DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON WHITE SANDS
100 Headquarters Avenue
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5000

July 24, 2013

REPLY TO
ATTENTION OF

Environmental Division

Mr. John Kieling, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

SUBJECT: 2012 Long Term Monitoring Program Report for Multiple Sites

Dear Mr. Kieling:

Enclosed is the document submittal titled: *2012 Long Term Monitoring Program Report, Multiple Sites: CCWS-06 (SWMUs 50, 155), WSMR-14 (SWMUs 114, 115), CCWS-07 (SWMUs 41-46), WSMR-54 (SWMU 143), CCWS-09 (SWMU 198), WSMR-55 (SWMU 154), CCWS-11 (SWMs 55, 56, 56a), CCWS-62 (SWMU 82), CCWS-16 (SWMU 197), WSMR 71 (SWMUs 47, 48), CCWS-65 (SWMU 61), CCWS-75 (SWMUs 38, 39), CCWS-76 (SWMU 65), White Sands Missile Range July 2013.*

This report addresses long term monitoring activities at White Sands Missile Range sites during the calendar year 2012. Laboratory analytical data for all sites with groundwater monitoring requirements are included in the enclosed CD.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Should you have any questions regarding this matter, please contact Mr. Benito Avalos of our Environmental Compliance Branch at (575) 678-2225.

I am forwarding this letter with enclosure (document print copy w/CD) to Ms. Neelam Dhawan, NMED-HWB; and without enclosure to Mr. Dave Cobrain, NMED-HWB; Mr. Paul Torcoletti, EPA Region 6; Mr. Sudhakar Matlapudi, CB&I; and Mr. Robert Rowden, AEC.

Sincerely,

Jose A. Gallegos
Chief, Environmental Division

Enclosure

Shaw Environmental, Inc. (A CB&I Company)

Date: ***July 16, 2013***
Project No.: ***139791***

TRANSMITTAL LETTER:

To: Mr. Benito Avalos

Address: US Army Garrison — White Sands
ATTN: IMWE-WSM-PW-E-EC
Building 163 Springfield Street
White Sands Missile Range, NM 88002

Re: Final 2012 Long Term Monitoring Report
Contract No. W91ZLK-05-D-0017, Task Order No. 0008

For: ***Review*** ____ ***As Requested*** ____ ***Approval*** ____ ***Corrections*** ____ ***Submittal*** ***X*** ***Other*** ____

Item No:	***No. of Copies***	***Date:***	***Document Title***
1	3 hard copies, 3 CD copies	July 2013	2012 Long Term Monitoring Program Report Multiple Sites: CCWS-06 (SWMUs 50, 155), WSMR-14 (SWMUs 114, 115), CCWS-07 (SWMUs 41-46), WSMR-54 (SWMU 143), CCWS 09 (SWMU 198), WSMR-55 (SWMU 154), CCWS-11 (SWMU 55, 56, 56a), CCWS-62 (SWMU 82), CCWS-16 (SWMU 197), WSMR-71 (SWMUs 47, 48), CCWS-65 (SWMU 61), CCWS-75 (SWMUs 38, 39), CCWS-76 (SWMU 65) White Sands Missile Range, New Mexico

Additional copies have been sent to those on distribution below. Please call with questions or comments. Thank you.

Sincerely:

Chris Long
Technical Lead PG
PH: 281-531-3179

PC: Cynthia Borlinghaus - AEC (1 copy w/ CD)

PC: Robert Rowden - AEC (1 CD copy)

ACA08-045

FINAL

2012 Long Term Monitoring Program Report Multiple Sites: CCWS-06 (SWMUs 50, 155), WSMR-14 (SWMUs 114, 115), CCWS-07 (SWMUs 41-46), WSMR-54 (SWMU 143), CCWS-09 (SWMU 198), WSMR-55 (SWMU 154), CCWS-11 (SWMU 55, 56, 56a), CCWS-62 (SWMU 82), CCWS-16 (SWMU 197), WSMR-71 (SWMUs 47, 48), CCWS-65 (SWMU 61), CCWS-75 (SWMUs 38, 39), CCWS-76 (SWMU 65)

White Sands Missile Range, New Mexico

July 2013

White Sands Missile Range, New Mexico

Shaw Environmental, Inc.
(A CB&I Company)
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
July 2013	Final Report	January 2012 – January 2013

4. TITLE AND SUBTITLE

2012 Long Term Monitoring Program Report, Multiple Sites: CCWS-06 (SWMUs 50, 155), WSMR-14 (SWMUs 114, 115), CCWS-07 (SWMUs 41-46), WSMR-54 (SWMU 143), CCWS-09 (SWMU 198), WSMR-55 (SWMU 154), CCWS-11 (SWMU 55, 56, 56a), CCWS-62 (SWMU 82), CCWS-16 (SWMU 197), WSMR-71 (SWMUs 47, 48), CCWS-65 (SWMU 61), CCWS-75 (SWMUs 38, 39), CCWS-76 (SWMU 65)

5a. CONTRACT NUMBER

W91ZLK-05-D-0017

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Bradley Davis – Zia Engineering and Environmental Consultants, LLC
Chris Long – Shaw Environmental, Inc. (A CB&I Company)

5d. PROJECT NUMBER

139791

5e. TASK NUMBER

Task Order 08

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Shaw Environmental, Inc. (A CB&I Company)
1401 Enclave Parkway, Suite 250
Houston, TX 77077

5f. WORK UNIT NUMBER

8. PERFORMING ORGANIZATION REPORT NUMBER

ACA08-045

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Department of the Army
U.S. Army White Sands Missile Range
100 Headquarters Avenue
ATTN: IMWE-WSM-PWEEC (Benito Avalos)
White Sands Missile Range, NM 88002

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSORING/MONITORING AGENCY REPORT NUMBER

12. DISTRIBUTION AVAILABILITY STATEMENT

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report serves to document the status of groundwater monitoring and other activities taking place during calendar year 2012 at 14 sites, listed in Table 1 and displayed on Figure 1, at White Sands Missile Range, New Mexico, U.S. Environmental Protection Agency/New Mexico Environment Department ID No. NM2750211235. Monitoring efforts focus on source characterization and defining contaminant characteristics. Other requirements pertaining to a specific site are explained in the section of this report addressing that site. Standard operating procedures used as field method guidance are listed in Appendix A. Chemical analytical procedures and requirements are addressed briefly in Appendix B. Complete analytical data sets from each event are provided on the data DVD (Appendix C). For continuity, sites are presented in the same order as previous reports.

15. SUBJECT TERMS

Solid Waste Management Units, SWMU, Installation Restoration and Compliance Cleanup Program, IRP, monitor well, landfill, Resource Conservation and Recovery Act, RCRA

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Benito Avalos
Unclassified	Unclassified	Unclassified	None	146	19b. TELEPHONE NUMBER (*Include area code*) 575-678-5359

Final
2012 Long Term Monitoring Program Report Multiple Sites: CCWS-06 (SWMUs 50, 155), WSMR-14 (SWMUs 114, 115), CCWS-07 (SWMUs 41-46), WSMR-54 (SWMU 143), CCWS 09 (SWMU 198), WSMR-55 (SWMU 154), CCWS-11 (SWMU 55, 56, 56a), CCWS-62 (SWMU 82), CCWS-16 (SWMU 197), WSMR-71 (SWMUs 47, 48), CCWS-65 (SWMU 61), CCWS-75 (SWMUs 38, 39), CCWS-76 (SWMU 65)
White Sands Missile Range, New Mexico

ACA08-045

July 2013

ABSTRACT

This report serves to document the status of groundwater monitoring and other activities taking place during calendar year 2012 at 14 sites, listed in Table 1 and displayed on Figure 1, at White Sands Missile Range, New Mexico, U.S. Environmental Protection Agency/New Mexico Environment Department ID No. NM2750211235. Monitoring efforts focus on source characterization and defining contaminant characteristics. Other requirements pertaining to a specific site are explained in the section of this report addressing that site. Standard operating procedures used as field method guidance are listed in Appendix A. Chemical analytical procedures and requirements are addressed briefly in Appendix B. Complete analytical data sets from each event are provided on the data DVD (Appendix C). For continuity, sites are presented in the same order as previous reports.

1389791. RD0110 • Final • July 2013 • ACA08-045

1389791. RD0110 • Final • July 2013 • ACA08-045

This page intentionally left blank.

Table of Contents

Table of Contents (continued)

1389791. RD0110 • Final • July 2013 • ACA08-045

List of Figures

1389791. RD0110 • Final • July 2013 • ACA08-045

List of Tables

1389791.RD0110 • Final • July 2013 • ACA08-045

List of Appendices

1389791. RD0110 • Final • July 2013 • ACA08-045

1389791. RD0110 • Final • July 2013 • ACA08-045

This page intentionally left blank.

Acronyms and Abbreviations

µg/L	micrograms per liter
AOC	Area of Concern
AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, and xylene
CAC	Corrective Action Complete
CCWS	Compliance/Cleanup Program for White Sands Missile Range
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	contaminant of concern
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
ft	foot, feet
ft/ft	feet per foot
HELSTF	High Energy Laser Systems Test Facility
HTA	Hazardous Test Area
HWB	(NMED) Hazardous Waste Bureau
ID	Identification
Incin	Incinerator (NMED designation)
IRP	Installation Restoration Program
LC	Launch Complex
LDU	Land Disposal Unit (NMED designation)
LNAPL	light non-aqueous phase liquid
mg/L	milligrams per liter
mL/min	milliliters per minute
MNA	Monitored Natural Attenuation
MTBE	Methyl tert-butyl ether
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NOD	Notice of Disapproval
OB/OD	Open Burn/Open Detonation
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	RCRA Facility Investigation
RSI	Request for Supplemental Information
Shaw	Shaw Environmental, Inc. (A CB&I Company)
SI	Surface Impoundment (NMED designation)
STP	sewage treatment plant
SVE	Soil vapor extraction
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TDS	total dissolved solids

1389791. RD0110 • Final • July 2013 • ACA08-045

Acronyms and Abbreviations (continued)

TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TSA	Technical Support Area
UST	underground storage tank
VEDRS	vacuum enhanced diesel recovery system
VOC	volatile organic compound
WSMR	White Sands Missile Range
WTS	White Sands Technical Service

1389791. RD0110 • Final • July 2013 • ACA08-045

1.0 INTRODUCTION

This report serves to document the status of groundwater monitoring and other activities completed during calendar year 2012 at 14 sites, listed in Table 1 and displayed on Figure 1, at White Sands Missile Range (WSMR), New Mexico, U.S. Environmental Protection Agency/New Mexico Environment Department (EPA/NMED) Identification (ID) No. NM2750211235. Monitoring efforts focus on source characterization and defining contaminant characteristics. Other requirements pertaining to a specific site are explained in the section of this report addressing the specific site. For continuity, sites are presented in the order used in previous reports.

Background

WSMR is an active installation serving as the U.S. Army's largest rocket and missile development, firing, and testing facility. It is a major center for the testing of new missile systems. WSMR is located in south-central New Mexico within the Tularosa Basin, with areas along the western and northwestern boundary extending into the Jornada del Muerto Basin. WSMR is the largest land-area military installation in the United States, covering nearly 3,200 square miles. The installation is approximately 100 miles long and 25 to 40 miles wide.

The WSMR Main Post area is located at the southwestern corner of the installation, approximately 27 miles east-northeast of Las Cruces, New Mexico and 45 miles north of El Paso, Texas. WSMR headquarters and most installation support activities are located within the Main Post area.

Scope of Services

Groundwater monitoring was the major activity performed at these sites. WSMR has temporarily suspended groundwater monitoring activities at a portion of the sites due to issues specific to these sites (described in site-specific sections). At sites where low-flow purging techniques were utilized, the procedures followed are given in *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations* (ASTM International, 2002) and the NMED Position Paper - *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED-Hazardous Waste Bureau [HWB], 2001). Chemical analyses were performed by National Environmental Laboratory Accreditation Program-accredited laboratories. Completed chain of custody forms are provided with the analytical data reports on the accompanying data DVD (Appendix C). Purge water generated during each of the sampling events has been disposed of through the WSMR Hazardous Waste Management Center.

1389791.RD0110 • Final • July 2013 • ACA08-045

Regulatory Criteria and Status

The regulatory status of the various WSMR sites is presented in Table 2 and further discussed below. Potentially applicable standards for concentrations of constituents in the groundwater at WSMR can be found in the New Mexico Water Quality Control Commission (NMWQCC) regulations for groundwater protection as referenced in 20.6.2 New Mexico Administrative Code (NMAC). No cleanup levels have been established for any WSMR Solid Waste Management Unit (SWMU). The investigative efforts are pursuant to Appendix IV of the 2009 WSMR Resource Conservation and Recovery Act (RCRA) permit. These efforts focus on source characterization and defining contaminant characteristics as stated under Task III.

Remediation System Monitoring and Additional Site Activities

Of the sites discussed in this document, two have had remediation systems operating in the past: the High Energy Laser Systems Test Facility (HELSTF) Systemic Diesel Spill, and the HELSTF Technical Support Area (TSA) Gasoline Spill. The HELSTF Diesel Spill (SWMU 154) has an idle remediation system consisting of a vacuum enhanced diesel recovery system (VEDRS). The remediation system at the HELSTF TSA site has been dismantled.

Additionally, Rhodes Canyon Landfill (SWMUs 114 and 115) and the North Oscura Peak Landfill (SWMUs 47 and 48), have been the subject of past remediation efforts (capping and removal, respectively). The Tula Peak Site (SWMU 61) underwent source removal activities in 2010 that were documented in a Closure Report (Zia, 2011).

1389791. RD0110 • Final • July 2013 • ACA08-045

2.0 RED RIO BOMBING RANGE LANDFILLS (SWMUs 50 & 155) (CCWS-06)

Red Rio Bombing Range, located in northeastern WSMR (Figure 1), is an active (live-fire) bombing range. Common practice from 1967 to 1987 was to dispose of munitions and dummy projectiles in trenches with earthen cover. Red Rio Landfill consists of six inactive RCRA-regulated munitions disposal areas located northwest of the bombing range. The disposal areas were designated as SWMUs 50, 51, 52, 53, 54, and 155. SWMUs 50-54 are collocated and approximately two miles northwest of SWMU 155. According to the NMED 2008 Annual Fee Letter (NMED, 2008a), Table A, SWMUs 50-54 are consolidated as SWMU 50 and listed as operating unit Land Disposal Unit (LDU)-11. SWMU 155 is listed as operating unit LDU-12. The December 2009 WSMR RCRA Permit lists these landfills as Hazardous Waste Management Units. Four monitor wells were installed in 1995 around each of the two disposal areas (Figure 2). Construction details are provided in Table 3. Only one of the wells, RRW-02, consistently has a limited quantity (no more than a liter) of water. WSMR conducted periodic groundwater monitoring from 1995 to 2001. The site currently has no active groundwater monitoring program and is considered in interim status while the bombing range is still in active use. Red Rio Landfill is a RCRA regulated unit. No regulatory action has taken place for a number of years.

1389791.RD0110 • Final • July 2013 • ACA08-045

Subsurface geologic conditions at Red Rio Bombing Range Landfills were characterized using stratigraphic descriptions logged during borehole drilling activities in 1995. The stratigraphy consists of a thin (a few feet) to missing layer of alluvium or colluvium overlying weathered, fractured bedrock. The unconsolidated deposits are characterized as thinly bedded, alternating sequences of sandy silt and silty sands. Bedrock in this locality is described as highly fractured siltstone.

2.1 Scope of Services

Red Rio Bombing Range is currently an active bombing range. As such, no groundwater monitoring activities took place at this site during the calendar year. Due to the active (live-fire range in continuous use) status of this site, no groundwater monitoring activities are planned for next year.

2.2 Regulatory Criteria

The disposal sites are on an active bombing range and under interim status. The landfills are RCRA regulated units and the Munitions Rule does not apply. No regulatory action has taken place for a number of years. The current active (live-fire) range status precludes safe access, preventing continued monitoring activities.

2.3 Groundwater Monitoring Results

Red Rio Bombing Range is currently an active bombing range. No groundwater monitoring activities took place at this site during this calendar year. The last sampling event occurred in 2001. No groundwater monitoring activities are funded or planned.

2.4 Remediation System Monitoring and Additional Site Activities

None.

2.5 Summary

No monitoring activity occurred at this site during calendar year 2012.

3.0 OSCURA BOMBING RANGE LANDFILL (SWMUs 41-46) (CCWS-07)

Oscura Bombing Range is located in northeastern WSMR near the Oscura Range Center (Figure 1). The bombing range is currently utilized by the Air Force for live-fire training. Initial dates for disposal operations at Oscura Bombing Range Landfill are not known. When in use, the common practice was much like that at Red Rio Landfill. Spent munitions were gathered and deposited at the landfill where they were burned and buried. Such activities at Oscura Bombing Range Landfill ceased in 1992. Oscura Bombing Range Landfill consists of SWMUs 41, 42, 43, 44, 45, and 46. According to the NMED 2008 Annual Fee Letter, Table A, SWMUs 41 through 46 are listed as operating units LDU-13 through -18, respectively. The December 2009 WSMR RCRA Permit lists SWMUs 41 through 46 as Hazardous Waste Management Units.

Four monitor wells were installed in 1995 around the former landfill. Three of the wells had sufficient water for sampling; the fourth was dry. A supplemental well was added in 1997 to replace the dry well. The locations of all wells are shown on Figure 3. Construction details are provided in Table 4. WSMR conducted periodic groundwater monitoring from 1995 to 2001. The site currently has no active groundwater monitoring program and is considered in interim status while the bombing range is still in active use. Oscura Bombing Range Landfill is a RCRA regulated unit. No regulatory action has taken place for a number of years.

1389791. RD0110 • Final • July 2013 • ACA08-045

From the ground surface to a depth of approximately 250 feet (ft) below ground surface (bgs), the sediments are characterized as numerous alternating thin to thick bedded units of unconsolidated gravelly clay, clayey silt, silty sand, and sandy clay with occasional gravel lenses. Sediments encountered at the top of the saturated zone, from approximately 225 ft bgs to 260 ft bgs, are described as yellowish-green and greenish gray sands and silts interbedded with thin clay seams.

Measured groundwater elevations in the wells indicate a flow direction to the east-northeast. Regional flow direction of groundwater is believed to be south-southwest. The local east-northeast flow direction suggests a groundwater "rise" or "mound" created by the recharge from the immediately adjacent abandoned earthen stock tank.

3.1 Scope of Services

Oscura Bombing Range is currently an active bombing range. As such, no groundwater monitoring activities took place at this site during the calendar year.

3.2 Regulatory Criteria

These sites are on an active bombing range and under interim status. Current physical status is as follows:

- Earthwork has obscured the area.
- Target storage has encroached on the site.
- Surface water adjacent to site is encroaching on one of the wells (OMW-4). From time to time the well is surrounded by standing water, but is not inundated.
- Past sampling events showed that one of the monitor wells (OMW-03) consistently produced a very small quantity of formation water very high in metals.

Oscura Bombing Range Landfill is a RCRA regulated unit. No regulatory action has taken place for a number of years. The current active range status precludes continuing monitoring activities.

3.3 Groundwater Monitoring Results

Oscura Bombing Range is currently an active bombing range. No groundwater monitoring activities took place at this site during the calendar year. The last sampling event occurred in 2001. No groundwater monitoring activities are funded or planned.

3.4 Remediation System Monitoring and Additional Site Activities

None.

3.5 Summary

No monitoring activity occurred at this site during calendar year 2012.

4.0 LAUNCH COMPLEX 38 DIESEL SPILL (SWMU 198) (CCWS-09)

Launch Complex (LC) 38 is located 13 miles east of the WSMR Main Post, just north of Nike Avenue. The Defense Fuels Agency stored a strategic reserve of diesel fuel in a 150,000-gallon aboveground storage tank (AST) at LC-38 until 2000, when an annual evaporative loss measurement revealed a loss of approximately 31,000 gallons of diesel fuel from corroded piping to the soil beneath the site. Fuel is no longer stored in the AST at LC-38; the tank and its associated piping have been removed.

WSMR conducted a preliminary investigation in February 2001 to characterize the extent of contamination and site geology, and an additional investigation in November 2003 to further supplement data collected in 2001. They completed a total of ten soil borings at LC-38. Soil samples were analyzed for total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Four monitor wells were installed at the site in November 2003, as shown on Figure 4. Construction details are provided in Table 5.

1389791. RD0110 • Final • July 2013 • ACA08-045

The geology of the LC-38 site is characterized by five major lithologic facies determined from the lithologic logging of cores from seven soil borings across the LC-38 site. The lithologic facies are listed (lowest to highest) as follows:

- **Clay Facies.** The clay facies is located from approximately 100 ft bgs to 110 ft bgs (maximum depth augured) and consists of a lean, hard, dry clay. Minor discontinuous silt lenses are evident in this facies. The depositional environment is likely a meandering fluvial system. The clay was potentially deposited as oxbow lake deposits or back flood plain deposits from crevasse splay during flood stage.
- **Intermixed Facies.** The intermixed facies, located from approximately 82 ft bgs to 100 ft bgs, consists of well-sorted fine-grained sand and silt layers with minor discontinuous silt and clay lenses. The depositional environment is likely that of a meandering fluvial system. The fine-grained sands were likely deposited as either point bar deposits within the stream or more likely as over bank deposits close to the stream. The silts and clay deposits likely represent finer overbank sediments deposited increasingly farther away from the fluvial source. The vertically intermixed nature of the sands, silts, and clays shows the meandering nature of the fluvial system over time.

- **Clay Facies.** The clay facies, located from approximately 60 ft bgs to 82 ft bgs, consists of a lean, hard, dry clay with very minor well-sorted, fine-grained sand and silt lenses. The clay was potentially deposited as oxbow lake deposits or back flood plain deposits from crevasse splay during flood stage.
- **Intermixed Facies.** This intermixed facies, located from approximately 33 ft bgs to 60 ft bgs, consists of well-sorted fine-grained sand deposits with major discontinuous silt and clay lenses. As described in the intermixed facies above, this facies is likely the result of a meandering fluvial system.
- **Sand Facies.** The sand facies, located from the surface to approximately 33 ft bgs, is dominated by well-sorted, fine-grained quartzose sand. Minor medium-grained sands and trace silt are present in this unit. Very minor discontinuous silt, clay, and caliche lenses are present. This facies likely shows the transition from fluvial deposition to eolian deposition.

Based on the results of the previous investigations, WSMR has petitioned NMED to change the status of LC-38 to Corrective Action Complete with Controls (ARCADIS, 2011a). WSMR plans to conduct future groundwater monitoring as a control until such time that data demonstrate stable or declining dissolved concentrations and the NMED approves a cessation of the groundwater monitoring at the site.

1389791. RD0110 • Final • July 2013 • ACA08-045

4.1 Scope of Services

On 18 September 2012, petroleum/water interface probe data were collected from the LC-38 monitoring wells MW-001 through MW-004. No petroleum product was found in any wells on site. Groundwater was determined to be at 233.06 ft bgs, 237.59 ft bgs, 237.25 ft bgs, and 236.97 ft bgs in monitoring wells MW-001, MW-002, MW-003, and MW-004, respectively.

An MP10 Micropurge® Control along with a Sample Pro® 1.75-inch stainless steel sampling pump with disposable polyethylene bladders were used for sample collection. Sample parameters taken at the time of sample collection are included in Table 6. Figure 5 shows the potentiometric surface at the site.

The groundwater samples were analyzed for total chromium, diesel range organics (DRO), and hexavalent chromium. One primary and one duplicate sample were collected from MW-004. Results are summarized in Table 7. DRO was detected in all of the wells with a highest concentration of 338 micrograms per liter (µg/L) in MW-004. Total chromium was detected in all of the wells sampled. Chromium was detected at a highest concentration of 798 µg/L which is above the NMWQCC standard for chromium of 50 µg/L. Results for total chromium detected during this sampling event are similar to results from the SWMU

Assessment sampling conducted in January 2004. The highest total chromium detection from 2004 was from MW-002 (1,760 µg/L). Hexavalent chromium was not detected.

All laboratory reports, summary analytical tables, field notes, and additional figures including water flow direction and contaminant concentrations are included in Appendix C.

WSMR found no petroleum product in any wells on site using the oil/water interface probe.

4.2 Regulatory Criteria

The WSMR December 2009 RCRA Permit, Appendix 4, Table 4-1 lists the site as a SWMU requiring corrective action (SWMU 198). This unit was included in a Corrective Action Complete (CAC) petition dated January 2011. The CAC is currently under NMED review.

4.3 Groundwater Monitoring Results

WSMR continued annual petroleum/water interface probe monitoring at the LC-38 monitoring wells. DRO was detected using chemical analysis of groundwater; however all reported concentrations are below screening levels. Additionally, total chromium was detected above the NMWQCC standard; however, the chromium is not a constituent associated with diesel fuel and its presence in the groundwater beneath the site is not attributable to the diesel fuel release. Figure 6 shows locations and concentrations of total metals exceeding regulatory criteria.

4.4 Remediation System Monitoring and Additional Site Activities

None.

4.5 Summary

Water level measurements and investigation for free product in the site's monitor wells were accomplished in September 2012. No product was detected.

DRO was detected using chemical analysis of groundwater at concentrations below screening levels. Additionally, total chromium was detected above the NMWQCC standard; however, the chromium is not a constituent associated with diesel fuel and its presence in the groundwater beneath the site is not attributable to the diesel fuel release.

This page intentionally left blank.

1389791. RD0110 • Final • July 2013 • ACA08-045

5.0 OPEN BURN/OPEN DETONATION AREA (SWMUs 55, 56, & 56A) (CCWS-11)

The Open Burn/Open Detonation (OB/OD) area at WSMR is located at the foot of the San Augustin Mountains approximately 10 miles north of the main post. This site was utilized in the past for demolition of explosives and propellants. The OB/OD unit consists of both an open detonation area (two prepared pits) and an open burning pan (Figure 7). The combined burning and detonation operations are treated as a single thermal treatment unit for RCRA permitting purposes. OB/OD was operated as a RCRA Subpart X treatment unit under permit number NM2750211235-OB/OD. NMED, in a 12 January 2000 letter, instructed WSMR to cease using the unit by 31 December 2000. The last detonation at the OD pits occurred on 30 November 2000. The partial closure of OB/OD was completed according to the provisions of the closure plan under the operating permit. WSMR performed closure activities in 2001 and those activities are described in *Risk Assessment and Closure Report for the Open Burn/Open Detonation (OB/OD) Unit at the Hazardous Test Area (HTA), September 2002* (MEVATEC, 2002). WSMR submitted a Closure Certification to NMED on 4 November 2002.

1389791. RD0110 • Final • July 2013 • ACA08-045

Geology at the OB/OD site is generally characterized by three primary features. A relatively thin soil profile—5 to 10 ft on average—is present over the majority of the area. In some areas, this layer is lacking, and outcrops of Precambrian granite or diorite are observed. The soil is rocky, and has a low organic fraction. Underneath the soil layer is a granite wash layer that varies in thickness across the site from 0 to 35 ft. This layer is composed of angular, coarse-grained material that remains close to its source area. The third primary feature is a rind of weathered granite or diorite underlain by unweathered granite. The thickness of weathered rock was observed to vary between 10 ft and 99 ft, based on borehole logs. In addition, based on drilling conducted within the east detonation pit, unique cuttings that were produced from the interval 89 ft to 99 ft indicated the presence of a fault that crosses the area in the northwest-southeast direction. A total of 48 wells exist in and around the OB/OD site. Of these, 12 are currently utilized for ongoing groundwater monitoring. Table 8 lists construction details for the 12 wells.

The OB/OD is listed in the NMED Annual Fee Letter (NMED, 2008a), Table A, as three operating units. The letter identifies the open burn pan as SWMU 55 and the two open detonation pits as SWMUs 56 and 56a. They are listed as operating units OB/OD-3, OB/OD-1, and OB/OD-2, respectively. The WSMR December 2009 RCRA Permit, Appendix 4, Table 4-4 lists the site as Hazardous Waste Management Units (SWMUs 55, 56,

and 56A). In practice, the three operating units are combined for reporting and closure purposes.

5.1 Scope of Services

WSMR is currently monitoring the HTA wells associated with these SWMUs on a semi-annual schedule. Twelve monitoring wells were sampled for two semi-annual events on 13-15 February 2012 (Winter) and 3-7 August 2012 (Summer). Field parameters measured at the time of sample collection are included in Table 9. Figure 8 shows the potentiometric surface at the site.

5.2 Regulatory Criteria

A Final Post-Closure Care Plan (Shaw, 2011a) was submitted in January 2011. Subsequently, an investigation work plan was submitted in February 2012 as required by the WSMR December 2009 RCRA Permit. NMED approved the work plan with modifications in October 2012. Field investigations are ongoing.

5.3 Groundwater Monitoring Results

The contaminants of concern (COC) for the OB/OD site are RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine, an explosive compound), nitrate, and perchlorate. Table 10 and Figure 9 summarize results for these three COCs. The maximum RDX concentration was 85.9 µg/L from the August 2012 sample at HTA 10A, and 14 of the 24 samples collected in February and August exceeded the 6.11 µg/L screening level. The maximum perchlorate concentration was 19,200 µg/L from the August 2012 sample at HTA 15, and 20 of the 24 samples collected in February and August exceeded the 26 µg/L screening level. The maximum nitrate concentration was 23.3 mg/L from the February 2012 sample at HTA 19, and 8 of the 24 samples collected in February and August exceeded the 10 mg/L screening level. Ongoing groundwater monitoring shows no significant changes from previous sampling events. Laboratory and complete summary tables from the 2012 sampling are presented in Appendix C.

5.4 Remediation System Monitoring and Additional Site Activities

None.

5.5 Summary

Ongoing groundwater monitoring shows no significant changes in conditions from previous sampling events. RDX, nitrate-nitrite, and perchlorate were detected in several wells at concentrations exceeding screening levels.

6.0 HELSTF TECHNICAL SUPPORT AREA SPILL (SWMU 197) (CCWS-16)

The HELSTF is located on WSMR approximately 18.5 miles northeast of the Main Post, approximately 2.2 miles north of U.S. Highway 70. HELSTF became operational in September 1985. The primary mission of the facility is to support the testing and evaluation of high-energy laser systems, subsystems, components, and materials. The TSA for HELSTF was constructed in 1987. It is adjacent to Highway 70, approximately 2 miles from the main HELSTF area and contains support facilities, including a fueling station, separate from the more hazardous test facilities. A 3000-gallon AST at the fueling station lost an estimated 1,485 gallons of unleaded gasoline. The loss, estimated on the basis of an inventory review, occurred over an indeterminate period ending in March of 2000. The fueling station was shut down in March 2000, the AST was emptied and the pump was removed. The station has not been returned to service since March 2000.

1389791. RD0110 • Final • July 2013 • ACA08-045

WSMR investigated the TSA site during May and June 2000, at which time three monitor wells were installed. During the investigation, two water-bearing zones were encountered. The first zone, located approximately 34 ft bgs, is perched in nature and laterally discontinuous. The second water-bearing zone encountered is the regional groundwater table, located approximately 90 ft bgs. The regional aquifer is in unconsolidated silty sands and moderately sorted sand layers. Contamination reached approximately 30 ft bgs with maximum concentrations encountered near a depth of 17 ft bgs. WSMR utilized a soil vapor extraction (SVE) system for remediation of the site contaminants. Details are noted in Section 6.4, including discussion of a follow-up investigation performed between 2005 and 2010.

Based on findings from the site investigations, the subsurface geology consists primarily of poorly sorted fine grain sands with silt and clay lenses from ground surface down to approximately 20 to 25 ft. Below that, fine sands and clays become the predominant lithology in the form of 1 to 4 ft thick silty sands with interstitial clays. Between 30 to 35 ft bgs, a saturated silty clay/poorly sorted sand is present beneath the site. A fourth regional monitoring well was installed in 2004. A Corrective Measures Implementation investigation was conducted in March 2009 in which vapor monitoring wells were installed in the shallow subsurface. Water levels collected from the four monitor wells and three of the vapor extraction wells indicate two separate areas of perched water above the regional water table. These water bearing zones are separated by clays that vary from 5 to 10 ft thick and are separated from the regional aquifer by a thick sequence of clay, with interstitial silty clay and

poorly graded sand lenses beginning at approximately 35 to 40 ft and ending around 89 to 90 ft.

The regional aquifer exists at approximately 90 ft bgs within poorly graded sand lenses with interstitial clay as sequences. The regional aquifer was calculated to have a south and east flow direction with a hydraulic gradient of 0.0025 feet per foot (ft/ft). Four regional groundwater monitor wells exist at the site. Construction details are provided in Table 11. Site features are shown on Figure 10.

6.1 Scope of Services

WSMR proposed continued compliance monitoring of the existing monitor wells in the RCRA Facility Investigation (RFI) Report (BAE Systems, 2004a) as a precautionary measure to assure early detection of impact to the regional aquifer. Annual sampling for benzene, toluene, ethyl benzene, and xylenes (BTEX) is to be conducted at all existing monitor wells completed in the regional aquifer. During calendar year 2012, groundwater samples were analyzed for BTEX and for Methyl tert-butyl ether (MTBE) by EPA Method 8260B. Water level data collected was used to generate the potentiometric surface of the regional aquifer (Figure 11). Data for the calendar year 2012 groundwater monitoring is presented below.

1389791. RD0110 • Final • July 2013 • ACA08-045

6.2 Regulatory Criteria

The WSMR December 2009 RCRA Permit, Appendix 4, Table 4-1 lists the site as a SWMU requiring corrective action (SWMU 197).

WSMR submitted the RFI Report (BAE Systems, 2004a) to NMED HWB during 2006, and received review comments in December 2006 (NMED, 2006a). Among the comments was a request that the corrective measure (discussed in Section 6.4, below) be reinstated, since "gasoline was still present in the subsurface." A Corrective Measures Implementation (CMI) work plan (WTS, 2007) was submitted to the NMED for review in September 2007.

In 2009, supplemental soil and groundwater monitoring was conducted in preparation for implementing the CMI Work Plan. After evaluating the success of the SVE in remediating the upper 25 ft of soil and developing a geologic and hydrogeologic conceptual site model for the site, supplemental sampling and testing were conducted to confirm current site conditions and further evaluate the viability of the proposed remedy. Results of the supplemental work conducted in 2009 were documented in a status report submitted to the NMED in March 2011 (ARCADIS, 2011b). NMED is requiring additional remedial actions at the site.

6.3 Groundwater Monitoring Results

All laboratory reports, complete analytical tables, field notes, and additional figures including water flow direction and contaminant concentrations are included in Appendix C. Figure 11 of this report shows the inferred potentiometric surface at SWMU 197.

Groundwater sampling was conducted at HELSTF TSA on 16 through 20 March 2012. Monitor wells HMW48, 49, 50, and 52 were sampled using low-flow sampling techniques. An MP10 Micropurge® Control along with a Sample Pro® 1.75-inch stainless steel sampling pump with disposable polyethylene bladders were used for sample collection.

Low flow sampling techniques were used to remove approximately 1 gallon of water from each well prior to the stabilization of water quality parameters and sample collection. Drawdown of the water table was minimized to less than 0.5 ft during purge and sample collection at each well. Sample parameters taken at the time of sample collection are included in Table 12.

Sample results are listed in Table 13, and the laboratory report is provided in Appendix C with complete tables. Analytical results indicate that VOCs were not detected in any of the regional monitor wells with the exception of MTBE in the sample from well HMW52. MTBE was a common gasoline additive in the mid 1980s.

This is evidence that MTBE is present in the regional aquifer at HMW52. EPA has not set a national standard for MTBE, but has issued an advisory at the 20 to 40 parts per billion level for taste and odor impacts. NMED has listed MTBE as a "toxic pollutant" (20.6.2.7.VV NMAC) although there is no associated human health standard. Among the requirements for completion of monitored natural attenuation (MNA) (20.5.12.1226.A NMAC) is an MTBE concentration of 0.1 milligrams per liter (mg/L) (100 µg/L). Thus, the detection at TSA is significantly less than the completion criteria for MNA.

Based on the above noted regulatory guidance and the limited analytical data, WSMR proposes continued monitoring for MTBE at this time. HMW50 is located approximately 70 ft downgradient of HMW52 and serves as a migration downgradient sentinel point. MTBE has not been detected in HMW50.

6.4 Remediation System Monitoring and Additional Site Activities

WSMR initiated an SVE system as a pilot study/interim remedial action during July 2000. Results of the pilot study indicated that SVE would be an effective method of remediation at the facility. WSMR operated the pilot SVE system for a period of 4 months utilizing one of four vapor extraction wells installed into the shallow impacted soils and perched water table.

The SVE system removed an estimated 1,800 gallons of product, which is in excess of the reported release, providing further evidence of prior long-term leakage.

WSMR conducted a follow up investigation in 2004 which is detailed in the *RCRA Facility Investigation High Energy Laser Systems Test Facility Technical Support Area Fuel Spill* (BAE Systems, 2004a). This study provided additional groundwater and soil sampling to determine the effectiveness of the interim remedial action on the subsurface conditions. The investigation determined that the SVE interim remedial action was effective in removing the contamination from the upper, more porous sediments from zero to 25 ft bgs.

The human health and ecological exposure pathways relevant to the remaining contamination are all incomplete, leading to the conclusion of "no current or future human health or ecological risk." Continued compliance monitoring of the existing monitor wells is contemplated as a precautionary measure to assure early detection of impact. Annual sampling for BTEX of all existing monitor wells completed in the regional aquifer should be sufficient to detect any release. After a period of 10 years (beginning in 2004), continued monitoring or other actions can be revisited.

1389791. RD0110 • Final • July 2013 • ACA08-045

However, as discussed in Section 6.2, above, NMED did not accept these conclusions and requested that the remedial action be continued. The work plan for this action (WTS, 2007) was approved, with guidance, on 16 January 2008 by NMED. The work plan was executed in 2009.

In March 2009, six wells (HVW-05 through HVW-10) were installed in the zone of saturated soils (HVW-05 through HVW-10). Soil samples were collected from saturated soils (from 16 to 31 ft bgs) for characterization purposes. No gasoline constituents were detected above the soil screening levels. Some constituents were detected above the dilution attenuation factor (DAF 1) standards. Light non-aqueous phase liquid (LNAPL) was encountered in some of the wells and was sampled. The product analyses confirmed that the product was slightly weathered gasoline, which most resembled an 87 octane gasoline. Hydraulic testing was conducted to further develop the understanding of the hydro-geologic conditions. Results from the tests indicated that little or no hydraulic connectivity exists between wells screened in the shallow saturated soils, further supporting the conclusion that lateral groundwater flow within the vadose zone is very limited. Product recovery testing was performed in late 2009 and early 2010 to assess the recoverability of LNAPL. Results from the testing showed that product recoverability is negligible. A full description of these investigations with sampling results is included in the Status Report (ARCADIS, 2011b).

6.5 Summary

WSMR sampled the HELSTF TSA monitor wells using low flow sampling techniques in March 2012. Analytical results indicate that BTEX compounds were not detected in any regional samples collected. MTBE was detected in the sample from HMW52 collected during March 2012. Based on the detections from this sampling event and the previous events in 2007 through 2012, MTBE appears to be present in the regional aquifer at HMW52.

1389791. RD0110 • Final • July 2013 • ACA08-045

This page intentionally left blank.

7.0 TULA PEAK INCINERATOR SITE (SWMU 61) (CCWS-65)

The Tula Peak Incinerator Site is located mid-range just south of the Tularosa Gate and north of Holloman Air Force Base. The incinerator, actually a converted boiler shell used for thermal treatment, was utilized to burn unexploded ordnance after which the debris was buried in trenches at the site. Reports also describe miscellaneous aircraft and missile parts present in the trenches. The initial startup date is unknown, but operation of the unit had ended by 1988. In 1997, four monitor wells were installed at the site, as shown on Figure 12. Construction details are provided in Table 14. WSMR conducted periodic groundwater monitoring from 1995 to 2001. The site currently has no active groundwater monitoring program. The Tula Peak Incinerator Site is a RCRA regulated unit and the Munitions Rule does not apply.

The site consisted of four burial pits and four bomblet burial areas that have been combined as SWMU-57 (SWMUs 57-60 were combined and re-named SWMU-57) (WSMR December 2009 WSMR RCRA Permit, Appendix 4, Table 4-4. All of the burial pits are referred to by the NMED designation, the regulated unit LDU-1. The incinerator has been listed as SWMU 61. It is called by the NMED designation, regulated unit Incinerator (Incin)- 1. SWMU 61 was petititoned for CAC Status as part of the 1995 Class III Permit Modification, in which EPA Region 6 approved No Further Action.

1389791. RD0110 • Final • July 2013 • ACA08-045

Subsurface conditions were characterized from cuttings retrieved during borehole drilling for installation of the monitor wells. From ground surface to approximately 70 ft bgs, the geology is characterized as unconsolidated very fine-grained sand and gypsiferous silt with selenite crystals. From 70 to 300 ft bgs, the geology is characterized as alternating layers of thinly bedded gypsiferous silts with selenite, fine-grained sands and reddish-brown clays. The top of the zone of saturation (water table) was noted at approximately 18 to 20 ft bgs. During borehole drilling, fluid circulation was lost at approximately the 18 to 20 foot depth interval and the 55 to 60 foot depth interval at well locations TP-1 and TP-2, respectively. Fluid loss suggests the presence of possible subsurface dissolution cavities in the evaporite-rich sediments. Potentiometric surface elevations suggest a flow direction to the east-southeast.

7.1 Scope of Services

The Tula Peak Former Ordnance Disposal Site and Incinerator are currently inactive. No groundwater monitoring activities took place at this site during calendar year 2012.

7.2 Regulatory Criteria

The December 2009 WSMR RCRA Permit lists SWMU 61 as a Hazardous Waste Management Unit. At the end of this reporting period, the site has undergone remediation; the current physical state of the site is described below, under Remediation System Monitoring and Additional Site Activities. Access to the site is controlled by a locked fence. The site is listed in the Table 8-1 of the December 2009 RCRA permit requiring a closure plan submittal. The NMED approved the Clean Closure Plan in April 2008. WSMR submitted a RCRA Clean Closure Report to NMED in September 2011. The Clean Closure Report is currently under NMED review.

7.3 Groundwater Monitoring Results

Results from past monitoring events detected minimal or no potential contaminants.

7.4 Remediation System Monitoring and Additional Site Activities

From 2008 through 2010, the Tula Peak Site was remediated. The site consisted of a burn chamber for munitions disposal (identified as Incin-1), and burial sites for inert munitions removed from the range; missile parts removed from the range as part of testing; and aircraft parts consisting of aerial drones and surface targets.

The work began with the survey of the site and the establishment of a grid for geophysical investigation. WSMR performed Digital Geophysical Mapping by the electromagnetic induction technique, using a Geonics© EM 31 conductivity meter.

WSMR unearthed the pits to characterize them for content and began sifting the removed material for proper disposal. Items identified were inert submunitions; missile and aircraft parts; inert Mk 82 series bombs; and inert 750-pound demolition bombs, which were recovered and demilitarized.

Approximately 7,000 cubic yards of soil containing submunitions and smaller metallic debris were introduced into the sifter and placed into roll off containers for further inspection and demilitarization. Due to the type of soil, the inert munitions were sifted a second time to remove additional soil in order to better process them through the ring shredder. The sifted soil was stockpiled on site for eventual backfill into the pits.

A total of 105,280 pounds of scrap metal was removed from the site and turned in to the WSMR Range Residue Accumulation Point for recycling. A total of 222,461 inert submunitions were demilitarized by running through a ring shredder.

1389791.RD0110 • Final • July 2013 • ACA08-045

Confirmation samples were collected from the base and sidewalls of each pit. Results indicate no contamination left on site. Results of the remediation efforts are detailed in the Closure Report (Zia, 2011).

7.5 Summary

No groundwater monitoring activities took place at this site during 2012. Removal actions for potential contamination sources at this site were completed in 2010. No groundwater monitoring is planned.

This page intentionally left blank.

1389791. RD0110 • Final • July 2013 • ACA08-045

8.0 RHODES CANYON LANDFILL (SWMUs 114 & 115) (WSMR-14)

Rhodes Canyon Landfill served the Rhodes Canyon Range Center and surrounding area, and is located at the junction of Range Road 6 and Range Road 7 in the central region of WSMR (Figure 13). The site consists of SWMU 114 and 115, SWMUs 114-115 occupy approximately 24 acres in Sierra County. SWMU 115 was reported to receive sanitary waste and missile debris from up-range impact areas (A.T. Kearney, 1988). It was closed in 1976. No starting date was noted. WSMR opened SWMU 114 in 1976 upon closing of SWMU 115 and ceased receiving material September 1987. SWMU 114 reportedly only received office refuse and construction debris from the range center (WSMR, 1998).

There are currently six monitor wells associated with the landfill. Groundwater exists at an average depth of 72 to 81 ft bgs. The monitor wells are RCRA-compliant and are screened across the water table.

1389791.RD0110 • Final • July 2013 • ACA08-045

The RCRA Facility Assessment conducted by A.T. Kearney, Inc. (1988) concluded that there was low potential for a release from SWMU 114 and 115 to groundwater, surface water, air, or subsurface gas. International Technology Corporation conducted a Phase I RFI (ITC, 1992). This RFI recommended that a security fence be installed and that a Class 3 Permit Modification be implemented to terminate the RFI/Corrective Measures Study (CMS) process at WSMR-14. However, the 1998 *Installation Action Plan* noted the landfill cap was deficient and there were no surface water control measures in place. A designed landfill cap and storm water control measures would minimize the potential for groundwater contamination from the site. These corrective measures were installed in 2004 under the NMED approved CMI Work Plan (BAE Systems, 2003).

Groundwater monitoring at Rhodes Canyon Landfill began in 1995 with the installation of four monitor wells (designated RMW-1, RMW-2, RMW-3, and RMW-4). WSMR installed two additional wells in 2005 (WTS, 2005a). Construction details are noted in Table 15. The annual sampling events have not detected any COCs that can be directly linked to the landfill, but certain water quality parameters have been noted above the NMWQCC standards. These instances can be attributed to naturally occurring constituents within the regional aquifer and are not likely the result of leachate from SWMU 114 or 115. The native soil cover placed over SWMUs 114 and 115 limits infiltration from precipitation events and thus reduces the potential for formation of leachate.

8.1 Scope of Services

The annual groundwater monitoring event at SWMUs 114 and 115 consists of site inspection, groundwater measurements, and sampling of four wells by low-flow methods. Inspection includes monitoring the status and integrity of the fence, monitor wells, and native soil landfill cap. Table 16 lists the analytical constituents and methods relating to the groundwater sample analysis.

8.2 Regulatory Criteria

WSMR continues groundwater monitoring at SWMUs 114 and 115 as required for post-closure care and monitors a total of four wells annually at this site. The sample types and laboratory analysis are noted in the State-approved Post Closure Care Plan (also known as the *Corrective Measures Implementation Report*, September 2004 (BAE Systems, 2004), and the *Addendum to the CMI Report*, December 2005 (WTS, 2005b). NMED accepted closure of the landfills in correspondence dated 12 July 2006 (NMED, 2006b). The NMED 2008 Annual Fee Letter (NMED, 2008a) identifies SWMU 114 as an operating unit (Table A) and SWMU 115 as a corrective action unit (Table B). The December 2009 WSMR RCRA Permit issued by NMED lists SWMU 114 and 115 as Hazardous Waste Management Units that have achieved closure and are currently under post-closure care.

1389791. RD0110 • Final • July 2013 • ACA08-045

8.3 Groundwater Monitoring Results

8.3.1 Sampling Procedures

WSMR sampled four groundwater monitor wells at SWMUs 114 and 115 from 21 to 22 August 2012. Historic and current measurements to the water level surface indicate a fairly stable water table in the immediate area of SWMU 114 and 115. Potentiometric surface shown in Figure 14. Calculations indicate a gradient of 0.0015 ft/ft to the south with a slight easterly component.

A QED© sampling system was utilized at SWMUs 114 and 115 to monitor the water level, enabling a shut down if pumping exceeded the recharge rate of the well. While purging, a YSI 556 MPS water quality meter with flow cell was utilized to record groundwater field parameters. A portable Orion AQ4500 turbidimeter provided turbidity measurements. Parameters were allowed to stabilize prior to collection of the sample. The parameters recorded at the time of sampling for each of the wells are shown in Table 17. These parameters were within ranges typical of groundwater at WSMR. The total volume of purge water generated during this event was approximately five gallons.

8.3.2 Analytical Results

The samples collected from the four wells were analyzed for TPH, VOCs, SVOCs, lead, and water quality parameters. All laboratory reports, complete analytical tables, and field notes

are included in Appendix C. Table 18 shows concentrations of analytes detected during the 2012 sampling event. Sulfate and total dissolved solids (TDS) were detected at concentrations exceeding their respective screening levels. Figure 15 shows water quality parameters that exceeded regulatory criteria at Rhodes Canyon.

8.4 Remediation System Monitoring and Additional Site Activities

Inspections at the landfill are scheduled to occur semi-annually each year. Copies of the inspection forms are included in Appendix D. The inspection report form was developed based on the inspection requirements given in the *CMI Work Plan* and similar inspections that occur at soil covers elsewhere on WSMR. Erosion damage has been repaired yearly and waste has not been exposed. Erosion is mainly confined to three of the four erosion control channels (rock lined) located on the north side of the borrow pit. The channels were originally installed in 2007 following significant gully formation from storm events. WSMR will continue to monitor the site for erosion and repair impacted areas as needed. Post Closure Care of the soil cover will continue until groundwater monitoring is no longer deemed necessary through 5 year reviews, not to exceed 25 years.

8.5 Summary

The analytical results for the most recent round of groundwater sampling at the landfill did not reveal detectable concentrations of TPH, VOCs, SVOCs, or lead in any of the samples. Sulfate and TDS were detected at concentrations above screening levels. WSMR will continue to monitor this site as detailed in the post-closure care documents.

This page intentionally left blank.

9.0 HELSTF GROUNDWATER STUDY – CONSTRUCTION LANDFILL (SWMUs 38 & 39) (CCWS-75), CHROMATE SPILL (SWMU 143) (WSMR-54), AND SYSTEMIC DIESEL SPILL (SWMU 154) (WSMR-55)

Groundwater monitoring at the three HELSTF sites is conducted as a single campaign. Accordingly, the events will be presented and discussed together.

HELSTF is located near the depositional axis of the Tularosa Basin, just south of the eolian gypsum dunes of the White Sands National Monument. As a result of the central basin setting and the proximity to the source of the gypsum sand (Lake Lucero), the subsurface geology at HELSTF is dominated by unconsolidated, fine-grained clastic sediments interspersed with gypsum and minor selenite re-deposited from solution. These uppermost fine sediments are generally underlain by yellowish brown silty sand or poorly graded sands to at least 90 ft bgs. A laterally pervasive clay layer was observed at approximately 60 ft bgs. The stratigraphic units have been described as laterally discontinuous.

1389791.RD0110 • Final • July 2013 • ACA08-045

A RFI Phase III study of the HELSTF Site as a whole was initiated and completed in 2007. This study, identified as the HELSTF Groundwater Study was prompted by NMED in order to provide a better understanding of the groundwater in the vicinity of HELSTF and how it relates to each of the SWMUs and Areas of Concern (AOCs). Thus, it will encompass all SWMUs, AOCs, and monitor wells at the site (Figure 16). As part of the Phase III RFI at HELSTF, the groundwater study included sampling of existing monitor wells and 13 new monitor wells installed during the fall of 2006. The report of activities was delivered to NMED in 2008 (WTS, 2008a).

One product of the RFI Phase III study was a completely revised groundwater monitoring program for HELSTF as a whole, based on the current understanding of groundwater conditions at HELSTF. The program is designed to continue observation of groundwater conditions for the HELSTF facility as a whole, while maintaining an appropriate focus on the SWMUs that were previously monitored – Construction Landfills (SWMUs 38 & 39), Storage Yard Chromate Spill (SWMU 143), and Systemic Diesel Spill (SWMU 154) as described in the following sections.

In response to NMED comments on the Phase III RFI Report, a Revised Phase III RFI Report was submitted to the NMED on September 14, 2009 (ARCADIS, 2009). This report was modified again in 2010 to add more current groundwater data and to include an evaluation of soil data against the NMED's 2009 update to the soil screening levels (ARCADIS, 2010). The Revised Phase III RFI Report provide additional supporting

information to demonstrate that the hydrogeology within the HELSTF area is extremely complex. Although contamination within the vadose zone water and regional groundwater is widespread, the groundwater contamination can be attributed to four sites within the HELSTF: SWMU 142 – HELSTF Cleaning Facility Sump; SWMU 143 – HELSTF Storage Yard Chromium Spill Site; SWMU 144 – Laser System Test Center Wastewater Discharge Pond; and SWMU 154 – HELSTF Systemic Diesel Spill Site. The reports concluded that there is no evidence to suggest the other sites within HELSTF contributed to groundwater contamination. The 2010 revised Phase III RFI Report included a detailed revised Conceptual Site Model and risk assessments that showed that there are no current risks to human health or the environment associated with any of the sites. Because of the nature of the poor quality groundwater, there are no current or future risks associated with the groundwater. However, as a conservative measure, the report recommended continued long-term monitoring.

9.1 SWMU Discussions

9.1.1 HELSTF Construction Landfill (SWMUs 38 & 39) (CCWS-75)

1389791.RD0110 • Final • July 2013 • ACA08-045

The HELSTF Construction Landfill consists of approximately five disposal cells which were utilized for disposal of construction debris and other material (Figure 17). The site is located northeast of the HELSTF test area and is designated as SWMUs 38 and 39 (CCWS-75). The NMED 2008 Annual Fee Letter (NMED, 2008a), Table A, lists the sites as operating units, LDU-6 and -9, respectively. The December 2009 WSMR RCRA Permit lists SWMUs 38 and 39 as Hazardous Waste Management Units. Records indicate usage of the landfill from the early 1960s until 1989. The landfills were described as unlined trenches approximately 300 ft long, 50 ft wide, and 8 ft deep. On two occasions, the landfill was reportedly utilized for disposal of contaminated soil. According to the 1988 RCRA Facility Assessment (A.T. Kearney, 1988), soil contaminated with chromated water, which leaked in June of 1986 from Test Cell 1, was deposited in the construction landfill. In August of 1988, a release report notes approximately 50 gallons of low power chemical laser oil was accidentally released to the soil. The impacted soil was then excavated and taken to the construction landfill. In addition, in 1990, chromium-contaminated soil from SWMU 143 was deposited at the construction landfill.

Data presented in the Phase III RFI Reports (ARCADIS 2009 and 2010) demonstrate that there has been no significant release associated with SWMUs 38 and 39, and there is no evidence to suggest groundwater contamination associated with these SWMUs. A Closure Plan was submitted to the NMED on May 13, 2011 (ARCADIS, 2011c). The Closure Plan includes provisions for placing a soil cover over the former landfills. The Closure Plan presents a Post-Closure Care Plan that includes semi-annual inspection of the cover, and long-term groundwater monitoring. Figures 18, 19, and 20 show water quality parameters,

dissolved metals, and total metals exceeding regulatory criteria in groundwater at SWMUs 38 and 39.

9.1.2 HELSTF Storage Yard Chromate Spill (SWMU 143) (WSMR-54)

The HELSTF Chromate Spill Site is designated as SWMU 143. The NMED 2008 Annual Fee Letter (NMED, 2008a), Table B, lists the site as a corrective action unit. The December 2009 WSMR RCRA Permit lists SWMU 143 as a SWMU requiring corrective action. The site is located in the east corner of the equipment storage area (Figure 21). It was discovered in December 1989 and was most likely the result of a leaking 55-gallon drum of corrosion inhibitor containing hexavalent chromium and zinc. Corrective measures were taken in 1990 when approximately 125 cubic ft of soil were removed from the site and disposed of at SWMU 38 and 39. A roof structure (later replaced by a cap) was placed over SWMU 143 to limit infiltration of precipitation. Detectable amounts of hexavalent chromium were observed in monitor wells adjacent to the site during the Phase II RFI completed in 1994. During 1998, an in-situ gaseous reduction demonstration project was carried out which apparently reduced 70 percent by mass of the hexavalent chromium to trivalent chromium. Figures 22 and 23 show total metals and VOCs exceeding regulatory criteria in groundwater at SWMU 143.

9.1.3 HELSTF Systemic Diesel Spill (SWMU 154) (WSMR-55)

The HELSTF Systemic Diesel Spill Site is designated as SWMU 154 (WSMR-55). The NMED 2008 Annual Fee Letter (NMED, 2008a), Table B, lists the site as a corrective action unit. The December 2009 WSMR RCRA Permit lists SWMU 154 as a SWMU requiring corrective action. This spill is located in the area surrounding the Cleaning Facility (Figure 24). An investigation at the Cleaning Facility in 1990 found free-phase fuel product in a soil boring. The product was released from a 30,000-gallon underground storage tank (UST) that supplied boilers in the Cleaning Facility's basement. This UST was installed in late 1979 or early 1980 and removed in 1988. Estimates are that 100,000 gallons of fuel may have been released. The free product was found to be floating on a perched water-bearing zone between 40 and 50 ft bgs.

A VEDRS operated at the site starting in 1995 to recover free product. The VEDRS consists of a network of 11 skimming wells which remove free product found on the surface of the perched water table.

The Systemic Diesel Spill (SWMU 154) is commingled with contamination from the Cleaning Facility Sump (SWMU 142). For the interim, monitoring of the diesel spill will also provide adequate information concerning the cleaning facility. Issues related to the two sites will be addressed during the planned CMS.

Figures 25, 26, and 27 show total metals, DRO, and VOCs exceeding regulatory criteria in groundwater at SWMU 154.

9.2 Scope of Services

The HELSTF sites have been subjected to semi-annual groundwater monitoring since 1998 (1994 for the Diesel Spill Site) to determine the concentration of contaminants in the groundwater. This is a continuation of the ongoing groundwater monitoring program at HELSTF. However, advantage was taken of lessons learned during previous events to significantly modify the analytical schedule and to accommodate some different wells to be sampled. Construction details for the selected wells are provided in Table 19. The current analytical schedule, depending on site, is shown on Table 20. Figure 28 shows the location of wells currently being used for LTM activities. Since 2004 WSMR has elected to initiate low-flow sampling methods where possible. The monitor wells associated with the various sites were sampled during March 2012 (first event) and August-September 2012 (second event), utilizing low flow sampling techniques.

9.3 Regulatory Criteria

Groundwater monitoring is ongoing, pending acceptance of the Phase III RFI Report. A Closure Plan for the HELSTF Construction Landfill was submitted in May 2011 per Table 8-1 of the WSMR December 2009 RCRA Permit. The Closure Plan is currently under NMED review.

9.4 Groundwater Monitoring Results

The three sites at HELSTF are sampled as a single campaign. Accordingly, all of the results will be reported together. This is a continuation of the ongoing groundwater monitoring program at HELSTF. However, advantage was taken of lessons learned during previous events to significantly modify the analytical schedule and to accommodate some different wells to be sampled. The analytical schedule for the sites is shown on Table 20.

9.4.1 Sampling Procedures

The 2012 events continued to use low-flow sampling techniques. The production rate was generally set at < 200 milliliters per minute (mL/min) and the sample collected when temperature and conductivity stabilized. The parameters recorded at the time of sampling for each of the wells is shown in field notes and tables within Appendix C.

9.4.2 Analytical Results

The analytes detected for each site are shown in Appendix C along with the associated laboratory reports. Detected analytes are shown in Tables 21, 22 and 23. Figures 18, 19, and 20 show water quality parameters, dissolved metals, and total metals exceeding regulatory

criteria in groundwater at SWMUs 38 and 39. Figures 22 and 23 show total metals and VOCs exceeding regulatory criteria in groundwater at SWMU 143. Figures 25, 26, and 27 show total metals, DRO, and VOCs exceeding regulatory criteria in groundwater at SWMU 154. Although the native groundwater at HELSTF has a total dissolved solids content greater than 10,000 mg/L, the concentrations are compared to NMWQCC standards.

Concentrations above those standards are in bold print**.** The data shown are consistent with previous events and the data from the newly-designated wells are also consistent with the long-term record.

- For the site as a whole, chloride and sulfate are elevated with respect to standards.
- For the Chromate Spill Site (SWMU 143), chromium remains the principal contaminant of concern.
- For the Systemic Diesel Spill Site (SWMU 154), low levels of a number of VOCs are routinely detected, associated with the commingled spill from the Cleaning Facility (SWMU 142). The main constituent of concern, DRO, is still detected above NMED TPH screening values at SWMU 154.
- Throughout the three sites, sporadic observations of various other metals (arsenic and selenium), some above NMWQCC standards, are ascribed to native sources.

1389791. RD0110 • Final • July 2013 • ACA08-045

9.5 Remediation System Monitoring and Additional Site Activities

At the HELSTF Systemic Diesel Spill (SWMU 154), the VEDRS was in operation between 1995 and 2006 utilizing a network of wells to remove free product on the perched water table in the vicinity of SWMU 154. The system consists of the 11 extraction wells, the vacuum system, itself, and carbon canisters. Exhaust is released to the atmosphere through an elevated stack. Initial recovery rates were as high as 200 gallons per month. Recovery rates began to decline in 1998 and continued to decline through 2004. During 2004, performance analysis revealed that the VEDRS was no longer removing product in a cost-effective manner. The decision at the time was to continue operating only the skimming pump portion of the system. The system [skimming pumps, only] was started up again in October 2005. Product recovered in 2005/2006 was minimal and the skimming pumps have also been shut down. A hydrocarbon recoverability test was conducted in 2009 to determine whether the skimming system should be restarted. The recoverability test concluded that recoverability was negligible and the system remains inactive.

9.6 Summary

Ongoing groundwater monitoring shows little change in conditions. Analytical results of groundwater sampling are presented in Tables 21, 22, and 23, and summarized above in Section 9.4.2.

With the exception of hypothetical vapor intrusion into future buildings at SWMUs 143 and 154, the Human Health and Ecological Risk Assessments performed for the SWMUs within the HELSTF concluded no current or future risk to human health or the environment. Long term groundwater monitoring will be continued under the current program until a new groundwater monitoring program for the HELSTF area is developed and approved by the NMED.

1389791. RD0110 • Final • July 2013 • ACA08-045

10.0 MAIN POST LANDFILL NO. 3 (SWMU 65) (CCWS-76)

The former Main Post Landfill No. 3 is located in the southeast portion of the WSMR Main Post area (Figure 29). This site is identified as SWMU 65. The NMED 2008 Annual Fee Letter (NMED, 2008a), Table A, lists the site as operating unit LDU-10. The December 2009 WSMR RCRA Permit lists SWMU 65 as a Hazardous Waste Management Unit. The SWMU boundary encompasses an area of approximately 49 acres (MEVATEC, 2001). SWMU 65 was used as a disposal site for sanitary waste from the early 1960s to 1982. A portion of the site was also used as a scrap metal accumulation point from the 1970s until at least the late 1990s. Landfill operations utilized typical trench style disposal methods.

SWMU 65 is located along the western edge of the Tularosa Basin near the alluvial fans of the Organ Mountains. The alluvial fans formed on the slopes of the uplifted fault blocks characteristic of this portion of the Basin and Range Province (WSMR, 1998). The alluvial material in the area of the landfill is classified as the Sonoita-Pinaleno-Aladdin association, and is principally made up of gravelly sandy loam. Site-specific geology can be further characterized based on the lithology noted when installing monitor wells in the immediate area. Typical of alluvial fans, the site consists of layers of sand, silt, and clay in various proportions and intermixed with gravel. The unconsolidated alluvial material underlying the site may be as thick as 4,000 to 6,000 ft. Monitor wells and test wells in the vicinity of the site have not reached bedrock (USAEHA, 1976). Groundwater exists at an average depth of just over 200 ft.

1389791.RD0110 • Final • July 2013 • ACA08-045

The SWMU had four monitor wells (two installed in 1991 and two more in 1993). Groundwater monitoring occurred semi-annually from 1996 to 2001. This program did not detect potential COCs. A RFI report was submitted in 2001 (MEVATEC, 2001). Upon review of the RFI, NMED questioned the construction of the current monitor wells and whether they were able to detect potential leachate from SWMU 65 and issued a Request for Supplemental Information (RSI) on 14 July 2003 (NMED, 2003). The groundwater monitoring program at SWMU 65 remained inactive pending the Phase III RFI proposed as a result of the NMED 2003 RSI.

WSMR received approval of the Phase III RFI Work Plan and initiated the efforts described in the work plan in November 2007. Four additional monitor wells have been installed and certain other activities have been completed. WSMR sampled the new wells in February 2008 and provided the results of all activities in a RFI Report dated January 21, 2009 (WTS, 2009).

Annual groundwater monitoring at the site was inactive while WSMR completed the Phase III RFI Work Plan which includes installation and sampling of four new monitor wells and soil sampling in certain areas of the site. One new monitor well was located to the west, or up-gradient, while the other three were located east, or down-gradient from the landfill. Construction details, coordinates, and elevations of monitor wells associated with SWMU 65 appear in Table 24. The four new monitor wells were first sampled in February 2008.

10.1 Scope of Services

The annual groundwater monitoring event consists of groundwater measurements and sampling of four wells (MPL-09, MPL-10, MPL-11, and MPL-12) by low-flow methods.

10.2 Regulatory Criteria

WSMR submitted a Phase III RFI report in January 2009 and presented a Revised Phase III RFI in February 2011 (Zia, 2011). The Revised Phase III RFI demonstrated that there has been no significant release associated with SWMU 65, and there is no evidence to suggest groundwater contamination associated with this SWMU. A Closure Plan was submitted to the NMED on March 14, 2011 (ARCADIS, 2011d) per Table 8-1 of the WSMR December 2009 RCRA Permit. The Closure Plan includes provisions for placing a soil cover over the former landfills. The Closure Plan presents a Post-Closure Care Plan that includes semi-annual inspection of the cover, and long-term groundwater monitoring.

10.3 Groundwater Monitoring Results

Groundwater sampling from the newly installed wells was accomplished from 5 to 7 March 2012. The parameters recorded at the time of sampling for each of the wells is shown in Table 25. These parameters are within ranges typical of groundwater at WSMR in this vicinity.

Analytical results from the March 2012 groundwater monitoring event detected constituents consistent with prior sampling at the site. In addition, perchlorate and chloromethane were detected in low concentrations. The results (laboratory reports and summary table) are included in Appendix C. The potentiometric surface is shown on Figure 30 based on current groundwater measurements.

The analytical results did not reveal constituents in the groundwater that could directly be attributed to leachate from the landfill. Detected analytes were not above their associated NMWQCC Standard (Table 26).

10.4 Remediation System Monitoring and Additional Site Activities

SWMU 65 does not have a remediation system. During 2006, WSMR removed various scrap materials (electrical cable, large metal tanks, and downed utility poles) from the surface of the site. Additional construction debris was removed in 2007. These materials appear to have been dumped at the site about the time the landfill stopped receiving waste or slightly after.

10.5 Summary

Analytical results for the groundwater sampling at SWMU 65 did not reveal any indication of contaminants leaching into the groundwater from the landfill cells. Detected analytes were not above their associated NMWQCC Standard. WSMR proposes to continue monitoring the groundwater at this site on an annual basis until such time that the Closure Plan is approved by the NMED, and implemented, and the Post-Closure Care period begins.

This page intentionally left blank.

11.0 FORMER SEWAGE TREATMENT PLANT PERCOLATION DITCHES (SWMU 82) (CCWS-62) (FORMERLY WSMR-62)

The Former Sewage Treatment Plant (STP) Percolation Ditches are located east of the STP in the southern portion of WSMR (Figure 31). These ditches were formerly designated as SWMUs 82 and 83 (CCWS-62) The NMED 2008 Annual Fee Letter (NMED, 2008a), Table A, combines the two SWMUs, listing them as operating unit SWMU 82; the December 2009 WSMR RCRA Permit follows this designation. WSMR utilized the percolation ditches for surface disposal of treated effluent from the STP during the period from 1958 through 1986. In 1995, it was discovered that groundwater in the area of STP had small concentrations of cyanide. It is hypothesized that this contamination is a result of photographic chemicals discharged to the sewer over a period of years. A CMS was completed (MEVATEC, 2000). An addendum to the CMS was prepared in 2004 (BAE Systems, 2004b) and transmitted to NMED HWB. WSMR has a requirement to continue the groundwater monitoring at SWMU-82.

1389791.RD0110 • Final • July 2013 • ACA08-045

WSMR has conducted quarterly or semi-annual groundwater monitoring at the STP percolation ditches on a routine basis since 2000. The planned monitoring program as presented in the CMS Addendum (BAE Systems, 2004a) has been modified. A total of 26 wells remain in the sampling program. Construction details are also provided in Table 27. Sampling is currently conducted in compliance with the *RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3,* May 2008), (WTS, 2008b). Specifics of the monitoring plan are discussed in Sections 11.2 and 11.3 of this document.

The site geology in the vicinity of the contaminant zone is characterized by alluvial fan sediments originating along the eastern flank of the Organ Mountains. The alternating horizons of sands, silts and clays observed in borings were considered the distal portion of the alluvial fan. Deposits of unconsolidated or lightly-consolidated fan deposits were observed to become finer-grained with increasing depth below surface, and with increasing distance away from the mountain front.

11.1 Scope of Services

This is a continuation of the ongoing groundwater monitoring program at the former STP Percolation Ditches. The monitor wells associated with SWMU 82 are on a nominal semi-annual sampling schedule. Samples were collected from 17 January 2012 through 7 February 2012 (Winter) and 10 July through 24 July 2012 (Summer).

11.2 Regulatory Criteria

WSMR currently monitors the site in accordance with an NMED approved plan titled: *RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3,* May 2008) (WTS, 2008b). This RCRA monitoring plan is the culmination of multiple requirements identified in NMED correspondence as noted below.

The 24 August 2007 correspondence (*Notice of Disapproval, RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235,WSMR-07-001*) is a continuation of a previous NMED letter of 7 August 2006 (*NMED Response to the White Sands Missile Range (WSMR) Comment Response Letter Regarding the Evaluation of Monitored Natural Attenuation (MNA) STP Ditches (SWMUs 82 and 83) White Sands Missile Range, EPA ID NO. NM2750211235, HWB-WSMR-99-007*).

Additionally, the current monitoring plan has been modified to incorporate the requirements of the NMED 18 March 2008 letter (*Rejection of the Revised RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82), White Sands Missile Range, EPA ID No. NM2750211235, WSMR-07-001*), and (NMED 25 March 2008 e-mail message, *Monitoring plan clarifications – STP Ditches*).

1389791. RD0110 • Final • July 2013 • ACA08-045

Cyanide is the only COC associated with this site. A petition for adoption of MNA as the preferred remedy (BAE Systems, 2004b) is pending with NMED HWB. A Closure Plan (Shaw, 2011b) was submitted in June 2011 per the December 2009 WSMR RCRA Permit. The Closure Plan is currently being reviewed by NMED.

11.3 Groundwater Monitoring Results

11.3.1 Sampling Procedures

The scope of the monitoring plan discussed in Section 11.2 is as follows. Monitoring equipment to be used includes various nitrogen gas-powered bladder pumps and controllers for low-flow sampling. For the shallower wells, pumps with disposable bladders (such as QED© Sample-Pro) are used, so that only new parts contact the sample. For the deeper wells (greater than 300 ft), a high-lift bladder pump is used and decontaminated between wells. For each sampling event, 26 wells are sampled; three wells are sampled in duplicate; and two wells are sampled in duplicate for laboratory matrix-spike analyses.

For this event, the pumping rate was generally set at 250 mL/min and the sample collected when temperature, pH, and conductivity stabilized. WSMR purged the wells with a portable QED© bladder pump. During purging, WSMR used a YSI 556 MPS water quality meter with flow cell to record groundwater field conditions. A portable Orion AQ4500 turbidimeter provided turbidity measurements. Field parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation/reduction potential) were allowed to stabilize prior to collection of the sample. The field parameters recorded at the time of sampling for each of the wells are shown in the field notes contained within Appendix C.

The analytical schedule for this site is shown on Table 28. Table 29 includes depth to water measurements for sampled and non-sampled wells in the STP area. Figure 32 shows the potentiometric surface of the site. Table 30 lists field parameters from the sampling event including carbon dioxide and ferrous iron.

11.3.2 Analytical Results

Detections from the 2012 sampling events are included in Table 31 and Table 32. The associated laboratory reports and complete summary reports are provided in Appendix C. The data shown are consistent with previous events. Cyanide was detected in multiple samples at concentrations exceeding the NMWQCC standard.

Cyanide is the only contaminant of concern related to site activities. Data demonstrate that total cyanide concentrations are trending downward in general. Even with a noisy (highly variable) record and a relatively limited period of observation, the data show that natural attenuation is occurring at the former STP percolation ditches site. Significant improvements in water quality should be apparent well within the 30-year time frame identified in the previous document (BAE Systems, 2004b).

A comparison of total cyanide values contoured from data gathered in 2000 versus data gathered in 2012 is shown in Figure 33. One condition is apparent in the figures: the total area impacted by cyanide contamination shows little change, reflecting the negligible groundwater movement taking place from 2000 through 2012. From 2000 to 2012, the portions of the site impacted by higher concentrations appeared much smaller in 2012, reflecting the ongoing effects of intrinsic remediation. WSMR will continue to monitor the STP site for cyanide attenuation.

11.4 Remediation System Monitoring and Additional Site Activities

None. Intrinsic remediation (natural attenuation) is occurring.

11.5 Summary

Cyanide remains the only contaminant of concern. Groundwater conditions at this site will be evaluated as part of the ongoing monitoring of MNA.

12.0 NORTH OSCURA PEAK LANDFILL (SWMUs 47 & 48) (WSMR-71)

The landfill at North Oscura Peak consisted of three landfill cells designated as SWMUs 47 and 48. Disposal activities took place from 1960 to 1989. The site was remediated according to the CMI Work Plan (MEVATEC, 1999) in late 2001 and 2002. Remediation activities are detailed in the *Voluntary Corrective Measures Implementation Report for the North Oscura Peak Landfill* (BAE Systems, 2004c). WSMR removed approximately 2,680 cubic yards of solid waste and disposed it at the Rio Rancho Landfill north of Albuquerque, NM. Confirmation samples taken from the excavated landfill revealed minor amounts of residual contamination. The human health and ecological risk assessment concluded the remaining contamination did not pose an unacceptable risk (BAE Systems, 2004c).

12.1 Scope of Services

No monitoring activities associated with this site occurred in 2012.

1389791.RD0110 • Final • July 2013 • ACA08-045

12.2 Regulatory Criteria

This site is proposed for a Class III Permit Modification for Corrective Action Complete.

12.3 Groundwater Monitoring Results

No monitor wells are associated with this site. The Oscura Mountains lack significant groundwater and it is unknown whether any groundwater source exists below the site (BAE Systems, 2004c).

12.4 Remediation System Monitoring and Additional Site Activities

Following remediation efforts at SWMUs 47-48, silt fencing was installed to limit surface soil erosion. No other efforts were made to promote vegetation growth on the bare soil. The WSMR Land Manager, Dr. David Lee Anderson, surveyed the vegetative recovery at the site in October 2006 and September 2007, four and five years after remediation efforts were complete. He found roughly 50 percent vegetative cover at the site during both surveys.

12.5 Summary

Remediation efforts at SWMUs 47-48 are complete and native vegetation at the site is recovering well. WSMR will submit a Petition for Corrective Action Complete and Class III Permit Modification.

This page intentionally left blank.

1389791. RD0110 • Final • July 2013 • ACA08-045

13.0 REFERENCES

ARCADIS, 2009, *Phase III RCRA Facility Investigation (RFI) Report – HELSTF Sites,* September 2009

ARCADIS, 2010, *Revised Phase III RCRA Facility Investigation (RFI) Report – HELSTF Sites – Second Revision*, August, 2010.

ARCADIS, 2011a, *Petition to Perform Class III Modifications to Change the Status of Solid Waste Management Units 19, 47, 48, 63, 64, 108, 157, 158, 159, 164, 167, 168 and 198 from Corrective Action Required to Corrective Action Complete or Corrective Action Complete with Controls, White Sands Missile Range RCRA Part B Permit (No. NM2750211235),* January 2011.

ARCADIS, 2011b, *Status Report for the High Energy Laser System Test Facility Technical Support Area Gasoline Spill Site SWMU 197 (CCWS-16)*, March 17, 2011.

ARCADIS, 2011c, *Closure Plan – Former High Energy Laser Systems Test Facility (HELSTF) Construction Landfills, SWMU 38 & 39 (CCWS-75)*, May 2011

ARCADIS, 2011d, *Closure Plan - Main Post Landfill 3, SWMU 65 (CCWS-76),* March 2011.

ASTM International, March 2002, *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations* D 6771-02, West Conshohocken, Pennsylvania.

A.T. Kearney, Inc., 1988, *RCRA Facility Assessment PR/VSI Report, White Sands Missile Range, White Sands, New Mexico*, Alexandria, VA.

BAE Systems, 2003, *Revised Final Rhodes Canyon Landfill Corrective Measures Implementation Work Plan, WSMR-14; SWMUs 114 and 115*. WSMR, New Mexico.

BAE Systems, 2004a, *RCRA Facility Investigation High Energy Laser Systems Test Facility Technical Support Area Fuel Spill*, WSMR New Mexico.

BAE Systems, 2004b, *Former Sewage Treatment Plant Percolation Ditches (SWMUs 82 and 83) Corrective Measures Study Addendum, Monitored Natural Attenuation Proposal*, WSMR, New Mexico.

BAE Systems, 2004c, *Voluntary Corrective Measures Implementation Report for the North Oscura Peak Landfill, SWMU 47, 48, and 49 (IRP ID WSMR-71)*, WSMR, New Mexico.

BAE Systems, 2005, *Corrective Measures Implementation Report for the Rhodes Canyon Landfill, (WSMR-14; SWMUs 114 and 115)*. WSMR, New Mexico.

1389791. RD0110 • Final • July 2013 • ACA08-045

ITC, 1992, International Technology Corporation, *Phase I RCRA Facility Investigation, White Sands Missile Range*, 1992.

MEVATEC, 1999, *Corrective Measures Implementation Work Plan for the North Oscura Peak Landfill, Solid Waste Management Units 47, 48, and 49 (DSERTS WSMR-71),* WSMR, New Mexico.

MEVATEC, 2000, *Sewage Treatment Plant Former Percolation Ditches Corrective Measures Study at White Sands Missile Range*, August.

MEVATEC, 2001, *RCRA Facility Investigation, Former Main Post Landfill No. 3, WSMR-61 (SWMU 65)*, WSMR (New Mexico), WSMR.

MEVATEC, 2002, *Risk Assessment and Closure Report for the Open Burn/Open Detonation (OB/OD) Unit at the Hazardous Test Area (HTA*), September 2002.

NMED, 2001, New Mexico Environmental Department – Hazardous Waste Bureau (NMED-HWB), October 2001, Position Paper - *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring*, Santa Fe, New Mexico.

NMED, 2003, Request for Supplemental Information, Main Post Landfill III. 14 July 2003.

NMED, 2006a, New Mexico Environment Department – Hazardous Waste Bureau, October 13, 2006, Response to the SWMU Assessment Report for the LC-38 Diesel Spill on White Sands Missile Range, WSMR-06-008 and WSMR-06-004.

NMED, 2006b, New Mexico Environment Department – Hazardous Waste Bureau, July 12, 2006, Rhodes Canyon Landfill (WSMR-14) Closure Verification White Sands Missile Range EPA ID No. NM2750211235.

NMED, 2008a, 2008 Annual Fee, White Sands Missile Range NM2750211235, 1 October 2008 Letter.

NMED, 2012, *Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document*, Hazardous Waste Bureau and Groundwater Quality Bureau, Voluntary Remediation Program, Table A-1 Updated February 2012.

Shaw, 2011a, *Final Closure and Post Closure Care Plan, Open Burning/Open Detonation Units at Hazardous Test Area Site (CCWS-11/SWMU 55, 56 and 56A), White Sands Missile Range Performance-Based Acquisition, White Sands, New Mexico*, January 2011.

Shaw, 2011b, *Final Closure Plan, SWMU 82, Former Sewage Treatment Plant Percolation Ditches (CCWS-62), White Sands Missile Range, New Mexico*, June 2011

USAEHA, 1976, U.S. Army Environmental Hygiene Agency, 1976, *Water Quality Engineering Survey No. 66-0138-77*, Aberdeen Proving Ground (Maryland).

WSMR, 1998, White Sands Missile Range, *White Sands Missile Range, Range-wide Environmental Impact Statement*, WSMREIS-1, WSMR, January 1998.

WTS, 2005a, Letter Report: *Installation of Two Monitor Wells at Rhodes Canyon Range Center*. White Sands Technical Services, LLC, May.

WTS, 2005b, *Addendum Corrective Measures Implementation Report Rhodes Canyon Landfill*, White Sands Technical Services, LLC, December.

WTS, 2005c, Revised Considerations of Monitored Natural Attenuation, Letter Report ES-EC-TO-015-05-070, White Sands Technical Services, LLC, October.

WTS, 2007, *Corrective Measures Implementation Work Plan HELSTF Technical Support Area Fuel Spill CCWS-16, (SWMU 197)*, White Sands Technical Services, LLC, September 2007.

WTS, 2008a, *PHASE III RFI REPORT – HELSTF SITES: Construction Landfill (SWMUs 38 and 39) – IRP ID WSMR-52; Chromate Spill Site (SWMU 143) – WSMR-54; Systemic Diesel Spill (SWMU 154) – WSMR-55; and HELSTF Groundwater – WSMR-85*, White Sands Technical Services, LLC, February 2008.

WTS, 2008b, *RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3*, White Sands Technical Services, LLC, May 2008

WTS, 2009, *Phase III RCRA Facility Investigation Report Former Main Post Landfill No. 3 (Scrap Yard) CWS-76, SWMU 65*, White Sands Technical Services, LLC, January 21, 2009.

Zia, 2011, *Revision II Phase III RCRA Facility Investigation Report Former Main Post Landfill No. 3 (Scrap Yard) CCWS-76, SWMU 65*, February 2011.

This page intentionally left blank.

Figures

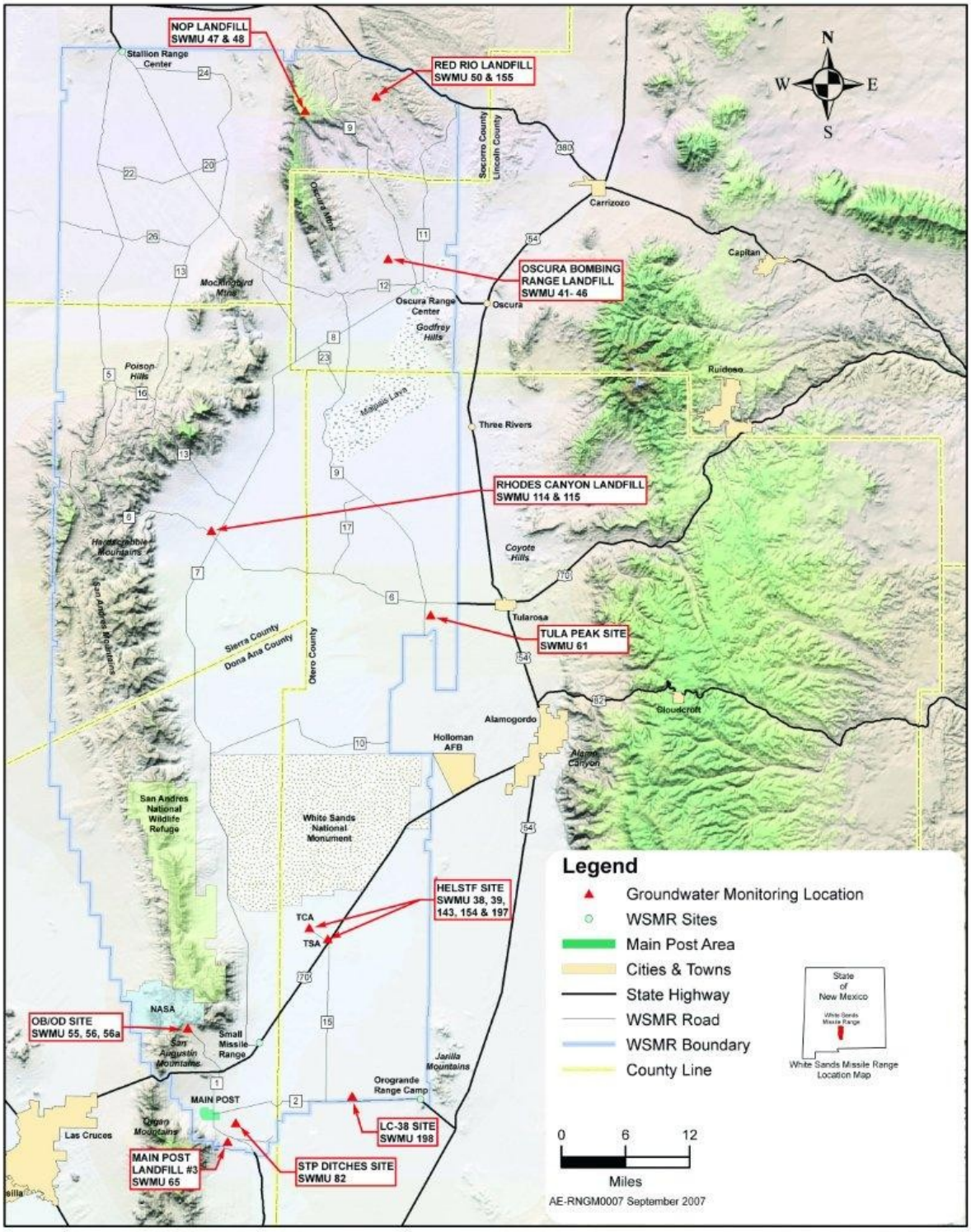
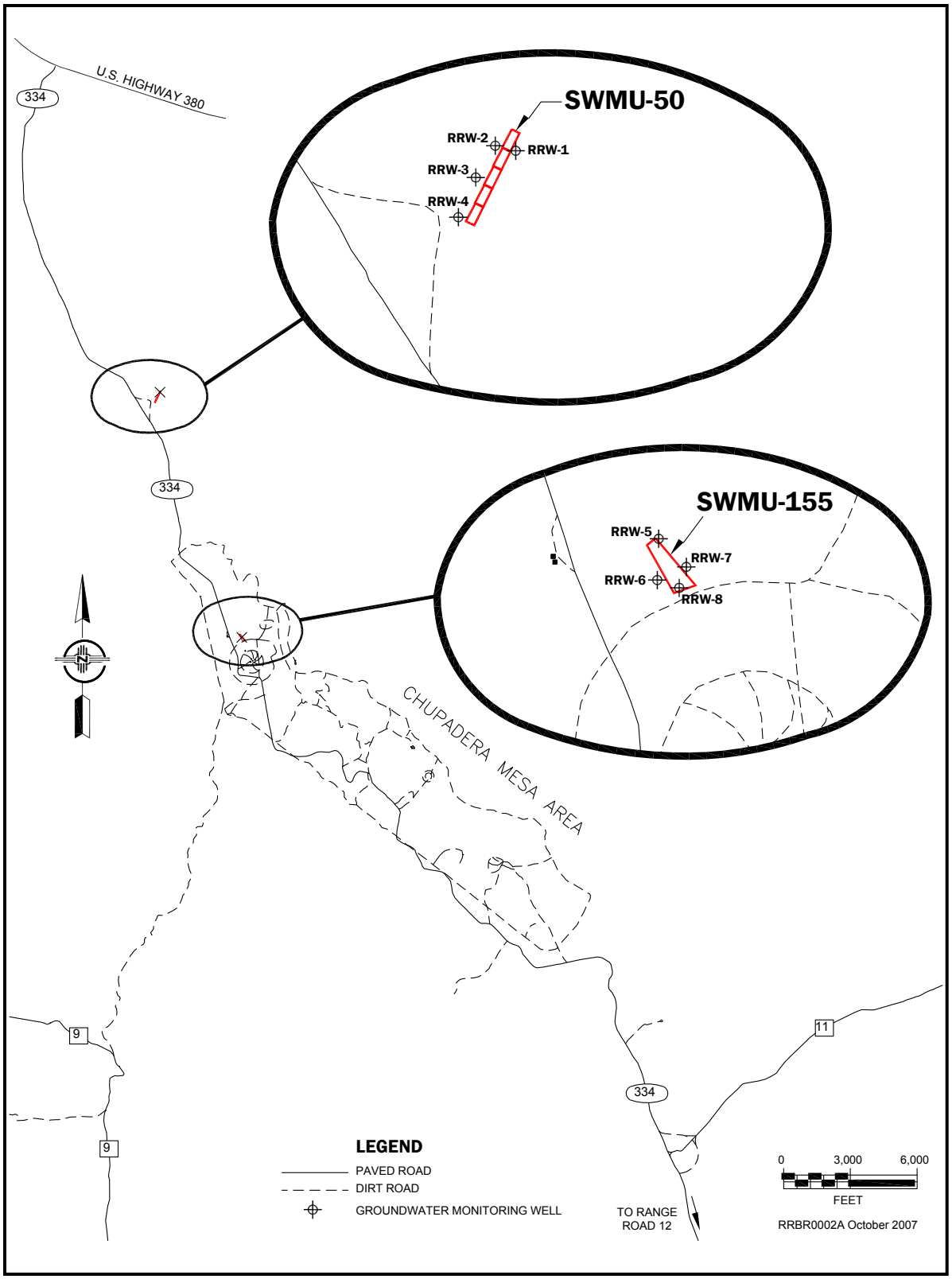


Figure 1
Locations of Sites Addressed in this Report



1389791. RD0110 • Final • July 2013 • ACA08-045

Figure 2
Red Rio Bombing Range Landfills (SWMUs 50 & 155) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

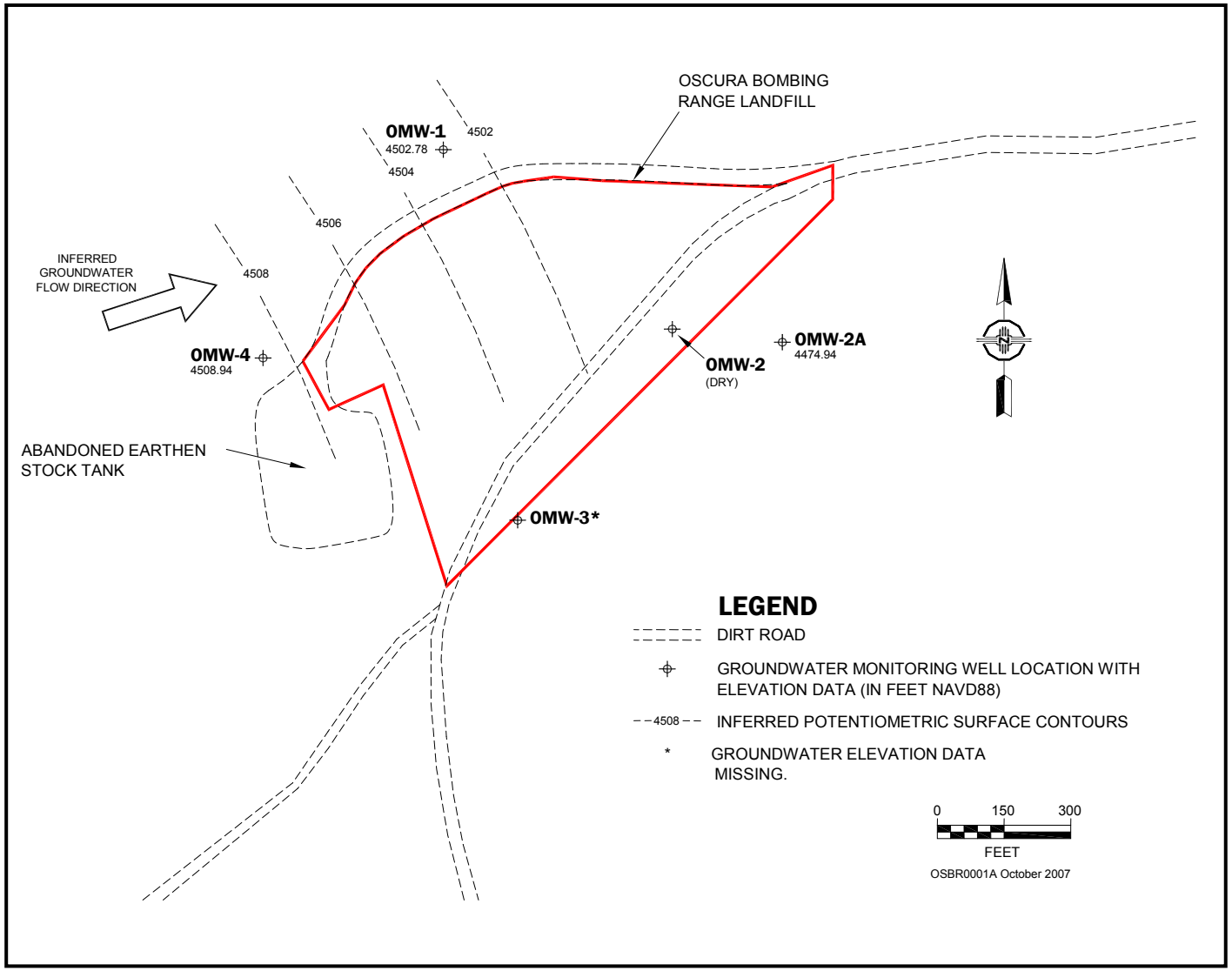


Figure 3
Oscura Bombing Range Landfill (SWMUs 41-46) Site Map

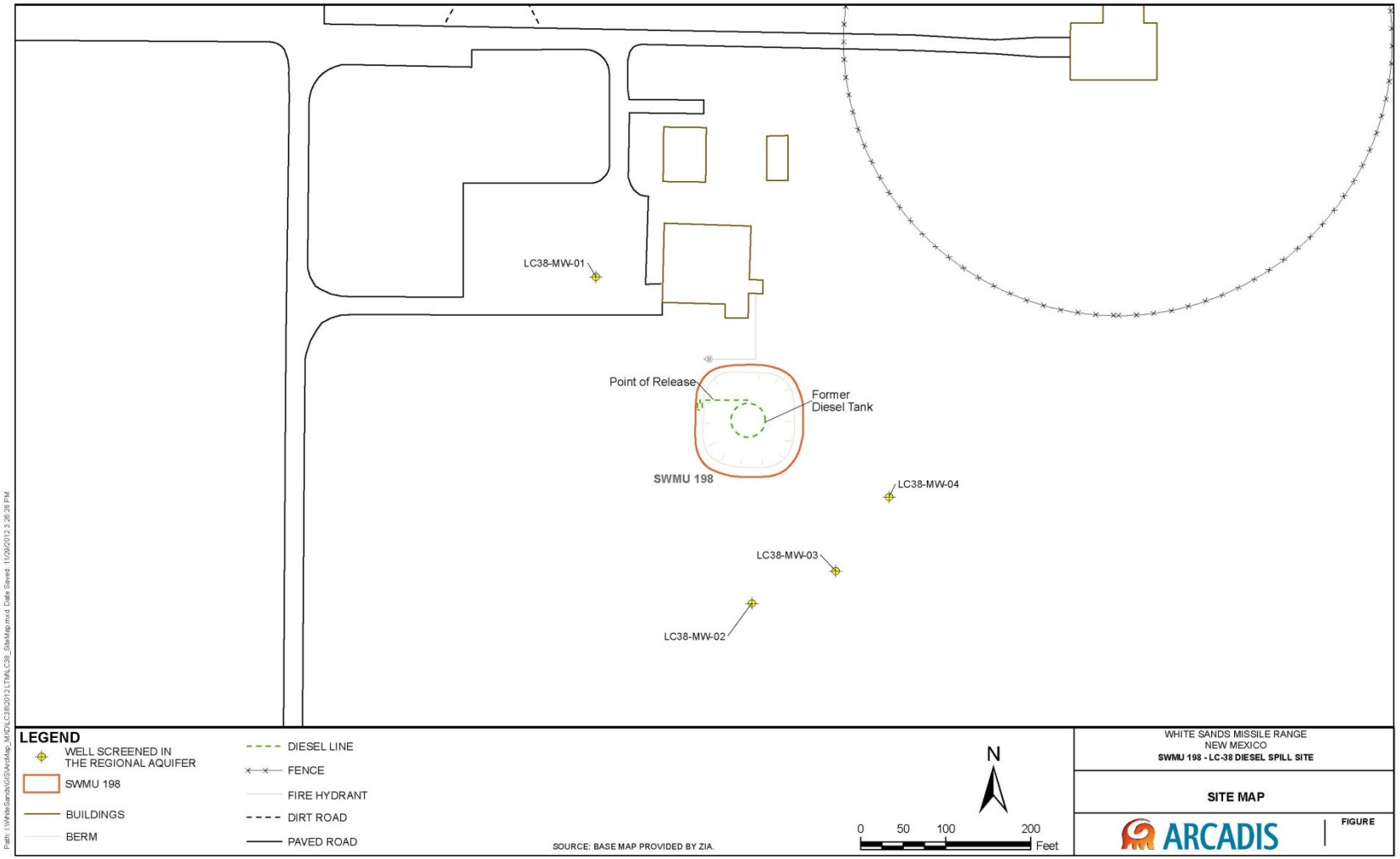


Figure 4
Launch Complex 38 (SWMU 198) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

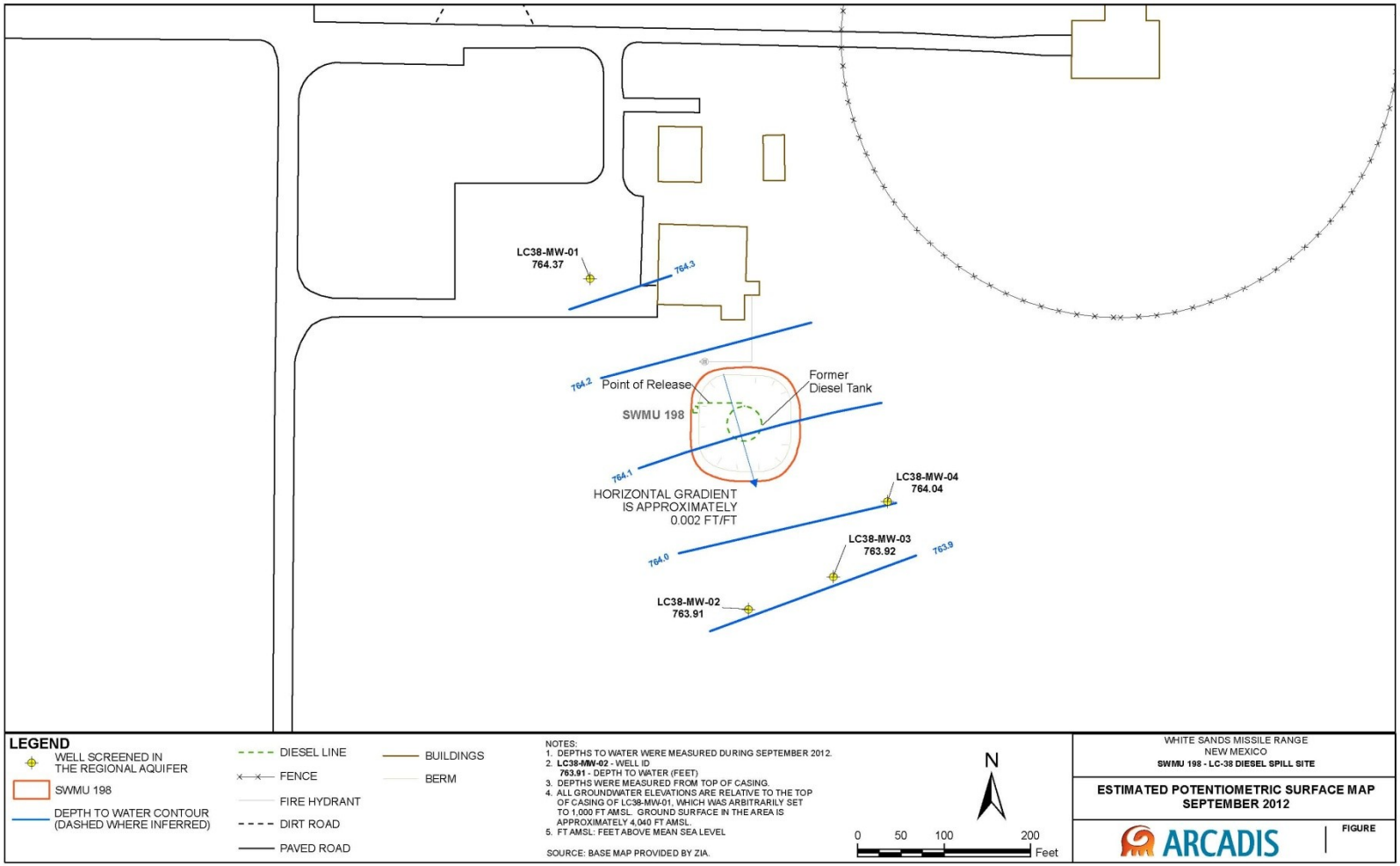


Figure 5
Launch Complex 38 (SWMU 198) Potentiometric Surface

139791. RD0110 • Final • July 2013 • ACA08-045

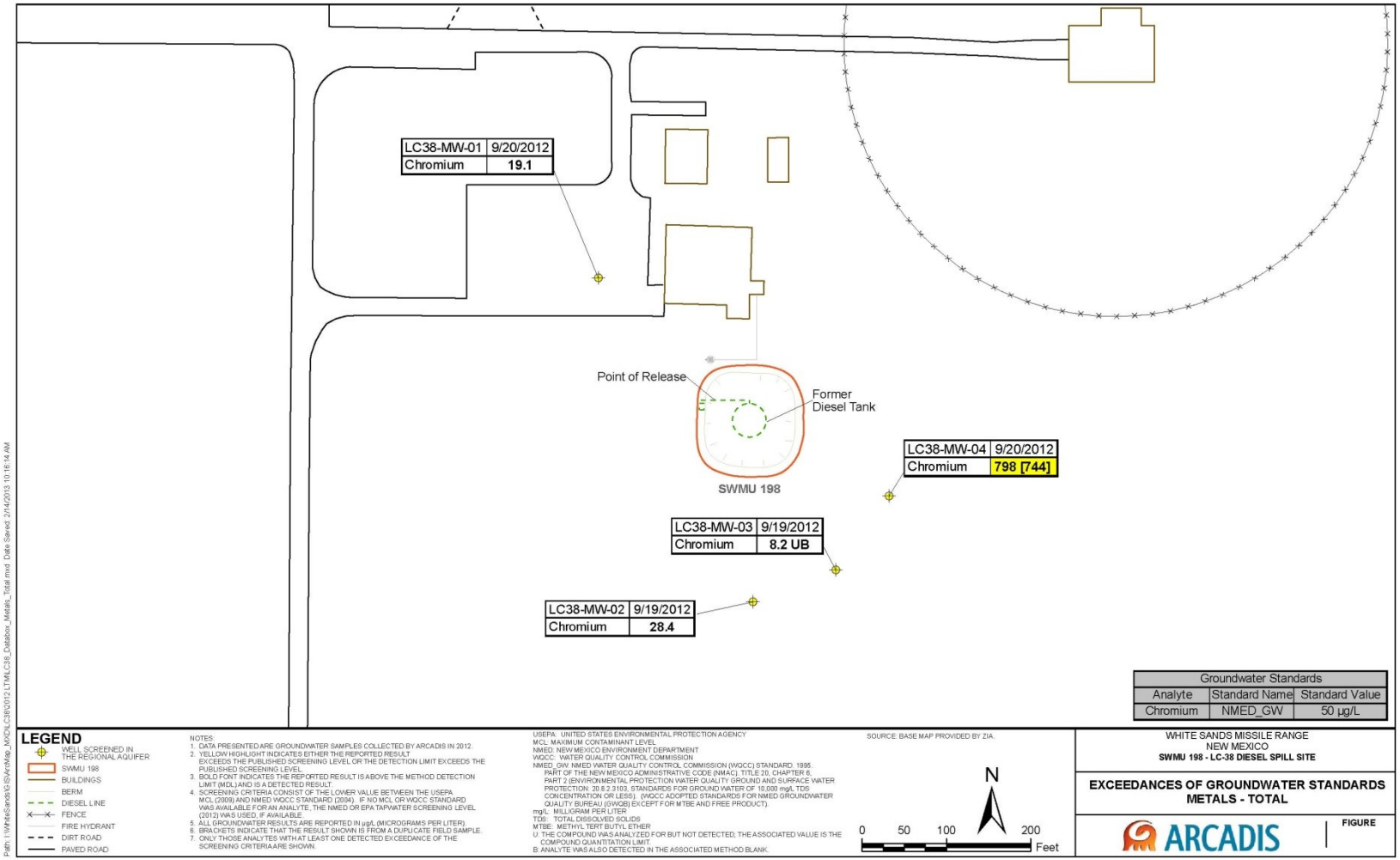


Figure 6
Launch Complex 38 (SWMU 198) Total Metals Groundwater Exceedances

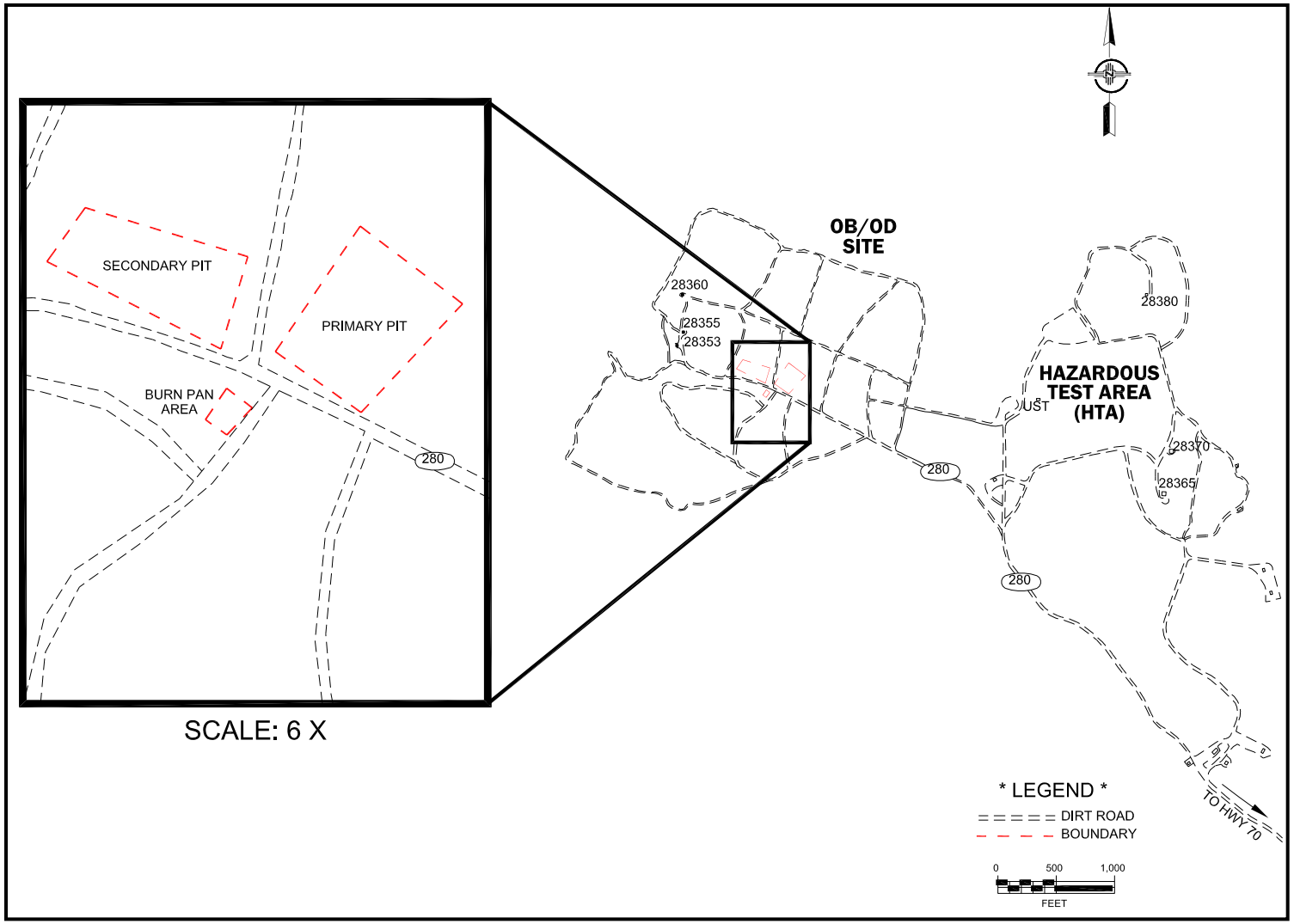


Figure 7
Open Burn / Open Detonation Area (SWMUs 55, 56, & 56a) Site Map

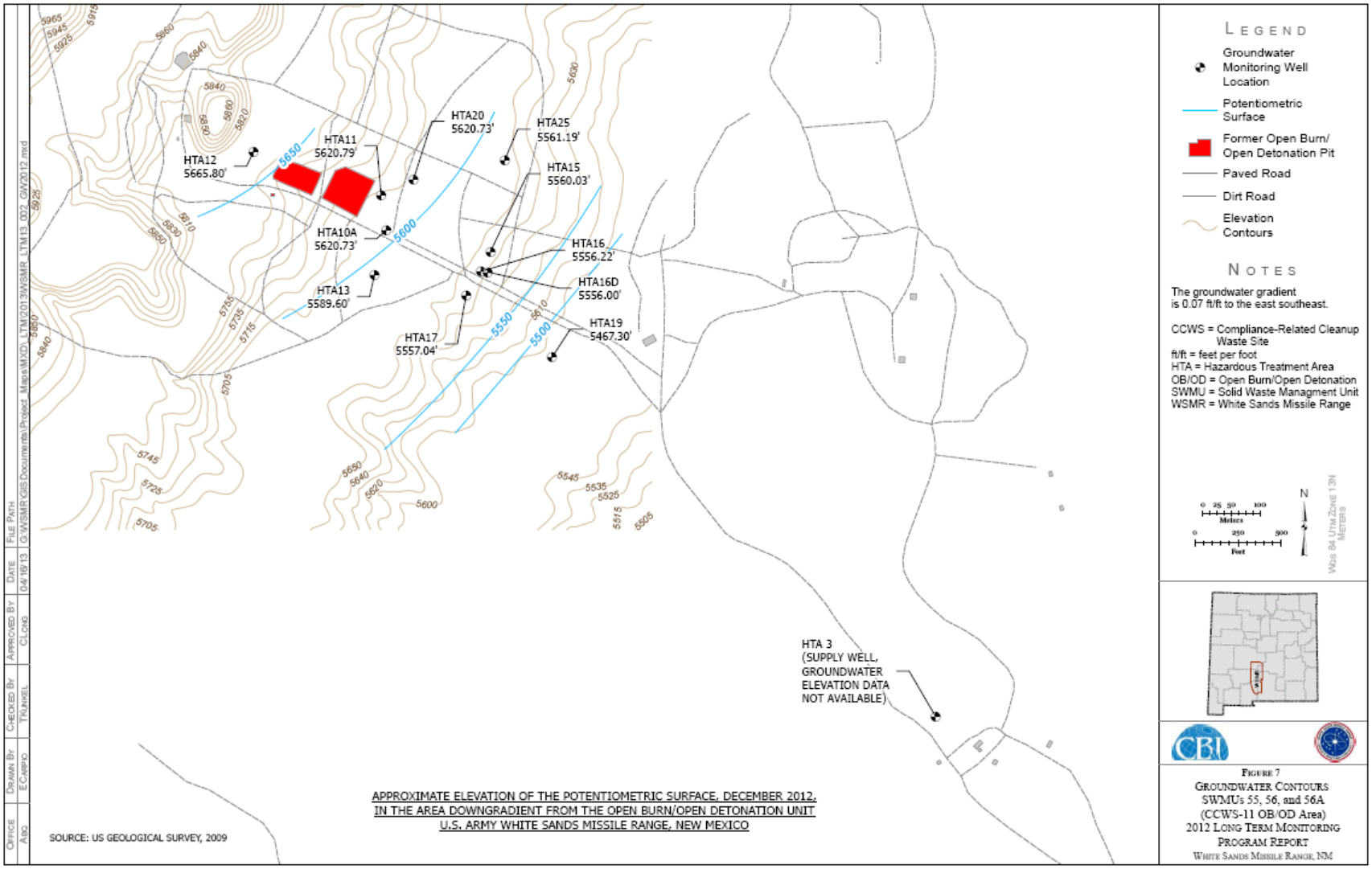


Figure 8
OB/OD (SWMUs 55, 56, and 56a) Potentiometric Surface

139791. RD0110 • Final • July 2013 • ACA08-045

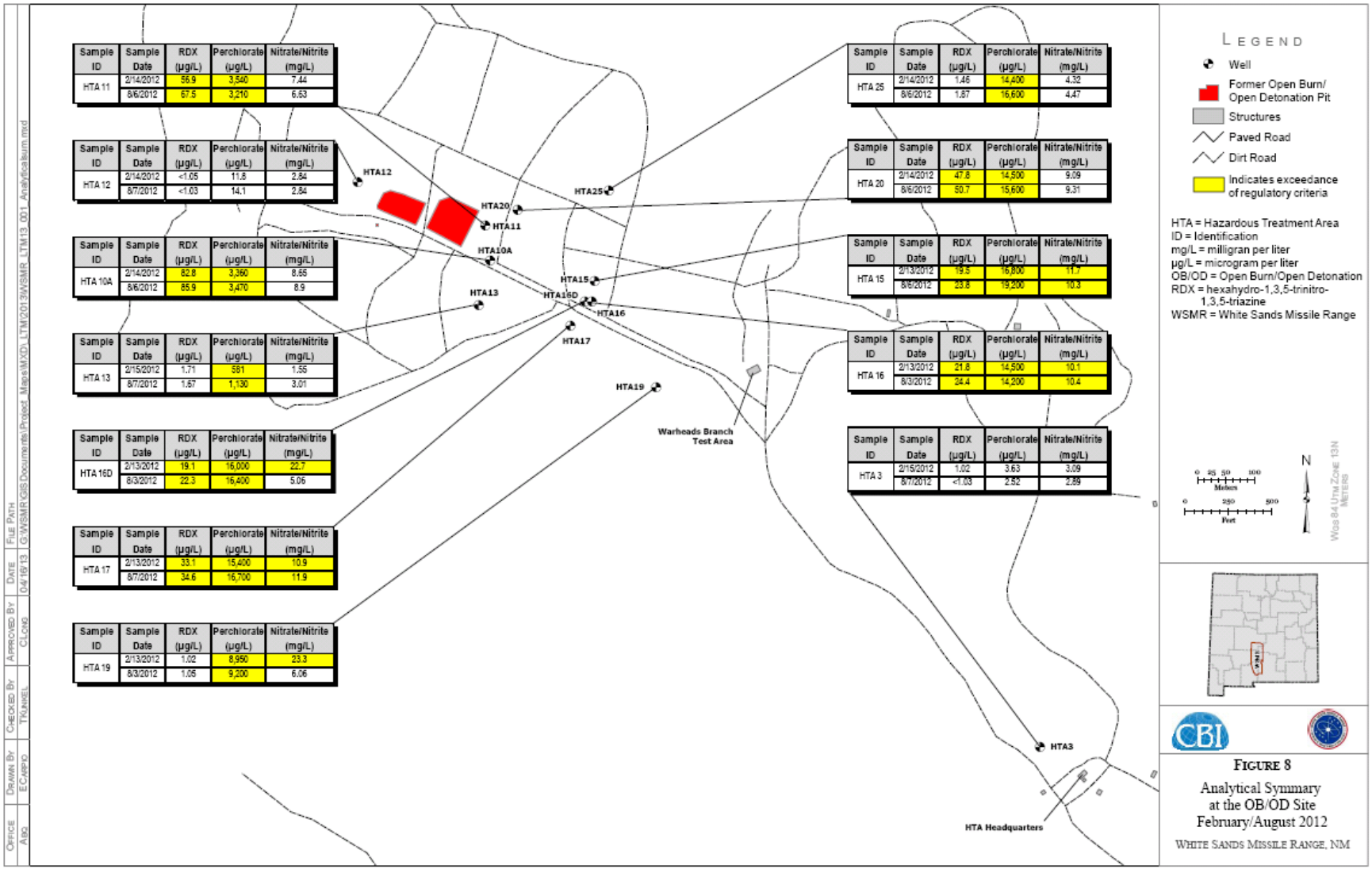


Figure 9
Analytical Summary at the OB/OD Site. Summer and Winter 2012 data

139791. RD0110 • Final • July 2013 • ACA08-045

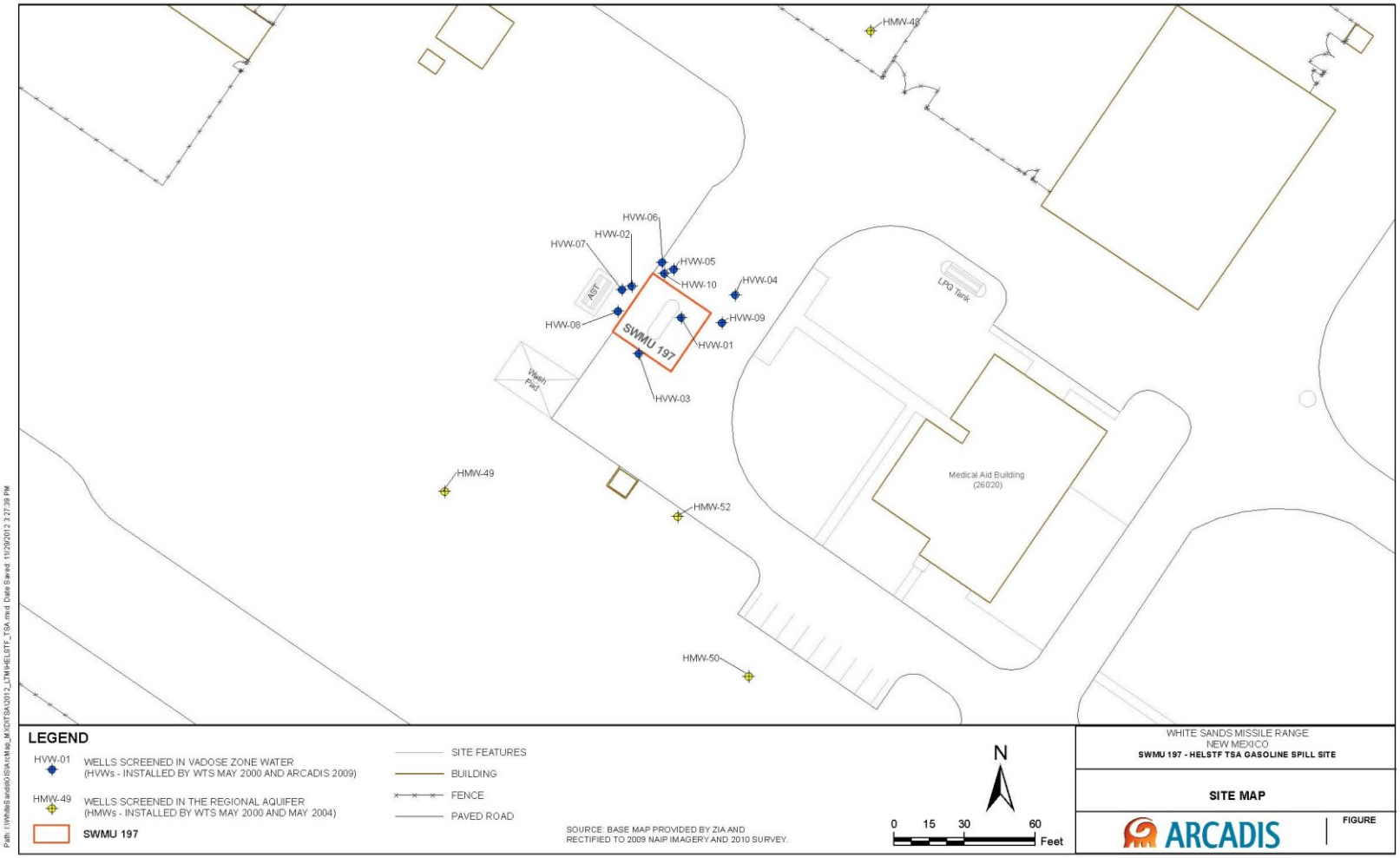


Figure 10
HELSTF TSA (SWMU 197) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

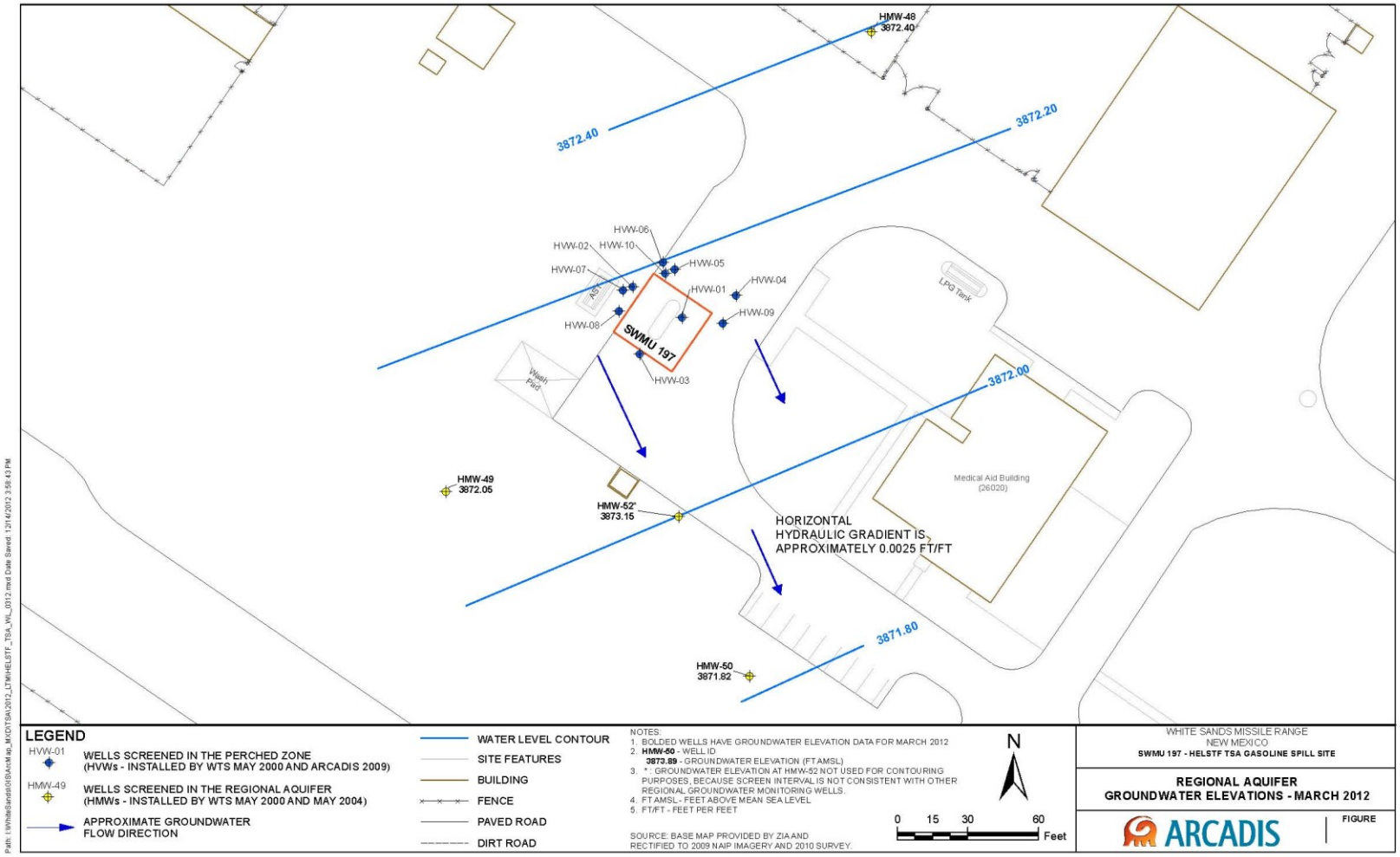


Figure 11
Potentiometric Surface of the Regional Aquifer at SWMU 197 (HELSTF Site TSA Gasoline Spill)

139791. RD0110 • Final • July 2013 • ACA08-045

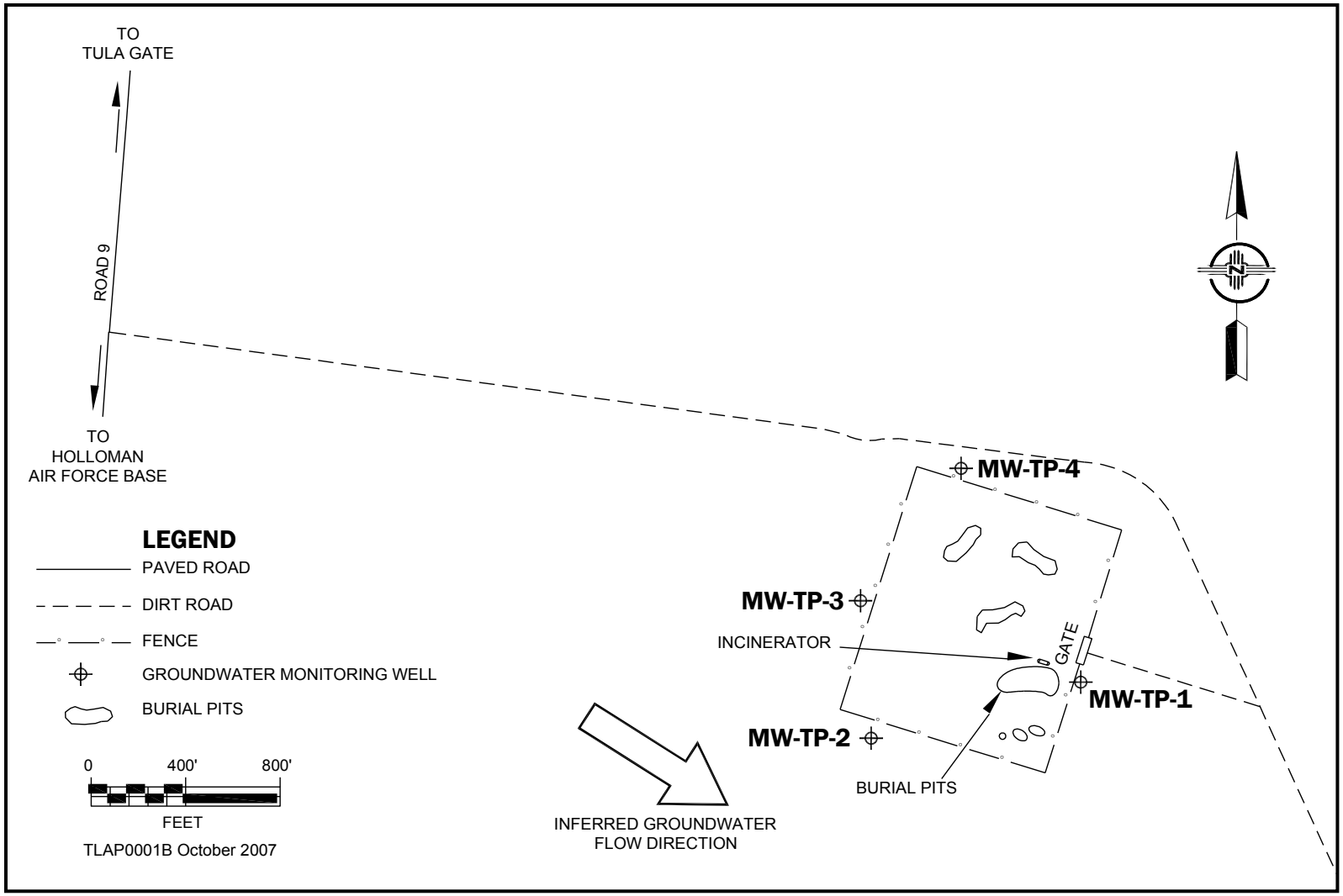


Figure 12
Tula Peak Incinerator (SWMU 61) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

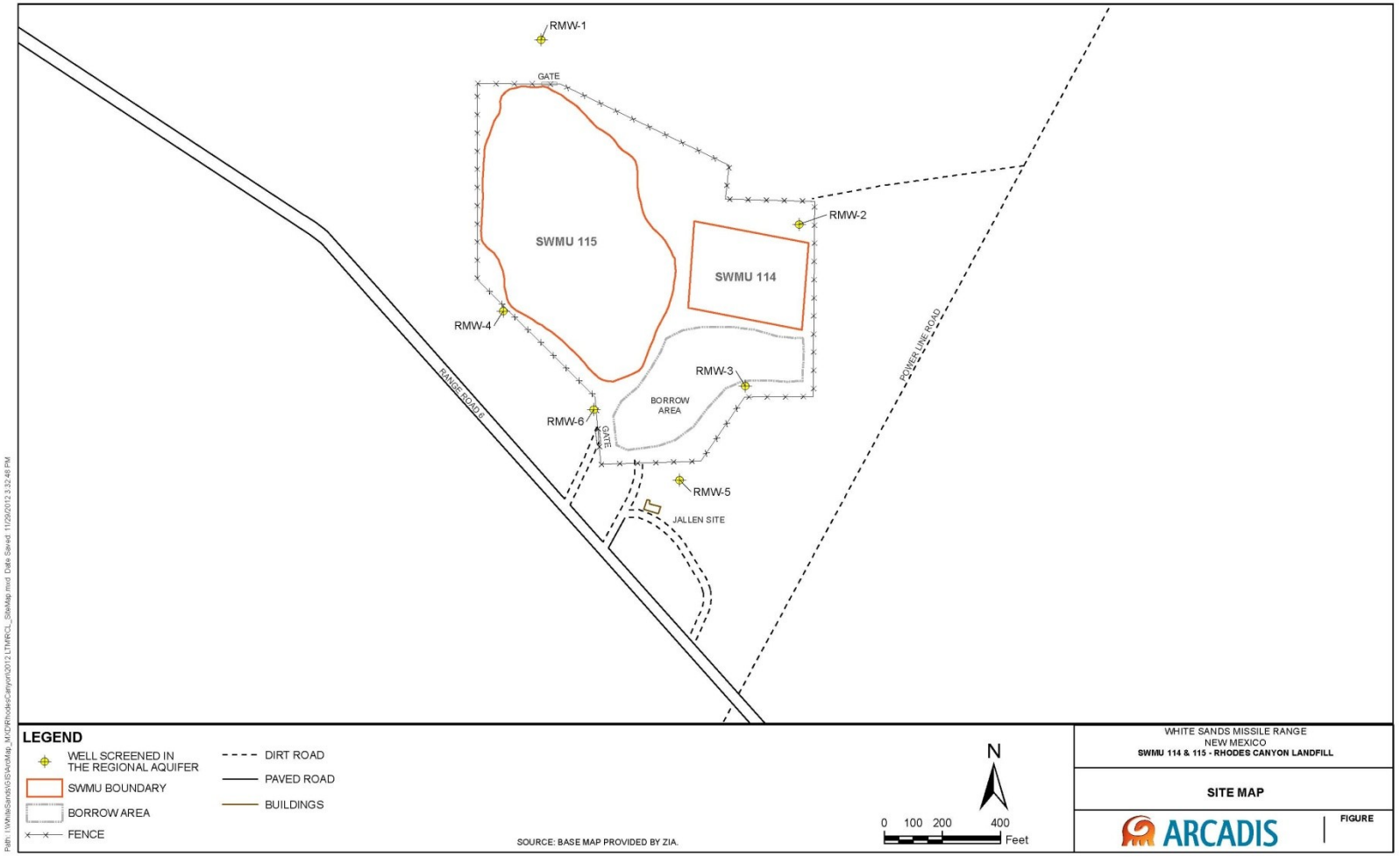


Figure 13
Rhodes Canyon Landfill (SWMU 114 & 115) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

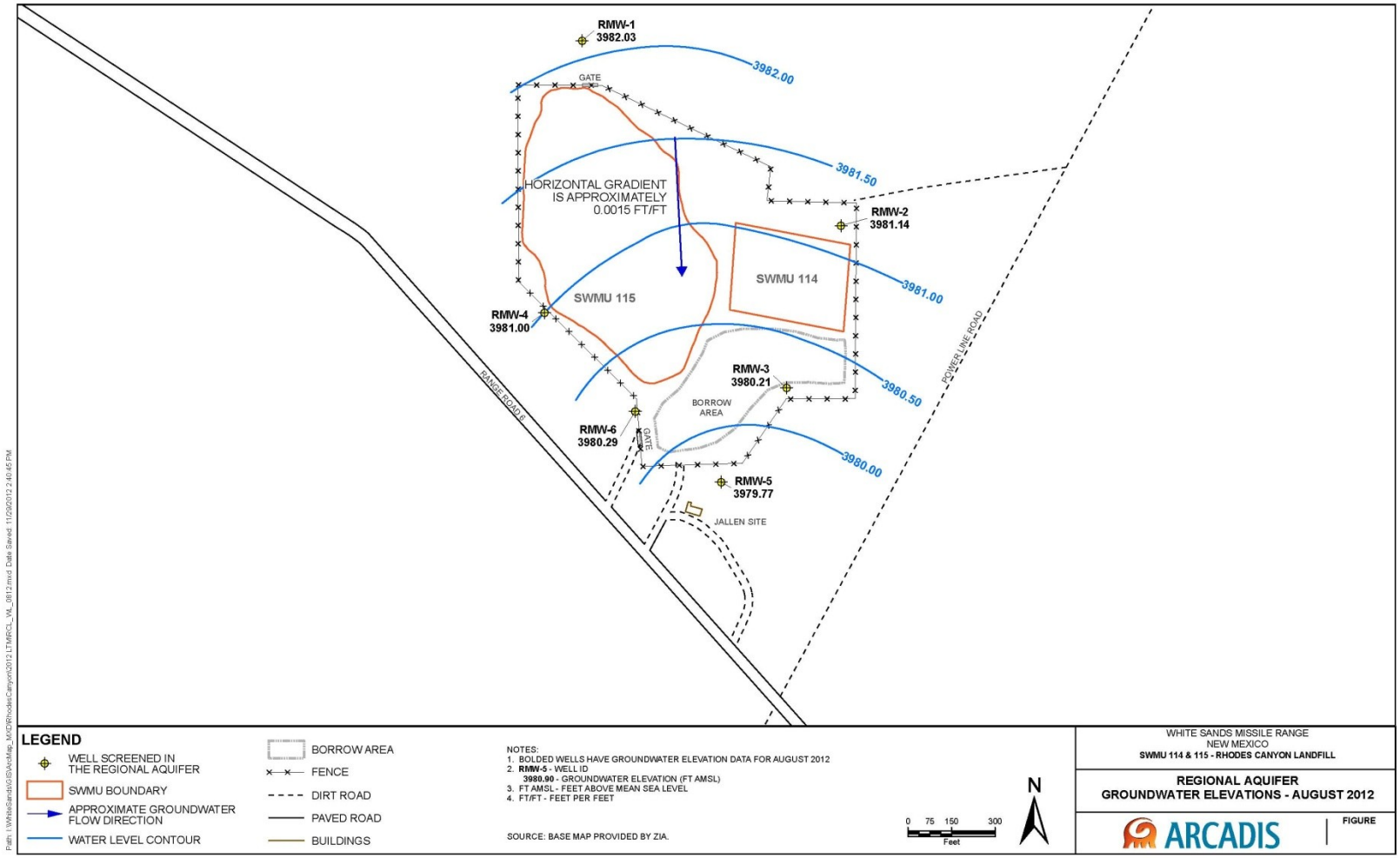


Figure 14
Potentiometric Surface of the Regional Aquifer at Rhodes Canyon (SWMU 114 and 115) Site Map

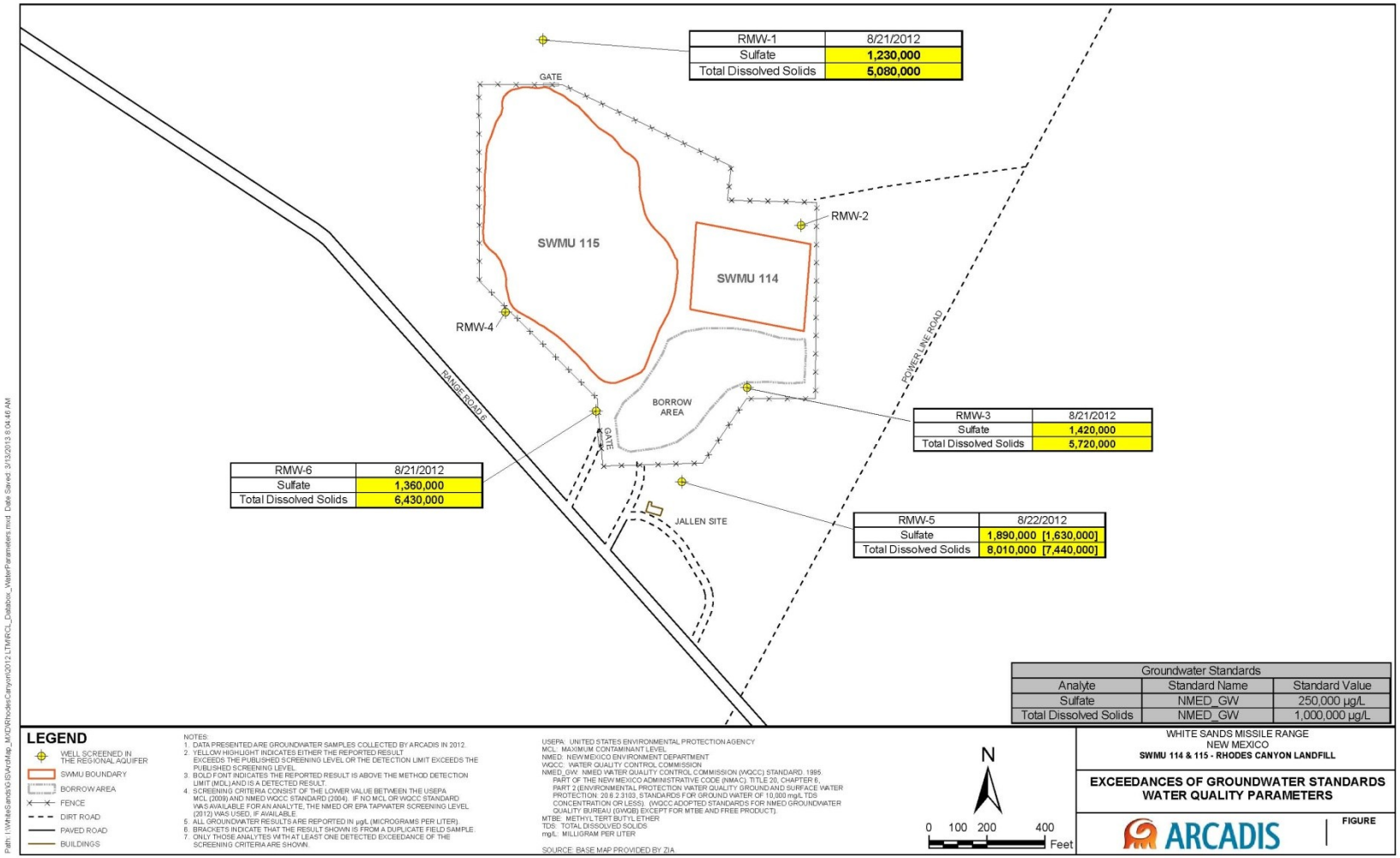
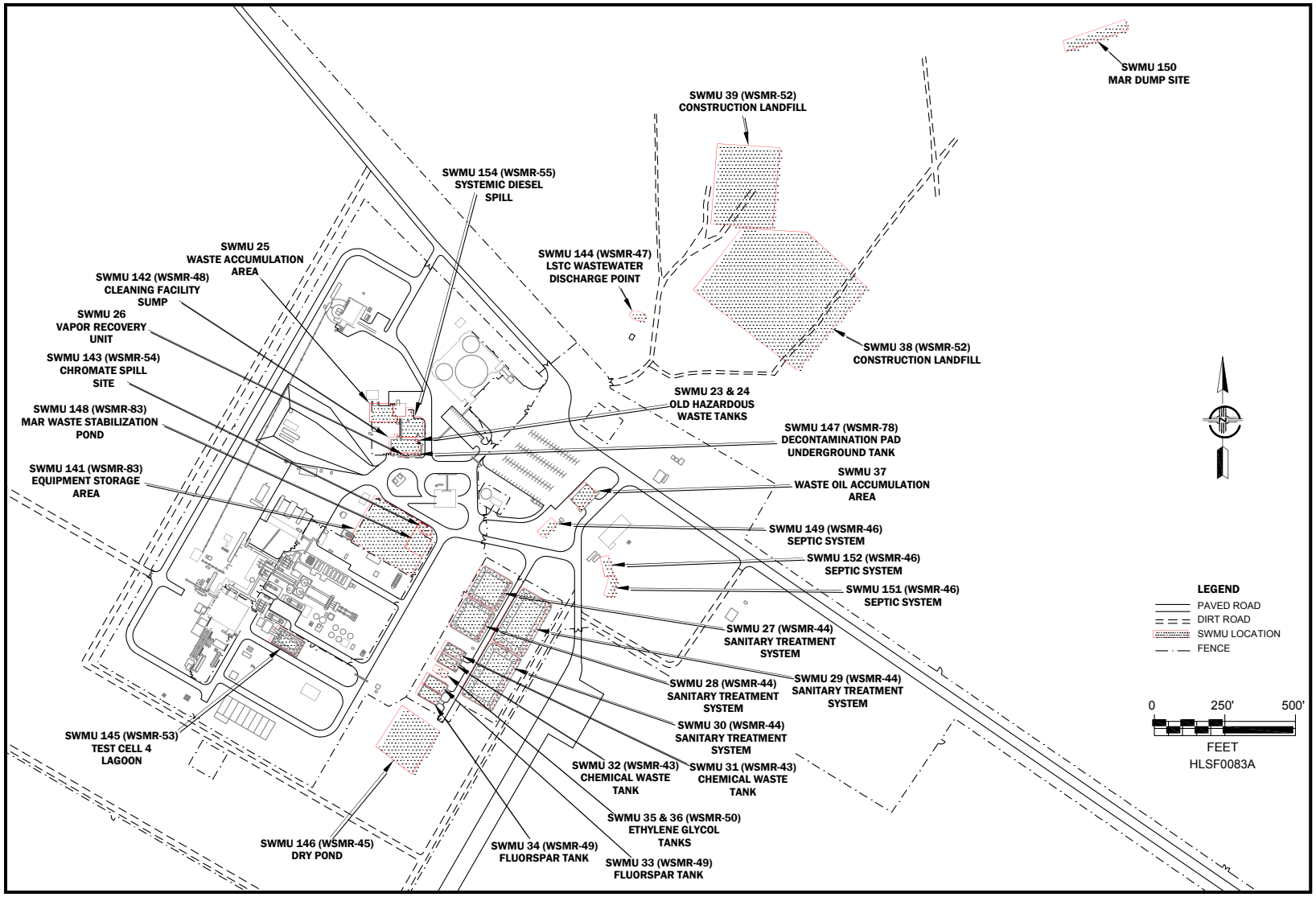


Figure 15
Rhodes Canyon Landfill (SWMUs 114 & 115) Water Quality Parameters Groundwater Exceedances



139791. RD0110 • Final • July 2013 • ACA08-045

Figure 16
HELSTF Site Map (SWMUs 38, 39, 143, and 154)

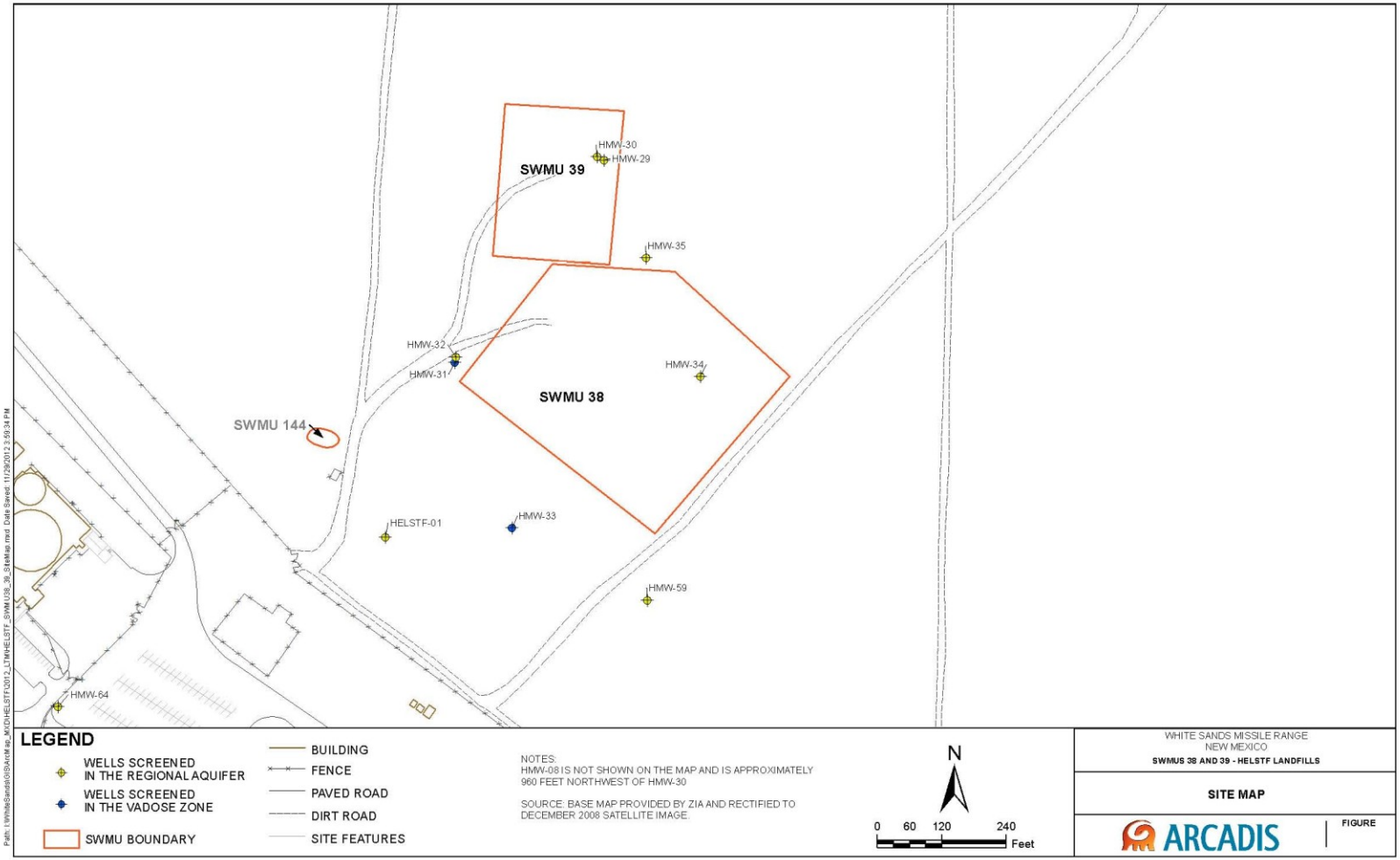


Figure 17
HELSTF Construction Landfill (SWMUs 38 & 39) Site Map

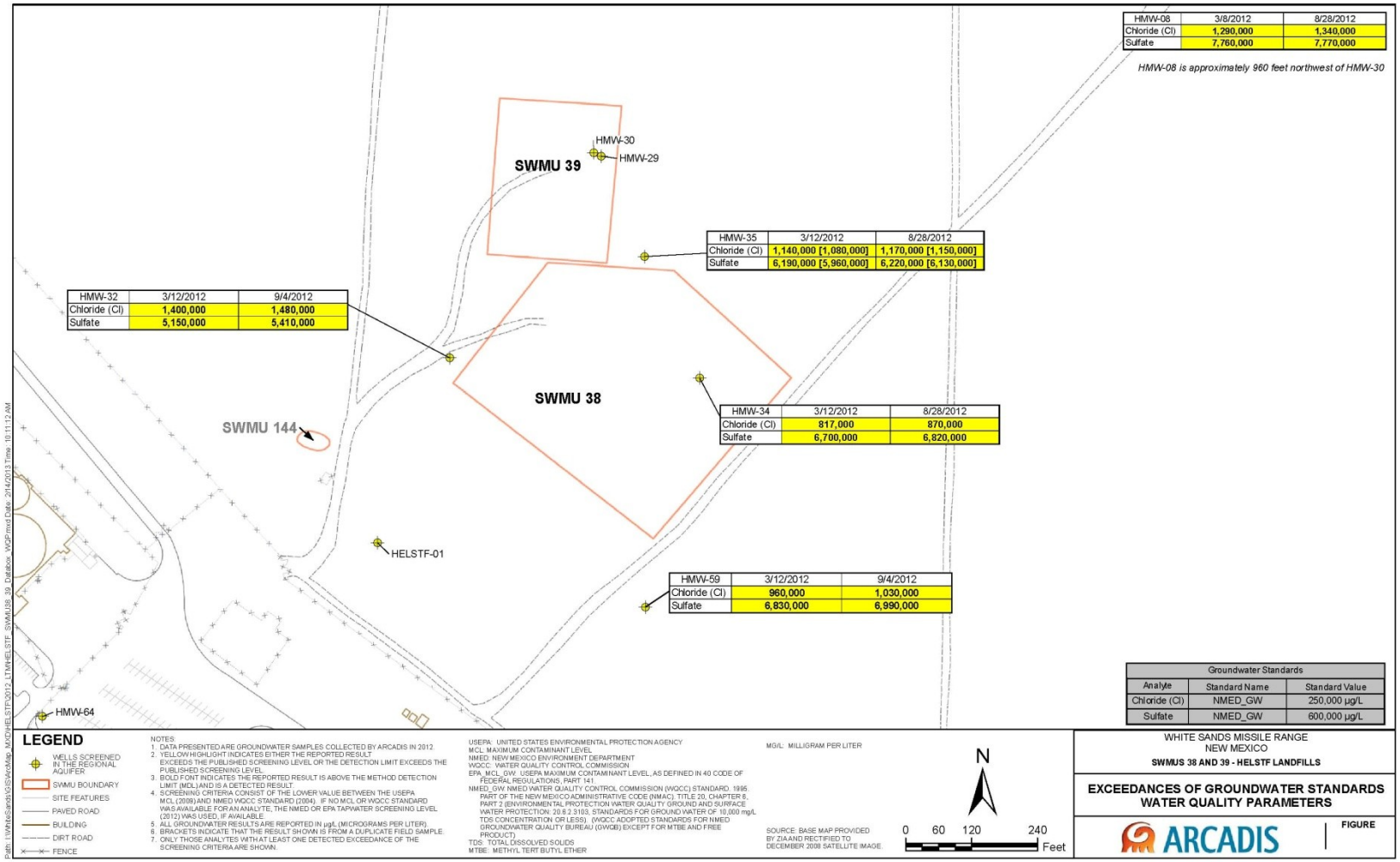


Figure 18
HELSTF Construction Landfill (SWMUs 38 & 39) Water Quality Parameters Groundwater Exceedances

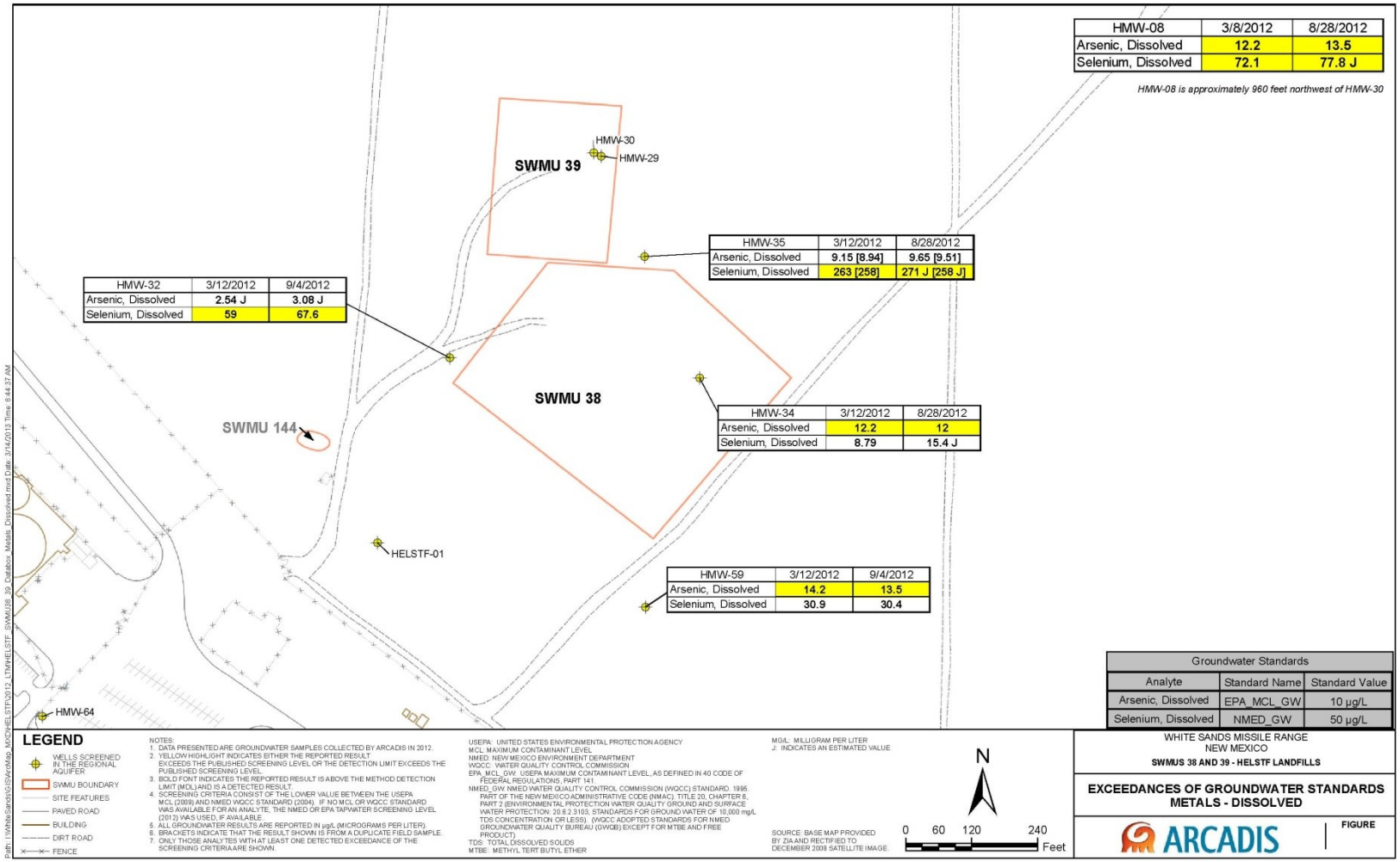


Figure 19
HELSTF Construction Landfill (SWMUs 38 & 39) Dissolved Metals Groundwater Exceedances

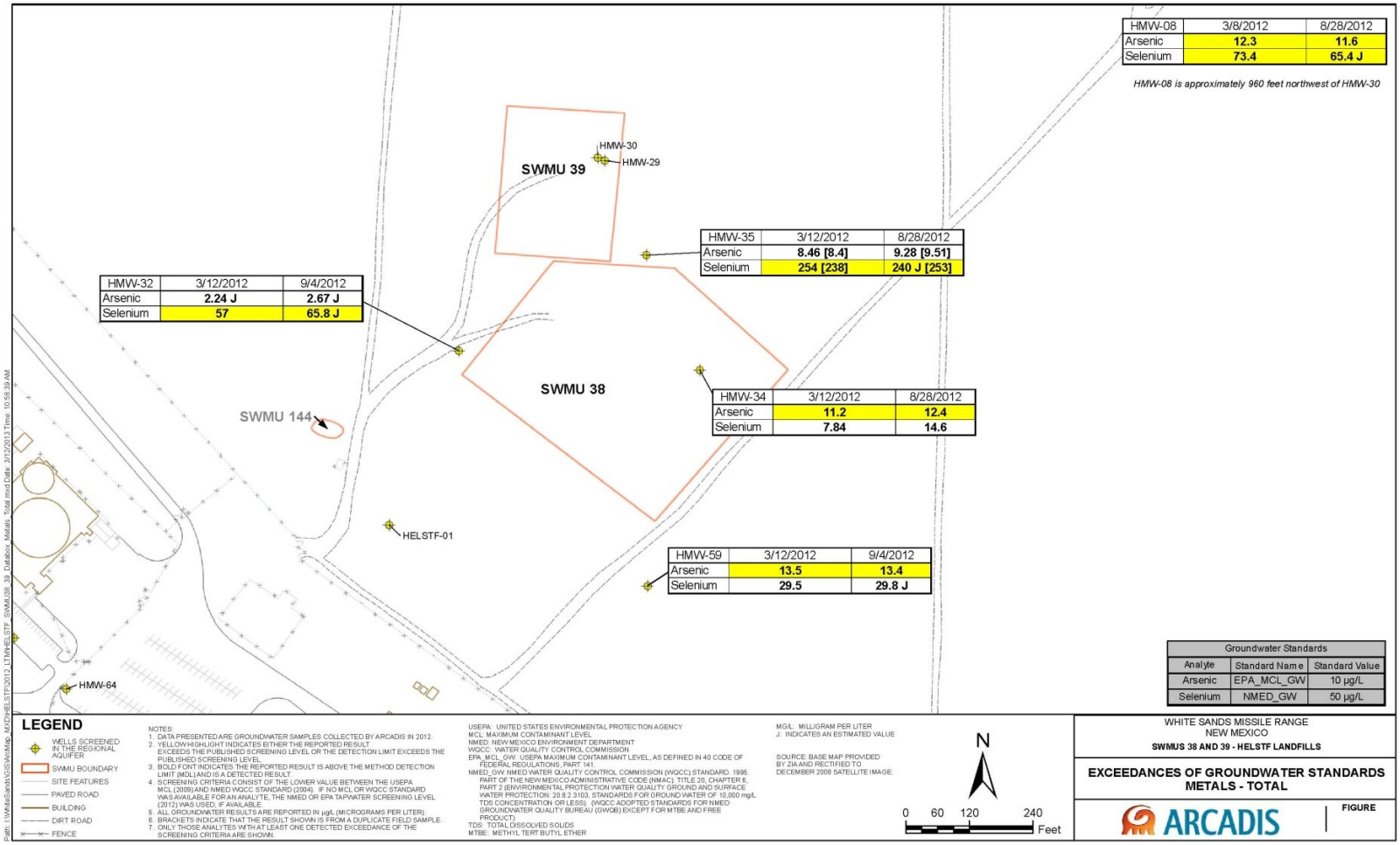


Figure 20
HELSTF Construction Landfill (SWMUs 38 & 39) Total Metals Groundwater Exceedances

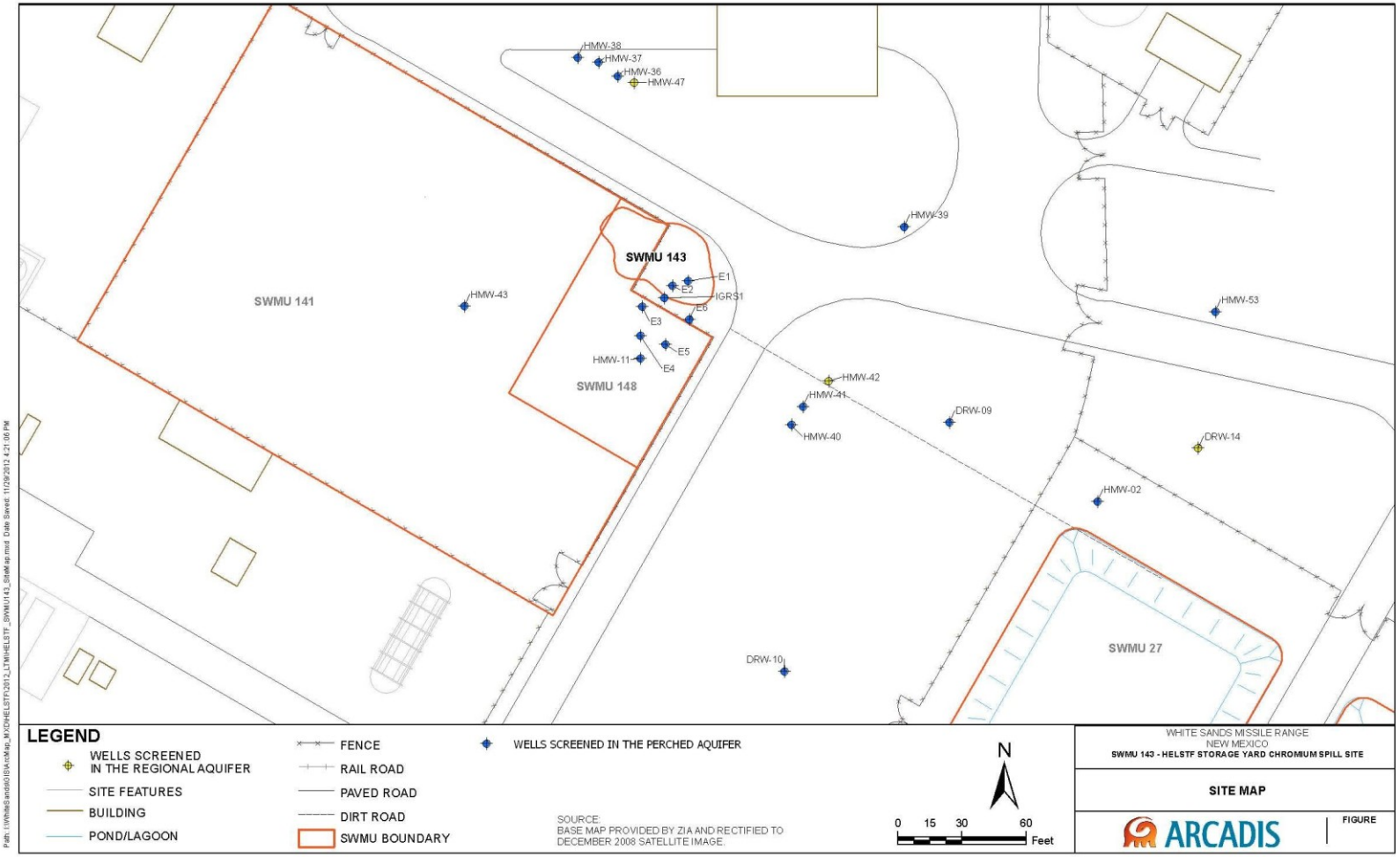


Figure 21
HELSTF Chromate Spill (SWMU 143) Site Map

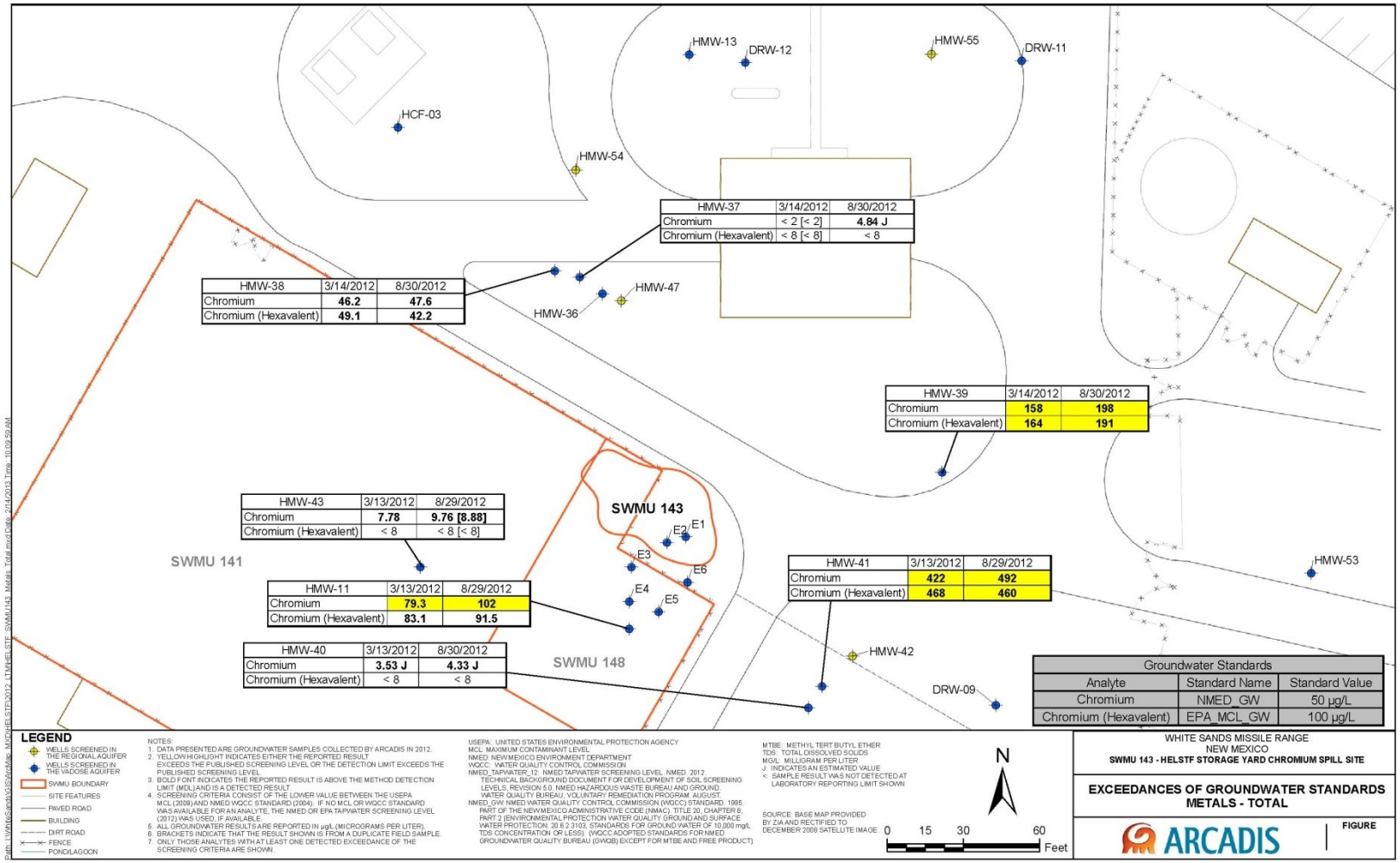


Figure 22
HELSTF Chromate Spill (SWMU 143) Total Metals Groundwater Exceedances

139791. RD0110 • Final • July 2013 • ACA08-045

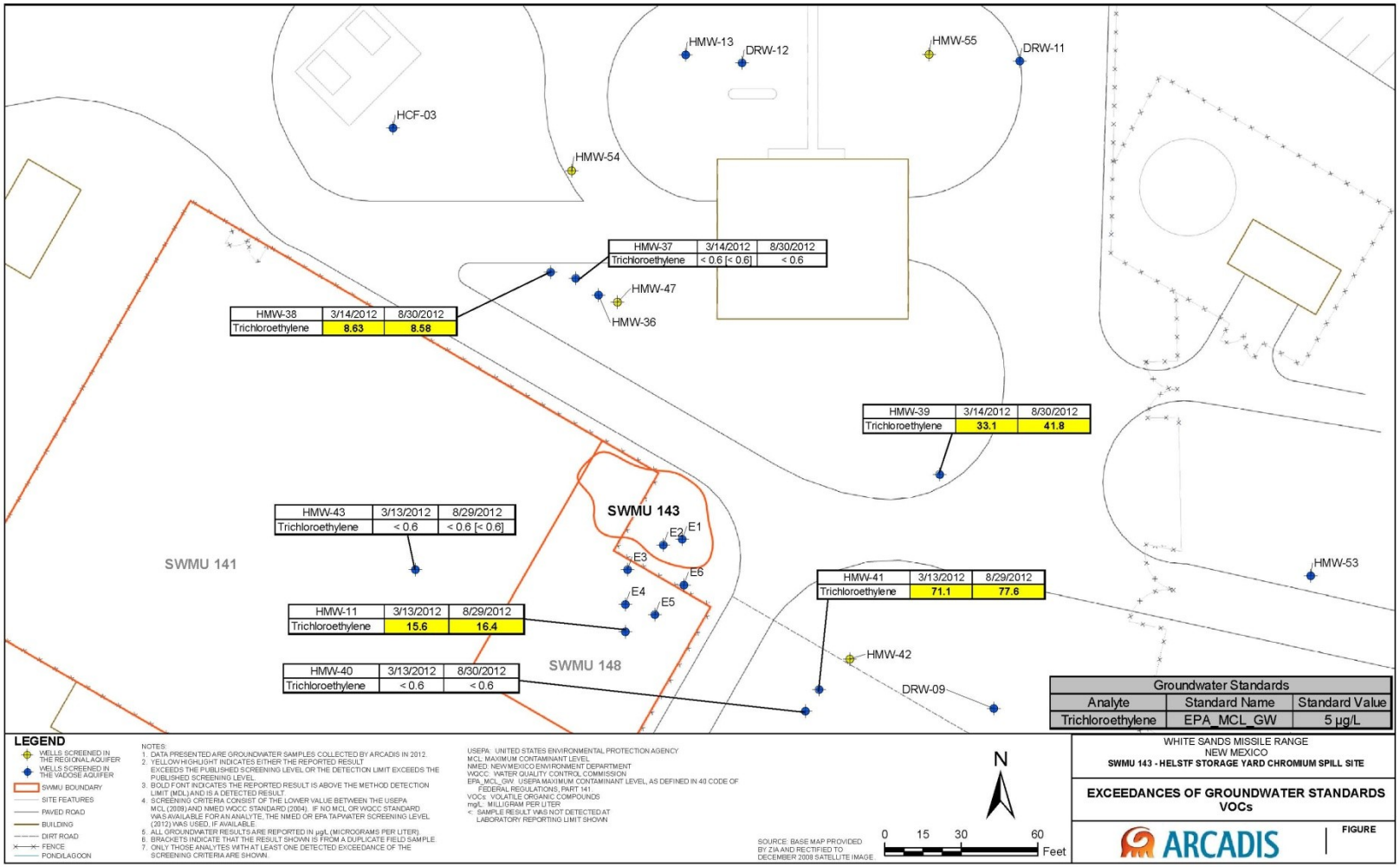


Figure 23
HELSTF Chromate Spill (SWMU 143) VOC Groundwater Exceedances

139791. RD0110 • Final • July 2013 • ACA08-045

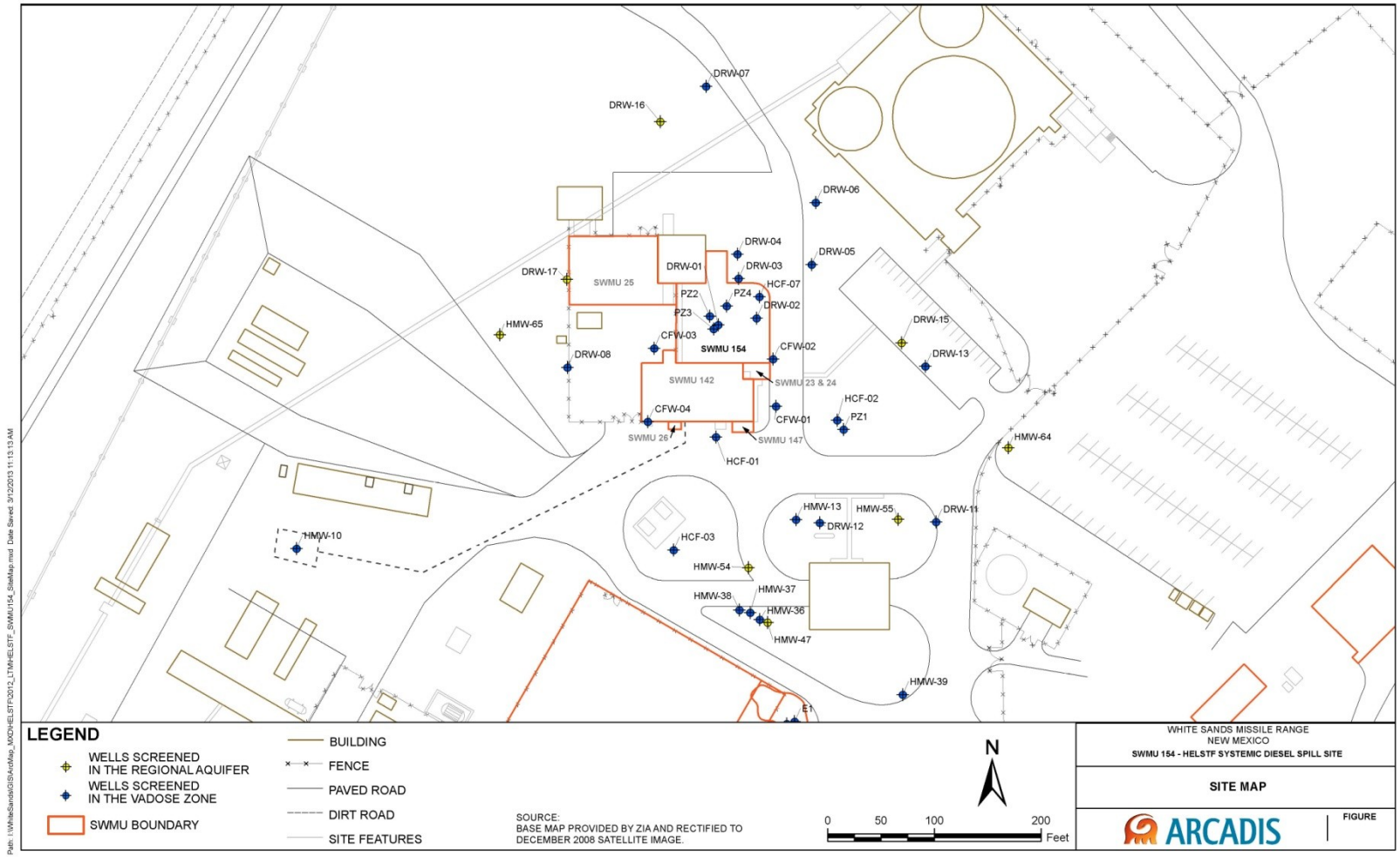


Figure 24
HELSTF Systemic Diesel Spill (SWMU 154) Site Map

139791. RD0110 • Final • July 2013 • ACA08-045

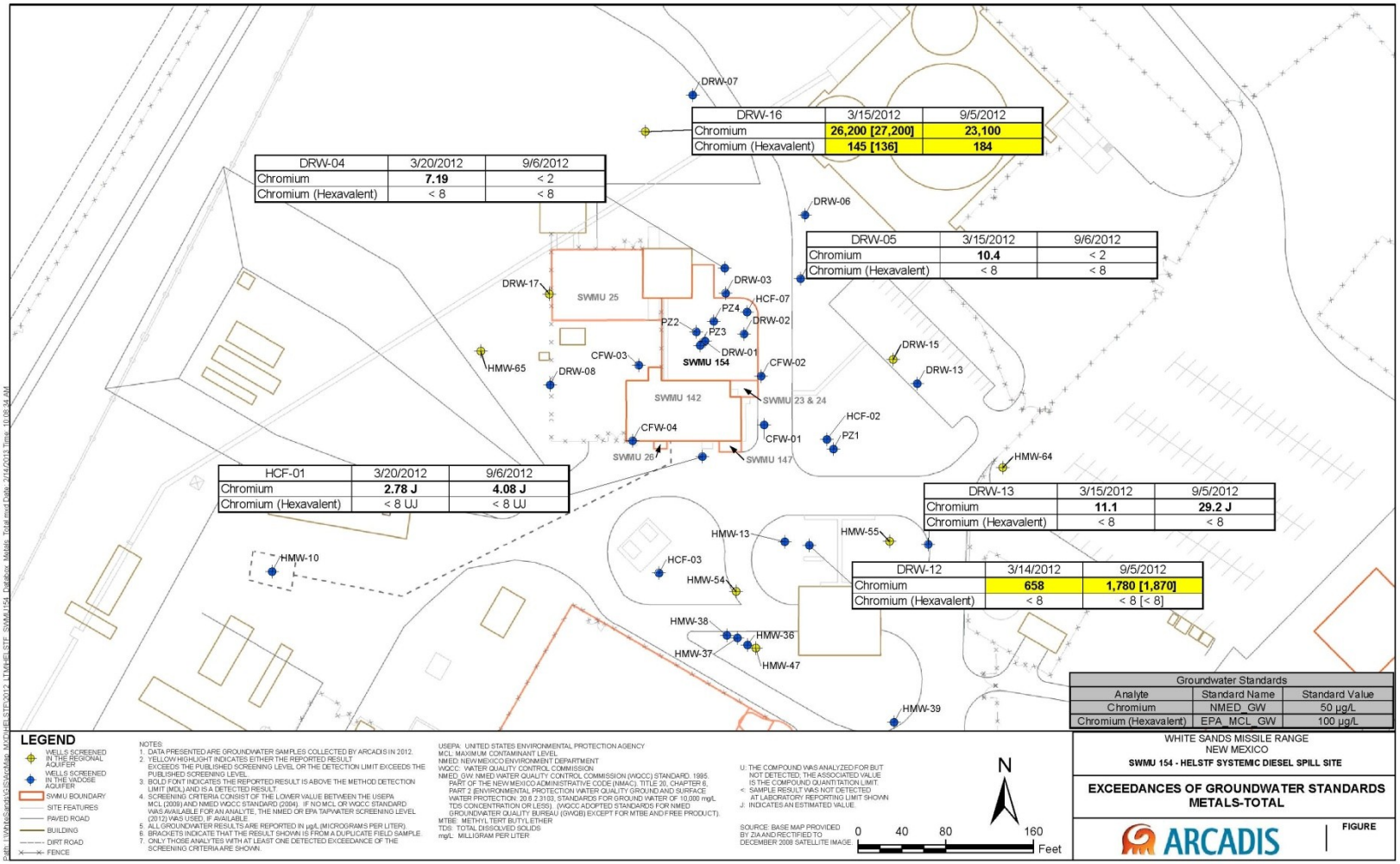


Figure 25
HELSTF Systemic Diesel Spill (SWMU 154) Total Metals Groundwater Exceedances

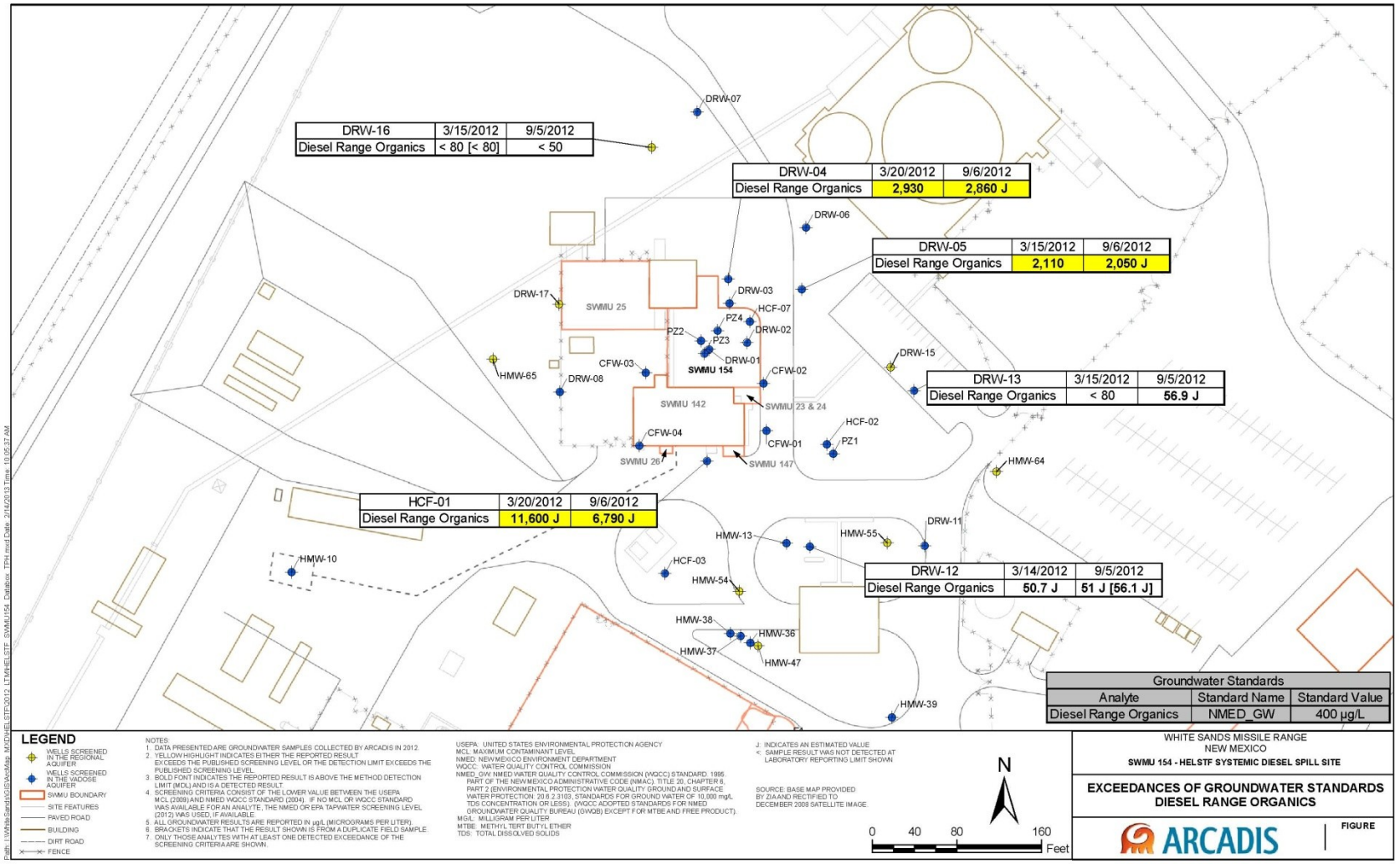


Figure 26
HELSTF Systemic Diesel Spill (SWMU 154) DRO Groundwater Exceedances

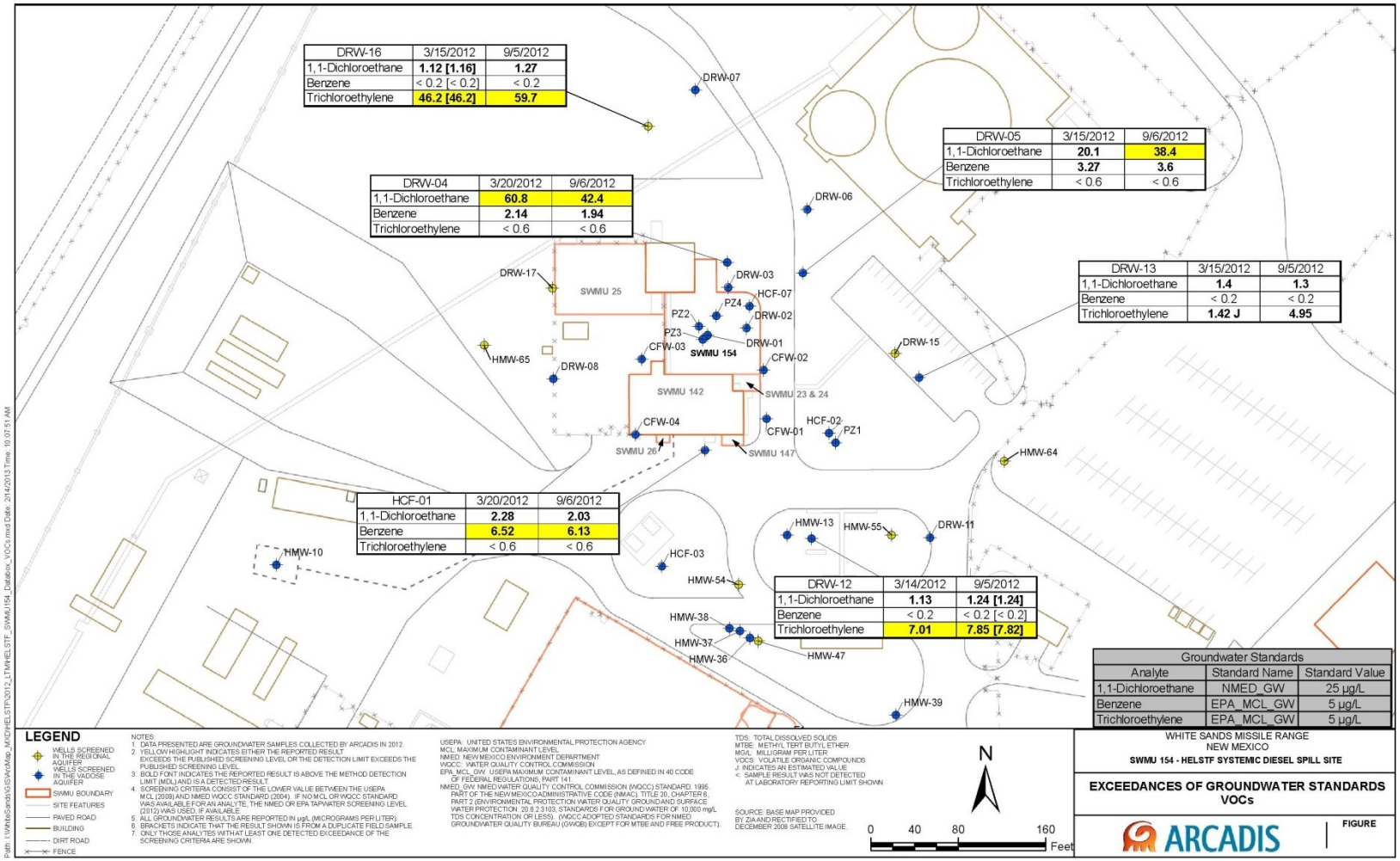


Figure 27
HELSTF Systemic Diesel Spill (SWMU 154) VOC Groundwater Exceedances

139791. RD0110 • Final • July 2013 • ACA08-045

Figure 28
Wells Selected for HELSTF Long Term Monitoring Program

139791. RD0110 • Final• July 2013 • ACA06-045

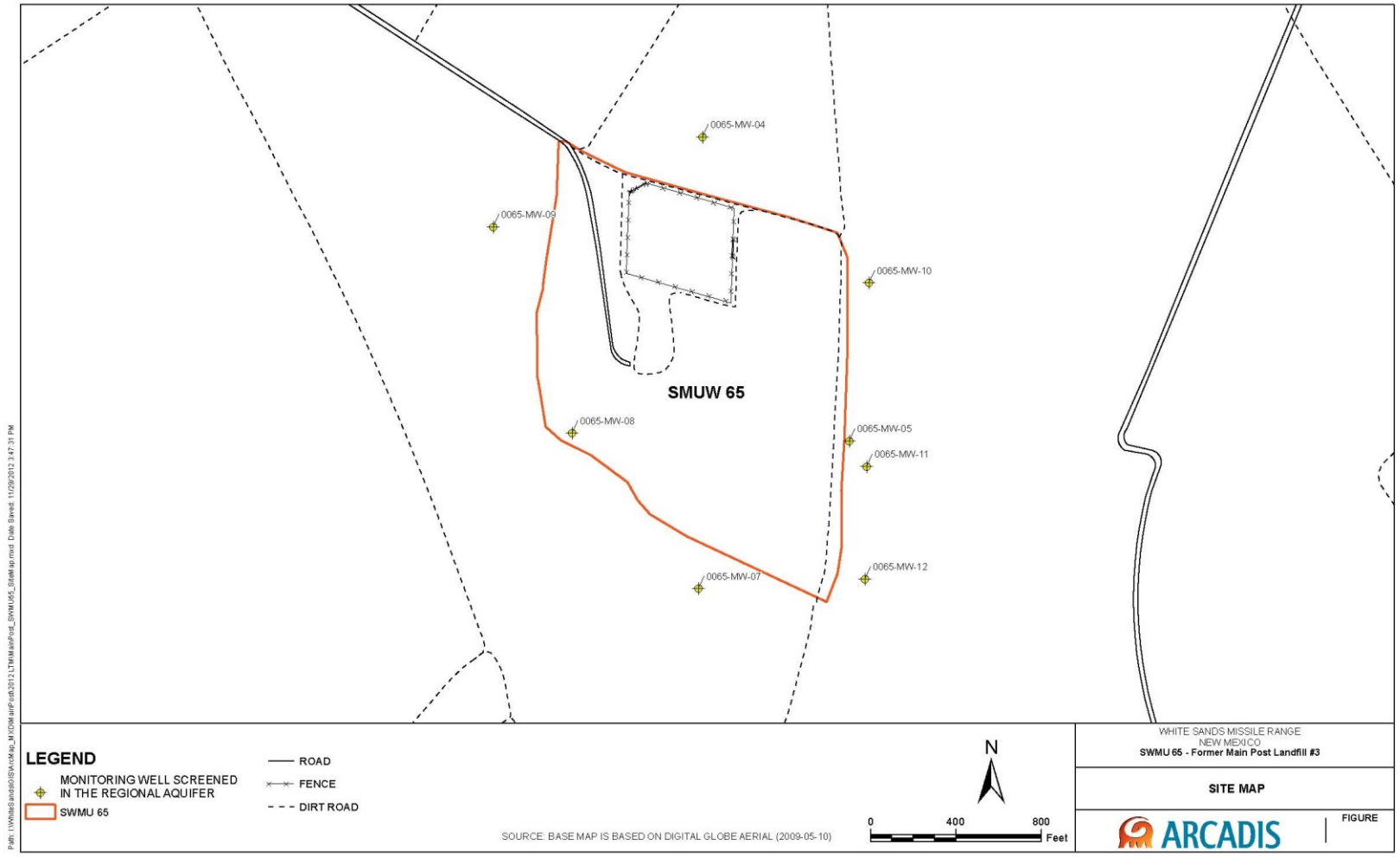


Figure 29
Main Post Landfill No. 3 (SWMU 65) Site Map

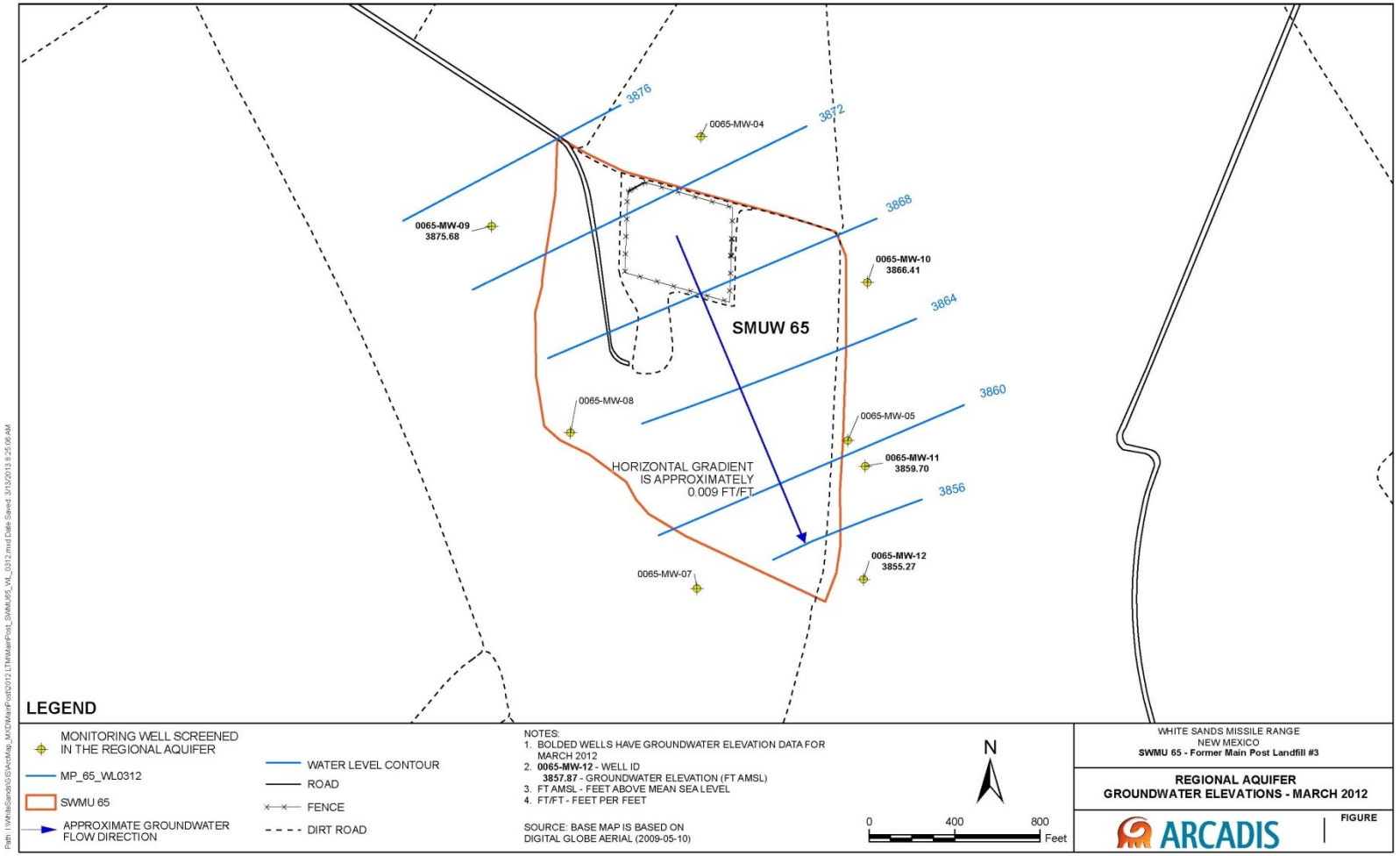


Figure 30
Potentiometric Surface of the Regional Aquifer at SWMU 65 (Main Post Landfill)

139791.RD0110 • Final• July 2013 • ACA06-045

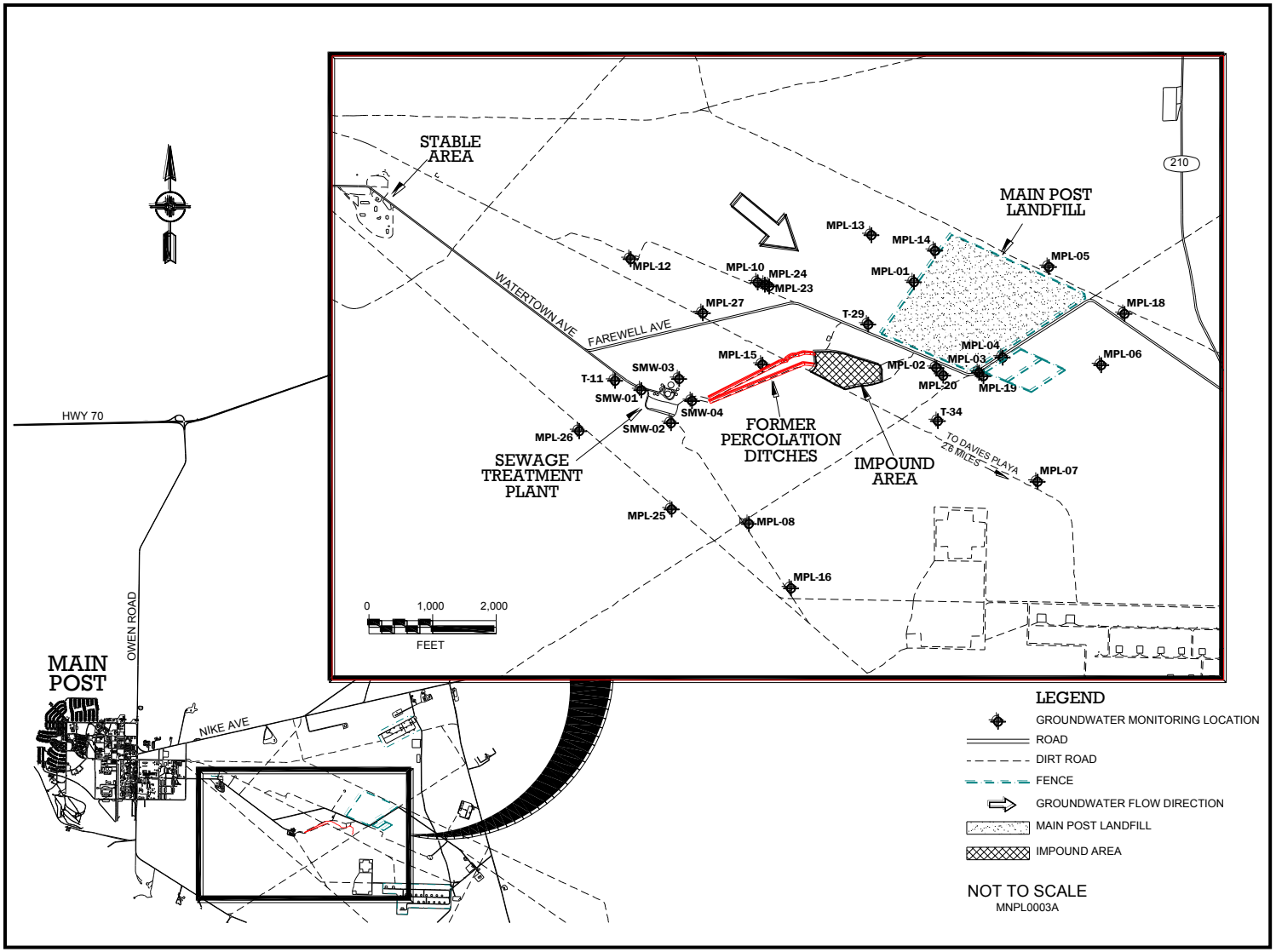


Figure 31
Former STP Percolation Ditches (SWMU 82) Site Map

139791.RD0110 • Final• July 2013 • ACA08-045

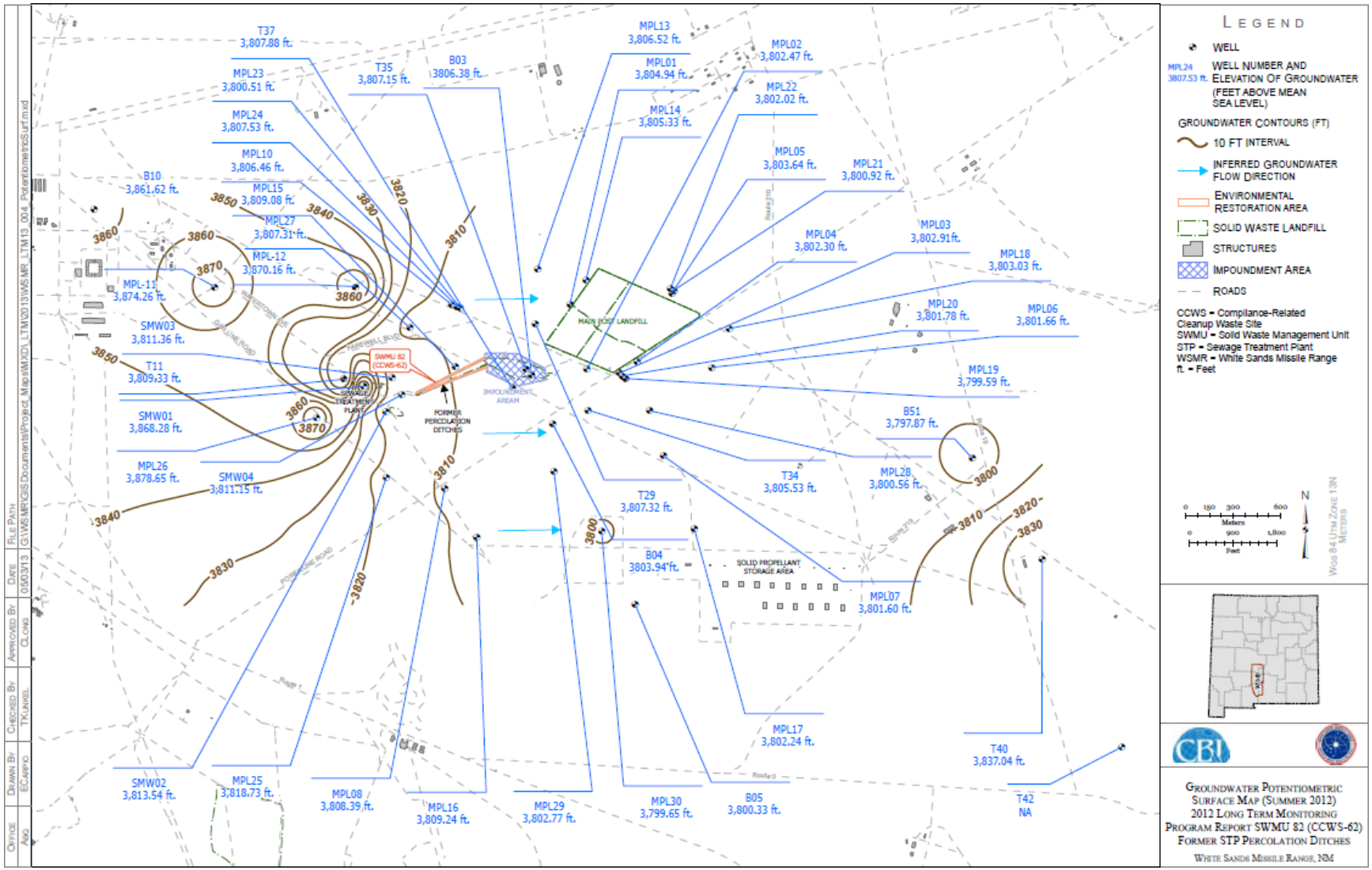


Figure 32
Potentiometric Surface of the STP Percolation Ditches Site

139791. RD0110 • Final• July 2013 • ACA08-045

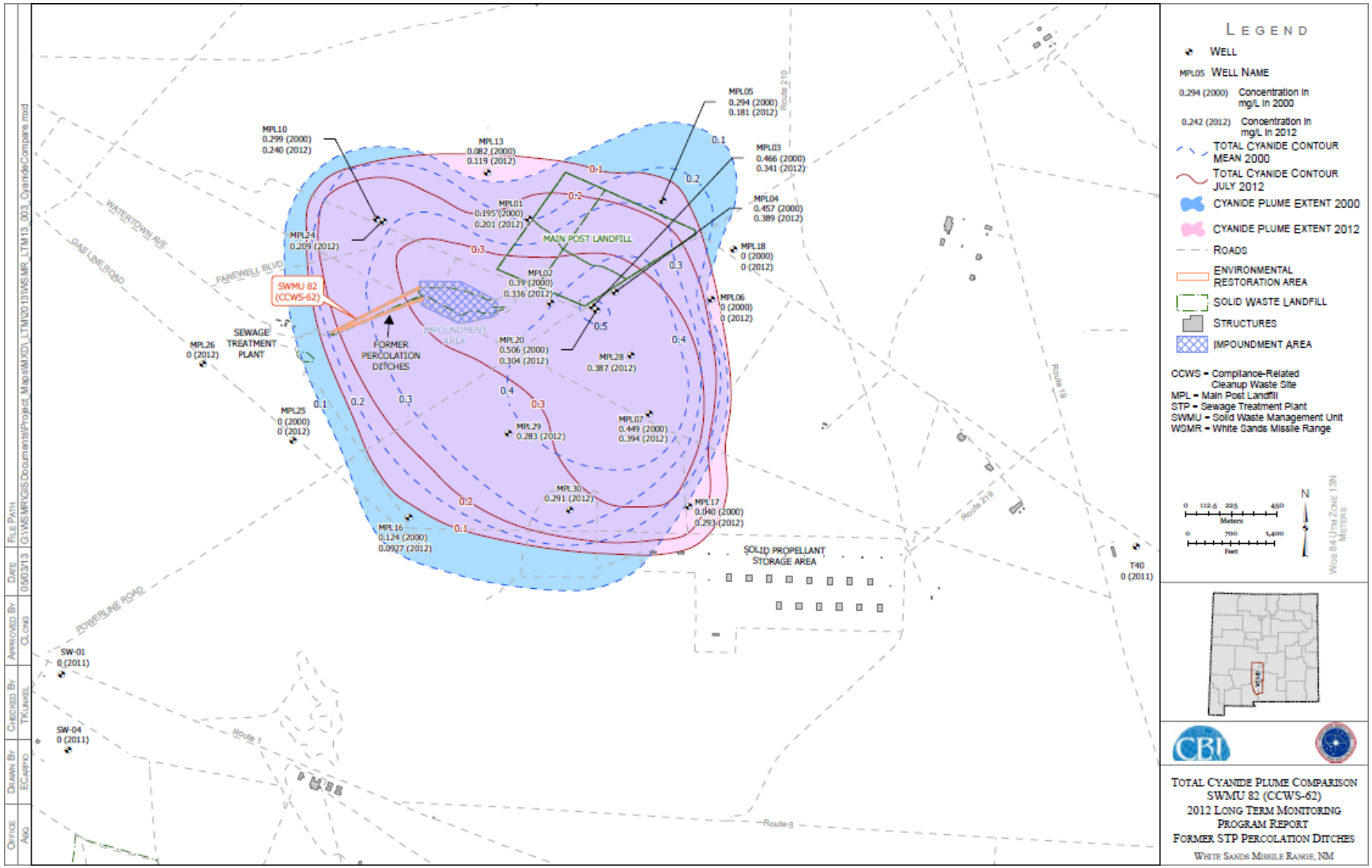


Figure 33
Total Cyanide Plume Comparison SWMU 82

Tables

Table 1
WSMR RCRA-Related Groundwater Monitoring Activities

Site Name	SWMU Designation	Monitoring Schedule	Separate Permit	No. Wells	Latest Sampling Event	Comments	Contractor	Summary of Significant Findings
Red Rio Landfill	50, 155	Annual	No	4	August 2001	IGWM	n/a	No monitoring activities have occurred during the reporting period
Oscura Bombing Range Landfill	41-46	Annual	No	4	August 2001	IGWM	n/a	No monitoring activities have occurred during the reporting period.
LC-38 Diesel Spill	198	Annual	No	4	September 2012	GWM	Arcadis	No product was detected on the water table. Low level concentrations of DRO were detected.
OB/OD	55, 56, 56a	Semi-Annual	Yes	12	March 2012/ August 2012	GWM	Shaw	Observations of nitrate, perchlorate, and RDX are consistent with previous sampling events.
HELSTF TSA Spill	197	Annual	No	4	March 2012	GWM	Arcadis	No BTEX was detected in the monitor wells. However, MTBE was confirmed in one well in the regional aquifer.
Tula Peak Incinerator Site	61	Annual	No	4	August 2001	IGWM	n/a	No monitoring activities have occurred during the reporting period. Site cleanup (removal) was completed.
Rhodes Canyon Landfill	114, 115	Annual	Yes	4	August 2012	O&M / GWM	Arcadis	No COCs were detected in the monitor wells.
HELSTF Construction Landfill	38, 39	Semi-Annual	No	5	May 2012/ August 2012	GWM	Arcadis	See HELSTF Groundwater Study
HELSTF Chromate Spill	143	Semi-Annual	No	9	May 2012/ August 2012	GWM	Arcadis	See HELSTF Groundwater Study
HELSTF Systemic Diesel Spill	154	Semi-Annual	No	11	May 2012/ August 2012	O&M / GWM	Arcadis	See HELSTF Groundwater Study
Main Post Landfill 3	65	n/a	No	4	March 2012	RFIA	Arcadis	The analytical results do not indicate constituents in the groundwater that could directly be attributed to leachate from the landfill.
Former STP Percolation Ditches	82	Semi-Annual	No	26	March 2012/ August 2012	RFIA	Shaw	Cyanide remains the only contaminant of concern.
HELSTF Groundwater Study	—	n/a	No	n/a	May 2012/ August 2012	Inclusive of CCWS-75 and IRP Sites WSMR -54, -55	Arcadis	[Formerly designated as IRP Site WSMR-85] Inclusive of CCWS-75 and IRP Sites WSMR-54, -55
North Oscura Peak Landfill	47, 48	n/a	No	n/a	n/a		n/a	No activity.

BTEX = *Benzene, toluene, ethyl benzene, and xylene.*
CCWS = *Compliance/Cleanup Program Site.*
COC = *Constituent of Concern.*
DRO = *Diesel Range Organics.*
GWM = *Groundwater Monitoring Program.*
HELSTF = *High Energy Laser System Test Facility.*
ID = *Identification.*
IGWM = *Inactive Groundwater Monitoring Program.*
IRP = *Installation Restoration Program.*
LC = *Launch Complex.*
MTBE = *Methyl tert-butyl ether.*
n/a = *Not applicable.*
No. = *Number.*
O&M = *Operations and Maintenance.*
OB/OD = *Open burn/open detonation.*
RCRA = *Resource Conservation Recovery Act.*
RDX = *Hexahydro-1,3,5-trinitro-1,3,5-triazine.*
RFIA = *RCRA Facility Investigation Activity.*
STP = *Sewage Treatment Plant.*
SWMU = *Solid Waste Management Unit.*
TSA = *Technical Support Area.*
WSMR = *Installation Restoration Program Site.*

Table 2
Regulatory Status of Sites

Site	SWMU Designation	NMED (2006) Designation	Current Regulatory Status	Notes
Red Rio Landfill	(North) 50, (South) 155	LDU-11 and LDU-12	Regulated unit, Interim status – active bombing range	
Oscura Bombing Range Landfill	41, 42, 43, 44, 45, 46	LDU-13 to -18	Regulated unit, Interim status – active bombing range	
Launch Complex 38 Diesel Spill	198	SWMU	Annual GWM. Unit included in CAC petition dated January 2011. NOD from NMED on petition dated October 11, 2011.	Corrective action unit
OB/OD	55, 56, 56a	OB/OD-1, -2, and -3	Regulated unit awaiting Post Closure Care Permit; semi-annual GWM	
HELSTF TSA Spill	197	SWMU	Annual GWM; Status report submitted March 2011. NOD from NMED on Status Report dated April 11, 2012.	Corrective action unit Groundwater TDS > 10,000 ppm
Tula Peak Incinerator Site	61	Incin-1	Regulated unit, Inactive, undergoing closure	Associated with LDU-1, SWMU 57
Rhodes Canyon Landfill	114, 115	(114) LDU-5 and (115) SWMU	Post Closure Care; annual GWM	
HELSTF Construction Landfill	38, 39	LDU-6 and LDU-9	Regulated units, included in second revision of HELSTF Phase III RFI report; NOD on Second Revision from NMED on March 5, 2012. Closure Plan submitted May 2011. NOD from NMED on Closure Plan dated October 2011. A request for extension dated February 6, 2013 for submittal of a revised Closure Plan by December 31, 2013.	Groundwater TDS > 10,000 ppm
HELSTF Chromate Spill	143	SWMU	Included in Second Revision of HELSTF Phase III RFI Report submitted August 2010; NOD on Second Revision from NMED on March 5, 2012. Request for extension dated February 6, 2013 sent to NMED for submittal of a Phase IV RFI Work Plan to June 30, 2013. This letter included a request to defer the Revised RFI Report. Semi-annual groundwater monitoring program conducted.	Corrective action unit Groundwater TDS > 10,000 ppm
HELSTF Systemic Diesel Spill	154	SWMU	Included in second revision of HELSTF Phase III RFI Report submitted August 2010; NOD on Second Revision from NMED on March 5, 2012. Request for extension dated February 6, 2013 sent to NMED for submittal of a Phase IV RFI Work Plan to June 30, 2013. This letter included a request to defer the Revised RFI Report. Semi-annual groundwater monitoring program conducted.	Corrective action unit Groundwater TDS > 10,000 ppm
Main Post Landfill No. 3	65	LDU-10	Regulated unit, Inactive; Revision 2 of Phase III RFI Report submitted February 2011. Closure Plan submitted December 2010. NOD from NMED for Closure Plan included comments on Phase III RFI report, dated August 10, 2011. Annual groundwater monitoring program conducted.	
STP Percolation Ditches	82	SI-3	Regulated unit, Semiannual GWM	Requires Closure Plan
North Oscura Peak Landfill	47, 48	SWMU	Regulated unit, All waste removed in 2002. Unit included in CAC petition dated January 2011. NOD from NMED on petition dated October 11, 2011. Extension request for petition submitted Feb 29, 2002. Extension request for petition granted April 26, 2012. Additional request for extension dated February 6, 2013 for submittal of the petition by March 29, 2013. The draft petition will be submitted to WSMR on Friday, April 12, 2013.	

CAC = *Corrective Action Complete.*
GWM = *Groundwater monitoring.*
HELSTF = *High Energy Laser Systems Test Facility.*
Incin = *Incinerator.*
LDU = *Land Disposal Unit.*
NMED = *New Mexico Environmental Department.*
NOD = *Notice of Disapproval.*
OB/OD = *Open burn/open detonation.*
ppm = *Parts per million.*
RCRA = *Resource Conservation Recovery Act.*
RFI = *RCRA Facility Investigation.*
SI = *Surface Impoundment.*
STP = *sewage treatment plant.*
SWMU = *Solid Waste Management Unit.*
TDS = *Total dissolved solids.*
TSA = *Technical Support Area.*
WSMR = *White Sands Missile Range.*

Table 3
Construction Details for Red Rio Bombing Range Monitor Wells

Well No. [a]	Northing [b]	Easting [b]	Elevation [c] Brass Marker (ft)	Elevation [c] Top of PVC (ft)	Total Well Depth (ft bgs)	Screen Interval (ft bgs)
RRW-1	3738031.031	384776.011	6,318.58	6,320.84	52.00	27-47
RRW-2	3738039.692	384740.972	6,314.87	6,317.04	68.00	53-63
RRW-3	3737985.256	384707.619	6,304.82	6,307.26	46.60	27-37
RRW-4	3737917.187	384677.742	6,298.69	6,301.12	46.00	26-41
RRW-5	3734731.294	385873.577	6,011.09	6,013.53	22.00	7-17
RRW-6	3734660.524	385871.138	6,005.59	6,008.11	15.00	3-7
RRW-7	3734683.058	385920.922	6,005.88	6,008.35	30.25	15-25
RRW-8	3734647.186	385908.747	6,002.6	6,004.98	21.40	6-16

[a]All wells are 4" diameter PVC.
[b]Universal Transverse Mercator Coordinate System, Zone 13, NAD83.
[c] Elevations are based on North American Vertical Datum, 1988 (NAVD88).
bgs = Below ground surface.
ft = Feet.
NAD83 = North American Datum, 1983.
PVC = Polyvinyl chloride.

Table 4
Construction Details for Oscura Bombing Range Landfill Monitor Wells

Well No. [a]	Northing [b]	Easting [b]	Elevation [c] Brass Marker (ft)	Elevation [c] Top of PVC (ft)	Total Well Depth (ft bgs)	Screen Interval (ft bgs)
OMW-1	3712061.406	387062.132	4,709.55	4,711.72	220.0	190-220
OMW-2	3711934.772	387218.924	4,702.82	4,705.29	215.53	188-218 (dry)
OMW-2A	3711930.907	387223.945	4,702.80	4,705.23	255.0	220-250
OMW-3	3711799.892	387113.042	4,698.91	4,701.08	200.0	170-200
OMW-4	3711914.371	386938.679	4,706.50	4,708.67	212.83	185-215

[a]All wells are 4" diameter PVC.
[b]Universal Transverse Mercator Coordinate Systems, Zone 13, NAD83.
[c]Elevations are based on North American Vertical Datum, 1988 (NAVD88).
bgs = Below ground surface.
ft = Feet.
NAD83 = North American Datum, 1983.
PVC = Polyvinyl chloride.

Table 5
Construction Details for LC-38 Monitor Wells

Well No. [a]	Location Brass Cap (UTM, meters, NAD83)		Elevation [b] Brass Cap (ft)	LOC (ft)	Total Well Depth (ft bgs)	Screened Interval (ft bgs)
	Northing	Easting				
MW-001	3586246.449	381681.625	1,000.00	2.57	261	235-255
MW-002	3586129.780	381737.586	1,003.92	2.42	254	225-245
MW-003	3586141.289	381767.536	1,003.56	2.39	255	227-247
MW-004	3586167.830	381786.756	1,003.37	2.36	257	229-249

[a]All wells are 4" diameter PVC with stainless steel screens.

[b]Relative Elevation to MW-001. Arbitrary Elevation for MW-001 chosen as 1,000 ft. Actual Elevation unknown. Ground surface elevation in area is approximately 4,040 ft.

bgs = Below ground surface.
ft = Feet.
LOC = Length of casing.
NAD83 = North American Datum, 1983.
UTM = Universal Transverse Mercator.

Table 6
Field Parameters from the September 2012 LC-38 Sampling Event

Sample ID	Monitor Well	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Depth to Water (bgs) (ft)
LC38-DSPL-MW-001-0912	MW-001	26.62	-53.8	11.24	0.79	2.01	7.05	232.94
LC38-DSPL-MW-002-0912	MW-002	23.91	-64.7	8.685	1.14	4.36	7.37	237.43
LC38-DSPL-MW-003-0912	MW-003	25.14	-61.3	10.99	0.94	0.54	6.99	237.12
LC38-DSPL-MW-004-0912	MW-004	26.70	-67.4	11.82	0.79	37.7	6.88	236.95

°C = *Degrees Celsius.*
bgs = *Below ground surface.*
ft = *Feet.*
ID = *Identification.*
LC = *Launch Complex.*
mg/L = *Milligrams per liter.*
mS/cm = *MilliSiemens per centimeter.*
MW = *Monitoring Well.*
mV = *Millivolts.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*

Table 7
Analytical Results from the September 2012 LC-38 Sampling Event

Sample ID	Monitor Well	Total Chromium (mg/L)	DRO (mg/L)	Hexavalent Chromium (mg/L)
LC38-DSPL-MW-001-0912	MW-001	0.0191	0.106 J	<0.008
LC38-DSPL-MW-002-0912	MW-002	0.0284	0.0697 UJ	<0.008
LC38-DSPL-MW-003-0912	MW-003	0.0082 UB	0.0687 UJ	<0.008
LC38-DSPL-MW-004-0912	MW-004	**0.798**	0.294 J	<0.008
LC38-DSPL-MW-104-0912	MW-004 duplicate	**0.744**	0.338 J	<0.008
Screening Criteria		0.05[a]	0.4[b]	0.000031[c]

[a] *NMWQCC value for total chromium.*

[b] *NMED potable groundwater screening level for diesel, TPH guidance Table 6-2.*

[c] *EPA Tap Water Standard for Chromium VI (hexavalent chromium).*

< = *Less than the indicated laboratory reporting limit.*

Bold = *Analyte was detected above the screening level.*

DRO = *Diesel range organics.*

ID = *Identification.*

LC = *Launch Complex.*

mg/L = *Milligrams per liter.*

MW = *Monitoring well.*

Table 8
Construction Details for OB/OD Monitor Wells

Well No.	Northing	Easting	Elevation Top of Casing	Total Boring Depth (ft btoc)	Screen Interval (ft btoc)	DTW (ft btoc) Summer 2012	Potentiometric Elevation Summer 2012 (ft)
HTA 3	3595401.017	358079.848	5,356.81	164.81	59.81-109.81	-----	-----
HTA 10A	3596252.140	357115.435	5,690.43	82.43	62.43-82.43	69.70	5,620.73
HTA 11	3596313.225	357106.881	5,692.17	206.43	60.93-80.93	71.38	5,620.79
HTA 12	3596390.154	356882.906	5,756.71	166.93	131.93-151.93	90.91	5,665.80
HTA 13	3596252.067	357115.484	5,692.23	127.31	96.70-116.70	102.63	5,589.60
HTA 15	3596214.864	357298.680	5,645.09	122.17	79.17-99.17	85.06	5,560.03
HTA 16	3596180.104	357281.672	5,643.10	121.92	79.92-99.92	86.88	5,556.22
HTA 16D	3596179.083	357293.803	5,640.13	307.17	136.23-156.23	84.13	5,556.00
HTA 17	3596138.280	357255.941	5,643.64	122.15	87.15-107.15	87.38	5,556.26
HTA 19	3596029.687	357406.532	5,597.22	307.39	123.59-143.59	129.92	5,467.30
HTA 20	3596340.302	357163.219	5,701.56	117.22	76.57-96.57	80.83	5,620.73
HTA 25	Not listed	Not listed	5,646.03	125.03	97.46-117.46	84.84	5,561.19

btoc = *Below top of casing.*
DTW = *Depth to water.*
ft = *Feet.*
HTA = *Hazardous Test Area.*
OB/OD = *Open burn/open detonation.*

Table 9
Field Parameters from the OB/OD Sampling Event

Sample Date	Sample ID	Monitor Well	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Alkalinity (ppm)	pH	Depth to water (ft btoc)
2-15-12	HTA 3	HTA 3	10.95	124.2	0.718	3.60	0.82	245	13.12	-
8-7-12			28.66	-16.9	0.762	2.91	0.52	255	7.23	-
2-14-12	HTA 10A	HTA 10A	17.41	117.2	0.733	3.34	1.12	226	7.71	68.64
8-6-12			21.80	-28.1	0.805	3.89	0.00	221	7.68	69.67
2-14-12	HTA 11	HTA 11	15.09	108.8	0.749	3.79	2.01	229	7.59	70.40
8-6-12			24.16	-26.2	0.833	4.00	2.14	236	7.47	71.40
2-14-12	HTA 12	HTA 12	17.08	120.7	0.804	2.08	3.74	233	7.58	89.12
8-7-12			23.10	-33.5	0.910	2.58	0.76	236	7.55	90.92
2-15-12	HTA 13	HTA 13	16.94	44.1	0.728	0.34	1.53	253	9.08	102.01
8-7-12			23.64	-42.1	0.784	0.47	0.08	245	7.54	102.58
2-13-12	HTA 15	HTA 15	17.03	62.2	0.820	4.09	0.38	218	7.84	84.54
8-6-12			22.17	-29.1	0.897	4.83	0.00	214	7.64	85.07
2-13-12	HTA 16	HTA 16	17.54	-264.4	0.845	1.67	1.25	219	7.73	86.55
8-3-12			23.28	-237.6	7.091	0.44	8.57	300	6.90	86.74
2-13-12	HTA 16D	HTA 16D	17.74	102.2	0.818	2.61	17.9	217	7.84	83.78
8-3-12			25.05	-57.6	0.897	2.82	16.3	213	7.19	84.13
2-13-12	HTA 17	HTA 17	18.73	25.5	0.821	3.24	0.54	219	7.69	87.03
8-7-12			23.19	-42.7	0.890	4.12	0.21	223	7.76	87.37

Table 9 (continued)
Field Parameters from the OB/OD Sampling Event

Sample Date	Sample ID	Monitor Well	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Alkalinity (ppm)	pH	Depth to water (ft btoc)
2-13-12	HTA 19	HTA 19	16.29	92.0	0.812	3.84	0.42	186	7.87	129.46
8-3-12			23.44	-63.1	0.899	9.71	0.31	211	7.47	129.92
2-14-12	HTA 20	HTA 20	15.72	107.9	0.802	3.56	0.07	248	7.56	79.85
8-6-12			22.53	-28.5	0.877	3.95	0.38	236	7.52	80.85
2-14-12	HTA 25	HTA 25	16.68	66.2	0.835	0.86	0.34	248	7.49	84.44
8-6-12			23.05	-29.0	0.919	0.61	0.35	254	7.50	84.84

°C = *Degrees Celsius.*
btoc = *Below top of casing.*
ft = *Feet.*
HTA = *Hazardous Test Area.*
ID = *Identification.*
mg/L = *Milligrams per liter.*
mS/cm = *MilliSiemens per centimeter.*
mV = *Millivolts.*
NTU = *Nephelometric turbidity unit.*
OB/OD = *Open burn/open detonation.*
pH = *Measure of acidity.*
ppm = *Parts per million.*

Table 10
Summary Analytical Results for OB/OD

Sample ID	Sample Date	RDX (µg/L)	Perchlorate (µg/L)	Nitrate/Nitrite (mg/L)
HTA 3	2-15-12	1.02 U	3.63	3.09
	8-7-12	<1.03 U	2.52	2.89
HTA 10A	2-14-12	**82.8**	**3,360**	8.65
	8-6-12	**85.9**	**3,470**	8.9
HTA 11	2-14-12	**56.9**	**3,540**	7.44
	8-6-12	**67.5 U**	**3,210**	6.63
HTA 12	2-14-12	<1.05 U	**11.8**	2.84
	8-7-12	<1.03	**14.1**	2.84
HTA 13	2-15-12	**1.71**	**581**	1.55
	8-7-12	**1.67**	**1,130**	3.01
HTA 15	2-13-12	**19.5**	**16,800**	**11.7**
	8-6-12	**23.8**	**19,200**	**10.3**
HTA 16	2-13-12	**21.8**	**14,500**	**10.1**
	8-3-12	**24.4**	**14,200**	**10.4**
HTA 16D	2-13-12	**19.1**	**16,000**	**22.7**
	8-3-12	**22.3**	**16,400**	5.06
HTA 17	2-13-12	**33.1**	**15,400**	**10.9**
	8-7-12	**34.6**	**16,700**	**11.9**
HTA 19	2-13-12	1.02 U	**8,950**	**23.3 U**
	8-3-12	1.05 U	**9,200**	6.06
HTA 20	2-14-12	**47.8**	**14,500**	9.09
	8-6-12	**50.7**	**15,600**	9.31
HTA 25	2-14-12	**1.46**	**14,400**	4.32
	8-6-12	**1.87**	**16,600**	4.47
Screening Level		0.61 [a]	4 [b]	10 [c]

[a] *EPA Tap Water Standard.*

[b] *NMWQCC Standard.*

[c] *EPA MCL for Nitrate + Nitrite (as N).*

< = *Less than the indicated laboratory reporting limit.*

Bold = *Analyte was detected above the screening level.*

EPA = *U.S. Environmental Protection Agency.*

HTA = *Hazardous Test Area.*

ID = *Identification.*

µg/L = *Micrograms per liter.*

mg/L = *Milligrams per liter.*

NMED = *New Mexico Environment Department.*

OB/OD = *Open burn/open detonation.*

RDX = *Hexahydro-1,3,5-trinitro-1,3,5-triazine.*

NMWQCC = *New Mexico Water Quality Control Commission.*

Table 11
Construction Details for HELSTF TSA Regional Monitor Wells

Monitor Well ID	Northing	Easting	Elevation TOC (ft)	Total Well Depth (ft bgs)	Screen Interval (ft bgs)
HMW48	3609737.967	377896.496	3965.657	111.4	85 – 105
HMW49	3609678.059	377841.453	3965.503	113.0	85 – 105
HMW50	3609654.618	377880.738	3965.125	113.0	85 – 105
HMW52	3609674.999	377871.499	3963.191	99.8	88.5–93.5
HVW1	3609700.67	377871.897	3963.445	20	15-20
HVW2	3609704.891	377865.404	3962.623	36	31-36
HVW3	3609696.021	377866.457	3963.355	36	31-36
HVW4	3609703.629	377878.883	3963.116	36	31-36
HVW5	3609706.616	377870.993	3963.648	35	30-35
HVW6	3609707.511	377869.508	3963.671	no data	no data
HVW7	3609704.027	377864.221	3963.459	22	17-22
HVW8	3609701.492	377863.885	3963.412	30	25-30
HVW9	3609699.729	377877.136	3963.517	22	17-22
HVW10	3609706.169	377869.932	3963.698	31	29.5-31

Note: Location in Universal Transverse Mercator Coordinate Systems, Zone 13, NAD83

bgs = *Below ground surface.*
ft = *Feet.*
HELSTF = *High Energy Laser Systems Test Facility.*
ID = *Identification.*
NAD83 = *North American Datum, 1983.*
TOC = *Top of casing.*
TSA = *Technical Support Area.*

Table 12
HELSTF TSA Water Quality Parameters (March 2012)

Water Quality Parameter	HMW48	HMW49	HMW50	HMW52
Temp (°C)	23.24	19.43	21.34	19.20
Oxidation Reduction Potential (mV)	-43.6	-31.2	-33.0	-39.4
Conductivity (mS/cm)	9.231	9.904	9.685	37.83
Dissolved Oxygen (mg/L)	0.36	1.98	1.63	3.80
Turbidity (NTU)	8.63	3.66	0.54	1.23
pH	7.47	7.98	7.68	7.68
Depth to water (ft bgs)	90.53	90.54	91.24	90.06

°C = *Degrees Celsius.*
bgs = *Below ground surface.*
ft = *Feet.*
HELSTF = *High Energy Laser Systems Test Facility.*
mg/L = *Milligrams per liter.*
mS/cm = *MilliSiemens per centimeter.*
mV = *Millivolts.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*
TSA = *Technical Support Area.*

Table 13
Analytical Results of Sampling at the HELSTF TSA (March 2012)

Monitor Well ID	HMW48	HMW49	HMW50	HMW52	HMW52 (dup)
MTBE (µg/L)	< 0.3	< 0.3	< 0.3	10.3	< 0.3
Benzene (µg/L)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Toluene (µg/L)	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Ethylbenzene (µg/L)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Xylenes (µg/L)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

< = *Less than the indicated laboratory reporting limit.*
dup = *Duplicate.*
ID = *Identification.*
HELSTF = *High Energy Laser Systems Test Facility.*
MTBE = *Methyl tert-butyl ether.*
µg/L = *Micrograms per liter.*
TSA = *Technical Support Area.*

Table 14
Construction Details for Tula Peak Incinerator Site Monitor Wells

Well No. [a]	Northing [b]	Easting [b]	Elevation [c] Brass Marker (ft)	Elevation [c] Top of PVC (ft)	Total Well Depth (ft bgs)	Screen Interval (ft bgs)
TP-1	3658495.170	393579.000	4,170.73	4,173.02	47	22-42
TP-2	3658440.370	393376.115	4,164.50	4,166.71	43	18-38
TP-3	3658574.464	393365.797	4,167.21	4,169.03	45	20-40
TP-4	3658703.865	393463.146	4,166.75	4,168.86	43	18-38

[a]All wells are 4" diameter PVC.

[b]Universal Transverse Mercator Coordinate Systems, Zone 13, NAD83.

[c]Elevations are based on North American Vertical Datum, 1988 (NAVD88).

bgs = Below ground surface.
ft = Feet.
PVC = Polyvinyl chloride.

Table 15
Construction Details for Rhodes Canyon Landfill Monitor Wells

Well [a]	Location Brass Cap (UTM, meters, NAD83)		Elevation Brass Cap (NAVD88) (ft)	Elevation TOC (NAVD88) (ft)	Total Depth (ft bgs)	Screened Interval (ft btoc)
	Northing	Easting				
RMW-01 [b]	3671368.9089	360400.5035	4064.01	4066.35	94	76.3 – 96.3 Pump at 92 ft btoc
RMW-02	3671175.1088	360671.6885	4055.03	4057.46	88	70.4 – 90.4
RMW-03 [b]	3671005.2948	360614.7388	4053.21	4055.60	89	71.4 – 91.4 Pump at 82 ft btoc
RMW-04	3671084.1081	360360.9201	4061.13	4063.44	91	73.3 – 93.3
RMW-05 [b]	3670906.3383	360546.0193	4051.88	4054.31	89	66.4 – 86.4 Pump at 81 ft btoc
RMW-06 [b]	3670980.2288	360455.8632	4055.10	4057.60	90	67.5 – 87.5 Pump at 84 ft btoc

[a]All monitor wells are 4 inches in diameter.

[b]Primary wells to be sampled on an annual basis.

bgs = Below ground surface.
btoc = Below top of casing.
ft = Feet.
NAD83 = North American Datum of 1983.
NAVD88 = North American Vertical Datum of 1988.
TOC = Top of casing.
UTM = Universal transverse mercator.

Table 16
Rhodes Canyon Landfill Analytical Schedule

Parameter		Reference Method	Container	Maximum Hold Time	Preservative
Water Quality	Conductivity pH Temperature Turbidity	Field measured with YSI and turbidimeter	NA	NA	NA
	Alkalinity pH Total Dissolved Solids sulfate	SM 2320B SM-4500-H+ SM 2540C	1-liter polyethylene	48 hours	Chill to 4°C
Organics	VOCs	SW846-8260B	40-mL VOA vials (3)	14 days	HCl, pH<2 Chill to 4°C
	SVOCs	SW846-8270C	1-L amber (2)	7 days	Chill to 4°C
Total Metals	Lead	SW846-6010B	250 mL polyethylene	6 months	HNO_3, pH<2 Chill to 4°C

°C = *Degrees Celsius.*
HCl = *Hydrochloric acid.*
HNO_3 = *Nitric acid.*
L = *Liter.*
mL = *Milliliter.*
NA = *Not applicable.*
pH = *Measure of acidity (potential of hydrogen).*
SVOC = *Semivolatile organic compound.*
VOA = *Volatile organic analysis.*
VOC = *Volatile organic compound.*

Table 17
Rhodes Canyon Landfill Water Quality Parameters (August 2012)

Well	RMW-01	RMW-03	RMW-05	RMW-06
Temperature (°C)	23.19	23.24	23.23	23.42
pH	7.37	7.25	7.08	7.10
Conductivity (mS/cm)	8.240	9.325	11.92	10.44
Dissolved Oxygen (mg/L)	5.04	2.91	2.57	2.03
Turbidity (NTU)	0.10	0.05	0.14	0.64
Oxidation-Reduction Potential (mV)	-53.9	-52.2	-63.6	-48.5
Depth to Groundwater (ft bgs)	81.81	72.85	72.12	74.81

°C = *Degrees Celsius.*
bgs = *Below ground surface.*
ft = *Feet.*
mg/L = *Milligrams per liter.*
mS/cm = *MilliSiemens per centimeter.*
mV = *Millivolts.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*

Table 18
Analytical Results of Sampling at Rhodes Canyon Landfill (August 2012)

Constituents	Screening Level	Screening Level Source	Unit	RMW-1	RMW-3	RMW-5	RMW-6
Benzoic Acid	58,000	EPA Tap Water	µg/L	15.3	46.6	10.3	<2
Lead	50	NMWQCC	µg/L	<0.3 U	<0.3 U	<0.3 U	<0.3 U
Alkalinity, Total (As CaCO3)	- -	- -	mg/L	106	160	158	166
Sulfate	600	NMWQCC	mg/L	**1,230**	**1,420**	**1,890**	**1,360**
Total Dissolved Solids	1000	NMWQCC	mg/L	**5,080**	**5720**	**8,010**	**6,430**
pH	6-9	NMWQCC	pH units	7.48	7.12	7.01	6.94

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte detected above screening level.*
CaCO3 = *Calcium carbonate.*
EPA = *U.S. Environmental Protection Agency.*
RSL =*Regional Screening Level.*
µg/L = *Micrograms per liter.*
mg/L = *Milligrams per liter.*
NMED = *New Mexico Environment Department.*
pH = *Measure of acidity (potential of hydrogen).*
NMWQCC = *New Mexico Water Quality Control Commission.*

Table 19
Wells Selected for HELSTF Long Term Groundwater Monitoring Program

Well Name	UTM Northing Brass Cap	UTM Easting Brass Cap	Elevation feet Brass Cap (amsl)	Elevation feet TOC	Stickup (feet)	DTW TOC Summer 2012	Top of Screen TOC (feet)	Bottom of Screen TOC	Well TD	Aquifer
DRW-03	3611440.828	375070.992	3956.9027	3958.4038	2.2491	42.98	36.5011	56.5011	61.6	Lower Perched
DRW-04	3,611,447.8090	375,070.6760	3,956.8052	3,958.2790	1.4738	43.90	36.4738	56.4738	61.05	Lower Perched
DRW-05	3,611,444.8580	375,091.8200	3,955.6097	3,957.2735	1.6638	46.23	36.6638	56.6638	61.21	Lower Perched
DRW-12	3,611,371.0430	375,094.1780	3,956.5165	3,958.0549	1.5384	47.31	36.5384	56.5384	62.21	Lower Perched
DRW-13	3,611,415.7700	375,124.2750	3,954.8828	3,956.9997	2.1169	46.52	37.1169	57.1169	63.2	Lower Perched
DRW-16	3,611,485.6120	375,048.6040	3,955.3580	3,957.7339	2.38	72.90	67.3759	87.3759	92.81	Regional
HCF-01	3,611,395.5590	375,064.5060	3,957.0333	3,959.4851	2.4518	47.73	42.4518	62.4518	64.52	Lower Perched
HMW-08	3,611,953.7330	375,301.5870	3,957.9749	3,959.7569	1.78	76.24	76.982	101.982	99.75	Regional
HMW-11	3,611,303.2780	375,080.2270	3,955.7666	3,957.5079	1.7413	47.21	48.7413	63.7413	65.92	Lower Perched
HMW-32	3,611,590.7100	375,373.8010	3,954.9901	3,957.4401	2.45	73.87	76.45	91.45	92.33	Regional
HMW-34	3,611,579.4910	375,512.2990	3,955.4449	3,957.6249	2.18	75.46	77.18	92.18	92.77	Regional
HMW-35	3,611,646.7200	375,481.7210	3,954.9328	3,957.3528	2.42	74.10	65.92	85.92	87	Regional
HMW-37	3,611,345.3830	375,074.2690	3,955.6467	3,958.1305	2.4838	42.35	29.4838	44.4838	45.31	Lower Perched
HMW-38	3,611,346.1080	375,071.2610	3,955.9713	3,958.3749	2.4036	47.72	54.4036	64.4036	63.88	Lower Perched
HMW-39	3,611,321.9990	375,117.8120	3,954.7954	3,957.4253	2.6299	47.30	54.6299	64.6299	65.02	Lower Perched
HMW-40	3,611,293.8460	375,101.7400	3,953.4649	3,955.7356	2.27	25.2	30.2707	40.2707	40.95	Upper Perched
HMW-41	3,611,296.4350	375,103.3870	3,953.4451	3,955.7590	2.3139	45.67	51.3139	61.3139	61.47	Lower Perched
HMW-43	3,611,310.7020	375,055.1330	3,956.4230	3,959.0501	2.63	45.78	55.1271	65.1271	65.67	Lower Perched
HMW-59	3,611,453.0100	375,482.3240	3,953.9692	3,957.4392	3.47	75.18	71.47	81.47	87.73	Regional

DTW = *Depth to water.*
UTM = *Universal transverse mercator.*
HELSTF = *High Energy Laser System Test Facility.*
RCRA = *Resource Conservation and Recovery Act.*
RFI = *RCRA Facility Investigation.*
TD = *Total depth.*
TOC = *Top of casing.*

Table 20
Analyte List – HELSTF LTM (Diesel Spill, Chromate Spill, and Construction Landfill)

DRW-3, DRW-4, DRW-5, DRW-12, DRW-13, DRW-16, HCF-1
HMW-11, HMW-37, HMW-38, HMW-39, HMW-40, HMW-41, HMW-43

Parameter		Reference Method	Container	Maximum Hold Time	Preservative
Water Quality	Conductivity pH Temperature Dissolved Oxygen ORP Turbidity	Field measured with YSI and turbidimeter	NA	NA	NA
	Total Organic Carbon	415.1	40-mL VOA vials (2)	28 days	H_2SO_4, pH<2
Organics	VOCs	8260	40-mL VOA vials (3)	14 days	HCl, pH<2
	DRO	8015	500-mL ambers (2)	14 days	HCl, pH<2
Metals	Total Chromium	6010	250-mL polyethylene	6 months	HNO_3, pH<2
	Hexavalent Chromium	SM 3500-Cr D	Taken from Water Quality container.	24 hours	Chill to 4°C

Table 20 (continued)
Analyte List – HELSTF LTM (Diesel Spill, Chromate Spill, and Construction Landfill)

HMW-08, HMW-32, HMW-34, HMW-35, HMW-59

Parameter			Reference Method	Container	Maximum Hold time	Preservative
Water Quality	Conductivity, pH, Temperature Dissolved Oxygen, ORP, Turbidity		Field measured with YSI and turbidimeter	NA	NA	NA
	Total Organic Carbon		415.1	40-mL VOA vials (2)	28 days	H_2SO_4, pH<2 Chill to 4°C
Dissolved Ions	Chloride, Sulfate, Alkalinity, pH		300.1	250-mL polyethylene	28 days	Field filter Chill to 4°C
Organics	VOCs		8260	40-mL VOA vials (3)	14 days	HCl, pH<2 Chill to 4°C
	SVOCs		8270	1-L amber (2)	7 days	Chill to 4°C
	DRO		8015	40-mL VOA vials (3)	14 days	HCl, pH<2 Chill to 4°C
	GRO		8015	40-mL VOA vials (3)	14 days	HCl, pH<2 Chill to 4°C
Total/ Dissolved Metals (RCRA 8)	Arsenic Barium Cadmium Chromium Lead	Selenium Silver	6020	500-mL polyethylene	6 months	HNO_3, pH<2 Chill to 4°C
	Mercury		7470A		28 days	

°C = *Degrees Celsius.*
DRO = *Diesel range organics.*
GRO = *Gasoline range organics.*
H_2SO_4 = *Sulfuric acid.*
HCl = *Hydrochloric acid.*
HELSTF = *High Energy Laser System Test Facility.*
HNO_3 = *Nitric acid.*
L = *Liter.*
LTM = *Long term monitoring.*
mL = *Milliliters.*
NA = *Not applicable.*
ORP = *Oxidation reduction potential.*
pH = *Measure of acidity (potential of hydrogen).*
RCRA = *Resource Conservation Recovery Act.*
SVOC = *Semivolatile organic compound.*
VOA = *Volatile organic analysis.*
VOC = *Volatile organic compound.*

Table 21
Analytical Results of Sampling at HELSTF Construction Landfill (SWMUs 38 & 39) (2012)

Constituents	Screening Level	Screening Level Source	Location ID:	HMW-08	HMW-08	HMW-32	HMW-32	HMW-34	HMW-34	HMW-35	HMW-35 (Duplicate)	HMW-35	HMW-35 (Duplicate)	HMW-59	HMW-59
			Sample Date:	3/8/2012	8/28/2012	3/12/2012	9/4/2012	3/12/2012	8/28/2012	3/12/2012	3/12/2012	8/28/2012	8/28/2012	3/12/2012	9/4/2012
			Unit												
VOCs															
Acetone	1.2E+4	EPA Tap Water	µg/L	< 5	13.1 UB	< 5	<12.8 UB	< 5	10.9 UB	< 5	< 5	12 UB	15.7 UB	15 UB	15 UB
Chloromethane	190	EPA Tap Water	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethylene	5	EPA MCL	µg/L	0.95 J	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
SVOCs															
Benzoic Acid	58,000	EPA RSL	µg/L	6.0 UBJ	14.3	14.7 UB	6.7 UB	10.2 UB	10.6	6.0 UB	7.76 UB	12.2	13.3	6.0 UB	< 2
Metals															
Arsenic	10	EPA MCL	µg/L	**12.3**	**11.6**	2.24 J	2.67 J	**11.2**	**12.4**	8.46	8.4	9.28	9.51	**13.5**	**13.4**
Arsenic, Dissolved	10	EPA MCL	µg/L	**12.2**	**13.5**	2.54 J	3.08 J	**12.2**	**12**	8.94	9.15	9.65	9.51	**14.2**	**13.5**
Barium	1000	NMWQCC	µg/L	10.7	15.2	17.6	17	16.8	19.5	11	11	12.8	11.6	11.5	9.86 J
Barium, Dissolved	1000	NMWQCC	µg/L	9.24 J	9.64 J	17.3	15.6	16	20.5	10.3	10.9	11.9	11.9	10.5	9.91 J
Calcium	- -	NE	µg/L	459000	434000	422000	413000	418000	430000	456000	453000	459000	483000	426000	420000
Calcium, Dissolved	- -	NE	µg/L	450000	432000	430000	431000	449000	428000	466000	500000	483000	475000	455000	428000
Chromium	50	NMWQCC	µg/L	16.2	19.3	40.6	34.8	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Chromium, Dissolved	50	NMWQCC	µg/L	14.8	18.2	39.3	33.9 J	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Magnesium	- -	NE	µg/L	692000	653000	256000	247000 J	515000	518000	525000	513000	539000	554000	545000	506000 J
Magnesium, Dissolved	- -	NE	µg/L	694000	652000	258000	257000	523000	515000	546000	555000	555000	545000	555000	536000
Mercury	2	NMWQCC	µg/L	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Potassium	- -	NE	µg/L	63700	63500	49600 J	48800	50600 J	49800	43300	41700	44000	45000	54300 J	49100
Potassium, Dissolved	- -	NE	µg/L	64500	62100	50300 J	47800	52100 J	50800	45400	46500	45200	44500	54600 J	51000
Selenium	50	NMWQCC	µg/L	**73.4**	**65.4 J**	**57**	**65.8 J**	7.84	14.6	**254**	**238**	**240 J**	**253**	29.5	29.8 J
Selenium, Dissolved	50	NMWQCC	µg/L	**72.1**	**77.8 J**	**59**	**67.6**	8.79	15.4 J	**263**	**258**	**271 J**	**258 J**	30.9	30.4
Sodium	- -	NE	µg/L	2570000	2460000	2270000	2250000	2240000	2180000	2060000	2000000	1980000	2050000	2320000	2200000 J
Sodium, Dissolved	- -	NE	µg/L	2570000	2420000	2290000	2220000	2280000	2160000	2010000	2060000	2050000	2000000	2360000	2260000
Water Quality Parameters															
Alkalinity, Bicarbonate	- -	NE	µg/L	246000	247000	50000	51500	174000	182000	179000	180000	180000	181000	177000	178000
Alkalinity, Total	- -	NE	µg/L	246000	247000	50000	51500	174000	182000	179000	180000	180000	181000	177000	178000
Chloride (Cl)	250000	NMWQCC	µg/L	**1290000**	**1340000**	**1400000**	**1480000**	**817000**	**870000**	**1140000**	**1080000**	**1170000**	**1150000**	**960000**	**1030000**
pH	6-9	NMWQCC	pH Units	7.38	7.6	7.47	8.09	7.47	7.6	7.64	7.6	7.48	7.48	7.75	7.8
Sulfate	600000	NMWQCC	µg/L	**7760000**	**7770000**	**5150000**	**5410000**	**6700000**	**6820000**	**6190000**	**5960000**	**6220000**	**6130000**	**6830000**	**6990000**
Total Organic Carbon	- -	NE	µg/L	661 J	580 J	< 300	< 600	689 J	718 J	597 J	649 J	591 J	659 J	649 J	< 600

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte detected above screening level.*
EPA = *U.S. Environmental Protection Agency.*
RSL =*Regional Screening Level.*
GW = *Groundwater.*
HELSTF = *High Energy Laser Systems Test Facility.*
ID = *Identification.*
MCL = *Maximum contaminant level.*
µg/L = *Micrograms per liter.*
NE = *Not established.*
NMED = *New Mexico Environment Department.*
NMWQCC = *New Mexico Water Quality Control Commission.*
pH = *Measure of acidity (potential of hydrogen).*
SVOC = *Semi-volatile organic compound.*
VOC = *Volatile organic compound.*

Table 22
Analytical Results of Sampling at HELSTF Chromate Spill (SWMU 143) (2012)

Constituents	Screening Level	Screening Level Source	Location ID:	HMW-11	HMW-11	HMW-37	HMW-37	HMW-37	HMW-38	HMW-38	HMW-39	HMW-39	HMW-40	HMW-40	HMW-41	HMW-41	HMW-43	HMW-43	HMW-43
			Sample Date:	3/13/2012	8/29/2012	3/14/2012	3/14/2012	8/30/2012	3/14/202	8/30/2012	3/14/2012	8/30/2012	3/13/2012	8/30/2012	3/13/2012	8/29/2012	3/13/2012	8/29/2012	8/29/2012
			Unit																
Diesel Range Organics	400	NMED TPH Screening Guideline	µg/L	63.4 J	79.3 J	54.3 UB	51.9 UB	<50	54 J	121	55.3 J	51.2 J	70.5 J	55.3 J	62.3 J	64.6 J	55.2 J	66.4 J	56.9 J
VOCs																			
1,1-Dichloroethane	2.4	EPA Tap Water	µg/L	0.86 J	0.87 J	< 0.2	< 0.2	0.34 J	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.38 J	0.38	< 0.2	< 0.2	< 0.2
1,1-Dichloroethylene	5	NMWQCC	µg/L	0.52 J	0.45 J	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	1.32	1.38	< 0.2	< 0.2	2.41	2.22	< 0.2	< 0.2	< 0.2
Acetone	12,000	EPA Tap Water	µg/L	< 5	15 UB	< 5	< 5	15.2 UB	< 5	15	< 5	15 UB	< 5	15 UB	< 5	22.8 UB	< 5	15 UB	15 UB
Bromodichloromethane	0.12	EPA Tap Water	µg/L	< 0.2	< 0.2	**1.25**	**1.19**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chlorodibromomethane (Dibromochloromethane)	80	EPA MCL	µg/L	< 0.2	< 0.2	0.21 J	0.22 J	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chloroform	0.19	EPA Tap Water	µg/L	**0.31 J**	**0.31 J**	**15.3**	**16.2**	**10.5**	**0.41 J**	**0.42 J**	**0.44 J**	**0.49**	< 0.3	< 0.3	**0.68 J**	**0.72 J**	**1.25**	**2.46**	**2.49**
Chloromethane	190	EPA Tap Water	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethylene	5	EPA MCL	µg/L	**15.6**	**16.4**	< 0.6	< 0.6	< 0.6	**8.63**	**8.58**	**33.1**	**41.8**	< 0.6	< 0.6	**71.1**	**77.6**	< 0.6	< 0.6	< 0.6
Metals																			
Chromium	50	NMWQCC	µg/L	**79.3**	**102**	< 2	< 2	4.84 J	46.2	47.6	**158**	**198**	3.53 J	4.33 J	**422**	**492**	7.78	9.76	8.88
Chromium (Hexavalent)	0.031	EPA Tap Water	µg/L	**83.1**	**91.5**	< 8	< 8	< 8	**49.1**	**42.2**	**164**	**191**	< 8	< 8	**468**	**460**	< 8	< 8	< 8
Water Quality Parameters																			
pH	6-9	NMWQCC	pH Units	7.54	7.55	7.44	7.43	7.46	7.49	7.66	7.61	7.66	7.57	7.62	7.52	7.53	7.33	7.39	7.39
Total Organic Carbon	- -	NE	µg/L	1190	724 J	747 J	582 J	795 J	1340	1080	1460	1150	1400	1280	1460	803	1310	1160	1090

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte detected above screening level.*
µg/L = *Micrograms per liter.*
EPA = *U.S. Environmental Protection Agency.*
RSL =*Regional Screening Level*
GW = *Groundwater*
HELSTF = *High Energy Laser System Test Facility.*
ID = *Identification.*
MCL = *Maximum contaminant level.*
NE =*Not Established*
NMWQCC = *New Mexico Water Quality Control Commission.*
pH = *Measure of acidity (potential of hydrogen).*
VOC = *Volatile organic compound.*

Table 23
Analytical Results of Sampling at HELSTF Diesel Spill (SWMU 154) (2012)

Constituents	Screening Level	Screening Level Source	Location ID: / Sample Date: / Unit	DRW-04 3/20/2012	DRW-04 9/6/2012	DRW-05 3/15/2012	DRW-05 9/6/2012	DRW-12 3/12/2012	DRW-12 9/15/2012	DRW-13 3/15/2012	DRW-13 9/15/2012	DRW-16 3/15/2012	DRW-16 9/15/2012	HCF-01 3/20/2012	HCF-01 9/6/2012
TPHs															
Diesel Range Organics	400	NMED TPH Screening Guideline	µg/L	**2930**	**2860** J	**2110**	**2050** J	50.7 J	51 J	<80	56.9 J	<80	<50	**11600** J	**6790** J
VOCs															
1,1,1-Trichloroethane	60	NMWQCC	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1-Dichloroethane	2.4	EPA Tap Water	µg/L	**60.8**	**42.4**	**20.1**	**38.4**	1.13	1.24	1.4	1.3	1.16	1.27	2.28	2.03
1,1-Dichloroethylene	5	NMWQCC	µg/L	1.46	0.92 J	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	2.72	2.92	3.57
2-Phenylbutane	- -	NE	µg/L	0.74 J	1.39	1.11	1.04	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	1.62	0.63 J
Acetone	12,000	EPA Tap Water	µg/L	< 5	15 UB	< 5	15 UB	< 5	15 UB	< 5	15 UB	< 5	15 UB	< 5	15 UB
Benzene	0.39	EPA Tap Water	µg/L	**2.14**	**1.94**	**3.27**	**3.6**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	**6.52**	**6.13**
Carbon Disulfide	720	EPA Tap Water	µg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
CFC-11 (Trichlorofluoromethane)	1100	EPA Tap Water	µg/L	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chloroform	0.19	EPA Tap Water	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	**0.38 J**	**0.33 J**	1.82 UB	**2.14**	0.78 UB	**0.77 J**	< 0.3	< 0.3
Isopropylbenzene (Cumene)	390	EPA Tap Water	µg/L	0.62 J	2.56	1.51	1.56	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	1.55	1.15
MTBE	12	EPA Tap Water	µg/L	2.19	7.68	1.83	2.86	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	3.03	3.67
Naphthalene	1.43	NMED Tapwater Std.	µg/L	0.74 J	1.39	1.11	1.04	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
n-Butylbenzene	780	EPA Tap Water	µg/L	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
n-Propylbenzene	- -	NE	µg/L	< 0.3	< 0.3	0.36 J	0.3 J	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethylene	5	EPA MCL	µg/L	< 0.6	< 0.6	< 0.6	< 0.6	**7.01**	**7.85**	1.42 J	4.95	**46.2**	**59.7**	< 0.6	< 0.6
Metals															
Chromium	50	NMWQCC	µg/L	7.19	< 2 U	10.4	< 2 U	**658**	**1780**	11.1	29.2 J	**26200**	**23100**	2.78 J	4.08 J
Chromium (Hexavalent)	0.031	EPA Tap Water	µg/L	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	**145**	**184**	< 8 UJ	< 8 UJ
Water Quality Parameters															
pH	6-9	NMWQCC	pH Units	7.23	6.94	7.65	7.13	7.22	7.27	7.44	7.34	7.54	7.45	7.25	7.24
Total Organic Carbon	- -	NE	µg/L	14400	26200 UB	18300	17200	809 J	1560 J	1400	759 J	1400	1330 J	25300	17000

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte detected above screening level.*
EPA = *U.S. Environmental Protection Agency.*
GW = *Groundwater.*
HELSTF = *High Energy Laser System Test Facility.*
ID = *Identification.*
J = *Estimated concentration.*
MCL = *Maximum contaminant level.*
µg/L = *Micrograms per liter.*
MTBE = *Methyl tert-butyl ether.*
NMWQCC = *New Mexico Water Quality Control Commission.*
NS = *Not Sampled.*
pH = *Measure of acidity (potential of hydrogen).*
TPH = *Total petroleum hydrocarbon.*
VOC = *Volatile organic compound.*

Table 24
Construction Details for MPL No. 3 Monitoring Wells

Well	Location Brass Cap (UTM, meters, NAD83)		Elevation Brass Cap (ft, NAVD88)	Elevation TOC (ft, NAVD88)	Total Depth (ft bgs)	Screened Interval (ft, NAVD88)
	Northing	Easting				
MPL3-MW04	3579663.22	362970.24	4081.41	4082.63	268	3839.4 – 3814.4
MPL3-MW05	3579229.16	363179.65	4057.09	4058.29	266	3812.7 – 3792.7
MPL3-MW07	3579018.26	362965.45	4060.51	4062.49	263	3827.7 – 3797.7
MPL3-MW08	3579240.45	362784.91	4077.63	4079.67	265	3833.0 – 3813.3
MPL3-MW09	3579534.93	362671.78	4092.87	4095.22	230	3887.3 – 3867.3
MPL3-MW10	3579454.69	363208.28	4064.29	4066.62	216	3873.0 – 3853.0
MPL3-MW11	3579192.75	363204.66	4054.70	4056.95	216	3863.4 – 3843.4
MPL3-MW12	3579032.12	363202.30	4047.88	4049.89	211	3861 – 3841

bgs = *Below ground surface.*
ft = *Feet.*
MPL = *Main Post Landfill.*
MW = *Monitoring well.*
NAD83 = *North American Datum of 1983.*
NAVD88 = *North American Datum of 1988.*
TOC = *Top of casing.*
UTM = *Universal transverse mercator.*

Table 25
Parameters at Time of Sampling – MPL No. 3 (March 2012)

Well	0065-MW09	0065-MW10	0065-MW11	0065-MW12
Sample Date	3/5/2012	3/7/2012	3/6/2012	3/6/2012
Temperature (°C)	21.56	22.72	24.01	24.35
pH	6.97	6.55	7.41	7.42
Conductivity (µS/cm)	0.305	0.329	0.386	0.370
Dissolved Oxygen (mg/L)	4.83	3.62	4.84	4.87
Turbidity (NTU)	.50	9.27	.91	.80
Depth to Groundwater bgs (ft)	216.94	NR	194.97	192.00

°C = *Degrees Celsius.*
µS/cm = *MicroSiemens per centimeter.*
bgs = *Below ground surface.*
ft = *Feet.*
mg/L = *Milligrams per liter.*
MPL = *Main Post Landfill.*
MW = *Monitoring well.*
NR = *Not Recorded.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*

Table 26
Analytical Results of Sampling at the MPL No. 3 (March 2012)

Constituents	Screening Level	Screening Level Source	Location ID:	0065-MW-09	0065-MW-10	0065-MW-11	0065-MW-12	0065-MW-12
			Sample Date:	3-5-12	3-7-12	3-6-12	3-6-12	3-6-12
			Unit					
TPHs								
Diesel Range Organics	400	NMED TPH Screening Guideline	µg/L	64.3 J	<50	<100 UB	<100 UB	<100 UB
Metals								
Barium	1000	NMWQCC	µg/L	78.2	89.2	86.8	80.0	80.6
Barium, Dissolved	1000	NMWQCC	µg/L	80.5	84.8	85.3	78.4	80.7
Calcium Metal	- -	NE	µg/L	28500J	31600	44000	44000	43000
Calcium, Dissolved	- -	NE	µg/L	29500	31200	43700	43500	43200
Lead	50	NMWQCC	µg/L	< 0.3 U	< 0.3 U	<0.3 U	< 0.3 U	< 0.3 U
Magnesium	- -	NE	µg/L	6690	7040	5790	5240	5070
Magnesium, Dissolved	- -	NE	µg/L	6690	6830	5360	5020	5050
Potassium	- -	NE	µg/L	1810	1660	1680	1680	1690
Potassium, Dissolved	- -	NE	µg/L	1850	1640	1600	1700	1700
Sodium	- -	NE	µg/L	21000	21900	23500	23500	23000
Sodium, Dissolved	- -	NE	µg/L	20300 J	20900	21100	22000	21900
Water Quality Parameters								
Alkalinity, Bicarbonate	- -	NE	µg/L	76800	74300	94100	113000	113000
Alkalinity, Total (As CaCO3)	- -	NE	µg/L	76800	74300	94100	113000	113000
Chloride (Cl)	250000	NMWQCC	µg/L	13200	15800	21100	16800	16800
pH	6-9	NMWQCC	pH Units	7.19	7.50	7.62	7.71	7.61
Sulfate	600000	NMWQCC	µg/L	44900	55200	54100	39900	40100
Total Organic Carbon	- -	NE	µg/L	524 J	1240	1110	384 J	399 J

< = *Less than the indicated laboratory reporting limit.*
µg/L = *Micrograms per liter.*
CaCO3 = *Calcium carbonate.*
GW = *Groundwater.*
ID = *Identification.*
MPL = *Main Post Landfill.*
MW = *Monitoring well.*
NMWQCC = *New Mexico Water Quality Control Commission.*
NE = *None Established.*
pH = *Measure of acidity (potential of hydrogen).*
TPH = *Total petroleum hydrocarbons.*

Table 27
Construction Details and Monitoring Status Former STP Percolation Ditches Monitor Wells

Well ID [a]	Type [b]	Location (UTM NAD83)		Elevation (NAVD88) Brass cap	Total Depth (ft bgs)	Screened Interval (ft bgs)	Depth Category	Sampling Frequency	Notes
MPL01	center zone	3,582,677.65N	364,991.89E	4,012.56 ft	220 ft	197-217	interface	semi-annual	Required for landfill monitoring program
MPL02	center zone	3,582,677.65N	364,991.89E	4,004.55 ft	220 ft	198-218	interface	semi-annual	Required for landfill monitoring program
MPL03	center zone	3,582,244.11N	365,303.25 E	3,997.75 ft	228.5 ft	205-225	interface	semi-annual	maintain as part of southern nested well group and required for landfill monitoring program
MPL04	center zone	3,582,316.39N	365,416.10 E	3,993.50 ft	225 ft	203-223	interface	semi-annual	Required for landfill monitoring program
MPL05	center zone	3,582,750.24N	365,637.58 E	3,991.90 ft	205 ft	182-202	interface	semi-annual	maintain as part of northeast nested well group
MPL06	zone edge	3,582,280.51N	365,887.83 E	3,975.97 ft	190 ft	167-187	interface	semi-annual	Maintain for monitoring potential eastward plume movement
MPL07	center zone	3,581,722.04N	365,583.48 E	3,983.39 ft	215 ft	182-212	interface	semi-annual	Continue
MPL10	center zone	3,582,676.54N	364,243.69 E	4,050.06 ft	275 ft	242-272	interface	semi-annual	maintain as part of northwest nested well group
MPL13	zone	3,582,902.56N	364,788.17 E	4,027.02 ft	235 ft	203-233	interface	semi-annual	Continue
MPL16	zone edge	3,581,211.72N	364,403.16 E	4,045.74 ft	255 ft	222-252	interface	semi-annual	Continue
MPL17	zone edge	3,581,265.56N	365,777.49 E	3,980.52 ft	225 ft	192-222	interface	semi-annual	Maintain for monitoring potential eastward plume movement
MPL18	zone edge	3,582,525.55N	365,999.30 E	3,976.61 ft	230 ft	197-227	interface	semi-annual	Maintain for monitoring potential eastward plume movement
MPL19	center zone	3,582,227.53N	365,324.22 E	3,995.53 ft	475 ft	452-472	deep-level	semi-annual	maintain as part of southern nested well group
MPL20	center zone	3,582,230.04N	365,313.55 E	3,996.72 ft	325 ft	302-322	mid-level	semi-annual	maintain as part of southern nested well group
MPL21	center zone	3,582,766.03N	365,648.25 E	3,992.38 ft	445 ft	422-442	deep-level	semi-annual	maintain as part of northeast nested well group
MPL22	center zone	3,582,774.96N	365,626.77 E	3,993.15 ft	310 ft	287-307	mid-level	semi-annual	maintain as part of northeast nested well group
MPL23	center zone	3,582,657.27N	364,298.94 E	4,046.48 ft	540 ft	518-538	deep-level	semi-annual	maintain as part of northwest nested well group
MPL24	center zone	3,582,665.48N	364,278.08 E	4,048.12 ft	315 ft	292-312	mid-level	semi-annual	maintain as part of northwest nested well group
MPL25	zone edge	3,581,589.59N	363,831.87 E	4,077.88 ft	275 ft	242-272	interface	semi-annual	Maintain for monitoring potential southwest plume movement
MPL26	up gradient	3,581,964.34N	363,389.40 E	4,097.89 ft	255 ft	222-252	interface	semi-annual	Keep sampling as background comparison
MPL28	center zone	3,582,005.69 N	365,494.85 E	3,988.12 ft	200 ft	175-195	interface	semi-annual	New well 2005
MPL29	zone edge	3,581,623.66 N	364,894.41 E	4,021.02 ft	225 ft	200-220	interface	semi-annual	New well 2005
MPL30	zone edge	3,581,247.14 N	365,194.09 E	4,002.18 ft	220 ft	195-215	interface	semi-annual	New well 2005
SMW01	up gradient	3,582,159.68 N	363,686.86 E	4,082.98 ft	286 ft	263-293	mid-level	semi-annual	Continue
SMW04	zone edge	3,582,108.19 N	363,929.76 E	4,068.53 ft	278.5 ft	254-284	interface	semi-annual	Continue
T40	down gradient	3,581,067.92 N	367,975.21 E	3,926.58 ft	140 ft	115-135	interface	semi-annual	(Existing RCRA-compliant) Sentinel well added down-gradient

[a]All wells are 4" diameter PVC.

[b]Center zone wells within area of zone above 0.2 mg/L total cyanide. Zone wells are those consistently within the defined zone, but outside of the 0.2 mg/L isopleth. Zone edge wells are those wells located on or near the 0.0 mg/L total cyanide isopleth.

bgs = Below ground surface.
ft = Feet.
ID = Identification.
MPL = Main Post Landfill.
NAD 83 = North American Datum of 1983.
NDVD 88 = North American Datum of 1988.
RCRA = Resource Conservation Recovery Act.
STP = Sewage treatment plant.
UTM = Universal transverse mercator.

Table 28
Former Sewage Treatment Plant Percolation Ditches Analytical Schedule

Parameter		Reference Method	Container	Maximum Hold Time	Preservative
Water Quality	Conductivity pH Temperature Dissolved Oxygen ORP Turbidity	Field measured with YSI and turbidimeter	NA	NA	NA
	Total Alkalinity pH Total Dissolved Solids Specific Conductance	310.1 150.1 160.1	1-liter polyethylene	14 days NA 7 days	Chill to 4°C
	Total Organic Carbon	415.1	40-mL VOA (2)	28 days	H_2SO_4, pH<2 Chill to 4°C
	Total Suspended Solids	160.2			
Dissolved Ions	Chloride Fluoride Sulfate	300.1	250-mL polyethylene	28 days	Field filter Chill to 4°C
Nutrients	Ammonia-N Nitrate/Nitrite Orthophosphate	350.1 Cd column 4500 SM4500	500-mL polyethylene	28 days	H_2SO_4, pH<2 Chill to 4°C

Table 28 (continued)
Former Sewage Treatment Plant Percolation Ditches Analytical Schedule

Parameter			Reference Method	Container	Maximum Hold Time	Preservative
Total Metals (RCRA 8 and TAL)	Antimony Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead	Nickel Selenium Silver Thallium Vanadium Zinc Sodium Potassium Magnesium Manganese	6010	500-mL polyethylene	6 months	HNO_3, pH<2 Chill to 4°C
	Mercury		7470A		28 days	
Cyanide	Total, free, and amenable Cyanide		9010	1-L polyethylene	14 days	NaOH, ph>12

°C = *Degrees Celsius.*
H_2SO_4 = *Sulfuric acid.*
HNO_3 = *Nitric acid.*
L = *Liters.*
mL = *Milliliters.*
NA = *Not available.*
NaOH = *Sodium hydroxide.*
ORP = *Oxidation reduction potential.*
pH = *Measure of acidity (potential of hydrogen).*
RCRA = *Resource Conservation Recovery Act.*
TAL = *Target Analyte List metal.*
VOA = *Volatile organic analysis.*

Table 29
Former Sewage Treatment Plant Percolation Ditches DTW (Summer 2012)

Well ID	Depth To Water (btoc)	Length of Casing	Ground Elevation (ft)	Groundwater Elevation (ft)
B02	dry	2	4,020.38	n/a
B03	216.06	2	4,024.44	3,806.38
B04	212.83	2	4,018.77	3,803.94
B05	195.93	2	3,998.26	3,800.33
B10	308.80	2	4,172.42	3,861.62
B51	150.25	2	3,950.12	3,797.87
MPL01	205.65	1.97	4,012.56	3,804.94
MPL02	199.17	2.91	4,004.55	3,802.47
MPL03	192.87	1.97	3,997.75	3,802.91
MPL04	188.93	2.27	3,993.50	3,802.30
MPL05	186.28	1.98	3,991.90	3,803.64
MPL06	172.23	2.08	3,975.97	3,801.66
MPL07	179.70	2.09	3,983.39	3,801.60
MPL08	248.11	1.98	4,058.48	3,808.39
MPL10	241.64	1.96	4,050.06	3,806.46
MPL-11	244.99	1.67	4,120.92	3,874.26
MPL-12	208.76	1.72	4,080.64	3,870.16
MPL13	218.68	1.82	4,027.02	3,806.52
MPL14	205.88	1.68	4,012.89	3,805.33
MPL15	243.15	1.7	4,053.93	3,809.08
MPL16	235.15	1.35	4,045.74	3,809.24
MPL17	177.14	1.14	3,980.52	3,802.24
MPL18	172.03	1.55	3,976.61	3,803.03
MPL19	194.35	1.59	3,995.53	3,799.59
MPL20	193.38	1.56	3,996.72	3,801.78
MPL21	190.26	1.2	3,992.38	3,800.92
MPL22	189.50	1.58	3,993.15	3,802.02
MPL23	243.60	2.37	4,046.48	3,800.51
MPL24	239.17	1.42	4,048.12	3,807.53

Table 29 (continued)
Former Sewage Treatment Plant Percolation Ditches DTW (Summer 2012)

Well ID	Depth To Water (btoc)	Length of Casing	Ground Elevation (ft)	Groundwater Elevation (ft)
MPL25	257.30	1.85	4,077.88	3,818.73
MPL26	217.39	1.85	4,097.89	3,878.65
MPL27	256.79	1.74	4,065.84	3,807.31
MPL28	185.03	2.53	3,988.12	3,800.56
MPL29	215.95	2.3	4,021.02	3,802.77
MPL30	199.95	2.58	4,002.18	3,799.65
SMW01	212.20	2.5	4,082.98	3,868.28
SMW02	257.42	2.5	4,073.46	3,813.54
SMW03	259.41	2.46	4,073.47	3,811.36
SMW04	254.88	2.5	4.068.53	3,811.15
T11	281.28	1.5	4,092.11	3,809.33
T29	209.02	1.9	4,018.24	3,807.32
T34	199.77	1.6	4,006.90	3,805.53
T35	216.75	1.8	4,025.70	3,807.15
T37	220.70	1.35	4,029.93	3,807.88
T40	128.78	2.44	3,968.26	3,837.04
T42	Flooded	2.04	3,921.53	n/a

bgs = *Below ground surface.*
btoc = *below top of casing.*
DTW = *Depth to water.*
ID = *Identification.*
MPL = *Main Post Landfill.*
MW = *Monitoring Well.*
n/a = *Not applicable.*

Table 30
Field Parameters from the Former STP Percolation Ditches Sampling Event

Monitor Well	Event	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Carbon Dioxide (mg/L)	Ferrous Iron (mg/L)
MPL01	Winter	21.89	57.9	0.341	4.18	2.03	8.48	8.0	0.01
MPL01	Summer	24.89	-24.4	0.377	5.19	14.70	8.02	8.0	0.01
MPL02	Winter	20.99	129.3	0.465	4.46	1.26	8.40	8.0	0.01
MPL02	Summer	24.33	-17.0	0.508	5.25	0.50	7.60	8.0	0.01
MPL03	Winter	20.22	149.0	0.565	3.67	1.00	8.04	10.0	0.00
MPL03	Summer	25.62	-12.1	0.621	4.46	3.92	7.58	14.0	0.09
MPL04	Winter	21.61	134.9	0.669	4.45	2.36	8.03	18.0	0.02
MPL04	Summer	26.24	-42.7	0.735	4.60	2.98	7.30	12.0	0.08
MPL05	Winter	21.79	3.9	0.471	5.79	0.31	7.78	8.0	0.00
MPL05	Summer	23.52	-63.1	0.430	5.69	0.10	7.05	8.0	0.00
MPL06	Winter	20.06	80.3	0.312	5.14	0.34	8.27	12.0	0.00
MPL06	Summer	24.63	-76.2	0.304	5.31	0.17	7.22	2.0	0.02
MPL07	Winter	23.22	131.6	0.866	4.09	0.21	7.97	18.0	0.02
MPL07	Summer	24.21	-43.0	0.841	4.27	0.20	6.93	12.0	0.03
MPL10	Winter	17.65	70.7	0.439	4.48	0.44	7.80	8.0	0.01
MPL10	Summer	24.95	-96.2	0.494	5.434	0.36	7.20	8.0	0.01
MPL13	Winter	18.89	15.0	0.329	5.30	5.29	8.15	8.0	0.04
MPL13	Summer	24.41	-120.5	0.365	6.103	1.52	7.37	8.0	0.03
MPL16	Winter	16.12	13.2	0.404	5.45	0.45	7.92	14.0	0.00
MPL16	Summer	24.91	-80.8	0.451	5.92	0.01	7.17	6.0	0.02
MPL17	Winter	22.61	-16.6	0.387	5.12	0.44	7.91	12.0	0.00
MPL17	Summer	23.93	-99.2	0.427	5.52	0.20	7.18	6.0	0.00
MPL18	Winter	22.47	-31.7	0.261	1.92	1.60	8.44	10.0	0.02
MPL18	Summer	23.61	-82.2	0.287	4.91	0.74	7.20	6.0	0.00
MPL19	Winter	18.23	-30.9	0.273	3.87	0.13	8.35	6.0	0.00
MPL19	Summer	25.96	-28.7	0.304	4.20	0.27	7.71	4.0	0.06
MPL20	Winter	19.22	103.8	0.549	3.95	0.19	8.40	10.0	0.02
MPL20	Summer	27.83	-35.6	0.608	4.91	0.23	7.62	10.0	0.02
MPL21	Winter	21.50	-36.3	0.266	4.22	0.34	8.00	8.0	0.03
MPL21	Summer	24.80	-24.3	0.290	3.01	0.10	7.79	8.0	0.03

Table 30 (continued)
Field Parameters from the Former STP Percolation Ditches Sampling Event

Monitor Well	Event	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Carbon Dioxide (mg/L)	Ferrous Iron (mg/L)
MPL22	Winter	16.67	-22.0	0.193	1.96	0.91	8.35	10.0	0.01
MPL22	Summer	26.98	-19.8	0.216	0.24	5.42	7.99	4.0	0.00
MPL23	Winter	20.97	-15.0	0.265	2.98	0.16	8.40	6.0	0.00
MPL23	Summer	28.96	-30.6	0.293	2.10	0.11	7.44	8.0	0.01
MPL24	Winter	17.82	83.2	0.376	1.66	0.48	8.26	8.0	0.00
MPL24	Summer	27.68	-33.5	0.415	3.05	2.33	7.71	8.0	0.00
MPL25	Winter	16.67	-3.2	0.395	1.96	2.04	8.17	6.0	0.02
MPL25	Summer	29.62	-24.7	0.443	0.47	1.4	7.54	6.0	0.02
MPL26	Winter	20.33	-38.8	1.276	6.19	2.68	7.72	16.0	0.05
MPL26	Summer	28.40	-87.4	1.405	5.23	4.01	6.59	6.0	0.10
MPL28	Winter	21.69	138.4	0.639	4.17	0.42	8.68	10.0	0.01
MPL28	Summer	26.70	-44.3	0.697	3.77	1.34	7.45	10.0	0.16
MPL29	Winter	20.72	86.3	0.614	4.54	1.75	7.85	16.0	0.02
MPL29	Summer	25.23	1.1	0.679	4.52	0.14	6.96	8.0	0.02
MPL30	Winter	14.38	82.6	0.554	5.06	1.40	7.67	10.0	0.00
MPL30	Summer	25.59	-18.5	0.625	4.76	1.93	7.02	6.0	0.05
SMW01	Winter	18.06	50.7	0.291	6.90	0.80	7.50	10.0	0.05
SMW01	Summer	31.34	-38.4	0.325	4.63	0.40	6.99	4.0	0.02
SMW04	Winter	17.70	46.5	0.307	2.96	3.65	7.85	6.0	0.03
SMW04	Summer	31.03	-45.1	0.326	5.27	0.12	7.12	6.0	0.00
T40	Winter	21.58	-29.2	0.334	4.06	0.92	7.78	6.0	0.00
T40	Summer	22.59	-79.6	0.386	5.63	0.32	7.05	16.0	0.00

°C = *Degrees Celsius.*
mg/L = *Milligrams per liter.*
MPL = *Main Post Landfill*
mS/cm = *MilliSiemens per centimeter.*
mV = *Millivolts.*
MW = *Monitoring Well.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*
STP = *Sewage treatment plant.*

Table 31
Analytical Results of Sampling at the STP Percolation Ditches (Winter 2012)

Parameter	Units	Screening Level	Screening Level Source	MPL-001 12/7/2012	MPL-002 12/6/2012	MPL-003 12/6/2012	MPL-004 12/7/2012	MPL-005 12/6/2012	MPL-006 12/10/2012	MPL-007 12/12/2012	MPL-010 12/13/2012	MPL-013 12/6/2012	MPL-016 12/10/2012	MPL-017 12/12/2012	MPL-018 12/10/2012	MPL-019 1/7/2013
Chloride	mg/L	250	NMWQCC	33.5 J	51.7 J	57.9 J	61.4 J	44.6	18.9	109	46.4	31.7	41.0	59.4	13.1	14.5
Fluoride	mg/L	1.6	NMWQCC	0.354 J	0.800 UN	0.800 UN	0.800 UN	0.286	0.320	0.123	0.300	0.0300	0.237	0.245	0.282	0.299
Nitrate and Nitrite as N	mg/L	10	EPA MCL	5.85	6.77	7.82	9.14	5.06	2.44	**11.9**	4.11	4.11	4.43	5.36	1.64	5.10
Orthophosphate	mg/L	NE	NE	0.158	0.199	0.132	0.449	0.0443	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulfate	mg/L	600	NMWQCC	39.9	72.5	111	144	52.2	36.3	129	49.5	49.5	64.7	60.5	34.3	48.4
Total Alkalinity	mg/L	NE	NE	102	103	122	148	104	91.7	114	70.7	70.7	84.7	87.1	103	89.3
Total Dissolved Solids	mg/L	1000	NMWQCC	482	330	408	508	218	218	620	326	232	302	324	208	156
Total Suspended Solids	mg/L	NE	NE	<5	<5	13.0	<5	<5	<5	<5	6.00	6.00	<5	<5	<5	<5
pH	s. u.	6.0 - 9.0	NMWQCC	7.76	7.65	7.47	7.27	7.63	7.49	7.29	7.68	7.79	7.64	7.67	7.94	7.46
Total Arsenic	mg/L	0.01	NMWQCC	0.00110	0.00354	0.00149	0.00160	0.00178	0.00136	0.00584	0.00717	0.00244	0.00280	0.00177	0.00189	0.00188
Total Barium	mg/L	1	NMWQCC	0.109	0.0622	0.0517	0.0636	0.101	0.113	0.0521	0.119	0.0912	0.0653	0.0746	0.135	0.0839
Total Cadmium	mg/L	0.01	NMWQCC	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Total Chromium	mg/L	0.05	NMWQCC	0.00336	0.00221	0.00235 J	0.00186 J	0.00260	0.00356	0.00158 J	0.00232	0.00305	0.00227	0.00185	0.00382	0.00288
Total Cobalt	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Copper	mg/L	1	NMWQCC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Lead	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	0.000546 J	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00104	<0.001
Total Mercury	mg/L	0.002	NMWQCC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.000129 J	<0.0002 UN	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.2	NMWQCC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Selenium	mg/L	0.05	NMWQCC	0.00339	0.0137	0.00568	0.00664	0.00485	0.00139	0.0236	0.0280	0.00896	0.00998	0.0454	0.00163	0.00203
Total Silver	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Thallium	mg/L	0.000365	NMED Tap Water	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Vanadium	mg/L	0.078	EPA RSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Zinc	mg/L	10	NMWQCC	<0.02	<0.02	0.0547	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Cyanide	mg/L	0.2	NMWQCC	0.162	**0.247**	**0.234**	**0.357**	0.0886	<0.01	**0.372**	**0.295**	0.128	0.105	0.0549	<0.01	<0.01
Amenable Cyanide	mg/L	0.2	NMWQCC	0.150	**0.228**	**0.220**	**0.318**	0.0861	<0.01	**0.366**	**0.292**	0.125	0.0406	0.0496	<0.01	<0.01
Weak Acid Diss Cyanide	mg/L	0.2	NMWQCC	0.0298	0.0356	0.0393	0.0419	<0.01	<0.01	0.0280	0.0317	0.0196	0.0139	<0.01	<0.01	<0.01

Table 31 (continued)
Analytical Results of Sampling at the STP Percolation Ditches (Winter 2012)

Parameter	Units	Screening Level	Screening Level Source	MPL-020 1/7/2013	MPL-021 1/9/2013	MPL-022 1/9/2013	MPL-023 1/2/2013	MPL-024 1/2/2013	MPL-025 1/10/2013	MPL-026 12/13/2012	MPL-028 12/12/2012	MPL-029 12/13/2012	MPL-030 12/10/2012	T-40 12/10/2012	SMW-01 12/26/12	SMW-04 12/26/2012
Chloride	mg/L	250	NMWQCC	76.3	19.6	12.2	12.4	36.6	52.9	160	76.1	54.1	59.8	29.1	19.0	22.0
Fluoride	mg/L	1.6	NMWQCC	0.800	0.312	0.387	0.287	0.288 J	0.215	2.00 UN	0.183	0.800 UN	0.448 J	0.159 J	0.280	0.333
Nitrate and Nitrite as N	mg/L	10	EPA MCL	8.70	1.52	1.09	1.55	5.05	8.57	5.73	8.16	6.19	7.51	2.30	5.12	2.82
Orthophosphate	mg/L	NE	NE	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.0256 J	<0.05	<0.05	0.0948	0.0517	<0.05
Sulfate	mg/L	600	NMWQCC	101	45.0	29.1	48.6	63.8	57.2	465	122	120	105	32.6	61.9	56.2
Total Alkalinity	mg/L	NE	NE	89.6	101	67.6	96.7	87.4	83.8	88.5	102	141	115	125	70.6	80.8
Total Dissolved Solids	mg/L	1000	NMWQCC	304	208	124	226	122	282	**1020**	512	448	430	302	214	236
Total Suspended Solids	mg/L	NE	NE	8	<5	6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
pH	s.u.	6.0 - 9.0	NMWQCC	7.39	7.80	8.12	7.80	7.77	7.75	7.25	7.25	7.38	8.21	8.15	7.06	7.43
Total Arsenic	mg/L	0.01	NMWQCC	0.00145	0.00250	0.00722	0.00166	0.00333	0.00155	0.0011	**0.0127**	0.00824	**0.0102**	0.00252	0.000769 J	0.000783 J
Total Barium	mg/L	1	NMWQCC	0.0734	0.0567	0.0824	0.0198	0.102	0.0683	0.0557	0.0701	0.0498	0.102	0.133	0.0759	0.0843
Total Cadmium	mg/L	0.01	NMWQCC	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Total Chromium	mg/L	0.05	NMWQCC	0.00172 J	0.00479	0.00133 J	0.00489	0.00207	0.00199	0.00336	0.00264	0.00274	0.00514	0.00615	0.00200	**0.0646**
Total Cobalt	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Copper	mg/L	1	NMWQCC	0.0107	0.00132 J	<0.002	<0.002	0.00187 J	<0.002	<0.002	<0.002	<0.002	0.00107 J	<0.002	<0.002	0.00189 J
Total Lead	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	0.000688 J	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Mercury	mg/L	0.002	NMWQCC	<0.0002	<0.0002	<0.0002	<0.0002	0.000162 J	0.000120 J	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.2	NMWQCC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.00513	<0.004	<0.004	<0.004	0.00596	<0.004	0.102
Total Selenium	mg/L	0.05	NMWQCC	0.00502	0.00120	0.00203	0.00168	0.0135	0.00534	0.00890	0.0494	0.0316	0.0368	0.00253	0.00267	0.00236
Total Silver	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Thallium	mg/L	0.000365	NMED Tap Water	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Vanadium	mg/L	0.078	EPA RSL	<0.01	<0.01	0.0189	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Zinc	mg/L	10	NMWQCC	0.0260	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Cyanide	mg/L	0.2	NMWQCC	**0.242**	<0.01	<0.01	<0.01	**0.256**	<0.01	<0.01	**0.343**	**0.351**	**0.364**	<0.01	<0.01	0.0121
Amenable Cyanide	mg/L	0.2	NMWQCC	**0.230**	<0.01	<0.01	<0.01	**0.255**	<0.01	<0.01	0.0825	**0.348**	**0.362**	<0.01	<0.01	<0.01
Weak Acid Diss Cyanide	mg/L	0.2	NMWQCC	0.0448	<0.01	<0.01	<0.01	0.0239	<0.01	<0.01	0.0615	0.0251	0.0370	<0.01	<0.01	<0.01

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte concentration exceeded the screening level.*
mg/L = *Milligrams per liter.*
MPL = *Main Post Landfill.*
MW = *Monitoring Well.*
NE = *None established.*
NMED = *New Mexico Environmental Department.*
pH = *Measure of acidity.*
s.u. = *Standard units.*
STP = *Sewage treatment plant.*
NMWQCC = *New Mexico Water Quality Control Commission.*
RSL =*Regional Screening Level*

Table 32
Analytical Results of Sampling at the STP Percolation Ditches (Summer 2012)

Parameter	Units	Screening Level	Screening Level Source	MPL-001 7/23/2012	MPL-002 7/24/2012	MPL-003 7/24/2012	MPL-004 7/23/2012	MPL-005 7/11/2012	MPL-006 7/12/2012	MPL-007 7/12/2012	MPL-010 7/10/2012	MPL-013 7/10/2012	MPL-016 7/11/2012	MPL-017 7/11/2012	MPL-018 7/11/2012	MPL-019 7/20/2012
Chloride	mg/L	250	NMWQCC	34	54.0	58.3	70.1	51.8	27.4	110	44.9	35.2	45	48.7	14.2	15.6
Fluoride	mg/L	1.6	NMWQCC	0.251	<0.2	0.173	0.220	0.307	0.272	0.143	0.208	0.258	0.26	0.231	0.285	0.388
Nitrate and Nitrite as N	mg/L	10	EPA MCL	2.99	6.74	7.48	7.88	5.34	2.53	**11.8**	5.74	5.02	5.82	5.48	1.67	2.19
Orthophosphate	mg/L	NE	NE	0.169	0.18	0.13	0.423	<0.0500	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.0500	<0.05
Sulfate	mg/L	600	NMWQCC	44.2	83.0	110	143	58.7	40.2	136	102	20	80.8	63.2	80.8	52.7
Total Alkalinity	mg/L	NE	NE	74.4	83.1	103	134	83.4	82.1	109	78	76.2	83.3	77.7	89.9	88.6
Total Dissolved Solids	mg/L	1000	NMWQCC	276	328	438	514	286	196	618	358	382	296	312	296	230
Total Suspended Solids	mg/L	NE	NE	5.5	<5	<5	<5	<5	20	12	<5	<5	<5	<5	<5	<5
pH	s.u.	6.0 - 9.0	NMWQCC	7.95	7.90	7.64	8.18	7.61	7.07	7.51	7.67	7.85	7.64	7.83	7.43	8.00
Total Arsenic	mg/L	0.01	NMWQCC	0.00187	0.00317	0.00489	0.00307	0.00145	0.00189	0.0098	0.00333	0.00133	0.0019	0.00181	0.00191	0.00187
Total Barium	mg/L	1	NMWQCC	0.104	0.0582	0.0465	0.0637	0.111	0.114	0.0565	0.123	0.0974	0.0724	0.0767	0.144	0.0757
Total Cadmium	mg/L	0.01	NMWQCC	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	**0.0628**	<0.0006	<0.006
Total Chromium	mg/L	0.05	NMWQCC	0.00357	0.00223 J	0.00214	0.00271	0.00259 J	0.00387	0.00212	0.00214	0.00261	0.00158	**0.0671**	0.0038	0.0036
Total Cobalt	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.0671**	<0.001	<0.001
Total Copper	mg/L	1	NMWQCC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00103	<0.002	<0.002	0.0637	<0.002	<0.0002
Total Lead	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	**0.0651**	<0.001	<0.001
Total Mercury	mg/L	0.002	NMWQCC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.2	NMWQCC	<0.004	0.0022	0.00333	0.0034	0.00239	0.00421	<0.004	0.00226	<0.004	<0.004	<0.004	<0.004	<0.004
Total Selenium	mg/L	0.05	NMWQCC	0.00742	0.0147	0.0236	0.0151	0.0048	0.00313	0.039	0.0147	0.0049	0.0075	0.00577	0.00209	0.00249
Total Silver	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	0.000313	<0.001	<0.001	<0.001	<0.001	**0.07**	<0.001	<0.001
Total Thallium	mg/L	0.000365	NMED Tap Water	<0.0002	<0.0002	<0.002	<0.0002	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.002	<0.0002
Total Vanadium	mg/L	0.078	EPA RSL	0.0121 J	<0.01	0.0115	0.0104	0.00684 J	<0.01	<0.01	0.00809	0.0069	<0.01	**0.504**	<0.01	0.00665 J
Total Zinc	mg/L	10	NMWQCC	<0.02	<0.02	0.0256	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.472	<0.02	<0.02
Total Cyanide	mg/L	0.2	NMWQCC	**0.201**	**0.336**	**0.341**	**0.389**	0.181	<0.01	**0.394**	**0.24**	0.119	0.0927	**0.293**	<0.01	<0.01
Amenable Cyanide	mg/L	0.2	NMWQCC	**0.2**	**0.335**	**0.340**	**0.389**	0.179	<0.01	0.195	**0.239**	0.117	0.0909	**0.291**	<0.01	<0.01
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC	0.0162	0.0263	0.0307	0.0339	0.0135	<0.01	0.03	0.0371	0.0208	0.0146	0.225	<0.01	<0.01

Table 32 (continued)
Analytical Results of Sampling at the STP Percolation Ditches (Summer 2012)

Parameter	Units	Screening Level	Screening Level Source	MPL-020 7/20/2012	MPL-021 7/19/2012	MPL-022 7/19/2012	MPL-023 7/17/2012	MPL-024 7/18/2012	MPL-025 7/19/2012	MPL-026 7/12/2012	MPL-028 7/23/2012	MPL-029 7/13/2012	MPL-030 7/13/2012	T-40 7/12/2012	SMW-01 7/18/12	SMW-04 7/18/11
Chloride	mg/L	250	NMWQCC	80.0	12.6	14.5	13.4	41.9	48.5	166	88.2	58.4	63.7	30.8	19.1	24
Fluoride	mg/L	1.6	NMWQCC	0.186	0.316	0.377	0.327	0.25	0.211	<2	0.181	0.136	0.228	0.175	0.284	0.292
Nitrate and Nitrite as N	mg/L	10	EPA MCL	7.41	1.75	1.34	1.53	3.95	4.81	7.46	7.48	7.51	9.29	2.38	2.73	3.1
Orthophosphate	mg/L	NE	NE	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.0853	<0.05	<0.05
Sulfate	mg/L	600	NMWQCC	102	49.8	30.7	54.7	71.3	57.8	499	131	127	111	35.8	63.5	58.3
Total Alkalinity	mg/L	NE	NE	84.6	75.9	57.5	87.5	69.2	80.7	66.4	80.8	143	113	109	67.6	73.7
Total Dissolved Solids	mg/L	1000	NMWQCC	460	202	130	206	266	328	**1140**	612	552	462	266	210	228
Total Suspended Solids	mg/L	NE	NE	<5	<5	9	<5	<5	<5	50	<5	<5	<5	<5	<5	<5
pH	s.u.	6.0 - 9.0	NMWQCC	7.77	7.89	8.42	8.16	7.88	7.88	7.36	7.77	7.57	7.60	7.69	7.14	7.53
Total Arsenic	mg/L	0.01	NMWQCC	0.00313	0.00262	0.00821	0.00187	0.0016	0.000924	0.00251	0.00447	0.00491	0.00616	0.00296	<0.001	0.000535
Total Barium	mg/L	1	NMWQCC	0.0653	0.0541	0.088	0.0186	0.0912	0.0664	0.0571	0.0725	0.0466	0.0961	0.136	0.0684	0.075
Total Cadmium	mg/L	0.01	NMWQCC	<0.006	<0.0006	<0.006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Total Chromium	mg/L	0.05	NMWQCC	0.00231	0.00393	<0.002	0.00484	0.00204	0.00141 J	0.00292	0.00334	0.00194	0.00424	0.00642	<0.002	0.0236
Total Cobalt	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Copper	mg/L	1	NMWQCC	<0.002	<0.002	0.00215	<0.002	<0.002	<0.002	0.00241	<0.002	<0.002	0.00139	<0.002	<0.002	0.00247
Total Lead	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Mercury	mg/L	0.002	NMWQCC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.2	NMWQCC	0.00374	<0.004	<0.004	<0.004	<0.004	<0.004	0.00821	0.00297	0.00394	<0.004	0.00645	<0.004	0.106
Total Selenium	mg/L	0.05	NMWQCC	0.0156	0.00197	0.00224	0.00217	0.0067	0.00362	0.00143	**0.0215**	0.0233	0.0262	0.00423	0.00215	0.00231
Total Silver	mg/L	0.05	NMWQCC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.001
Total Thallium	mg/L	0.000365	NMED Tap Water	<0.0002	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Total Vanadium	mg/L	0.078	EPA RSL	<0.01	0.0109	0.0213	0.00715	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00674 J
Total Zinc	mg/L	10	NMWQCC	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Cyanide	mg/L	0.2	NMWQCC	**0.304**	<0.01	<0.01	<0.01	**0.209**	<0.01	<0.01	**0.387**	**0.283**	**0.291**	<0.01	<0.01	<0.01
Amenable Cyanide	mg/L	0.2	NMWQCC	**0.304**	<0.01	<0.01	<0.01	<0.0100	<0.01	<0.01	0.385	**0.281**	**0.289**	<0.01	<0.01	<0.01
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC	0.0365	<0.01	<0.01	<0.01	0.0205	<0.01	<0.01	0.0427	0.0204	0.0288	<0.01	<0.01	<0.01

< = *Less than the indicated laboratory reporting limit.*
Bold = *Analyte concentration exceeded the screening level.*
mg/L = *Milligrams per liter.*
MPL = *Main Post Landfill.*
MW = *Monitoring Well.*
NE = *None established.*
NMED = *New Mexico Environmental Department.*
pH = *Measure of acidity.*
s.u. = *Standard units.*
STP = *Sewage treatment plant.*
NMWQCC = *New Mexico Water Quality Control Commission.*

Appendix A
Field Methods

The following Zia Standard Operating Procedures were used to guide the field programs described herein.

SOP 1	• Quality Control Program
SOP 1.0	- Procedure Information
SOP 1.1	- Chain of Custody
SOP 1.2	- Field Activity Documentation
SOP 2	• Sample Handling, Packing, and Shipping
SOP 2.0	- Procedure Information
SOP 2.1	- Sample Labeling
SOP 2.2	- Sample Numbering
SOP 2.3	- On-Site Sample Storage
SOP 4	• Calibration and Maintenance of Measuring and Test Equipment
SOP 4.0	- Procedure Information
SOP 4.1	- Field Instrument
SOP 5	• Water Level Measurements in Monitoring Wells
SOP 5.0	- Procedure Information
SOP 5.1	- Nonaqueous Phase Liquid Measurements in Monitoring Wells
SOP 6	• Field Equipment Decontamination
SOP 6.0	- Procedure Information
SOP 6.1	- Drilling, Development, and Heavy Equipment Decontamination
SOP 9	• Groundwater Sampling
SOP 9.0	- Procedure Information
SOP 9.1	- Cone Penetration Testing and Hydropunch Groundwater Sampling
SOP 9.2	- Surface Water Sampling
SOP 9.3	- Low-Flow Ground Water Sampling
SOP 13.0	• Field Quality Control Sampling
SOP 14.0	• Management of Investigation-Derived Waste
SOP 15.0	• Preparation, Revision, and Approval of Plans and Procedures
SOP 16.0	• Quality Inspections and Inspection Records

Appendix B
Chemical Analytical Program

139791. RD0110 • Final • July 2013 • ACA08-045

Chemical Analytical Program

Purpose

Zia Engineering and Environmental Services (Zia) follows standard practices from guidance promulgated by the US Environmental Protection Agency (EPA), the New Mexico Environmental Department, ASTM International , and others to ensure that data collected for decision making purposes is of appropriate quality and quantity to provide decision makers with sufficient environmental data. Zia uses the following general procedure when performing environmental investigations:

- determine appropriate Data Quality Objectives ,
- coordinate planned sampling within regulatory timeframes and White Sands Missile Range (WSMR) testing activities,
- collect environmental samples following accepted procedures,
- evaluate analytical data, and
- report the results to WSMR decision makers and appropriate regulatory bodies.

Analytical Laboratories

In order to meet the accepted analytical instrumentation and techniques including Quality Assurance/Quality Control (QA/QC) practices as described in EPA's SW-846, Zia utilizes laboratories which have attained certification through organizations such as the National Environmental Laboratory Accreditation Program or equivalent.

Data Validation

Upon receipt of analytical results, the Zia supervising engineer or scientist evaluates the data for completeness and applicability based on holding times, method and field blanks, comparison of field duplicates, trip blanks, matrix spike/matrix spike duplicate, and other laboratory QA results. If duplicates display an acceptable degree of agreement the results are averaged and the mean value reported. If the analytical data does not demonstrate an acceptable degree of quality and usefulness, the laboratory will be contacted to help determine the cause of any flaw and an appropriate response. Data quality consists of accuracy, precision, completeness, representativeness, and comparability.

References

Although not a complete list, the following documents provide applicable guidance regarding environmental sampling and analysis performed by Zia:

Data Quality Objectives

- U.S. Environmental Protection Agency , August 2000. *Guidance for the Data Quality Objectives Process,* EPA QA/G-4.

Groundwater Monitoring Systems and Sampling

- ASTM International, September 1998. *Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs* D 6312-98. West Conshohocken, Pennsylvania.
- ASTM International, July 2002. *Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers* D 5092-02. West Conshohocken, Pennsylvania.

- ASTM International, March 2002. *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations* D 6771-02. West Conshohocken, Pennsylvania.
- New Mexico Environmental Department – Hazardous Waste Bureau , October 2001. Position Paper - *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring*, Santa Fe, New Mexico.

Analytical Methods

- US Environmental Protection Agency, SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, available online at http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm

- Standard Methods for the Examination of Water & Wastewater, 21st Edition, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. 2005.

- US Environmental Protection Agency, EPA 821/C-99-004. EPA Methods and Guidance for the Analysis of Water, Version 2.0. June 1999.

- US Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes (MCAWW) Revised March 1983.

Evaluation of Analytical Data

- ASTM International, October 2000. *Standard Guide for Ranked Set Sampling: Efficient Estimation of a Mean Concentration in Environmental Sampling* D 6582-00. West Conshohocken, Pennsylvania.
- New Mexico Environmental Department – Solid Waste Bureau , October 1995. *New Mexico Solid Waste Management Regulations (20.9.1 NMAC)*, Santa Fe, New Mexico.
- New Mexico Environmental Department – Water Quality Control Commission , December 1995. *Ground and Surface Water Protection (20.6.2 NMAC)*, Santa Fe, New Mexico.
- U.S. Environmental Protection Agency , Winter 2004. *EPA 2004 Edition of the Drinking Water Standards and Health Advisories,* EPA 822-R-04-005.

Reporting

- New Mexico Environmental Department – Hazardous Waste Bureau , February 2003. Position Paper – *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites*, Santa Fe, New Mexico.
- New Mexico Environmental Department – Hazardous Waste Bureau Ground Water Quality Bureau and Voluntary Remediation Program, February 2004. *Technical Background Document for Development of Soil Screening Levels, Revision 2.0*, Santa Fe, New Mexico.

Appendix C
Data
(on DVD only)

Appendix D
Inspection Reports
Rhodes Canyon

Rhodes Canyon Landfill Inspection Form
Post Closure Care Monitoring of the Soil Cover

Inspections during the post closure care period are to occur semi-annually and shall include, at a minimum, each of the areas listed below. Specific information can be found in the CMI Work Plan for Rhodes Canyon Landfill (WSMR-14, SWMU 114 &115) Report No. WS-ES-EC-0311. Copies of this inspection form are to be kept in a bound notebook located at the WS-ES library and the WTS office.

Date of Inspection: 4/5/2012 **Inspector:** BRAD DAVIS, ALLISON JOINESS

	Yes	No
1. Gate closed?	☑	☐
2. Gate locked?	☑	☐
3. If gate not locked, is lock present? (LOCKED)	☑	☐
4. Walked fence line and inspected for breaches or deterioration?	☑	☐
5. Inspected landfill cover swale for erosion damage?	☑	☐
6. Inspected surrounding natural drainages for excessive erosion which may impact fence or landfill cap?	☑	☐
7. Has any solid waste been uncovered at the landfill site?	☐	☑

	Satisfactory	Unsatisfactory
5. Fence in condition		
a. Fence	☑	☐
b. Gates	☑	☐
c. Signs	☑	☐
d. Fence clear of trash	☑	☐
6. Groundwater monitoring well conditions		
a. Wells locked	☑	☐
b. Concrete pad condition	☑	☐
c. Well covers tight	☑	☐
7. Cap condition		
a. Traffic on cap	☑	☐
b. Excessive weed growth on or around cap (natural vegetation such as grasses and forbs are acceptable and desirable)	☑	☐
c. No visible ponding of precipitation cap	☑	☐
d. Lack of erosion	☑	☐
e. Settlement of cap	☑	☐
f. Animal activity	☑	☐
g. Trash on cap	☑	☐

Inspector's Signature: Allison Joiness Brad T. Davis

Re-inspection date, if necessary: _____

Rhodes Canyon Landfill Inspection Form
Post Closure Care Monitoring of the Soil Cover

Date of Inspection: 4/5/2012 **Inspector:** BRAD DAVIS, ALLISON JENNESS

Comments:

SOME MINOR ANIMAL BURROWING OCCURRING NEAR CHANNEL. Very little erosion was observed as compared to previous inspection. Did not appear to have much runoff since last inspection.

Actions Taken:

ATTEMPTED TO COVER ANIMAL BURROWS

NO Additional work on cap is warranted at this time.

- ✓ All unsatisfactory observations are to be immediately reported to the WSMR Environmental Services Division.
- ✓ All unsatisfactory observations must be fixed and re-inspected within 30 days.
- ✓ One copy of this inspection form will be maintained in bound notebook at ~~WTS~~ Zia office for three years from the date of inspection.
- ✓ One copy of this inspection form shall be kept on file with the WSMR Environmental Services Division for the remainder of the post-closure care period.
- ✓ Cap and well repairs will be conducted with the same materials and construction techniques used during the initial construction. Any modifications to these techniques or materials must be approved in writing by the NMED-HWB.

Rhodes Canyon Landfill Inspection Form
Post Closure Care Monitoring of the Soil Cover

Inspections during the post closure care period are to occur semi-annually and shall include, at a minimum, each of the areas listed below. Specific information can be found in the CMI Work Plan for Rhodes Canyon Landfill (WSMR-14, SWMU 114 &115) Report No. WS-ES-EC-0311. Copies of this inspection form are to be kept in a bound notebook located at the WS-ES library and the WTS office.

Date of Inspection: 8-22-12 **Inspector:** Bradley Davis

	Yes	No
1. Gate closed?	☑	☐
2. Gate locked?	☑	☐
3. If gate not locked, is lock present?	☐ N/A	☐
4. Walked fence line and inspected for breaches or deterioration?	☑	☐
5. Inspected landfill cover swale for erosion damage?	☑	☐
6. Inspected surrounding natural drainages for excessive erosion which may impact fence or landfill cap?	☑	☐
7. Has any solid waste been uncovered at the landfill site?	☐	☑

	Satisfactory	Unsatisfactory
5. Fence in condition		
a. Fence	☑	☐
b. Gates	☑	☐
c. Signs	☑	☐
d. Fence clear of trash	☑	☐
6. Groundwater monitoring well conditions		
a. Wells locked	☑	☐
b. Concrete pad condition	☑	☐
c. Well covers tight	☑	☐
7. Cap condition		
a. Traffic on cap	☑	☐
b. Excessive weed growth on or around cap (natural vegetation such as grasses and forbs are acceptable and desirable)	☑	☐
c. No visible ponding of precipitation cap	☑	☐
d. Lack of erosion	☑	☐
e. Settlement of cap	☑	☐
f. Animal activity minor	☑	☐
g. Trash on cap	☑	☐

Inspector's Signature: Bradley T. Davis

Re-inspection date, if necessary: _____

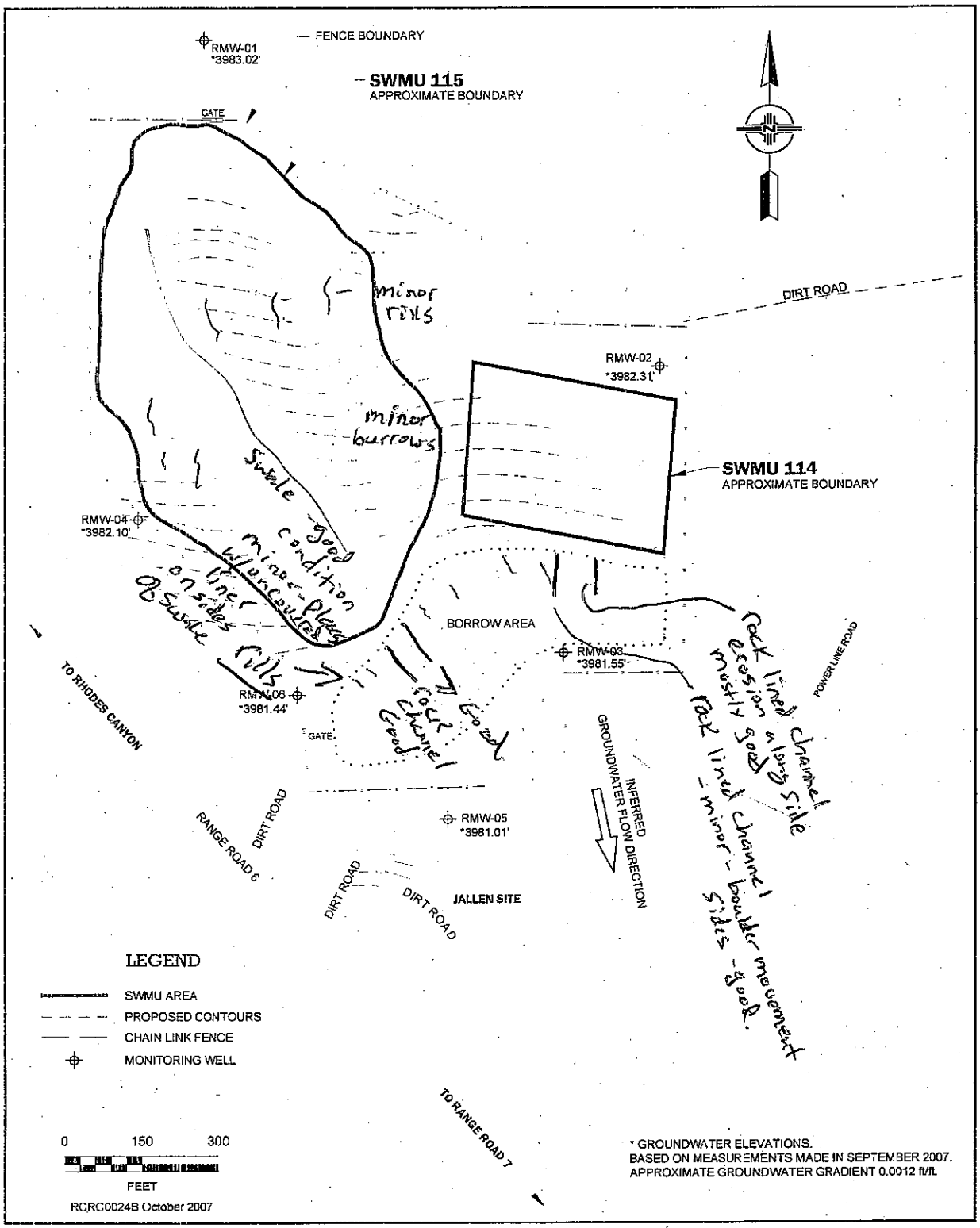
Rhodes Canyon Landfill Inspection Form
Post Closure Care Monitoring of the Soil Cover

Date of Inspection: 8-22-12 **Inspector:** Bradley Davis

Comments: rills forming on borrow pit - slope.
minor rills on cap. - some burrowing.
Fence in good condition. Vegetation looks - good.
Some erosion along sides of channels (rock lined)

Actions Taken: Recommend - fixes to cap following monsoon season - Cover rills to keep from forming gullies on north slope of borrow pit and on cap. fill in burrows

- ✓ All unsatisfactory observations are to be immediately reported to the WSMR Environmental Services Division.
- ✓ All unsatisfactory observations must be fixed and re-inspected within 30 days. Zia
- ✓ One copy of this inspection form will be maintained in bound notebook at ~~WPS~~ office for three years from the date of inspection.
- ✓ One copy of this inspection form shall be kept on file with the WSMR Environmental Services Division for the remainder of the post-closure care period.
- ✓ Cap and well repairs will be conducted with the same materials and construction techniques used during the initial construction. Any modifications to these techniques or materials must be approved in writing by the NMED-HWB.


RMW-01
*3983.02'
FENCE BOUNDARY
SWMU 115
APPROXIMATE BOUNDARY
GATE
minor rills
DIRT ROAD
RMW-02
*3982.31'
minor burrows
SWMU 114
APPROXIMATE BOUNDARY
RMW-04
*3982.10'
Stable good condition minor - plugs w/ uncovered liner on side
Obstable rills
BORROW AREA
RMW-03
*3981.55'
Rock lined channel erosion along side mostly good
Rock lined channel - minor - boulder movement sides - good.
POWER LINE ROAD
TO RHODES CANYON
RMW-06
*3981.44'
GATE
Good rock channel Good
INFERRED GROUNDWATER FLOW DIRECTION
RANGE ROAD 6
DIRT ROAD
RMW-05
*3981.01'
DIRT ROAD
DIRT ROAD
JALLEN SITE
LEGEND
SWMU AREA
PROPOSED CONTOURS
CHAIN LINK FENCE
MONITORING WELL
0
150
300
FEET
RCRC0024B October 2007
TO RANGE ROAD 7
* GROUNDWATER ELEVATIONS.
BASED ON MEASUREMENTS MADE IN SEPTEMBER 2007.
APPROXIMATE GROUNDWATER GRADIENT 0.0012 ft/ft.