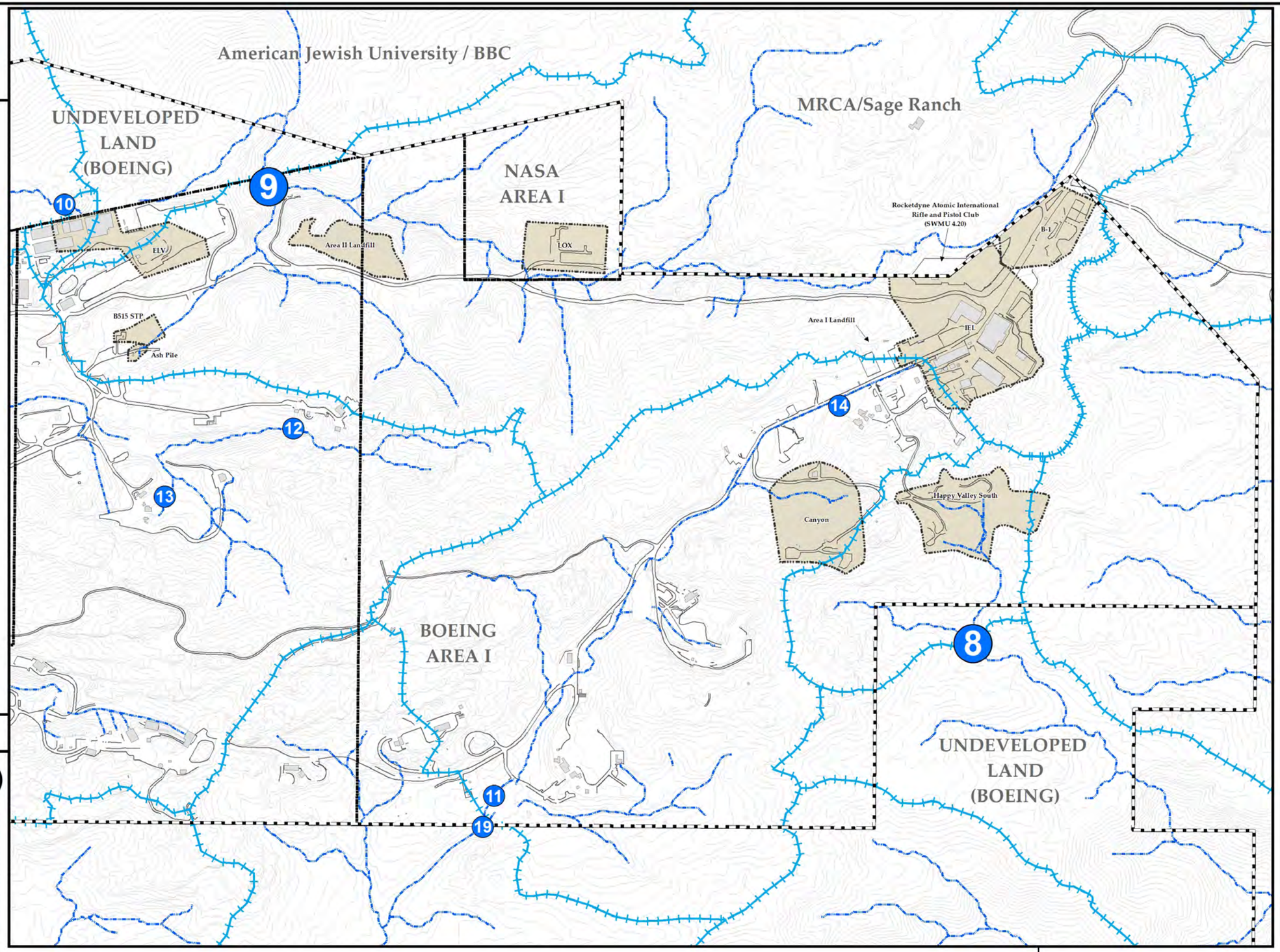
MWH

FIGURE 1 - 2

# Outfalls 008 and 009 Location Map

## Base Map Legend

- Administrative Area Boundary
- RFI Sites Within Outfall 008 and 009
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Existing Building or Structure
- Paved Road
- Elevation Contour




Feet
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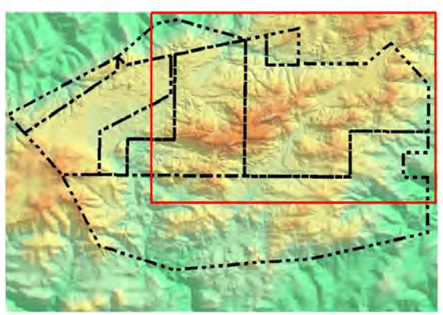

SANTA SUSANA FIELD LABORATORY

MWH FIGURE 1-3

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# Post Phase I ISRA
# In-Place Sample Results
# Outfall 008 Watershed

## Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Local Borrow Source Area
- NPDES Outfall
- Surface Water Divide
- Outfall Water Divide
- Surface Water Drainage
- Existing Building or Structure

## Figure Legend

- Actual ISRA Boundary

## Chemical Data Legend

Copper and/or Lead Sample Location (< 2 feet bgs)

- ≤ SRG
- > SRG and ≤ 2x SRG
- > 2x SRG and ≤ 10x SRG
- > 10x SRG

Dioxin Sample Location (< 2 feet bgs)

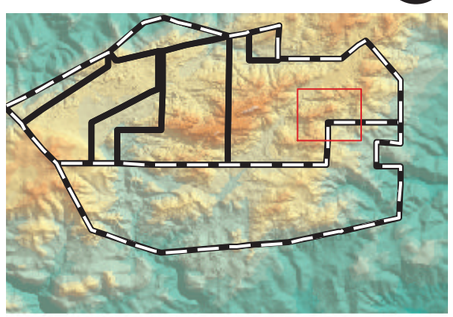
- ≤ SRG
- > SRG and ≤ 2x SRG
- > 2x SRG and ≤ 10x SRG
- > 10x SRG

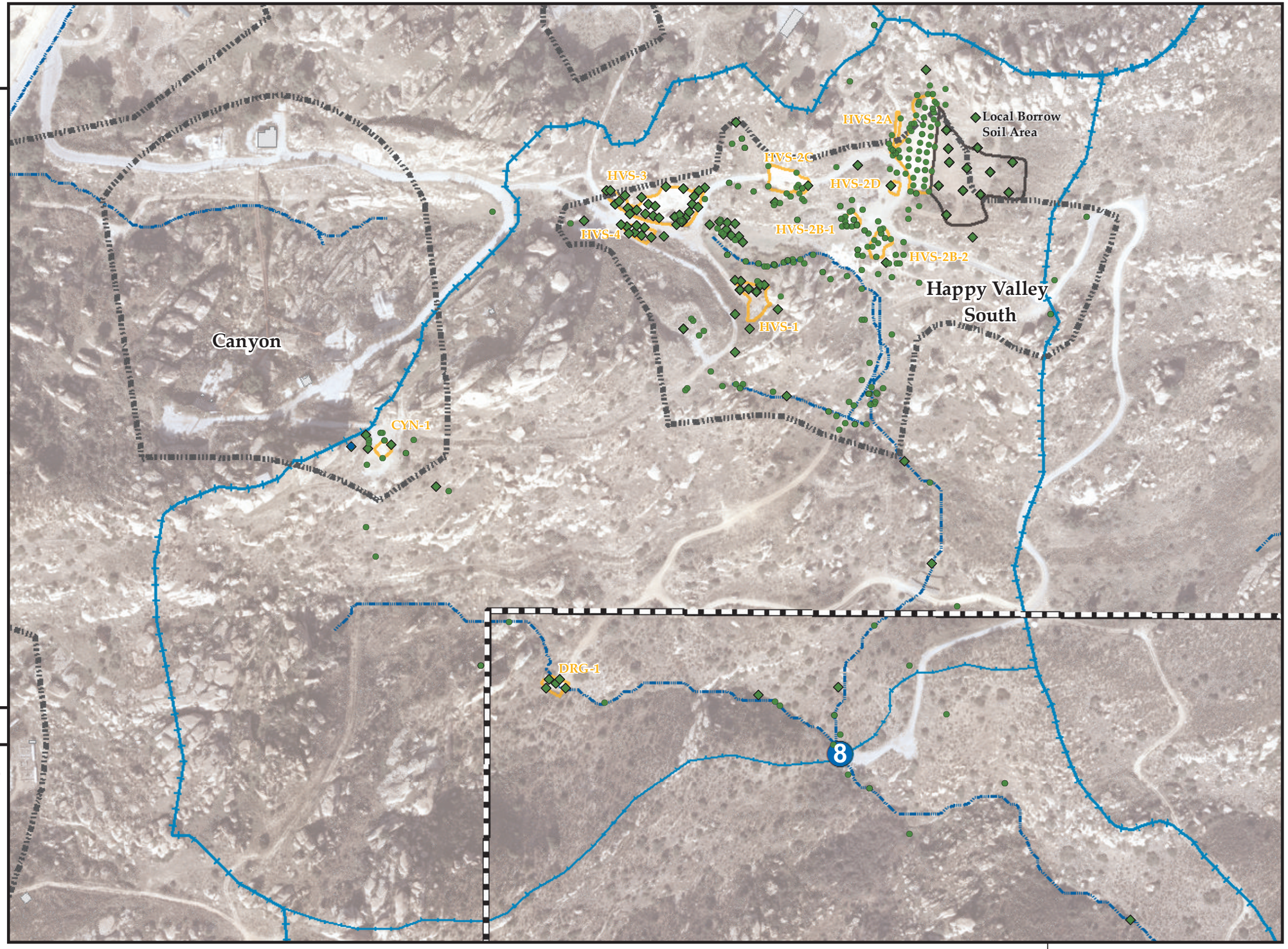
ISRA COCs/SRGs
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxins (TCDD TEQ): 3.0 pg/g

**Note:**
1. Aerial imagery was collected November 2009 and represents post-excavation conditions (Sage Inc., 2009).

Date: December 20, 2013

0 100 200 400 Feet






SANTA SUSANA FIELD LABORATORY

MWH FIGURE 1-4

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# Pre-Phase III ISRA
# In-Place Sample Results
# Eastern Outfall 009 Watershed

**Base Map Legend**

- Administrative Area Boundary
- RFI Site Boundary
- Soil Borrow Area
- NPDES Outfall
- Surface Water Divide
- Drainage
- Non Jurisdictional Surface Water Pathway
- Previous Excavation Area
- A/C Paving
- Dirt Road
- Elevation Contour

**Figure Legend**

- Actual ISRA Boundary
- Planned ISRA Boundary
- Former Planned ISRA Boundary

**Chemical Data Legend**

**Dioxin Sample Locations (< 2 feet bgs)**

- <= SRG
- > SRG and <= 2x SRG
- > 2x SRG and <= 10x SRG
- > 10x SRG

**Metal Sample Locations (< 2 feet bgs)**

- <= SRG
- > SRG and <= 2x SRG
- > 2x SRG and <= 10x SRG
- > 10x SRG

ISRA COCs/SRGs
Cadmium: 1 mg/kg
Copper: 29 mg/kg
Lead: 34 mg/kg
Mercury: 0.09 mg/kg
Dioxin: 3.0 pg/g

Figure Notes:

1. Remedial work planned at ISRA areas within the AILF RFI Site, A2LF RFI Site, and select ISRA areas in the LOX RFI Site will be addressed by the Boeing RCRA Facility Investigation (RFI) Program and the NASA Administrative Order on Consent (AOC) program, respectively.

2. Aerial imagery and topographic contours were collected June 2, 2010 by Sage Consultants, Inc., and represent pre-excavation conditions.

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Date: 12/18/2013

1 inch = 300 feet

0 300 600 Feet

MRCA / Sage Ranch

No samples shown on MRCA/ Sage Ranch because there are ongoing investigation activities and maintenance work being performed under DTSC oversight.

Remedial action at CMs will be evaluated as part of the Performance Monitoring Program

BOEING PROPERTY AREA I

B1-2
B1-1B
B1-1A
B1-1C
B1-1D
B1
CM-6
CM-7
CM-11
CM-8
CM-9
AILF-2
AILF-1
AILF
IEL-3
IEL-1
IEL
IEL-2 Soil Borrow Area
IEL-2
CTLI-1B
CTLI-1A
Outfall-014
APTF
B359
LETF
HVN

MWH

S A N T A S U S A N A F I E L D L A B O R A T O R Y

FIGURE 1-5