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

September 15, 2014

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Environmental Division

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SEP 22 2014

Hazardous Waste Bureau

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

Dear Mr. Kieling:

Enclosed is a document submittal titled: *2013 Long-Term Monitoring Program Report, Multiple Sites: SWMUs 114, 115, SWMU 143, SWMU 154, SWMUs 55, 56, 56A, SWMU 82, SWMU 197, SWMUs 38, 39, SWMU 65 White Sands Missile Range, New Mexico, August 2014.*

This report addresses groundwater monitoring activities at White Sands Missile Range (WSMR) sites during the calendar year 2013. Laboratory analytical data for all sites with groundwater monitoring requirements are included in the enclosed CD.

Three Notices of Disapproval letters were received by WSMR for Long-Term Monitoring Reports covering years 2008 through 2010; 2011; and 2012. All general comments and specific comment numbers 3, 5, 15, 21, 31, 45, 48 and 49 from the March 26, 2014 Disapproval (WSMR-12-001, WSMR-12-002, WSMR-12-003) are addressed in this 2013 Report. The remaining comments along with the 2011 and 2012 Disapprovals (WSMR-12-07 and WSMR-13-010) will be addressed in future long-term groundwater monitoring reports.

"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."

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

I am forwarding a copy of this letter with enclosure (1 print copy with CD) to Ms. Kristen Van Horn, NMED-HWB; and without enclosure to Ms. Neelam Dhawan, NMED-HWB; Mr. Dave Cobrain, NMED-HWB; Mr. Paul Torcoletti, EPA Region 6; Mr. Robert Rowden, AEC; and Mr. Sudhakar Matlapudi, CB&I.

Sincerely,

Jose A. Gallegos
Chief, Environmental Division

Enclosure

Final
2013 Long-Term Monitoring Program Report

Multiple Sites:
SWMUs 114, 115, SWMU 143, SWMU 198, SWMU 154, SWMUs 55, 56, 56A, SWMU 82, SWMU 197, SWMUs 38, 39, SWMU 65

White Sands Missile Range

August 2014

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14. ABSTRACT

This report serves to document the status of groundwater monitoring and other activities taking place during calendar year 2013 at nine 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 Identification 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.

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Final
2013 Long-Term Monitoring Program Report
Multiple Sites:
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White Sands Missile Range, New Mexico
ACA08-047

August 2014

Prepared for:

U.S. Army Garrison White Sands
Directorate of Public Works, Environmental Division
White Sands Missile Range, NM 88002-5048

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ABSTRACT

This report serves to document the status of groundwater monitoring and other activities taking place during calendar year 2013 at nine 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 Identification 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.

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Acronyms and Abbreviations

µg/L	microgram 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
CB&I	CB&I Federal Services, LLC
CCWS	Compliance/Cleanup Program for White Sands Missile Range
CD	compact disc
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	contaminant of concern
DAF	dilution attenuation factor
DRO	diesel range organics
DTW	depth to water
EPA	U. S. Environmental Protection Agency
GRO	gasoline range organics
HELSTF	High-Energy Laser Systems Test Facility
HTA	Hazardous Test Area
HWB	(NMED) Hazardous Waste Bureau
ID	identification
IRP	Installation Restoration Program
ISEB	in-situ enhanced bioremediation
L/min	liter per minute
LC	Launch Complex
LDU	Land Disposal Unit (NMED designation)
LNAPL	light non-aqueous phase liquid
MEVATEC	Mesilla Valley High Tech Industries
mg/L	milligram per liter
mL/min	milliliter per minute
MNA	monitored natural attenuation
MPL	Main Post Landfill
MTBE	methyl tert butyl ether
MW	monitoring well
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
No.	number
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

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Acronyms and Abbreviations (continued)

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
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSA	Technical Support Area
U.S.	United States
VEDRS	vacuum-enhanced diesel recovery system
VOC	volatile organic compound
WSMR	White Sands Missile Range
WTS	White Sands Technical Service

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1.0 INTRODUCTION

This 2013 Long-Term Monitoring Program Report serves to document the status of groundwater monitoring and other activities completed during calendar year 2013 at nine 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. Standard operating procedures used as field method guidance are listed in Appendix A, "Field Methods." Chemical analytical procedures and requirements are addressed briefly in Appendix B, "Chemical Analytical Program." Complete analytical data sets and field notes from each event are provided on the data compact disc (CD) as Appendix C, "Analytical Data and Field Documentation." Historical long-term groundwater monitoring data from 2010 onward for each site addressed in this Report has also been added to Appendix C.

1.1 Background

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WSMR is an active installation serving as the U.S. Army's (Army) largest rocket and missile development, firing, and testing facility. It is a major center for the testing of new missile systems. WSMR is the largest land area military installation in the United States, comprised of 3,200 square miles of land in Doña Ana, Sierra, Socorro, Lincoln, and Otero Counties, New Mexico. The installation is approximately 99 miles long (north to south) and 25 to 40 miles wide (east to west) (WTS, 2006).

WSMR functions as an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas, and instrumentation sites required to develop and test tactical and strategic weapons and weapons systems. WSMR is designated as a national range whose mission is the support of missile development and other test programs for the U.S. Army, U.S. Navy, U.S. Air Force, National Aeronautics and Space Administration, and other government agencies.

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.

1.2 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). 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 CD (Appendix C).

1.2.1 Low-Flow Purging Techniques

At sites where low-flow purging techniques were used, 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, 2001).

Groundwater purging and sampling will be conducted according to the following general steps:

1. Measure water levels (recorded to the nearest 0.01 foot) prior to purging in each monitoring well. Water levels should be monitored at 5-minute intervals during purging to ensure that minimal drawdown is occurring in the well during the purge event.
2. Begin purging the well at a predetermined low-flow rate based on site- and well-specific characteristics. If the water-yielding capability of the well is unknown, low-flow purging can be initiated at approximately 100 milliliters per minute (mL/min), (0.1 liter per minute [L/min]), and the drawdown measured. Based on the results, the purging rate may be increased incrementally up to approximately 500 mL/min (0.5 L/min), but will not exceed 1 L/min.
3. Monitor indicator parameters at least every 5 minutes until stabilization is achieved. The well is considered to be stable when the indicator parameters have stabilized over three consecutive readings spaced a minimum of 5 minutes apart.
4. Collect groundwater samples if minimal drawdown is achieved during purging. If the well consistently purges dry, an alternate purge method will be necessary.

1.2.2 Investigative-Derived Waste

Purge water generated during each of the sampling events has been containerized, characterized, and relinquished to the WSMR Hazardous Waste Management Center for disposal. Waste manifests are included with the field documentation and organized by site in Appendix C.

1.3 Regulatory Criteria and Status

The regulatory status of the various WSMR sites is presented in the site-specific sections of this Report. 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.

1.4 Remediation System Monitoring and Additional Site Activities

There are no active remediation systems at any of the sites currently under long-term monitoring requirements.

The Rhodes Canyon Landfill (SWMUs 114 and 115) has two landfill cap inspections completed every year; repairs are also completed as needed based on inspections. Landfill cap inspections and repairs are documented in Appendix D, “Inspection Reports Rhodes Canyon.”

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2.0 LAUNCH COMPLEX 38 DIESEL SPILL (SWMU 198)

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 10 soil borings at LC-38. Soil samples were analyzed for total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Four monitoring wells were installed at the site in November 2003, as shown on Figure 2. Construction details are provided in Table 2.

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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 feet below ground surface (bgs) to 110 feet 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 the flood stage.
- **Intermixed Facies.** The intermixed facies, located from approximately 82 feet bgs to 100 feet 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 overbank 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 feet bgs to 82 feet 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 the flood stage.
- **Intermixed Facies.** This intermixed facies, located from approximately 33 feet bgs to 60 feet 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 feet 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 recommends continued annual groundwater monitoring until such time that data demonstrate stable or declining dissolved concentrations and the NMED approves a cessation of the Long-Term Monitoring program.

2.1 Scope of Services

On August 27 and 28 2013, groundwater samples 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 233.96 feet bgs, 238.49 feet bgs, 237.23 feet bgs, and 237.09 feet 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 3. Figure 3 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 4. DRO was detected in all of the wells with a highest concentration of 173 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 1,030 µg/L, which is above the NMWQCC standard of 50 µg/L for chromium. 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.

2.2 Regulatory Criteria

Long-term monitoring requirements of groundwater at this site are discussed in a direction letter from NMED dated December 5, 2007, (NMED, 2007a). NMED evaluated a SWMU Assessment Report for this site and responded in a letter dated October 13, 2006 that this site required additional characterization of contamination (NMED, 2006a). WSMR proposed annual groundwater monitoring for 10 years at this site. NMED stated in their letter that 10 years of monitoring may not be sufficient. WSMR will continue to monitor groundwater at this site longer than 10 years per NMED request.

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. An Administratively Incomplete Determination was received from NMED on the petition dated October 11, 2011. WSMR submitted a revised petition in July 2013 and is currently under NMED review.

2.3 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.

2.4 Remediation System Monitoring and Additional Site Activities

There are no remediation systems or other site activities occurring at this time.

2.5 Summary

Water-level measurements and investigation for free product in the site's monitoring wells were accomplished in August 2013. 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.

3.0 OPEN BURN/OPEN DETONATION AREA (SWMUs 55, 56, AND 56a)

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 used 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 4). 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 January 12, 2000 letter, instructed WSMR to cease using the unit by December 31, 2000. The last detonation at the OD pits occurred on November 30, 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)* (Mesilla Valley High Tech Industries [MEVATEC], 2002). WSMR submitted a Closure Certification to NMED on November 4, 2002.

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Geology at the OB/OD site is generally characterized by three primary features. A relatively thin soil profile—5 to 10 feet 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 feet. 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 feet and 99 feet, based on borehole logs. In addition, based on drilling conducted within the east detonation pit, unique cuttings that were produced from the 89- to 99-foot interval indicated the presence of a fault that crosses the area in the northwest-southeast direction. A network of 12 wells is currently used for ongoing groundwater monitoring at the OB/OD. Table 5 lists construction details for these wells. Additional wells in the area of the OB/OD are measured during biannual water levels and are used for generation of the potentiometric surface maps at this site.

The OB/OD is listed in the NMED Annual Fee Letter (NMED, 2013), 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.

3.1 Scope of Services

WSMR is currently monitoring the Hazardous Test Area (HTA) wells associated with these SWMUs on a semi-annual schedule. Twelve monitoring wells were sampled for two semi-annual events on May 7 through 15, 2013 and October 18 through 24, 2013. Field parameters measured at the time of sample collection are included in Table 6. Figure 5 shows the potentiometric surface at the site.

3.2 Regulatory Criteria

The OB/OD site is listed in WSMR's permit requiring further investigations and post closure care. A Final Post-Closure Care Plan with an investigation work plan (Shaw Environmental, Inc. [Shaw], 2011a) was submitted in January 2011, and an NOD was received from NMED in November 2011. As a result of comment resolution, the investigation work plan was submitted separately for supplemental investigations in February 2012. NMED approved the work plan in October 2012. The supplemental investigation was completed, and an investigative report was submitted to NMED in 2013 (Shaw [a CB&I Company], 2013a) and is currently under NMED review.

3.3 Groundwater Monitoring Results

Long-term monitoring requirements of groundwater at this site are discussed in the Revised Final Investigation Work Plan for the OB/OD site on page 2-10, Section 2.5, paragraph 3 (Shaw, 2012). This document was approved in a letter from NMED dated October 12, 2012 (NMED, 2012a).

The contaminants of concern (COCs) for the OB/OD site are RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine, an explosive compound), nitrate, and perchlorate. Table 7 and Figure 6 summarize results for these three COCs. The maximum RDX concentration was 86.8 µg/L from the October 2013 sample at HTA 10A, and 13 of the 24 samples collected in May and October exceeded the 6.11 µg/L screening level. The maximum perchlorate concentration was 17,000 µg/L from the May 2013 sample at HTA 15, and 22 of the 24 samples collected in May and October exceeded the 4 µg/L screening level. The maximum nitrate concentration was 24.7 milligrams per liter (mg/L) from the May 2013 sample at HTA 19, and 7 of the 24 samples collected in May and October 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 2013 sampling events are presented in Appendix C.

3.4 Remediation System Monitoring and Additional Site Activities

The supplemental investigation (Shaw [a CB&I company], 2013a) included soil sample collection, bench-scale testing, and hydraulic testing of the aquifer. The soil sampling results from the investigation indicated the presence of perchlorate and explosives but at concentrations significantly below NMED residential soil screening levels (NMED, 2012b).

The in-situ enhanced bioremediation (ISEB) bench-scale testing indicated that ISEB with various carbon sources significantly degraded (greater than 90 percent reduction) the COCs in groundwater over the 12-week test period. The design of the ISEB system, estimated duration, and quantity of additives will be defined in the Post Closure Care Plan (Shaw, 2011a).

The aquifer testing indicated the aquifer had a low hydraulic conductivity on the order of 1 × 10E-4 centimeter/second, (1 to 2 feet per day), which WSMR will incorporate into the design of the groundwater remediation system.

3.5 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. Supplemental investigation of the site was completed in 2013 with results being incorporated into the design of the remediation system.

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4.0 HIGH-ENERGY LASER SYSTEMS TEST FACILITY TECHNICAL SUPPORT AREA SPILL (SWMU 197)

The High-Energy Laser Systems Test Facility (HELSTF) is located on WSMR approximately 18.5 miles northeast of the Main Post, and 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 Technical Support Area (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 other test facilities that contain more hazardous materials. A 3,000-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 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.

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WSMR investigated the TSA site during May and June 2000, at which time three monitoring wells were installed. During the investigation, two water-bearing zones were encountered. The first zone, located approximately 34 feet bgs, is perched in nature and laterally discontinuous. The second water-bearing zone encountered is the regional groundwater table located approximately 90 feet bgs. The regional aquifer is in unconsolidated silty sands and moderately sorted sand layers. Contamination reached approximately 30 feet bgs with maximum concentrations encountered near a depth of 17 feet bgs. WSMR used 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 feet bgs. Below that, fine sands and clays become the predominant lithology in the form of 1- to 4-foot-thick silty sands with interstitial clays. Between 30 to 35 feet 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 monitoring wells and three of the SVE 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 feet in thickness 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 feet and ending around 89 to 90 feet.

The regional aquifer exists at approximately 90 feet 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 foot per foot. Four regional groundwater monitoring wells exist at the site as well as 10 additional shallow wells screened in the perched aquifer or as soil-vapor wells. Construction details are provided in Table 8. Site features are shown on Figure 7.

4.1 Scope of Services

WSMR proposed continued compliance monitoring of the existing groundwater monitoring wells in the RCRA Facility Investigation (RFI) Report (BAE Systems, 2004a) as a precautionary measure to ensure 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 monitoring wells completed in the regional aquifer. During calendar year 2013, groundwater samples were analyzed for BTEX and for methyl tert butyl ether (MTBE) by EPA Method 8260B. Collected water-level data were used to generate the potentiometric surface of the regional aquifer (Figure 8). Water levels are presented in Table 9.

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 197).

WSMR submitted the RFI Report (BAE Systems, 2004a) to NMED Hazardous Waste Bureau (HWB) during 2006, and received review comments in November 2006 (NMED, 2006b). Among the comments was a request that the corrective measure (discussed in Section 4.4 below) be reinstated, since "gasoline was still present in the subsurface." A Corrective Measures Implementation (CMI) Work Plan (White Sands Technical Service [WTS], 2007a) was submitted to the NMED for review in September 2007. Long-term monitoring requirements of groundwater at this site are discussed in the RFI Report in Section 9.0 on page 36 (BAE Systems, 2004a), and in the Final CMI Work Plan for HELSTF TSA on page 19 (WTS, 2007a). The CMI Work Plan was approved by NMED in a letter dated January 16, 2008 (NMED, 2008b).

In 2009, supplemental soil and groundwater monitoring was conducted in preparation for implementing the CMI Work Plan (WTS, 2007a). After evaluating the success of the SVE in remediating the upper 25 feet 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 to further evaluate the viability of the proposed remedy

(SVE with air sparging or biosparging). Results of the supplemental work conducted in 2009 concluded that the proposed remedy would not be effective and were documented in a status report submitted to the NMED in March 2011 (ARCADIS, 2011b). An NOD dated April 11, 2012 was received from NMED on the Status Report requiring WSMR to further address the contaminants in the vadose zone. NMED stated that the proposed work within the CMI Work Plan was not completed.

4.3 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.

Groundwater sampling was conducted at HELSTF TSA on September 5, 2013. Monitoring 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.

Using low-flow sampling, approximately 1 gallon of water was purged 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 foot during purge and sample collection at each well. Sample parameters taken at the time of sample collection are included in Table 9.

Sample results are listed in Table 10, 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 monitoring wells with the exception of MTBE in the sample from well HMW52. MTBE was detected at 0.0126 mg/L. MTBE was a common gasoline additive in the mid-1980s.

MTBE is present in the regional aquifer at well 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.WW 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 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 feet downgradient of HMW52 and serves as a migration downgradient sentinel point. MTBE has not been detected in HMW50.

4.4 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 by using one of four vapor extraction wells installed in the shallow impacted soil and perched water table. The SVE system removed an estimated 1,800 gallons of product, which is in excess of the reported release, thus 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 feet bgs.

The human health and ecological exposure pathways relevant to the remaining contamination are all incomplete, therefore, leading to the conclusion of "no current or future human health or ecological risk." Continued compliance monitoring of the existing monitoring wells is contemplated as a precautionary measure to ensure early detection of impact. Annual sampling for BTEX of all existing monitoring 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.

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However, as discussed in Section 4.2 above, NMED did not accept these conclusions and requested that the remedial action be continued. The Work Plan for this action (WTS, 2007a) was approved, with guidance, on January 16, 2008 (NMED, 2008b). The Work Plan was executed in 2009.

In March 2009, six wells (HVW-05 through HVW-10) were installed in the zone of saturated soil in preparation for the implementation of the CMI Work Plan as mentioned in Section 4.2. Soil samples were collected from saturated soil (from 16 to 31 feet bgs) for characterization purposes. No gasoline constituents were detected above the soil screening levels. Some constituents were detected above the dilution attenuation factor (DAF) 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 an understanding of the hydrogeologic conditions. Results from the tests indicated that little or no hydraulic connectivity exists among wells screened in the shallow saturated soil, thus 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. The recommended controls for this site include continued long-term monitoring of the four regional monitoring wells (HMW48, 49, 50, and 52). A full description of these investigations with sampling results is included in a Status Report (ARCADIS, 2011b).

4.5 Summary

WSMR sampled the HELSTF TSA monitoring wells using low-flow sampling techniques in September 2013. Analytical results indicated that BTEX compounds were not detected in any regional samples collected. MTBE was detected in the sample from HMW52 collected during September 2013. Based on the detections from this sampling event and the previous events in 2007 through 2013, MTBE appears to be present in the regional aquifer at HMW52.

Based on the above-noted regulatory guidance and analytical data, WSMR proposes continued monitoring for BTEX and MTBE at this time. Although BTEX has not been detected in samples from the regional monitoring wells, continued monitoring of BTEX is recommended to ensure that constituents in the vadose zone water do not migrate to the Regional Aquifer. WSMR will also continue to monitor MTBE, which has been detected in HMW52 at declining concentrations. NMED recommends further addressing the vadose zone per the CMI Work Plan.

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5.0 RHODES CANYON LANDFILL (SWMUs 114 AND 115)

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 12). The site consists of SWMUs 114 and 115, and is designated as WSMR-14 in the U.S. Army Installation Restoration Program (IRP). WSMR-14 occupies 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 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 monitoring wells associated with the landfill. Groundwater exists at an average depth of 74 to 84 feet bgs. The monitoring wells are RCRA-compliant and are screened across the water table.

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The RCRA Facility Assessment conducted by A.T. Kearney, Inc. (1988) concluded that there was low potential for a release from SWMUs 114 and 115 to groundwater, surface water, air, or subsurface gas. International Technology Corp. (1992) conducted a Phase I RFI. 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 Revised Final Rhodes Canyon Landfill CMI Work Plan (BAE Systems, 2003). The CMI was completed in 2005 (BAE Systems, 2005).

Groundwater monitoring at Rhodes Canyon Landfill began in 1995 with the installation of four monitoring wells (designated as RMW-1, RMW-2, RMW-3, and RMW-4). WSMR installed two additional wells in 2005 (WTS, 2005a). Construction details are noted in Table 11. The annual sampling events have not detected any COCs that can be directly linked to the landfill, the water-quality parameters sulfate and total dissolved solids 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.

5.1 Scope of Services

The annual groundwater monitoring event at SWMU 114 and 115 consists of site inspection, groundwater measurements, and sampling of four wells (RMW-1, RMW-3, RMW-5, and RMW-6) by low-flow methods. Inspection includes monitoring the status and integrity of the fence, monitoring wells, and native soil landfill cap. Table 12 lists the analytical constituents and methods relating to the groundwater sample analysis.

5.2 Regulatory Criteria

WSMR continues long-term 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 on page 6 (also known as the CMI Report and Post Closure Care Plan [BAE Systems, 2004b], and the Addendum CMI Report [WTS, 2005b]). NMED accepted closure of the landfills in correspondence dated July 12, 2006 (NMED, 2006c). The NMED 2013 Annual Fee Letter (NMED, 2013) 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 SWMUs 114 and 115 as Hazardous Waste Management Units that have achieved closure and are currently under post-closure care.

5.3 Groundwater Monitoring Results

5.3.1 Sampling Procedures

WSMR sampled four groundwater monitoring wells at SWMU 114 and 115 from August 20 to 21, 2013. Historic and current measurements to the water-level surface indicate a fairly stable water table in the immediate area of WSMR-14 (Figure 10). Calculations indicate a gradient of 0.0011 feet per foot to the south with a slight easterly component.

While purging, a YSI™ 556-MPS water-quality meter with flow cell was used to record groundwater field parameters. A portable Lutron TU-016 turbidity meter 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 13. These parameters were within ranges typical of groundwater at WSMR. The total volume of purge water generated during this event was approximately 5 gallons.

5.3.2 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 14 shows analytes detected during the 2013 sampling event. Sulfate and total dissolved solids (TDS) were detected at concentrations exceeding their respective screening levels.

5.4 Remediation System Monitoring and Additional Site Activities

Inspections at SWMU 114 and 115 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 (BAE Systems, 2004b) 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.

5.5 Summary

The analytical results for the most recent round of groundwater sampling at SWMU 114 and 115 did not reveal detectable concentrations of TPH, VOCs, SVOCs (with the exception of benzoic acid), or lead in any of the samples. Benzoic acid was detected as "J-flagged," meaning the detected values were less than the laboratory limit of quantitation. 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 (BAE Systems, 2004b and WTS, 2005b).

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6.0 HELSTF GROUNDWATER STUDY – CONSTRUCTION LANDFILL (SWMUs 38 AND 39), CHROMATE SPILL (SWMU 143), AND SYSTEMIC DIESEL SPILL (SWMU 154)

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 feet bgs. A laterally pervasive clay layer was observed at approximately 60 feet bgs. The stratigraphic units have been described as laterally discontinuous.

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 monitoring wells at the site (Figure 11). As part of the Phase III RFI at HELSTF, the groundwater study included sampling of existing monitoring wells and 13 new monitoring wells installed during the fall of 2006. The report of activities was delivered to NMED in 2008 (WTS, 2008a).

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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 and 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 2009 update to the soil screening levels (ARCADIS, 2010). The Revised Phase III RFI Reports provided 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 revised Phase III RFI Reports included a detailed revised conceptual site model and risk assessments that showed 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.

The potentiometric surface at the three HELSTF sites is shown on Figure 12. Groundwater flow is to the east with an approximate hydraulic gradient of 0.0026 feet.

6.1 SWMU Discussions

6.1.1 HELSTF Construction Landfill (SWMUs 38 and 39)

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The HELSTF Construction Landfill consists of approximately five disposal cells that were used for disposal of construction debris and other material (Figure 13). The site is located northeast of the HELSTF test area and is designated as SWMUs 38 and 39 . The NMED 2013 Annual Fee Letter (NMED, 2013), 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 feet long, 50 feet wide, and 8 feet deep. On two occasions, the landfill was reportedly used 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 1988, a release report noted approximately 50 gallons of low-power chemical laser oil was accidentally released into 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.

6.1.2 HELSTF Storage Yard Chromate Spill (SWMU 143)

The NMED 2013 Annual Fee Letter (NMED, 2013), 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 14). It was discovered in December 1989 and was most likely the result of a leaking 55-gallon drum of corrosion inhibitor that contained hexavalent chromium and zinc. Corrective measures were taken in 1990 when approximately 125 cubic feet of soil were removed from the site and disposed of at SWMUs 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 monitoring 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 reduced 70 percent (by mass) of the hexavalent chromium to trivalent chromium.

6.1.3 HELSTF Systemic Diesel Spill (SWMU 154)

The NMED 2013 Annual Fee Letter (NMED, 2013), 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 15). 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 that supplied boilers in the Cleaning Facility's basement. This underground storage tank was installed in late 1979 or early 1980 and was 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 feet bgs.

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A vacuum-enhanced diesel recovery system (VEDRS) operated at the site starting in 1995 to recover free product. The VEDRS consists of a network of 11 skimming wells that 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 CMS.

6.2 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, lessons learned from previous events were applied to significantly

modify the analytical schedule and sample different wells periodically. Construction details for the selected wells are provided in Table 15. The current analytical schedule, depending on site, is shown in Table 16. Since 2004, WSMR has elected to initiate low-flow sampling methods where possible. Due to funding constraints during 2013, only one sample event was completed for the HELSTF Construction Landfill site (September 2013). Two events were conducted as usual for the Chromate Spill and Diesel Spill sites (March 2013 and September 2013 by using low-flow sampling techniques.

6.3 Regulatory Criteria

Long-term monitoring requirements of groundwater at this site are discussed in the Revised Final Phase III RFI Work Plan HELSTF Sites on page 159, Section 7.0 (WTS, 2006). The analytical suite identified in the Phase III RFI Work Plan includes: water quality parameters, ammonia-nitrogen, dissolved ions, total phosphorous, dissolved chromium VI, total and dissolved metals, VOCs, SVOCs, DRO, GRO, TOC, direct inject alcohols, and purge and trap alcohols. Monitoring requirements at the HELSTF sites have been evaluated and adjusted based on analytical results by WSMR. Currently water quality parameters, TOC, VOCs, DRO, hexavalent chromium, and total chromium are analyzed for LTM purposes. Although the sampling effort was reduced, the analytical suite still provides the necessary information required at these sites for the characterization and extent identification of all contamination, and still meets the objectives of the Long-Term Monitoring program.

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Groundwater monitoring is ongoing at the HELSTF sites, pending acceptance of the revised Final Phase III RFI Report. WSMR received an NOD on the Second Revision of the Phase III RFI from NMED on March 5, 2012. A Closure Plan for the HELSTF Construction Landfill was submitted in May 2011. An NOD was received from NMED on the Closure Plan dated October 2011. An agreement was made with the NMED to postpone revisions or responses to the Closure Plan at this time until the Phase III RFI is accepted by the NMED.

6.4 Groundwater Monitoring Results

The three sites at HELSTF are sampled as a single campaign. Accordingly, all of the results will be reported together. This action is a continuation of the ongoing groundwater monitoring program at HELSTF.

6.4.1 Sampling Procedures

The 2013 events continued to use low-flow sampling techniques. The production rate was generally set at less than 200 mL/min, and the sample was 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.

6.4.2 Analytical Results

The analytes detected for each site are shown in Appendix C along with the associated laboratory reports. Detected analytes are shown in Table 17 for the Construction Landfill, Table 18 for the Chromate Spill and Table 19 for the Systemic Diesel Spill. Although the native groundwater at HELSTF has a TDS content greater than 10,000 mg/L, the concentrations are compared to NMWQCC standards.

Concentrations above those standards are in bold print as shown in the tables**.** 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, WSMR-54), chromium remains the principal COC.
- For the Systemic Diesel Spill Site (SWMU 154, WSMR-54), a number of VOCs is routinely detected (some at concentrations above standards) and associated with the commingled spill from the Cleaning Facility (SWMU 142, WSMR-48).
- Throughout the three sites, sporadic observations of various other metals, some above NMWQCC standards, are ascribed to native sources.

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6.5 Remediation System Monitoring and Additional Site Activities

At the HELSTF Systemic Diesel Spill (SWMU 154), the VEDRS was in operation between 1995 and 2006 and used 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 was released into 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) resumed 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.

6.6 Summary

Ongoing groundwater monitoring shows little change in conditions. WSMR received an NOD on the Second Revision of the Phase III RFI from NMED on March 5, 2012. WSMR is currently responding to the NOD. A Closure Plan for the HELSTF Construction Landfill was submitted in May 2011. An NOD was received from NMED on Closure Plan dated October 2011. An agreement was made with the NMED to postpone revisions or responses to the Closure Plan at this time until the Phase III RFI is accepted by the NMED.

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.

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7.0 MAIN POST LANDFILL NO. 3 (SWMU 65)

The former Main Post Landfill No. 3 is located in the southeast portion of the WSMR Main Post area (Figure 16). This site is identified as SWMU 65 and as compliance cleanup program site CCWS-76. The NMED 2013 Annual Fee Letter (NMED, 2013), 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 used 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 monitoring 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 feet. Monitoring wells and test wells in the vicinity of the site have not reached bedrock (U.S. Army Environmental Hygiene Agency, 1976). Groundwater exists at an average depth of just over 200 feet.

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Groundwater monitoring occurred semi-annually at this site from 1996 to 2001. This program did not detect potential COCs. An RFI report was submitted in 2001 (MEVATEC, 2001). Upon review of the RFI, NMED questioned the construction of the current monitoring wells and whether they were able to detect potential leachate from SWMU 65. NMED then issued a Request for Supplemental Information on July 14, 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 Request for Supplemental Information.

WSMR received approval of the Phase III RFI Work Plan (WTS, 2007b) and initiated the efforts described in the Work Plan in November 2007. Four additional monitoring wells have been installed, 0065-MW09, 0065-MW10, 0065-MW11, and 0065-MW12. Additional activities, including drilling and sampling of six soil boreholes for characterization of the south part of the site as well as collection of background soil samples have been completed at

this site. WSMR sampled the new wells in February 2008 and provided the results of all activities in a Phase III RFI Report (WTS, 2009).

Annual groundwater monitoring at the site was inactive while WSMR completed the Phase III RFI Work Plan (WTS, 2007b), which includes installation and sampling of four new monitoring wells and soil sampling in certain areas of the site. One new monitoring 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 monitoring wells associated with SWMU 65 are provided in Table 20. The four new monitoring wells were first sampled in February 2008.

7.1 Scope of Services

The annual groundwater monitoring event consists of taking groundwater measurements and sampling the four additionally installed wells (0065-MW09, 0065-MW10, 0065-MW11, and 0065-MW12) by low-flow methods.

7.2 Regulatory Criteria

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Long-term monitoring requirements of groundwater at this site are discussed in the Revised Final Phase III RFI Work Plan on page 16 (WTS, 2007b). Analytical requirements at this site include: water quality parameters, dissolved ions, ammonia, nitrogen, total metals, mercury, chromium VI, total cyanide, dissolved metals, VOCs, SVOCs, DRO, GRO, and explosive residues. The Work Plan was approved with direction in a letter from NMED dated May 4, 2007 (NMED, 2007b).

NMED has received the Phase III RFI Report and submitted an NOD on September 11, 2009, which was addressed by a Revised Phase III RFI Report. An NOD was later submitted by the NMED on September 2, 2010. WSMR addressed the NOD and resubmitted the Revision II Phase III RFI Report (Zia Engineering and Environmental Consultants, LLC, 2011). WSMR will continue annual sampling and analysis of groundwater from the four new wells.

Data presented in the Revised Phase III RFI in February 2011 (Zia Engineering and Environmental Consultants, LLC, 2011) demonstrate 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). 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. An NOD was received from NMED dated August 10, 2011. An agreement was made with the

NMED to postpone revisions or responses to the Closure Plan at this time until the Phase III RFI is accepted by the NMED.

7.3 Groundwater Monitoring Results

Groundwater sampling from the newly installed wells was accomplished from August 29, 2013 to September 4, 2013. The parameters recorded at the time of sampling for each of the wells is shown in Table 21. These parameters are within ranges typical of groundwater at WSMR in this vicinity.

Analytical results from the 2013 groundwater monitoring event detected constituents consistent with prior sampling at the site (Table 22). The results (laboratory reports and summary table) are included in Appendix C. The potentiometric surface is shown on Figure 17 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 22).

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7.4 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.

7.5 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.

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8.0 FORMER SEWAGE TREATMENT PLANT PERCOLATION DITCHES (SWMU 82)

The Former Sewage Treatment Plant (STP) Percolation Ditches are located east of the STP in the southern portion of WSMR (Figure 18). These ditches were formerly designated as SWMUs 82 and 83 The NMED 2013 Annual Fee Letter (NMED, 2013), Table A, combines the two SWMUs, listing them as operating unit SWMU 82; the December 2009 WSMR RCRA Permit follows this designation. WSMR used 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, 2004c) and transmitted to NMED HWB. WSMR has a requirement to continue the groundwater monitoring at SWMU-82.

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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, 2004c) has been modified. A total of 26 wells remain in the sampling program. Construction details are also provided in Table 23. Sampling is currently conducted in compliance with the *RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3* (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.

8.1 Scope of Services

The former STP Percolation Ditches Site remains under long-term groundwater monitoring requirements. The monitoring wells associated with SWMU 82 are on a nominal semi-annual sampling schedule. Samples were collected from May 21, 2013 through June 5, 2013 and October 30, 2013 through November 15, 2013.

8.2 Regulatory Criteria

Long-term monitoring requirements for groundwater at this site are discussed in the Revised Final *RCRA Monitoring Plan, Former STP Percolation Ditches, WSMR-62 (SWMU 82, Surface Impoundment (SI)-3* in Section 11.2 (WTS, 2008b). NMED approved this plan in a letter dated June 25, 2008 (NMED, 2008c) This RCRA monitoring plan is the culmination of multiple requirements identified in NMED correspondence as noted below.

The August 24, 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 August 7, 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 March 18, 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 March 25, 2008 e-mail message, (*Monitoring plan clarifications – STP Ditches*). Additional requirements from NMED's 2008 letter that have been updated in the monitoring plan include: additional detail on sample procedures and data collection, updated analytical methods to include VOCs and cyanide, aquifer testing details and a model of hydrogeologic conditions.

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Cyanide is the only COC associated with this site. The December 2009 WSMR RCRA Permit calls for a Closure Plan to be prepared for the site. A Closure Plan (Shaw, 2011b) was prepared and submitted for NMED review in June 2011. In a letter dated January 22, 2013, NMED disapproved the Final Closure Plan for SWMU 82. WSMR submitted a Revised Final Closure Plan (Shaw [a CB&I company], 2013b) in July 2013 and is currently being reviewed by NMED HWB.

8.3 Groundwater Monitoring Results

8.3.1 Sampling Procedures

Groundwater monitoring equipment included 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) were used, so only new parts contacted the sample. For the deeper wells (greater than 300 feet), a high-lift bladder pump was used and decontaminated between wells. For each sampling event, 26 wells were sampled; three wells

were sampled in duplicate; and two wells were sampled in duplicate for laboratory matrix-spike analyses.

For this event, the pumping rate was generally set at 250 mL/min. WSMR purged the wells with a portable QED© bladder pump. During purging, WSMR used a YSI® 556-MPS or YSI® Pro Plus water-quality meter with flow cell to record groundwater field conditions. A portable Lutron® TU-2016 turbidity meter provided turbidity measurements. Field parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation/reduction potential) were allowed to stabilize prior to collecting the sample. The field parameters recorded during purging and sampling for each of the wells are shown in the field notes in Appendix C.

The analytical schedule for this site is shown in Table 24. Table 25 includes depth-to-water measurements for sampled and non-sampled wells in the STP area. Figure 19 shows the potentiometric surface of the site. Table 26 lists field parameters from the sampling event, including carbon dioxide and ferrous iron.

8.3.2 Analytical Results

Detections from the 2013 sampling events are included in Table 27 and Table 28. The associated laboratory reports and complete summary reports are provided in Appendix C. The data shown are typically consistent with previous events. Nitrate/nitrite has been detected above the NMWQCC standard of 10 mg/L in well MPL-006 in 2012 and 2013 in both summer and winter sampling. Values in 2013 were 13.6 mg/L in May and 13.7 mg/L in November. In November 2013, well MPL-016 also showed nitrate/nitrite above the NMWQCC standard with a value of 48.4 mg/L. Samples from MPL-016 from summer and winter 2012 and summer 2013 were below the NMWQCC standard. Nitrate/nitrite will continue to be monitored in all wells biannually.

Cyanide was detected in multiple samples at concentrations exceeding the NMWQCC standard of 0.2 mg/L in both the summer and winter sampling events. These exceedances are generally consistent with previous sampling events.

Based on the analytical results, cyanide is the only COC at this site. Although nitrate/nitrite has been detected above NMWQCC in a few wells throughout the monitoring history at this site, values are relatively low and most likely associated with the former use of this site as a percolation ditch for treated sewage. Values of nitrate/nitrite in groundwater show no trends of increasing or spreading.

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

indicate that natural attenuation is occurring at the former STP percolation ditches site. Significant improvements in water quality should be apparent within the 30-year time frame identified in the previous document (BAE Systems, 2004c).

A comparison of total cyanide values contoured from data gathered in 2000 versus data gathered in 2013 is shown on Figure 20. One condition is apparent in the figures: the total area impacted by cyanide contamination shows little change, thus reflecting the negligible groundwater movement that took place from 2000 through 2013. From 2000 to 2013, the portions of the site impacted by higher concentrations appeared smaller in 2013, thus reflecting the ongoing effects of intrinsic remediation. WSMR will continue to monitor the STP site for cyanide attenuation.

8.4 Remediation System Monitoring and Additional Site Activities

No active remediation systems or other site activities are occurring at this time. Intrinsic remediation (natural attenuation) is slowly occurring at this site.

8.5 Summary

Cyanide remains the only COC. The Revised Final Closure Plan (Shaw [a CB&I company], 2013b) is currently under review by NMED. The approved RCRA Monitoring Plan (WTS, 2008b) describes the monitoring activities that are being performed at the site. WSMR's intent is to continue a groundwater monitoring program for SWMU 82 under a Post Closure Care Plan that was provided within the aforementioned Closure Plan.

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Figures

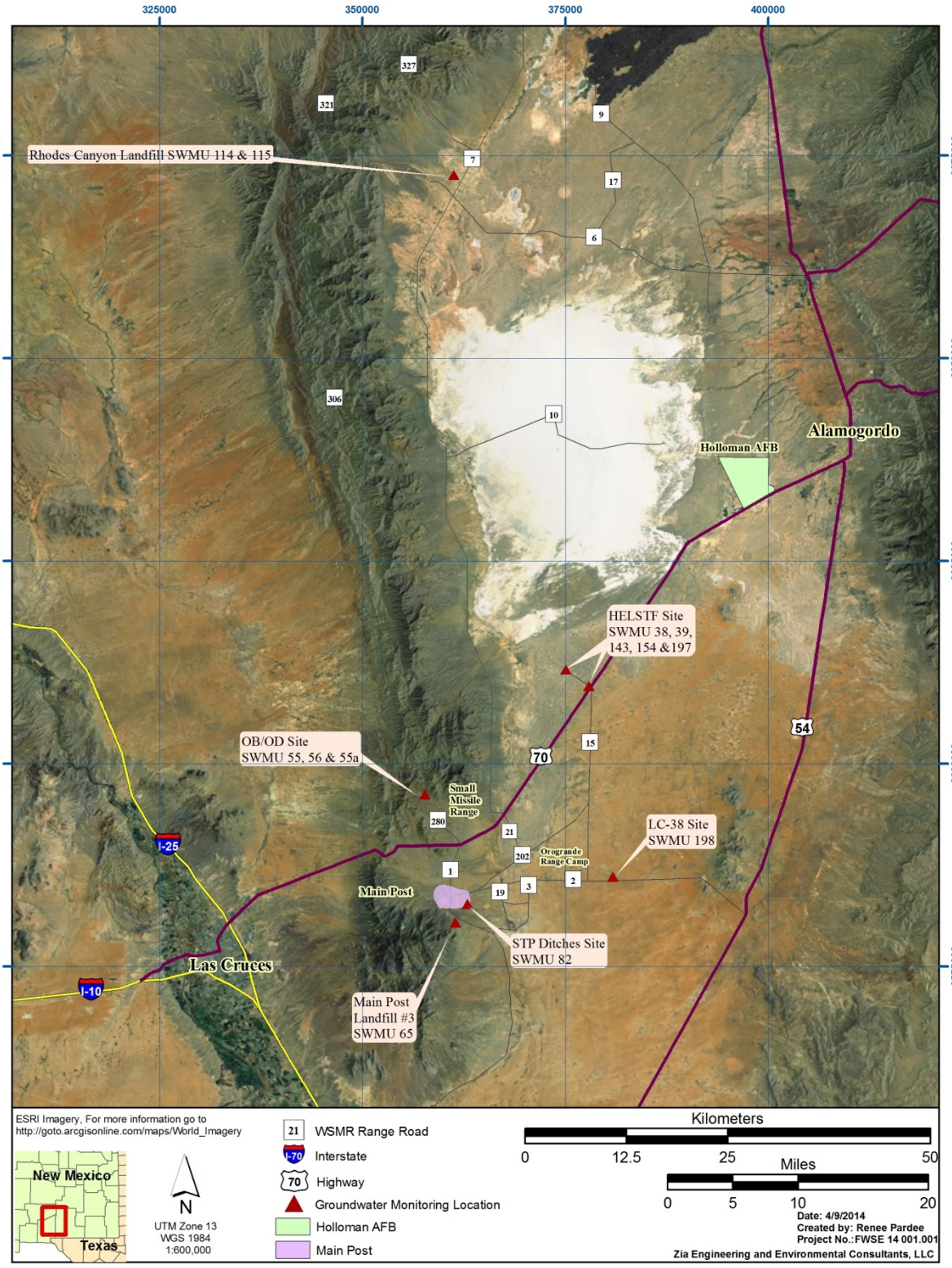

Figure 1
Location of Sites Requiring Long-Term Groundwater Monitoring

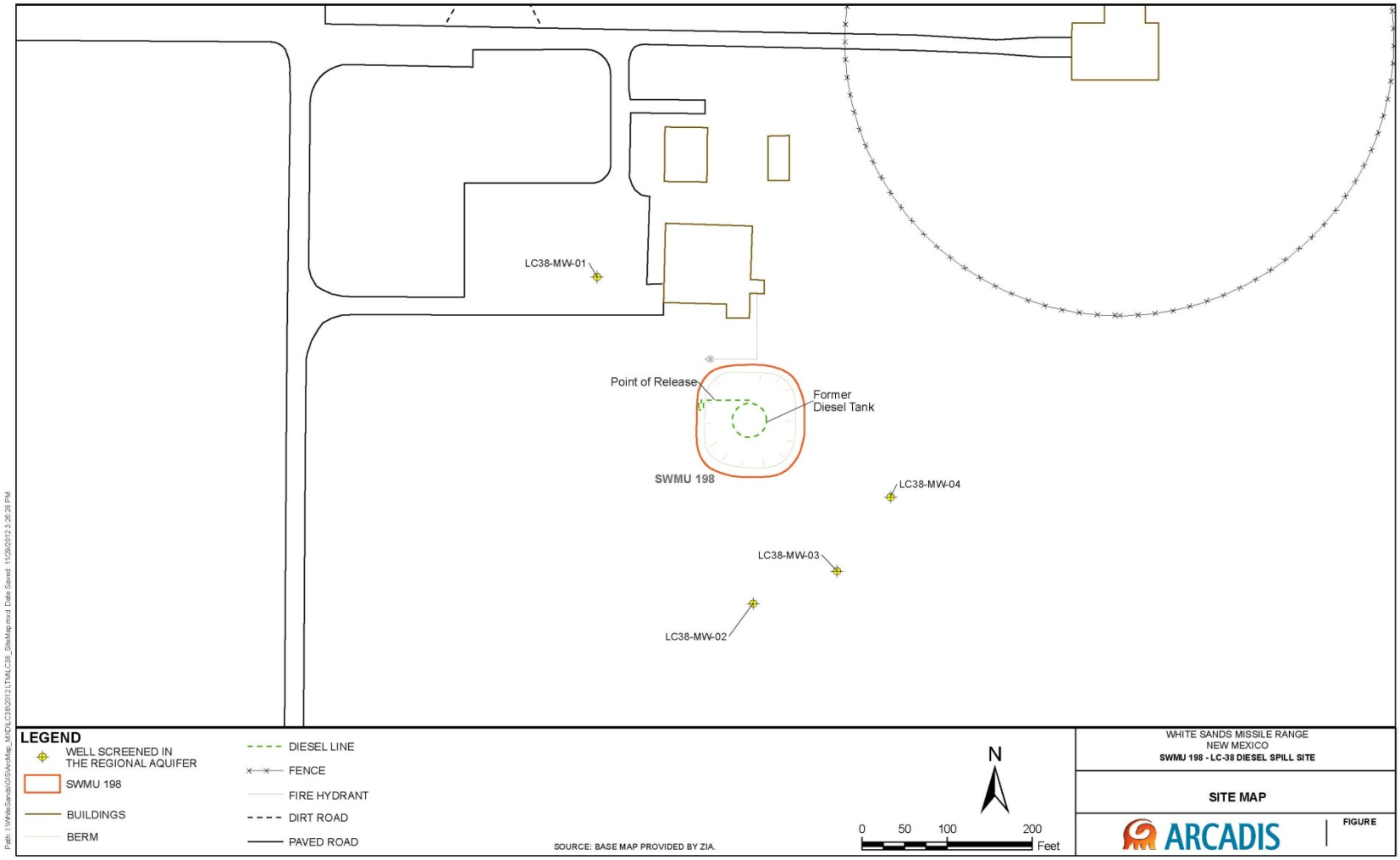

Figure 2
Launch Complex 38 (SWMU 198) (CCWS-09) Site Map

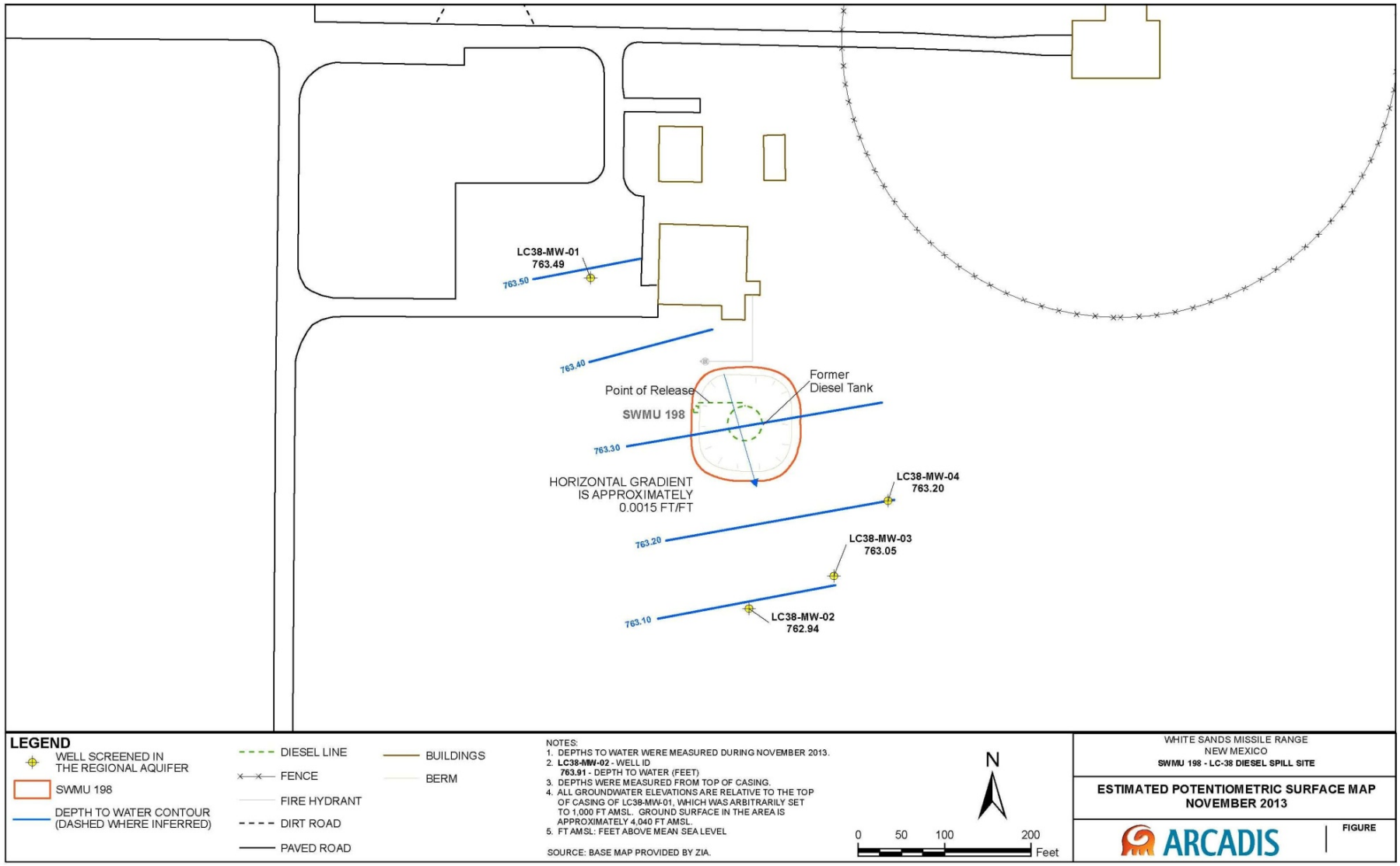

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Figure 3
Launch Complex 38 (SWMU 198) (CCWS-09) Potentiometric Surface

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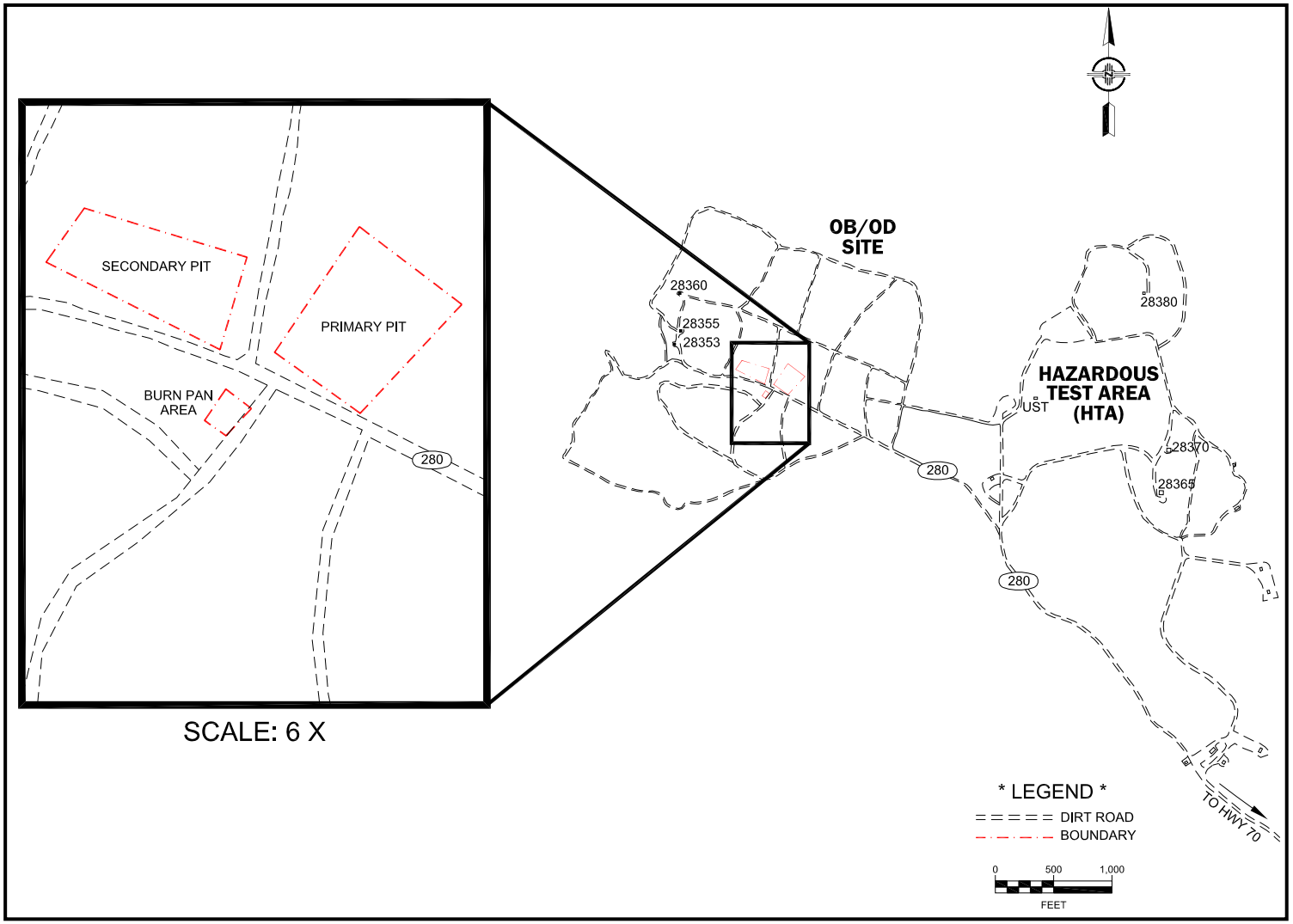

Figure 4
OB/OD Area (SWMUs 55, 56, and 56a) (CCWS-11) Site Map

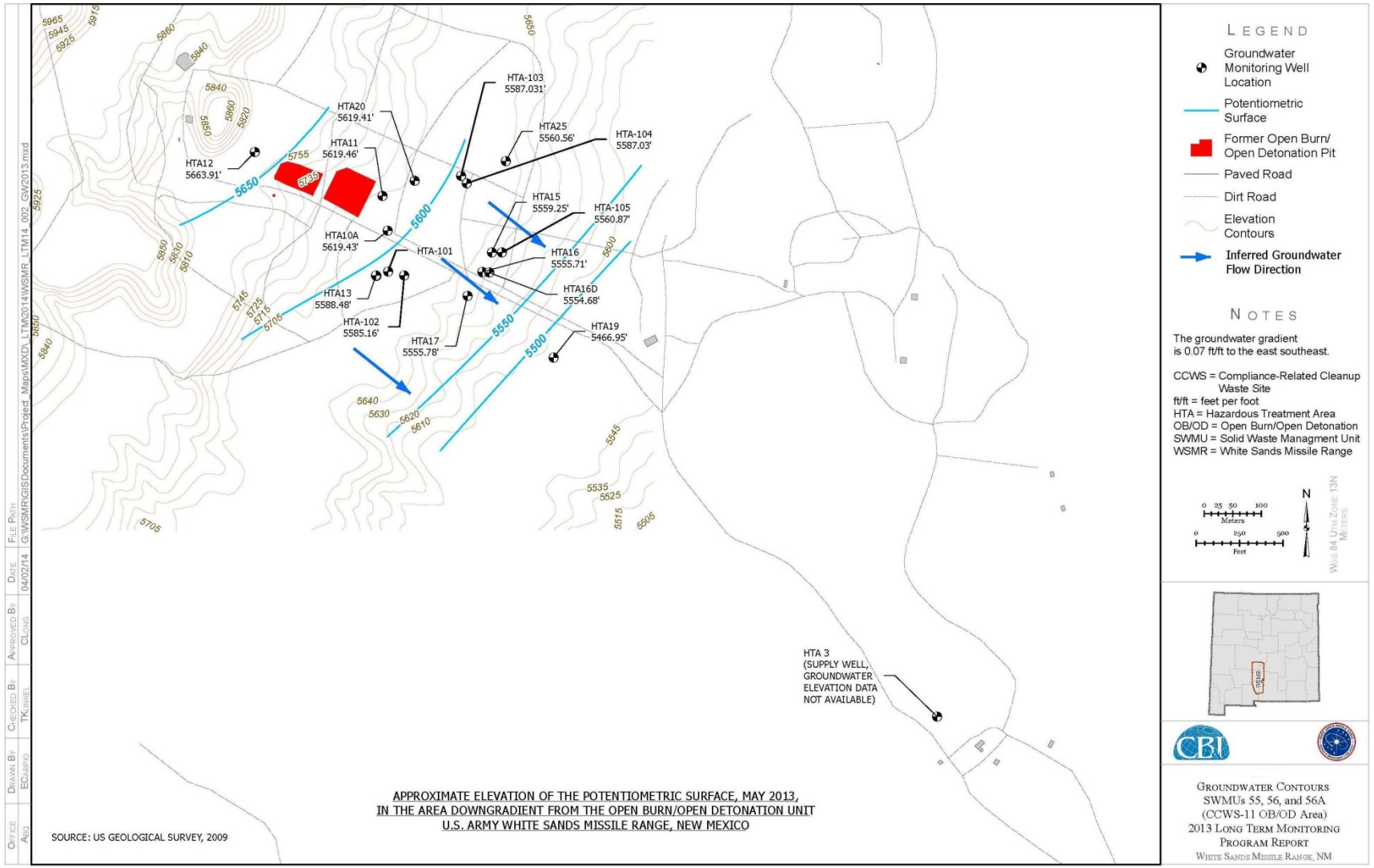

Figure 5
Open Burn/Open Detonation (SWMUs 55, 56, and 56a) Potentiometric Surface

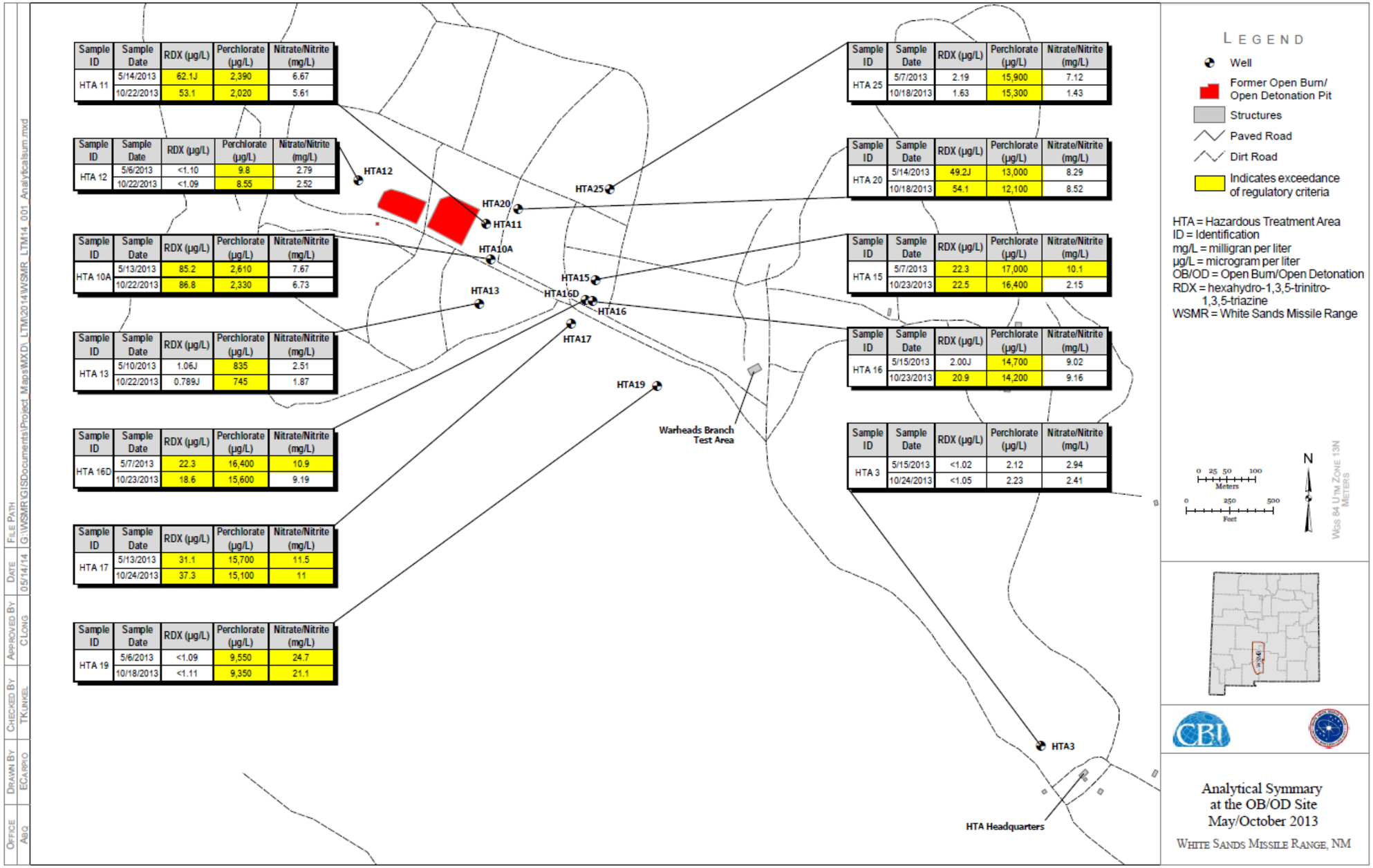

Figure 6
Analytical Summary at the OB/OD Site 2013 Data

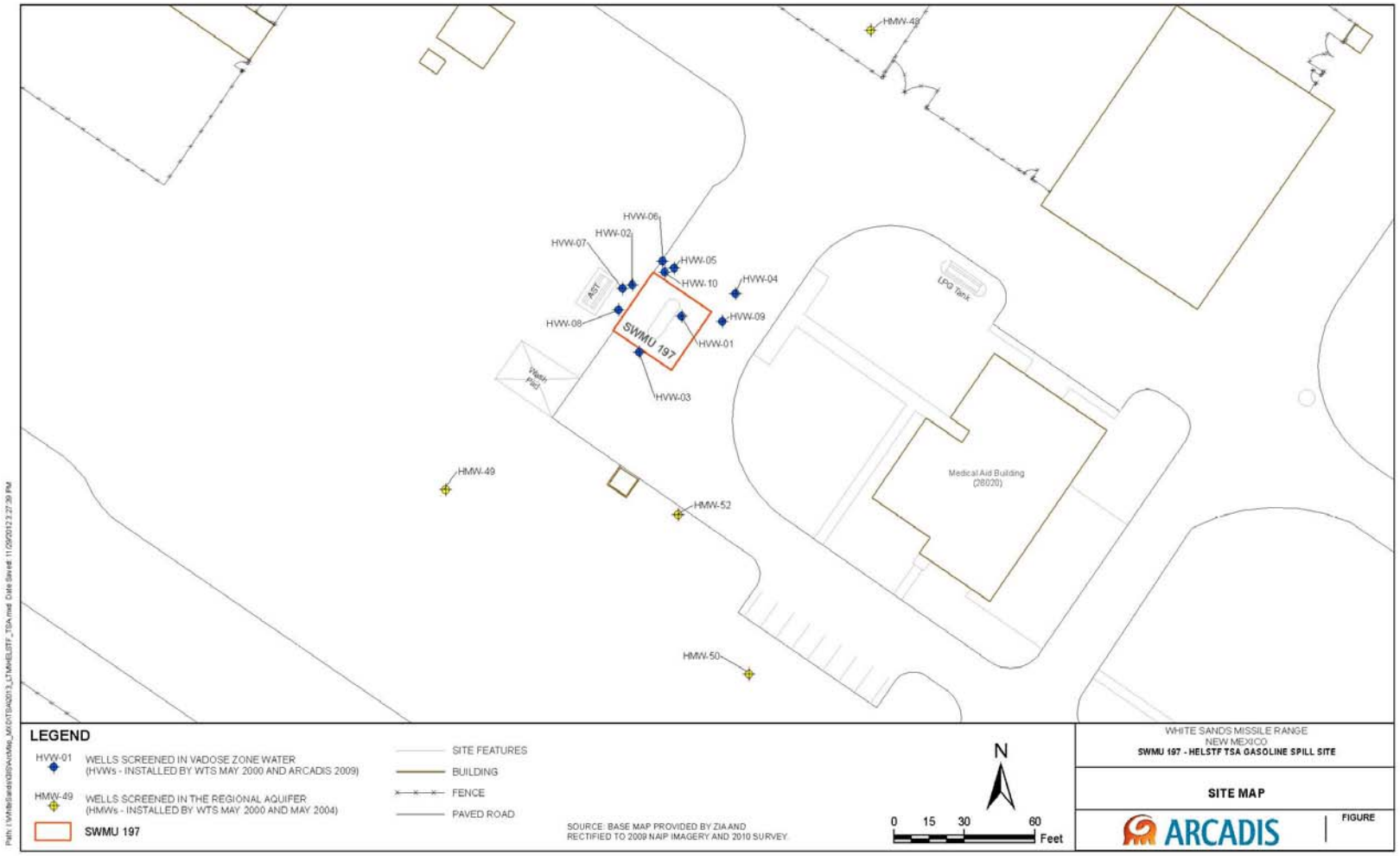

Figure 7
HELSTF TSA (SWMU 197) (CCWS-16) Site Map

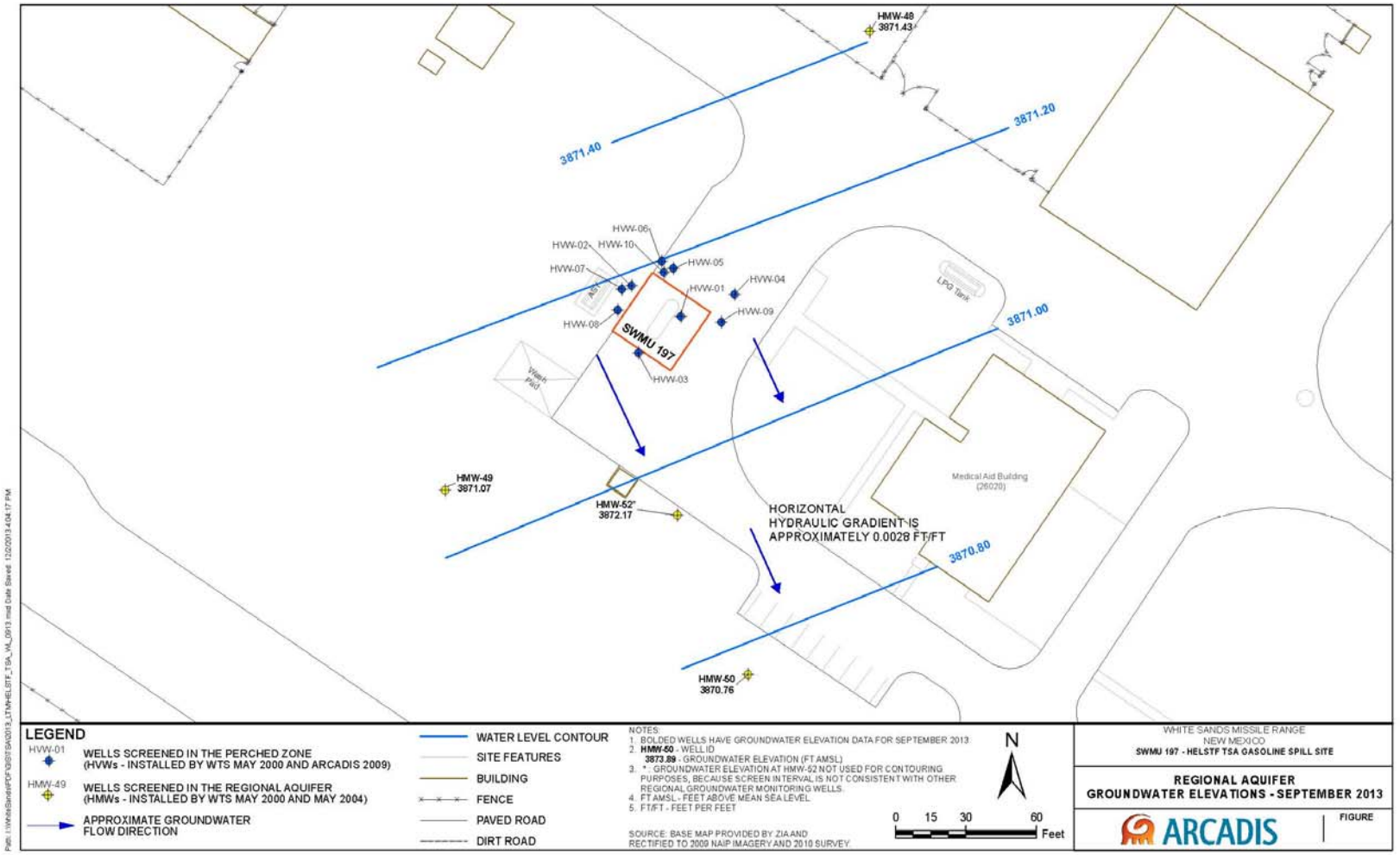

Figure 8
HELSTF TSA (SWMU 197) Potentiometric Surface of the Regional Aquifer

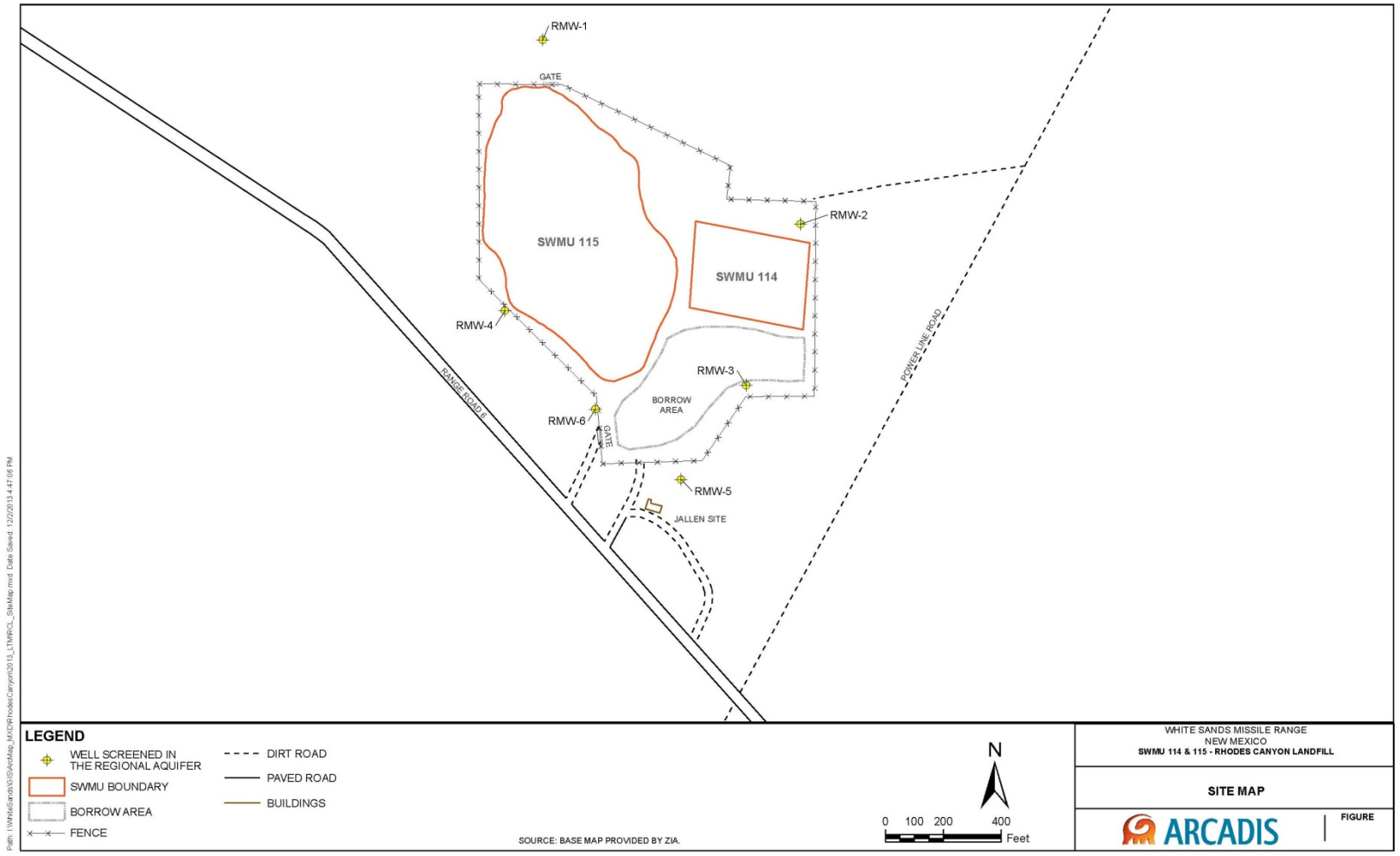

Figure 9
Rhodes Canyon Landfill (SWMUs 114 and 115) (WSMR-14) Site Map

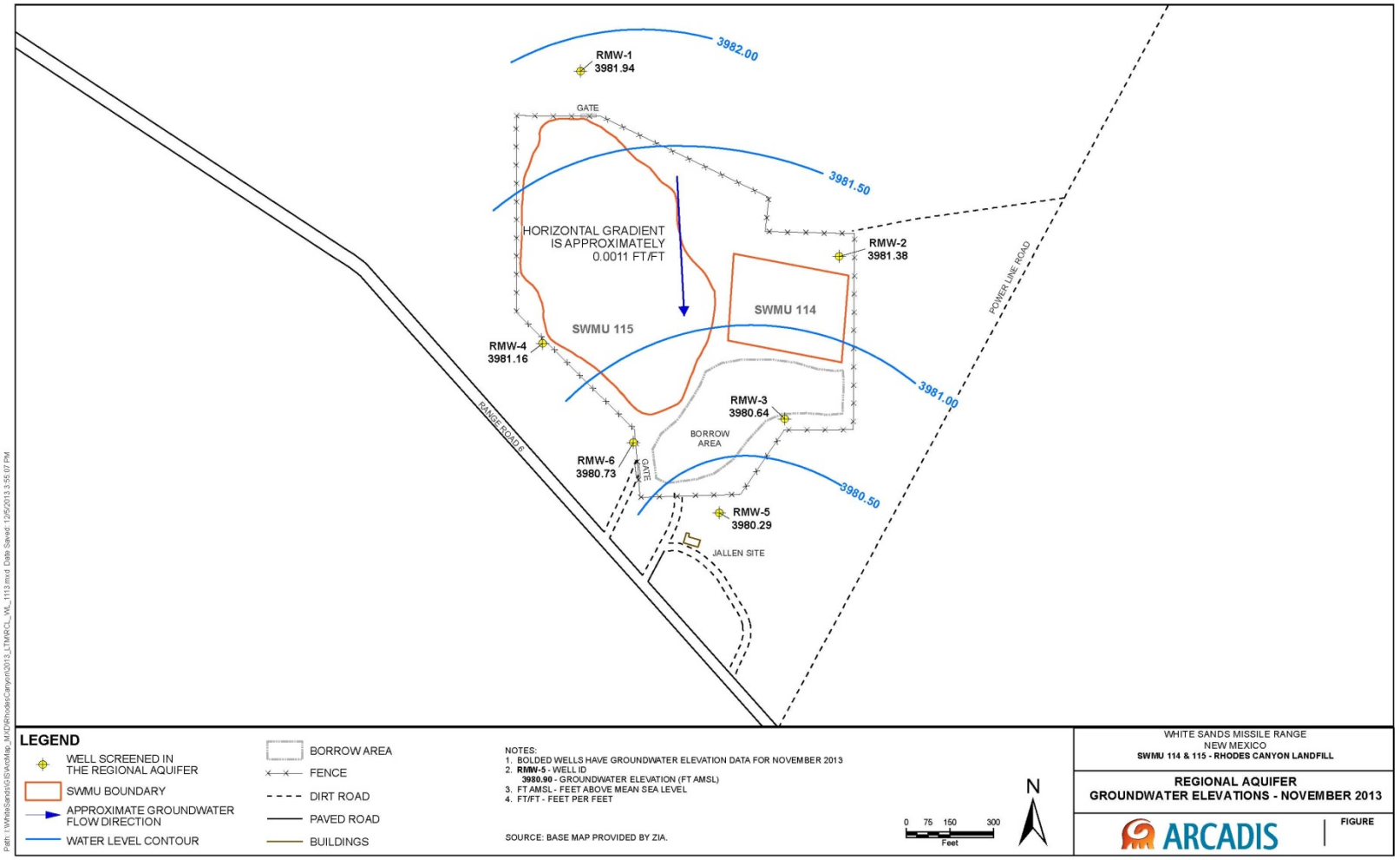

Figure 10
Rhodes Canyon Landfill (SWMUs 114 and 115) Potentiometric Surface of the Regional Aquifer

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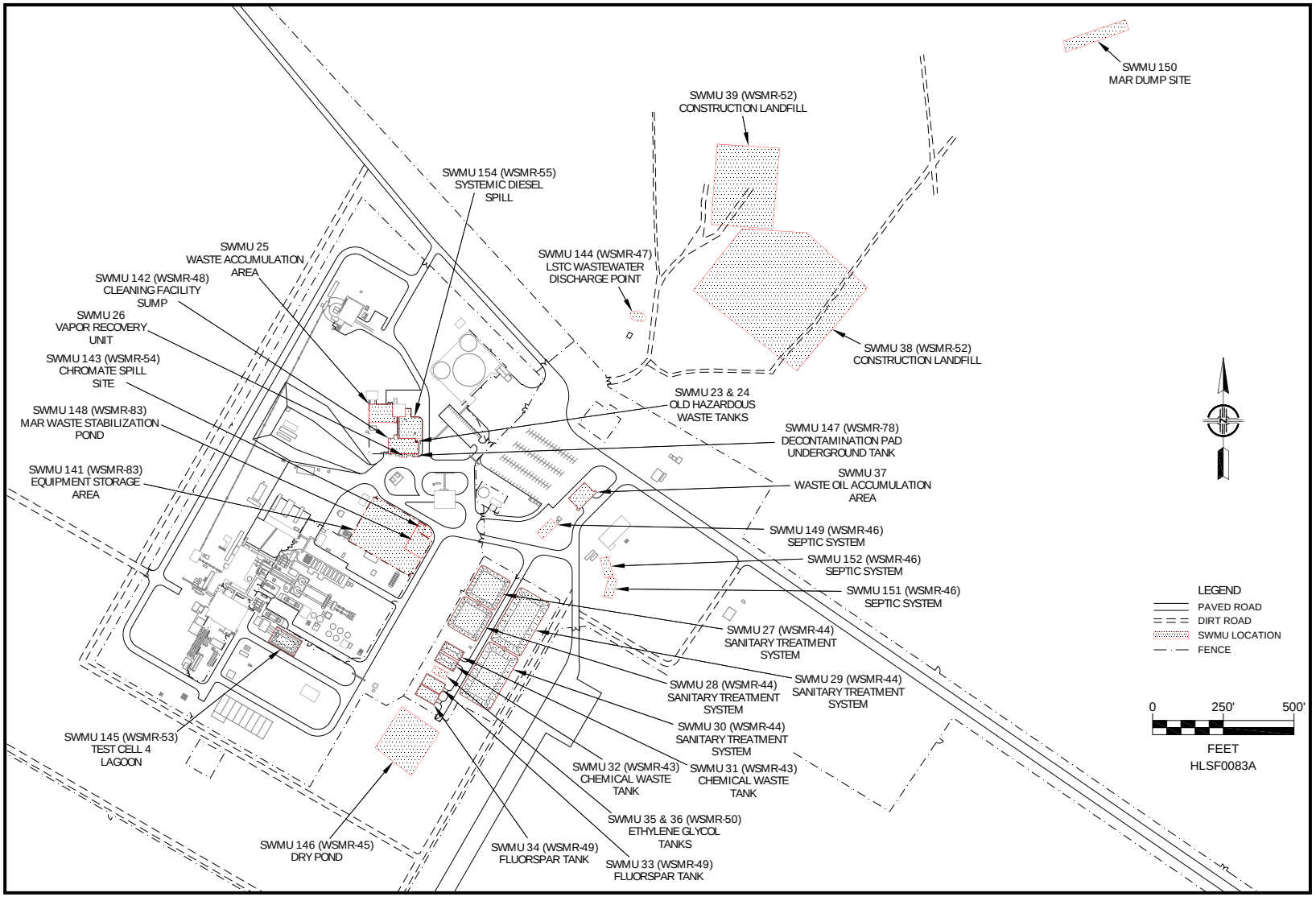

Figure 11
HELSTF Site Map

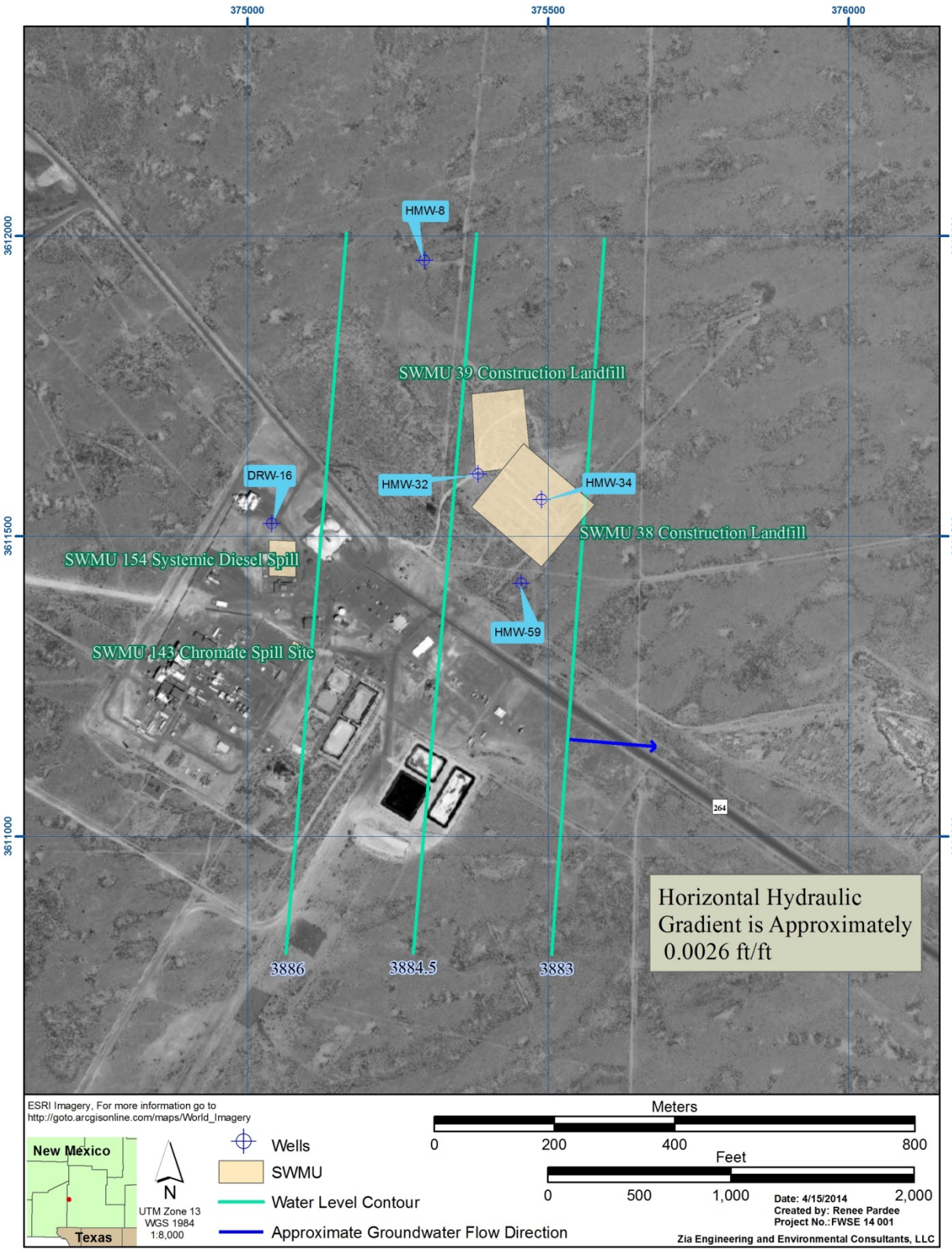

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Figure 12
HELSTF Sites Potentiometric Surface of the Regional Aquifer

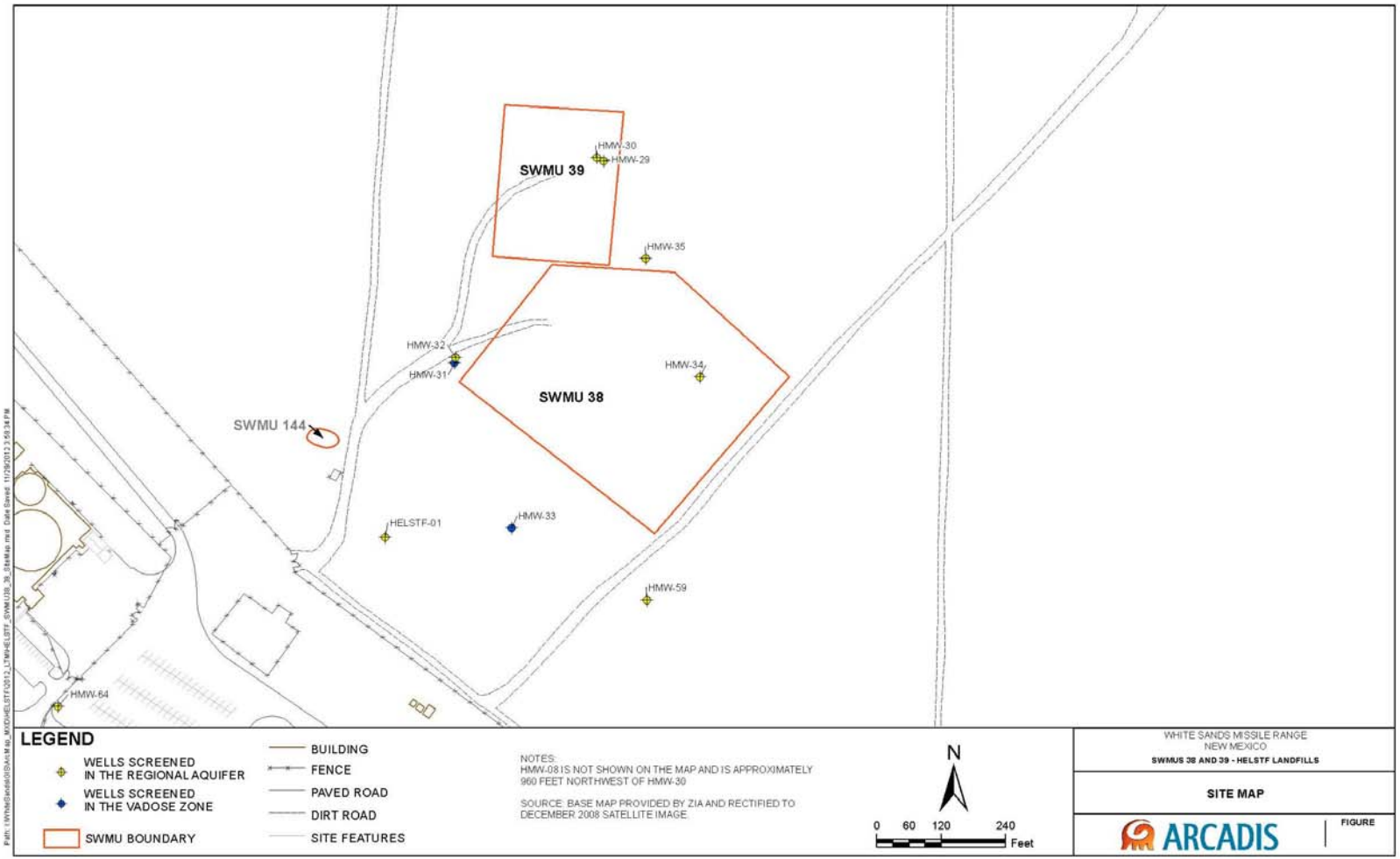

Figure 13
HELSTF Construction Landfill (SWMUs 38 and 39) (CCWS-75) Site Map

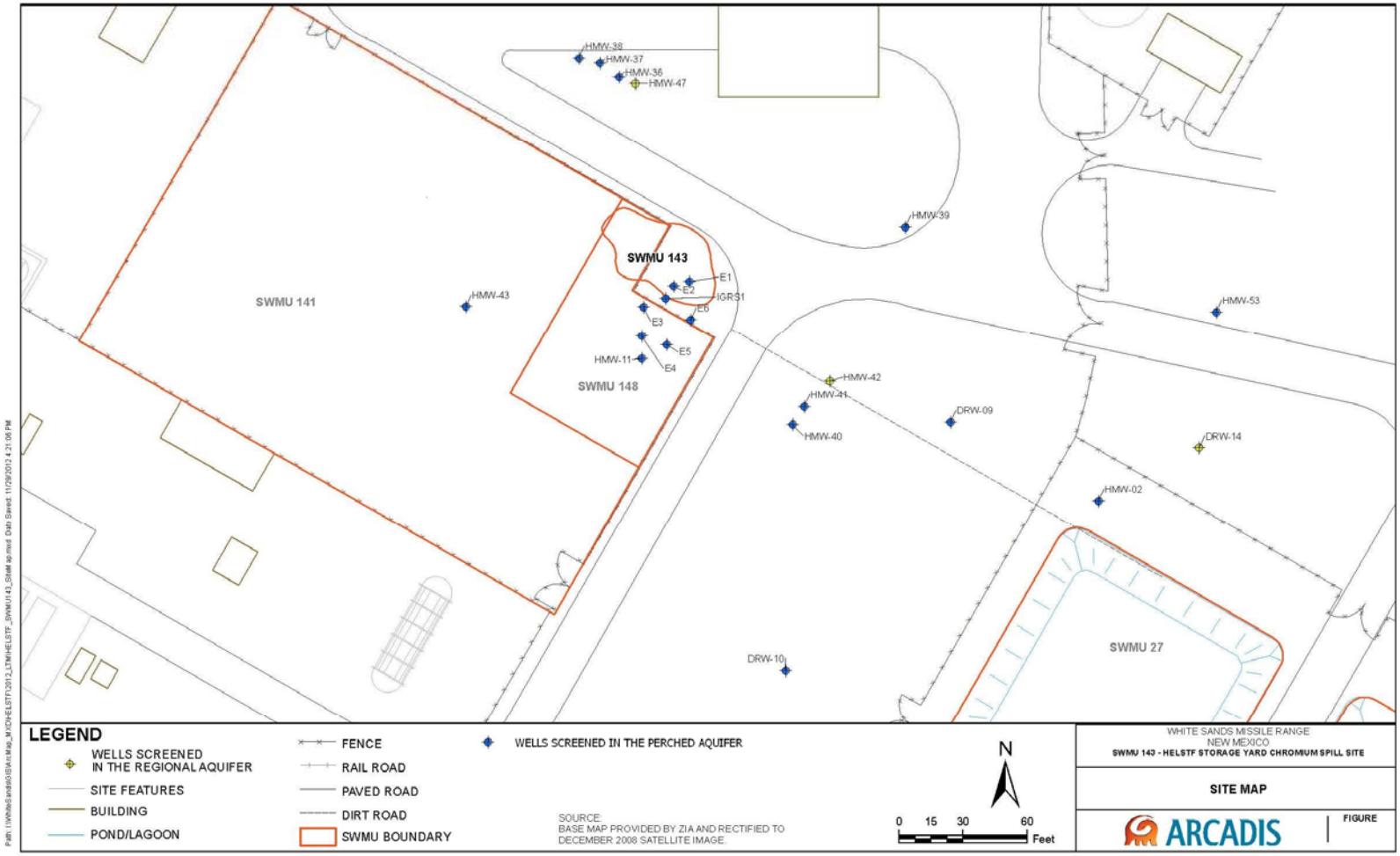

Figure 14
HELSTF Chromate Spill (SWMU 143, WSMR-54) Site Map

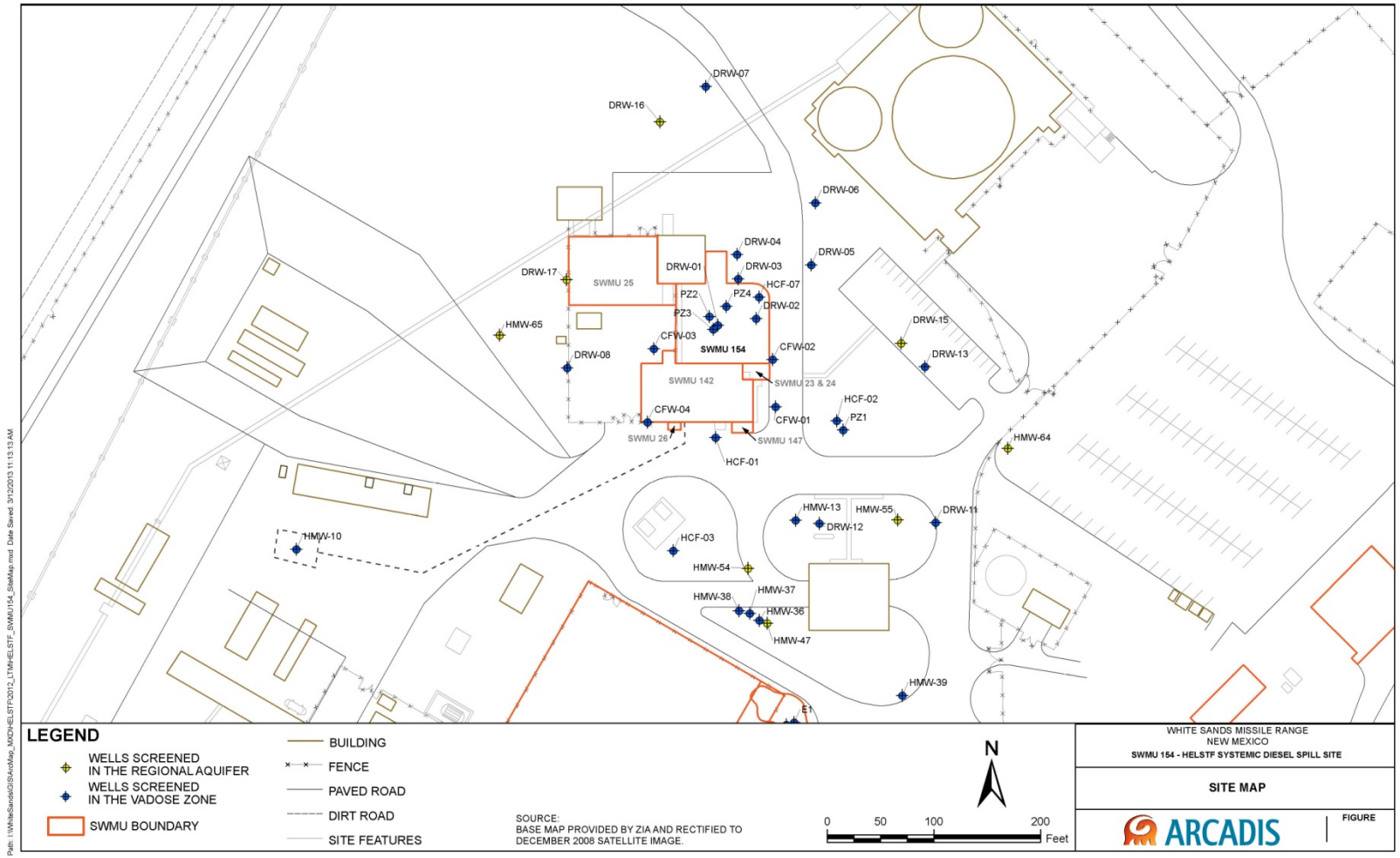

Figure 15
HELSTF Systemic Diesel Spill (SWMU 154, WSMR-55) Site Map

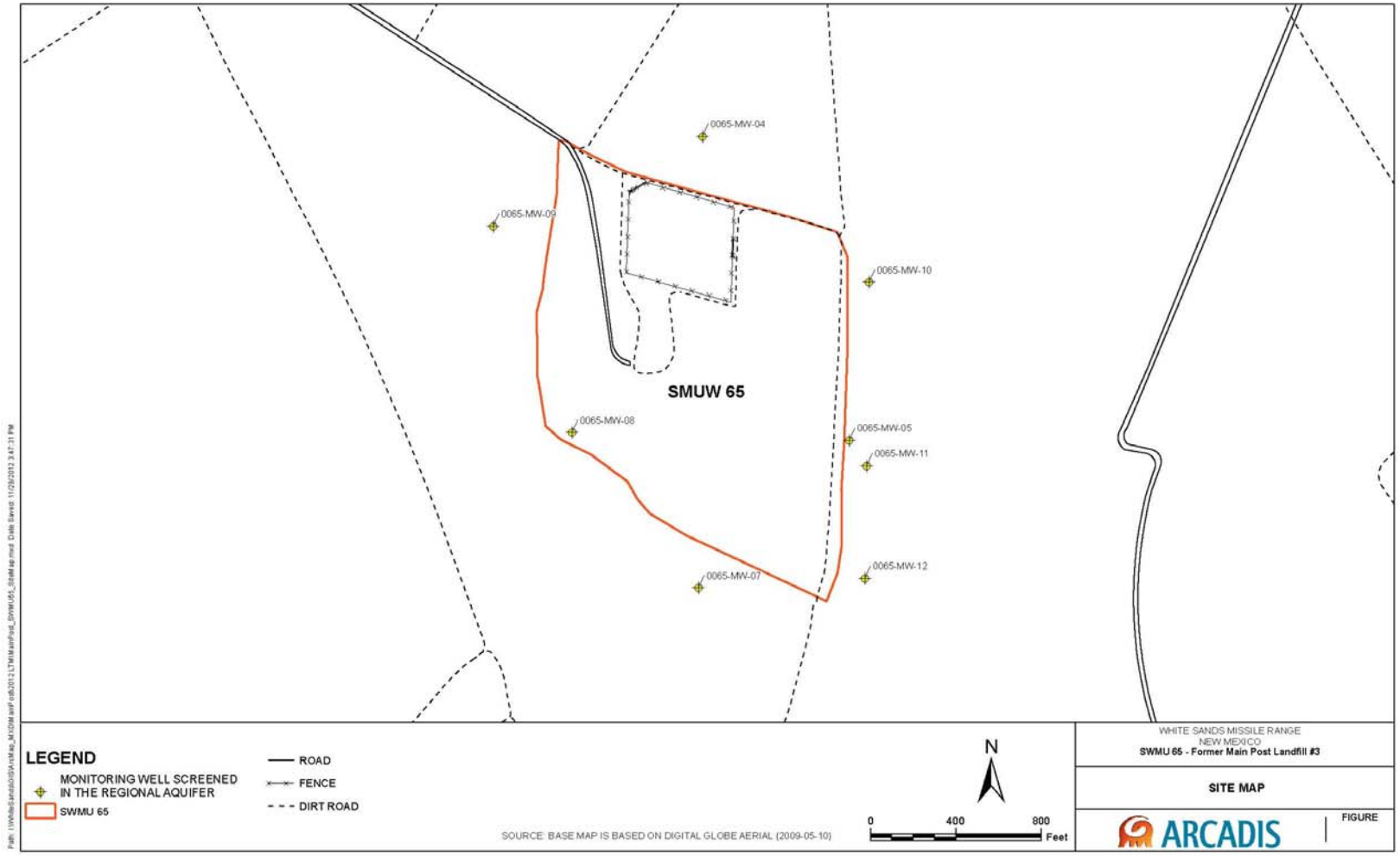

Figure 16
Main Post Landfill No. 3 (SWMU 65) (CCWS-76) Site Map

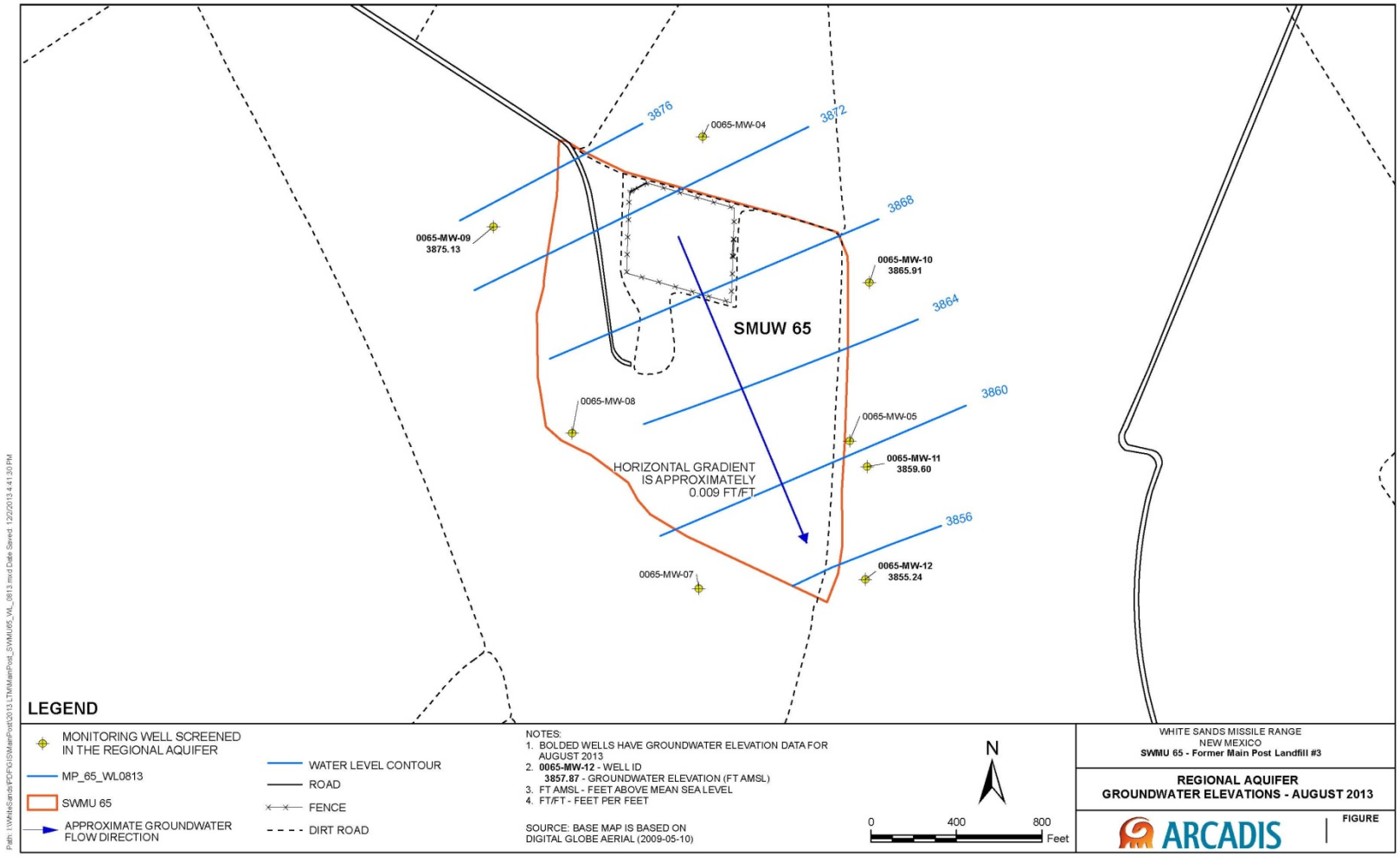

Figure 17
Main Post Landfill No. 3 (SWMU 65) Potentiometric Surface of the Regional Aquifer

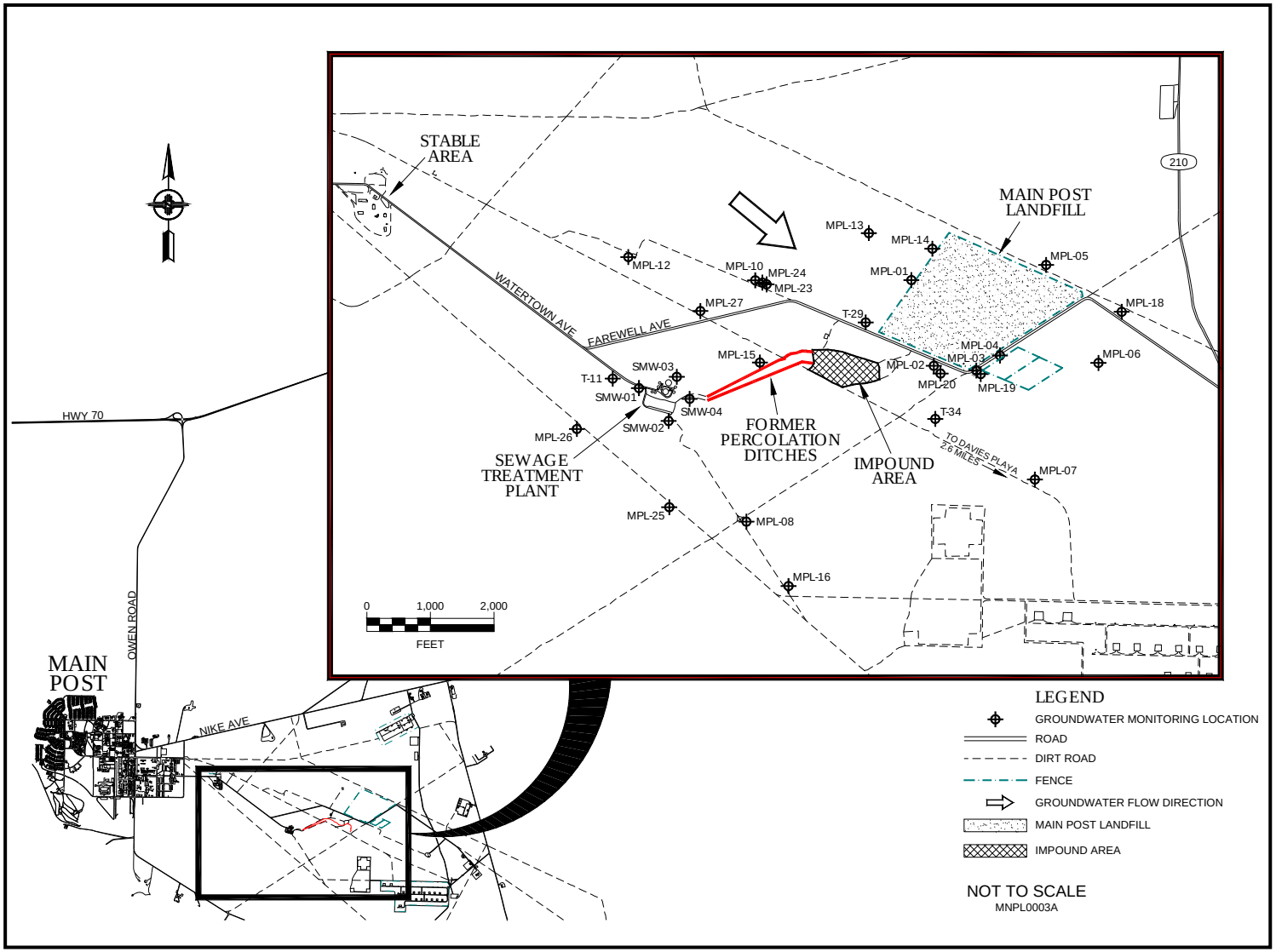

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Figure 18
Former Sewage Treatment Plant Percolation Ditches (SWMU 82) (WSMR-62) Site Map

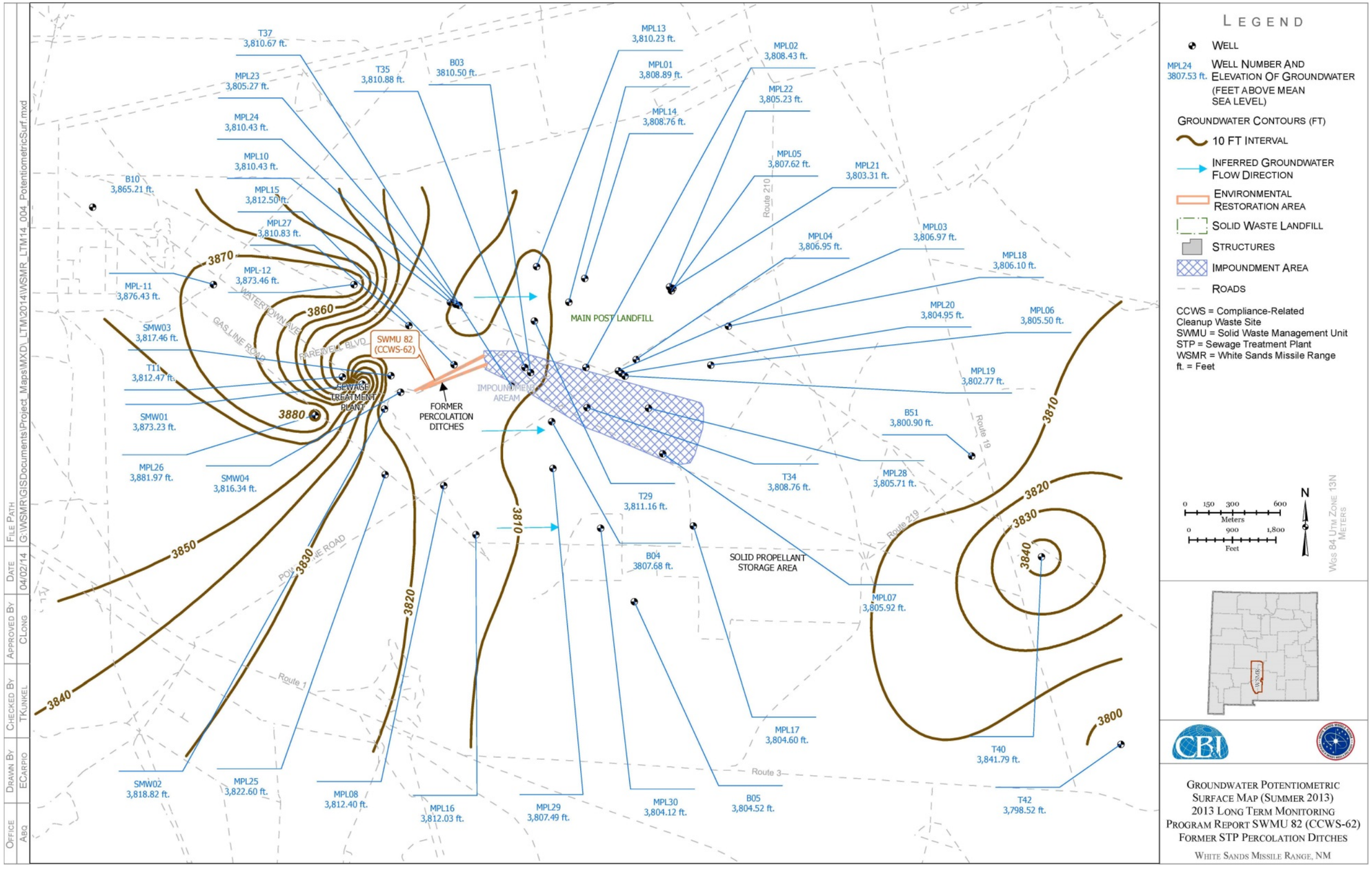

Figure 19
Former Sewage Treatment Plant Percolation Ditches (SWMU 82) Potentiometric Surface

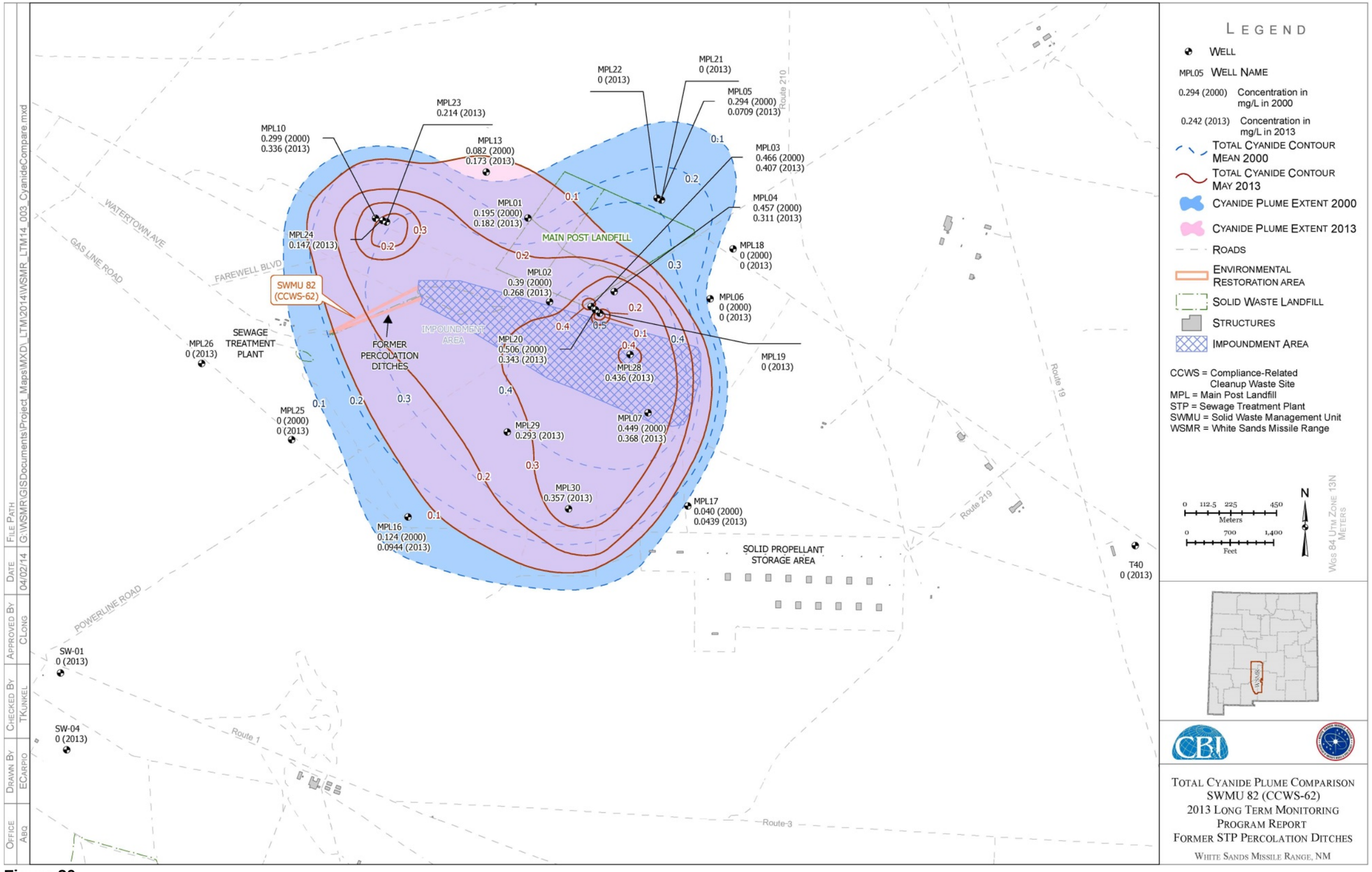

Figure 20
Total Cyanide Plume Comparison at the Former Sewage Treatment Plant Percolation Ditches (SWMU 82)

Tables

Table 1
WSMR RCRA-Related Groundwater Monitoring Activities

Site ID	Site Name	SWMU Designation	Monitoring Schedule	Separate Permit	No. Wells	Latest Sampling Event	Comments	Contractor	Summary of Significant Findings
CCWS-09	LC-38 Diesel Spill	198	Annual	No	4	August 2013	GWM	No Current Contractor	No product was detected on the water table. Low level concentrations of DRO were detected.
CCWS-11	OB/OD	55, 56, 56a	Semi-Annual	Yes	12	May 2013/ October 2013	GWM	CB&I Federal Services, LLC	Observations of nitrate, perchlorate, and RDX are consistent with previous sampling events.
CCWS-16	HELSTF TSA Spill	197	Annual	No	4	September 2013	GWM	No Current Contractor	No BTEX was detected in the monitoring wells. However, MTBE was confirmed in one well in the regional aquifer.
WSMR-14	Rhodes Canyon Landfill	114, 115	Annual	Yes	4	August 2013	O&M / GWM	No Current Contractor	No COCs were detected in the monitoring wells.
CCWS-75	HELSTF Construction Landfill	38, 39	Semi-Annual	No	5	September 2013	GWM	No Current Contractor	See HELSTF Groundwater Study
WSMR-54	HELSTF Chromate Spill	143	Semi-Annual	No	9	March 2013/ September 2013	GWM	No Current Contractor	See HELSTF Groundwater Study
WSMR-55	HELSTF Systemic Diesel Spill	154	Semi-Annual	No	11	March 2013/ September 2013	O&M / GWM	No Current Contractor	See HELSTF Groundwater Study
CCWS-76	Main Post Landfill 3	65	Annual	No	4	September 2013	RFIA	No Current Contractor	The analytical results do not indicate constituents in the groundwater that could directly be attributed to leachate from the landfill.
WSMR-62	Former STP Percolation Ditches	82	Semi-Annual	No	26	June 2013/ November 2013	RFIA	CB&I Federal Services, LLC	Cyanide remains the only COC.
n/a	HELSTF Groundwater Study	n/a	n/a	No	n/a	n/a	Inclusive of CCWS-75 and IRP Sites WSMR -54, -55	No Current Contractor	[Formerly designated as IRP Site WSMR-85] Inclusive of CCWS-75 and IRP Sites WSMR-54, -55

BTEX = *Benzene, toluene, ethyl benzene, and xylene.*
CCWS = *Compliance/Cleanup Program Site.*
COC = *Contaminant of Concern.*
DRO = *Diesel Range Organics.*
GWM = *Groundwater Monitoring Program.*
HELSTF = *High-Energy Laser System Test Facility.*
ID = *Identification.*
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 and 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 = *White Sands Missile Range. When the acronym is used with a number, it denotes an Installation Restoration Program Site.*

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Table 2
Construction Details for LC-38 Monitoring Wells

Well Name [a]	Location Brass Cap (UTM, meters, NAD83)		Elevation [b] Brass Cap (feet)	LOC (feet)	Total Well Depth (feet bgs)	Screened Interval (feet 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–inch-diameter polyvinyl chloride with stainless steel screens.

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

bgs = Below ground surface.
MW = Monitoring well.
LC = Launch Complex.
LOC = Length of casing.
NAD83 = North American Datum, 1983.
UTM = Universal transverse mercator.

Table 3
Field Parameters from the August 2013 LC-38 Sampling Event

Sample ID	Monitoring Well	Temp (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Depth to Water (feet bgs)
LC38-DSPL-MW-001-0813	MW-001	26.62	29.5	21.72	1.99	2.90	7.69	233.96
LC38-DSPL-MW-002-0813	MW-002	24.70	17.6	15.93	4.18	6.46	8.65	238.49
LC38-DSPL-MW-003-0813	MW-003	23.24	44.7	18.44	5.34	2.64	8.34	237.23
LC38-DSPL-MW-004-0813	MW-004	24.21	23.0	21.81	1.62	95	7.24	237.09

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

Table 4
Analytical Results from the August 2013 LC-38 Sampling Event

Sample ID	Monitoring Well	Total Chromium (mg/L)	DRO (mg/L)	Hexavalent Chromium (mg/L)
LC38-DSPL-MW-001-0813	MW-001	0.0123	0.136	<0.008
LC38-DSPL-MW-002-0813	MW-002	0.0235	0.0619	<0.008
LC38-DSPL-MW-003-0813	MW-003	0.00937	0.140	<0.008
LC38-DSPL-MW-004-0813	MW-004	1.03	0.173	<0.008
LC38-DSPL-MW-104-0813	MW-004 duplicate	1.02	0.171	<0.008
Screening Criteria		0.05[a]	0.4[b]	0.000431[c]

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.

[b] NMED potable groundwater screening level for diesel, TPH guidance Table 6-2. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.

[c] NMED Tap Water Standard, Table A-1, Tap Water column . 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.

< = *Less than the laboratory reporting limit, also qualified by U.*
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.*
NMAC = *New Mexico Administrative Code.*
NMED = *New Mexico Environment Department.*
NMWQCC = *New Mexico Water Quality Control Commission.*
TPH = *Total petroleum hydrocarbons.*

Table 5
Construction Details and Water Levels for OB/OD Monitoring Wells

Well Name	Location (UTM, meters, NAD83)		Elevation Top of Casing	Total Boring Depth (feet btoc)	Screen Interval (feet btoc)	Summer 2013	
	Northing	Easting				DTW (feet btoc)	Potentiometric Elevation (feet)
HTA 3	3595401.017	358079.848	5,356.81	164.81	59.81-109.81	no data	no data
HTA 10A	3596252.140	357115.435	5,690.43	82.43	62.43-82.43	71.00	5,619.43
HTA 11	3596313.225	357106.881	5,692.17	206.43	60.93-80.93	72.71	5,619.46
HTA 12	3596390.154	356882.906	5,756.71	166.93	131.93-151.93	92.80	5,663.91
HTA 13	3596252.067	357115.484	5,692.23	127.31	96.70-116.70	103.75	5,588.48
HTA 15	3596214.864	357298.680	5,645.09	122.17	79.17-99.17	85.84	5,559.25
HTA 16	3596180.104	357281.672	5,643.10	121.92	79.92-99.92	87.39	5,555.71
HTA 16D	3596179.083	357293.803	5,640.13	307.17	136.23-156.23	85.45	5,554.68
HTA 17	3596138.280	357255.941	5,643.64	122.15	87.15-107.15	87.86	5,555.78
HTA 19	3596029.687	357406.532	5,597.22	307.39	123.59-143.59	130.27	5,466.95
HTA 20	3596340.302	357163.219	5,701.56	117.22	76.57-96.57	82.15	5,619.41
HTA 25	Not listed	Not listed	5,646.03	125.03	97.46-117.46	85.47	5,560.56
HTA 101	3596181.320	257116.930	5,690.18	117.15	92.15-112.15	99.94	5,590.24
HTA 102	3596174.210	357145.150	5,681.20	114.00	89.0-109.0	96.04	5,585.16
HTA 103	3596348.850	357244.410	5,680.64	104.98	79.5-99.5	93.33	5,587.31
HTA 104	3596335.760	357254.210	5,673.51	107	81.66-101.66	86.48	5,587.03
HTA 105	3596214.240	357316.110	5,642.89	99.00	74.0-94.0	82.02	5,560.87

btoc = *Below top of casing.*
DTW = *Depth to water.*
HTA = *Hazardous Test Area.*
NAD83 = *North American Datum, 1983.*
OB/OD = *Open burn/open detonation.*
UTM = *Universal transverse Mercator, Zone 13.*

Table 6
Field Parameters from the OB/OD Sampling Event

Monitoring Well	Sample Date	Temperature (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Alkalinity (ppm)	pH	Depth to water (feet btoc)
HTA 3	5-15-13	22.26	13.8	0.689	56.0	0.08	245	7.42	no data
	10-24-13	20.7	156.7	0.801	7.42	1.26	250	7.18	no data
HTA 10A	5-13-13	21.90	44.7	0.796	5.69	0.51	220	7.44	71.00
	10-22-13	19.96	37.8	1.797	5.25	1.94	228	7.6	71.68
HTA 11	5-14-13	21.89	38.0	0.763	5.15	0.62	233	7.22	72.71
	10-22-13	19.64	46.2	1.853	6.21	3.41	234	7.4	73.42
HTA 12	5-6-13	20.37	18.8	0.849	3.29	0.35	225	8.10	92.80
	10-22-13	20.11	32.7	2.000	3.75	2.78	263	7.3	93.86
HTA 13	5-10-13	20.12	34.7	0.736	0.55	0.58	248	7.45	103.75
	10-22-13	17.41	-66.3	1.732	1.23	2.91	273	7.4	103.98
HTA 15	5-7-13	19.65	19.0	0.825	6.38	0.18	220	7.46	85.84
	10-23-13	20.2	289.2	0.943	8.81	2.40	217	7.27	85.99
HTA 16	5-15-13	20.95	-184.8	2.930	0.45	0.95	>300	6.57	87.39
	10-23-13	20.1	-236.5	0.948	8.89	3.83	224	7.16	87.58
HTA 16D	5-7-13	20.67	5.2	0.839	4.58	1.35	220	7.44	85.45
	10-23-13	20.1	285.7	0.938	8.87	4.94	217	7.21	84.81
HTA 17	5-13-13	20.60	70.7	0.842	7.03	0.60	225	7.39	87.86
	10-24-13	19.9	109.6	0.935	7.53	2.52	213	7.34	88.11

Table 6 (continued)
Field Parameters from the OB/OD Sampling Event

Monitoring Well	Sample Date	Temperature (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Alkalinity (ppm)	pH	Depth to water (feet btoc)
HTA 19	5-6-13	21.17	35.8	0.835	6.64	0.10	186	8.68	130.27
	10-18-13	19.68	54.5	1.436	6.16	1.33	184	6.48	130.58
HTA 20	5-14-13	21.40	53.7	0.788	5.42	0.48	236	7.19	82.15
	10-18-13	19.96	55.2	1.415	5.60	2.10	240	6.04	82.85
HTA 25	5-7-13	21.05	14.7	0.871	1.04	0.12	244	6.98	85.47
	10-18-13	20.91	50.5	1.522	1.66	1.75	231	6.22	85.68

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

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Table 7
Summary of Analytical Results for OB/OD

Sample ID	Sample Date	RDX (µg/L)	Perchlorate (µg/L)	Nitrate/Nitrite (mg/L)
HTA 3	5-15-13	<1.02	2.12	2.94
	10-24-13	<1.05	2.23	2.41
HTA 10A	5-13-13	85.2	2,610	7.67
	10-22-13	86.8	2,330	6.73
HTA 11	5-14-13	**62.1J**	2,390	6.67
	10-22-13	53.1	2,020	5.61
HTA 12	5-6-13	<1.10	9.80	2.79
	10-22-13	<1.09	8.55	2.52
HTA 13	5-10-13	1.06J	835	2.51
	10-22-13	0.789J	745	1.87
HTA 15	5-7-13	22.3	17,000	10.1
	10-23-13	22.5	16,400	2.15
HTA 16	5-15-13	2.00J	14,700	9.02
	10-23-13	20.9	14,200	9.16
HTA 16D	5-7-13	22.3	16,400	10.9
	10-23-13	18.6	15,600	9.19
HTA 17	5-13-13	31.1	15,700	11.5
	10-24-13	37.3	15,100	11
HTA 19	5-6-13	<1.09	9,550	24.7
	10-18-13	<1.11	9,350	21.1
HTA 20	5-14-13	**49.2J**	13,000	8.29
	10-18-13	54.1	12,100	8.52
HTA 25	5-7-13	2.19	15,900	7.12
	10-18-13	1.63	15,300	1.43
Screening Level		6.11 [a]	4.0 [b]	10 [c]

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

[b] *WSMR RCRA Permit Number NM2750211235, Appendix 3, Section 3.1, December 2009.*

[c] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.*

< = Less than the indicated laboratory reporting limit. Also qualified by U.

µg/L = Micrograms per liter.

Bold = Analyte was detected above the screening level.

HTA = Hazardous Test Area.

ID = Identification.

J = Estimated value. The analyte concentration was less than the limit of quantitation.

mg/L = Milligrams per liter.

NMAC = New Mexico Administrative Code.

NMED = New Mexico Environment Department.

NMWQCC = New Mexico Water Quality Control Commission.

OB/OD = Open burn/open detonation.

RCRA = Resource Conservation and Recovery Act.

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

WSMR = White Sands Missile Range.

Table 8
Construction Details for HELSTF TSA Monitoring Wells

Monitoring Well	Location (UTM, meters, NAD83)		Elevation TOC (feet)	Total Well Depth (feet bgs)	Screen Interval (feet bgs)
	Northing	Easting			
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

bgs = *Below ground surface.*
HELSTF = *High-Energy Laser Systems Test Facility.*
NAD83 = *North American Datum 1983.*
TOC = *Top of casing.*
TSA = *Technical Support Area.*
UTM = *Universal transverse Mercator, Zone 13.*

Table 9
HELSTF TSA Water-Quality Parameters and Water Levels (September 2013)

Monitoring Well	Date	Temperature (°C)	Oxidation Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Depth to water (feet btoc)
HMW48	9/5/2013	25.69	33.5	17.24	1.58	2.81	7.88	94.23
HMW49	9/5/2013	24.85	26.6	18.23	4.27	3.7	7.8	94.43
HMW50	9/5/2013	24.48	20.3	17.66	3.52	1.58	7.95	94.37
HMW52	9/5/2013	24.1	27.9	67.45	7.39	1.61	7.6	91.02

°C = *Degrees Celsius.*
btoc = *Below top of casing.*
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.*

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Table 10
Analytical Results of Sampling at the HELSTF TSA (September 2013)

Monitoring Well	MTBE (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
HMW48	<0.000300	<0.000200	<0.000600	<0.000300	<0.000600
HMW49	<0.000300	<0.000200	<0.000600	<0.000300	<0.000600
HMW49 duplicate	<0.000300	<0.000200	<0.000600	<0.000300	<0.000600
HMW50	<0.000300	<0.000200	<0.000600	<0.000300	<0.000600
HMW52	0.0126	<0.000200	<0.000600	<0.000300	<0.000600
Screening Level	0.012 [a]	0.01 [b]	0.75 [b]	0.75 [b]	0.62 [b]

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

[b] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.*

<	*= Less than the indicated laboratory reporting limit, also qualified by U.*
HELSTF	*= High-Energy Laser Systems Test Facility.*
mg/L	*= Milligrams per liter.*
MTBE	*= Methyl tert butyl ether.*
NMAC	*= New Mexico Administrative Code.*
NMED	*= New Mexico Environment Department.*
TSA	*= Technical Support Area.*

Table 11
Construction Details for Rhodes Canyon Landfill Monitoring Wells

Monitoring Well [a]	Location Brass Cap (UTM, meters, NAD83)		Elevation Brass Cap (NAVD88) (feet)	Elevation TOC (NAVD88) (feet)	Total Depth (feet bgs)	Screened Interval (feet 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 monitoring 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.
NAD83 = North American Datum of 1983.
NAVD88 = North American Vertical Datum of 1988.
TOC = Top of casing.
UTM = Universal transverse mercator.

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Table 12
Rhodes Canyon Landfill Analytical Schedule

Parameter		Reference Method	Container	Maximum Hold Time	Preservative
Water Quality	Conductivity pH Temperature Turbidity	Field measured with YSI and turbidity meter	NA	NA	NA
	Alkalinity pH Total Dissolved Solids Sulfate	SM 2320B SM 4500-H+ B SM 2540C E300	1-L polyethylene	48 hours	Chill to 4°C
Organics	VOCs	SW846-8260C	40-mL VOA vials (3)	14 days	HCl, pH<2 Chill to 4°C
	SVOCs	SW846-8270D	1-L amber (2)	7 days	Chill to 4°C
	TPH GRO	M8015V	40-mL VOA vials (3)	28 days	HCl, pH<2 Chill to 4°C
Total Metals	Lead	SW846-6020A	250-mL polyethylene	6 months	HNO_3, pH<2 Chill to 4°C

< = *Less than.*
°C = *Degrees Celsius.*
GRO = *Gasoline range organics.*
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.*
TPH = *Total petroleum hydrocarbons.*
VOA = *Volatile organic analysis.*
VOC = *Volatile organic compound.*

Table 13
Rhodes Canyon Landfill Water-Quality Parameters (August 2013)

Monitoring Well	Date	Temperature (°C)	Oxidation-Reduction Potential (mV)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Depth to Groundwater (feet bgs brass cap)*
RMW-01	8/20/2013	23.93	83.3	5.889	11.41	1.79	7.09	84.21
RMW-03	8/20/2013	26.41	79.8	6.927	10.08	0.75	6.8	74.8
RMW-05	8/21/2013	24.06	73.8	8.068	8.42	1.22	6.78	74.02
RMW-06	8/21/2013	24.91	59.8	7.472	9.9	1.25	6.83	76.87

* *Due to instrumentation error during the August sampling event, water levels were re-measured on November 26, 2013. Water-level data from November are presented.*

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

Table 14
Analytical Results of Sampling at Rhodes Canyon Landfill (August 2013)

Monitoring Well	Benzoic Acid (µg/L)	TPH GRO (mg/L)	Lead (mg/L)	Total Alkalinity (as $CaCO_3$) (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	pH
RMW-1	0.00434J	<0.0600	<0.000300	107	1,240	5,390	7.49
RMW-3	0.00402J	<0.0600	<0.000300	163	1,390	5,820	7.12
RMW-5	0.00814	<0.0600	0.000453J	171	2,540	7,740	7.1
RMW-6	0.00352J	<0.0600	<0.000300	169	1,340	6,730	7.0
Screening Level	58,000 [a]	NE	0.05 [b]	NE	600 [b]	1,000 [b]	6-9 [b]

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.*

[b] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.*

<	*= Less than the indicated laboratory reporting limit, also U qualified.*
µg/L	*= Micrograms per liter.*
Bold	*= Analyte detected above screening level.*
$CaCO_3$	*= Calcium carbonate.*
EPA	*= U.S. Environmental Protection Agency.*
GRO	*= Gasoline range organics.*
J	*= Estimated value. The analyte concentration was less than the limit of quantitation.*
mg/L	*= Milligrams per liter.*
NE	*= Not established.*
NMAC	*= New Mexico Administrative Code.*
NMWQCC	*= New Mexico Water Quality Control Commission.*
pH	*= Measure of acidity (potential of hydrogen).*
RSL	*= Regional Screening Level.*
TPH	*= Total petroleum hydrocarbons.*

Table 15
HELSTF Long-Term Groundwater Monitoring Program Wells

Monitoring Well	Location Brass Cap (UTM, meters, NAD83)		Elevation Brass Cap (NAVD88) (feet)	Elevation TOC (NAVD88) (feet)	Stickup (feet)	DTW September 2013 (feet btoc)	Top of Screen (feet btoc)	Bottom of Screen (feet btoc)	Total Well Depth (feet btoc)	Aquifer	Associated Site
	Northing	Easting									
DRW-03	3,611,440.8280	375,070.9920	3956.9027	3958.4038	2.2491	52.72	36.5011	56.5011	61.6	Lower Perched	Groundwater elevation only
DRW-04	3,611,447.8090	375,070.6760	3,956.8052	3,958.2790	1.4738	47.68	36.4738	56.4738	61.05	Lower Perched	Groundwater elevation only
DRW-05	3,611,444.8580	375,091.8200	3,955.6097	3,957.2735	1.6638	45.28	36.6638	56.6638	61.21	Lower Perched	HELSTF Diesel Spill
DRW-12	3,611,371.0430	375,094.1780	3,956.5165	3,958.0549	1.5384	46.60	36.5384	56.5384	62.21	Lower Perched	HELSTF Diesel Spill
DRW-13	3,611,415.7700	375,124.2750	3,954.8828	3,956.9997	2.1169	45.57	37.1169	57.1169	63.2	Lower Perched	HELSTF Diesel Spill
DRW-16	3,611,485.6120	375,048.6040	3,955.3580	3,957.7339	2.38	71.44	67.3759	87.3759	92.81	Regional	HELSTF Diesel Spill
HCF-01	3,611,395.5590	375,064.5060	3,957.0333	3,959.4851	2.4518	47.80	42.4518	62.4518	64.52	Lower Perched	HELSTF Diesel Spill
HMW-08	3,611,953.7330	375,301.5870	3,957.9749	3,959.7569	1.78	75.08	76.982	101.982	99.75	Regional	HELSTF Construction Landfill
HMW-11	3,611,303.2780	375,080.2270	3,955.7666	3,957.5079	1.7413	46.48	48.7413	63.7413	65.92	Lower Perched	HELSTF Chromate Spill
HMW-32	3,611,590.7100	375,373.8010	3,954.9901	3,957.4401	2.45	72.68	76.45	91.45	92.33	Regional	HELSTF Construction Landfill
HMW-34	3,611,579.4910	375,512.2990	3,955.4449	3,957.6249	2.18	74.27	77.18	92.18	92.77	Regional	HELSTF Construction Landfill
HMW-35	3,611,646.7200	375,481.7210	3,954.9328	3,957.3528	2.42	72.94	65.92	85.92	87	Regional	HELSTF Construction Landfill
HMW-37	3,611,345.3830	375,074.2690	3,955.6467	3,958.1305	2.4838	42.41	29.4838	44.4838	45.31	Lower Perched	HELSTF Chromate Spill
HMW-38	3,611,346.1080	375,071.2610	3,955.9713	3,958.3749	2.4036	46.96	54.4036	64.4036	63.88	Lower Perched	HELSTF Chromate Spill
HMW-39	3,611,321.9990	375,117.8120	3,954.7954	3,957.4253	2.6299	46.45	54.6299	64.6299	65.02	Lower Perched	HELSTF Chromate Spill
HMW-40	3,611,293.8460	375,101.7400	3,953.4649	3,955.7356	2.27	18.77	30.2707	40.2707	40.95	Upper Perched	HELSTF Chromate Spill
HMW-41	3,611,296.4350	375,103.3870	3,953.4451	3,955.7590	2.3139	44.92	51.3139	61.3139	61.47	Lower Perched	HELSTF Chromate Spill
HMW-43	3,611,310.7020	375,055.1330	3,956.4230	3,959.0501	2.63	46.40	55.1271	65.1271	65.67	Lower Perched	HELSTF Chromate Spill
HMW-59	3,611,453.0100	375,482.3240	3,953.9692	3,957.4392	3.47	74.00	71.47	81.47	87.73	Regional	HELSTF Construction Landfill

btoc = *Below top of casing.*
DTW = *Depth to water.*
HELSTF = *High-Energy Laser System Test Facility.*
NAD83 = *North American Datum of 1983.*
NAVD88 = *North American Vertical Datum of 1988.*
TOC = *Top of casing.*
UTM = *Universal transverse Mercator, Zone 13.*

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Table 16
Analyte List for Long-Term Monitoring at HELSTF Sites (Diesel Spill, Chromate Spill, and Construction Landfill)

Diesel Spill Site wells: DRW-5, DRW-12, DRW-13, DRW-16, HCF-1; Chromate Spill Site wells: HMW-11, HMW-37, HMW-38, HMW-39, HMW-40, HMW-41, HMW-43; Construction Landfill Site wells: 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 (all wells)	Field measured with YSI and turbidity meter	NA	NA	NA
	Total Organic Carbon (all wells)	M5310C	40-mL VOA vials (2)	28 days	H_2SO_4, pH<2, Chill to 4°C
	pH, Alkalinity (all wells)	M4500-H+ B	250-mL polyethylene	24 hours	Chill to 4°C
Organics	VOCs (all wells)	SW846-8260C	40-mL VOA vials (3)	14 days	HCl, pH<2, Chill to 4°C
	DRO (all wells)	M8015D	500-mL ambers (2)	14 days	HCl, pH<2, Chill to 4°C
	GRO (Construction Landfill wells only)	M8015V	40-mL VOA vials (3)	14 days	HCl, pH<2, Chill to 4°C
	SVOCs (Construction Landfill wells only)	SW846-8270D	1-L amber (2)	7 days	Chill to 4°C
Metals	Total Chromium (Diesel Spill and Chromate Spill wells only)	SW846-6020A	250-mL polyethylene	6 months	HNO_3, pH<2, Chill to 4°C
	Hexavalent Chromium (Diesel Spill and Chromate Spill wells only)	M3500-Cr D	Taken from Water Quality container.	24 hours	Chill to 4°C
	Total Metals (Construction Landfill wells only)	SW846-6020A	500-mL polyethylene		
Dissolved Ions	Chloride, Sulfate (Construction Landfill wells only)	E300, M2320B, M4500-H+ B	250-mL polyethylene	28 days	Field filter, Chill to 4°C
Total/ Dissolved Metals (RCRA 8)	Arsenic, Barium, Cadmium, Chromium, Lead, Selenium, Silver (Construction Landfill wells only)	SW846-6020A	500-mL polyethylene	6 months	HNO_3, pH<2, Chill to 4°C
	Mercury (Construction Landfill wells only)	SW846-7470A		28 days	

< = Less than.
°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.
mL = Milliliters.
NA = Not applicable.
ORP = Oxidation-reduction potential.
pH = Measure of acidity (potential of hydrogen).
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOA = Volatile organic analysis.
VOC = Volatile organic compound.

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Table 17
Analytical Results of Sampling at HELSTF Construction Landfill (SWMUs 38 and 39) (September 2013)

Constituents	Screening Level	Screening Level Reference	Location ID:	HMW-08	HMW-32	HMW-34	HMW-35	HMW-59
			Sample Date:	9/23/13	9/20/13	9/20/13	9/20/13	9/20/13
			Unit					
VOCs								
Trichloroethylene	100	NMWQCC [a]	µg/L	1.67J	<2	<2	<2	<2
SVOCs								
Benzoic Acid	58,000	EPA RSL Tap Water [b]	µg/L	7.96	<6	<2	8.02	7.72
Total Petroleum Hydrocarbons								
Diesel Range Organics	400	NMED TPH Guidance Table 6-2 [c]	µg/L	77.3B	82.7J	74.6J	72.1J	66.8J
Gasoline Range Organics	NE	NE	µg/L	<100	<100	<100	<100	<100
Metals								
Arsenic	100	NMWQCC [a]	µg/L	13.8	3.28J	12.7	9.97	16
Arsenic, Dissolved	100	NMWQCC [a]	µg/L	13.9	3.39J	12.5	10.5	16.2
Barium	1,000	NMWQCC [a]	µg/L	8.94J	15.7	15.2	9.76J	9.69
Barium, Dissolved	1,000	NMWQCC [a]	µg/L	8.42J	16.9	15.6	10.2	10.2
Calcium	NE	NE	µg/L	430,000	444,000J	406,000J	454,000J	434,000J
Calcium, Dissolved	NE	NE	µg/L	425,000	420,000	429,000	456,000	436,000
Chromium	50	NMWQCC [a]	µg/L	20.1	27.6	<6	<6	<6
Chromium, Dissolved	50	NMWQCC [a]	µg/L	20.9	29.2	<6	<6	<6
Magnesium	NE	NE	µg/L	702,000	267,000J	491,000J	559,000J	540,000J
Magnesium, Dissolved	NE	NE	µg/L	692,000	246,000	520,000	562,000	535,000
Mercury	2	NMWQCC [a]	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury, Dissolved	2	NMWQCC [a]	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Potassium	NE	NE	µg/L	62,500J	47,800	47,300	43,800	50,000
Potassium, Dissolved	NE	NE	µg/L	58,200J	46,300J	49,800J	44,800J	49,400J
Selenium	50	NMWQCC [a]	µg/L	76.8	63.8J	10.1J	257J	34.4J
Selenium, Dissolved	50	NMWQCC [a]	µg/L	81.2	64.3J	8.27J	271J	33.9J
Sodium	NE	NE	µg/L	2,560,000	2,350,000J	2,210,000J	2,120,000J	2,350,000
Sodium, Dissolved	NE	NE	µg/L	2,540,000	2,260,000	2,360,000	2,110,000	2,380,000

Table 17 (continued)
Analytical Results of Sampling at HELSTF Construction Landfill (SWMUs 38 and 39) (September 2013)

Constituents	Screening Level	Screening Level Reference	Location ID:	HMW-08	HMW-32	HMW-34	HMW-35	HMW-59
			Sample Date:	9/23/13	9/20/13	9/20/13	9/20/13	9/20/13
			Unit					
Water Quality Parameters								
Alkalinity, Total	NE	NE	mg/L	249	50.9	175	178	175
Chloride (Cl)	250	NMWQCC [a]	mg/L	1,330J	1,480J	959	1,290	1,070
pH	6-9	NMWQCC [a]	pH Units	7.43	8.11	7.53	7.53	7.75
Sulfate	600	NMWQCC [a]	mg/L	6,940J	4,800J	6,560	5,760	6,490
Total Organic Carbon	NE	NE	µg/L	<1,000	474J	1,050	913J	1,030

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.

[b] EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.

[c] NMED potable groundwater screening level for diesel, TPH guidance Table 6-2. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.

< = Less than the indicated laboratory reporting limit, also U qualified.
µg/L = Micrograms per liter.
B = Analyte detected in the associated method blank.
Bold = Analyte detected above screening level.
EPA =U.S. Environmental Protection Agency
HELSTF = High-Energy Laser Systems Test Facility.
ID = Identification.
J = Estimated value. The analyte concentration was less than the Limit of Quantitation.
mg/L = Milligrams per liter.
NE = Not established.
NMAC = New Mexico Administrative Code.
NMED = New Mexico Environment Department.
NMWQCC = New Mexico Water Quality Control Commission.
pH = Measure of acidity (potential of hydrogen).
RSL =Regional Screening Level.
SWMU = Solid Waste Management Unit
SVOC = Semi-volatile organic compound.
TPH =Total petroleum hydrocarbons.
VOC = Volatile organic compound.

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Table 18
Analytical Results of Sampling at HELSTF Chromate Spill (SWMU 143) (2013)

Constituents	Screening Level	Screening Level Source	Location ID:	HMW-11	HMW-11	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:	3/14/13	9/9/13	NS	9/11/13	3/13/13	9/10/13	3/13/13	9/11/13	3/12/13	9/10/13	3/12/13	9/10/13	3/14/13	9/9/13	9/9/2013
			Unit															FD
Diesel Range Organics	400	NMED TPH Guidance Table 6-2 [a]	µg/L	87.6J	101	NS	133B	<100	125	96.3J	149J	<80	98.3J	<80	107	<100	82.7J	83.9J
VOCs																		
1,1-Dichloroethane	25	NMWQCC [b]	µg/L	0.85J	0.74J	NS	0.68J	<1	<1	<1	<1	<1	<1	0.41J	0.35J	<1	<1	<1
1,1-Dichloroethylene	5	NMWQCC [b]	µg/L	0.51J	0.35J	NS	<1	<1	<1	1.17	1.25	<1	<1	2.27	2.31	<1	<1	<1
Acetone	12,000	EPA RSL Tap Water [c]	µg/L	<15	<15	NS	<15	11.8B	<15	11.5B	<15	<15	<15	<15	<15	12.1J	<15	<15
Acrylonitrile	0.045	EPA RSL Tap Water [c]	µg/L	<3	<3	NS	<3	<3	<3	<3	<3	<3	<3	**7.65J**	<3	<3	<3	<3
Bromodichloromethane	1.17	NMED Tap Water [d]	µg/L	<1	<1	NS	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.3J	<1	<1
Chlorodibromomethane (Dibromochloromethane)	1.47	NMED Tap Water [d]	µg/L	<1	<1	NS	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	1.93	NMED Tap Water [d]	µg/L	0.32J	<1	NS	6.81	0.58J	0.62J	0.42J	0.44J	<1	<1	0.71J	0.7J	6.1	5.15	5.34
Chloromethane	188	NMED Tap Water [d]	µg/L	<1	<1	NS	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethylene	100	NMWQCC [b]	µg/L	17.1	13	NS	<2	11.3	12.6	33.8	40.9	<2	<2	71.5	76.4	<2	<2	<2
Metals																		
Chromium	50	NMWQCC [b]	µg/L	66J	74.8	NS	3.27J	47.6	46.7	184	149	4.11J	3.76J	408	372	7.47J	7.39	6.5
Chromium (Hexavalent)	0.431	NMED Tap Water [d]	µg/L	87.6	90.7	NS	<8	45.7	52.4	177	173	<8	<8	455	440	8.62J	<8	<8
Water Quality Parameters																		
pH	6-9	NMWQCC [b]	pH Units	7.56	7.54	NS	7.40	7.52	7.55	7.65	7.64	7.76	7.60	7.59	7.48	7.36	7.57	7.52
Total Organic Carbon	NE	NE	µg/L	<1000	1400	NS	1,230	<1000	726J	556J	1,770	491	1,120	560	1,310	606J	722J	690J

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *NMED potable groundwater screening level for diesel, TPH guidance Table 6-2. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*
[b] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.*
[c] *EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.*
[d] *NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

< = Less than the indicated laboratory reporting limit, also U qualified.
µg/L = Micrograms per liter.
B = Analyte detected in the associated method blank.
Bold = Analyte detected above screening level.
EPA = U.S. Environmental Protection Agency.
FD = Field Duplicate.
HELSTF = High-Energy Laser System Test Facility.
ID = Identification.
J = Estimated value. The analyte concentration was less than the limit of quantitation.
mg/L = Milligrams per liter.
NE =Not established.
NMAC =New Mexico Administrative Code.
NMED = New Mexico Environment Department
NMWQCC = New Mexico Water Quality Control Commission.
NS = Not Sampled due to low water level.
pH = Measure of acidity (potential of hydrogen).
RSL =Regional Screening Level
SWMU = Solid Waste Management Unit.
TPH = Total petroleum hydrocarbons.
VOC = Volatile organic compound.

Table 19
Analytical Results of Sampling at HELSTF Diesel Spill (SWMU 154) (2013)

Constituents	Screening Level	Screening Level Reference	Location ID:	DRW-05	DRW-05	DRW-12	DRW-12	DRW-13	DRW-13	DRW-16	DRW-16	HCF-01	HCF-01
			Sample Date:	3/18/13	9/19/13	3/18/13	9/18/13	3/14/13	9/18/13	3/12/13	9/18/13	3-18-13	9/19/13
			Unit										
Diesel Range Organics	400	NMED TPH Guidance Table 6-2 [a]	µg/L	1,550J	1,340	<100	<100	91.4J	<100J	<100	<100	5,950J	15,400
VOCs													
1,1,1-Trichloroethane	60	NMWQCC [b]	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	25	NMWQCC [b]	µg/L	31.5	37.1	1.58	1.55	1.74	1.27	1.39	1.41	3.79J	2.55
1,1-Dichloroethylene	5	NMWQCC [b]	µg/L	0.48J	<1	<1	<1	<1	<1	3.91	5.65	<1	<1
1,2,3-Trichlorobenzene	5.2	EPA RSL Tap Water [c]	µg/L	<5	<5	<5	<5	<5	<5	<5	<5	<5	1.73J
2-Phenylbutane	NE	NE	µg/L	1.4	0.44J	<1	<1	<1	<1	<1	<1	1.93J	0.71J
Acetone	12,000	EPA RSL Tap Water [c]	µg/L	16B	<15	23.9B	<15	10.1J	<15	21.9	<15	<15	<15
Benzene	4.13	NMED Tap Water [d]	µg/L	4.09	3.21	<1	<1	<1	<1	<1	<1	5.47J	2.06
Carbon Disulfide	720	EPA RSL Tap Water [c]	µg/L	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
CFC-11 (Trichlorofluoromethane)	1100	EPA RSL Tap Water [c]	µg/L	<1	<1	<1	<1	<1	<1	<1	0.25J	<1	<1
Chloroform	1.93	NMED Tap Water [d]	µg/L	<1	<1	0.43B	0.41J	2.82	1.93	0.91J	0.93J	<1	<1
Isopropylbenzene (Cumene)	390	EPA RSL Tap Water [c]	µg/L	1.22	<1	<1	<1	<1	<1	<1	<1	1.68J	0.7J
MTBE	12	EPA RSL Tap Water [c]	µg/L	2.82	3.21	<1	<1	<1	<1	<1	<1	3.66J	2.94
n-Butylbenzene	780	EPA RSL Tap Water [c]	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
n-Propylbenzene	NE	NE	µg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethylene	100	NMWQCC [b]	µg/L	<2	<2	7.73	9.28	3.57	6.6	64.3	75.8	<2	<2
Metals													
Chromium	50	NMWQCC [b]	µg/L	<6	12.5	711	1,310	42.6	148	4,650	16,800	<6	<6
Chromium (Hexavalent)	0.431	NMED Tap Water [d]	µg/L	<10	<10	<10	<10	<10	<10	253	266	<10	<10
Water Quality Parameters													
pH	6-9	NMWQCC [b]	pH Units	7.35	7.32	7.28	7.11	7.38	7.13	7.34	7.35	7.18	7.42
Total Organic Carbon	NE	NE	µg/L	16,100B	13,300	1,750B	2,070	397J	1,230	<1000	1,990	14,200B	15,100

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *NMED potable groundwater screening level for diesel, TPH guidance Table 6-2. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

[b] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103NMAC.*

[c] *EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.*

[d] *NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

< = Less than the indicated laboratory reporting limit, .
µg/L = Micrograms per liter.
B = Analyte detected in the associated method blank.
Bold = Analyte detected above screening level.
EPA = U.S. Environmental Protection Agency.
HELSTF = High-Energy Laser System Test Facility.
ID = Identification.
J = Estimated value. The analyte concentration was less than the Limit of Quantitation.
mg/L = Milligrams per liter.
MTBE = Methyl tert butyl ether.
NE = Not established.
NMAC = New Mexico Administrative Code.
NMED = New Mexico Environment Department.
NMWQCC = New Mexico Water Quality Control Commission.
pH = Measure of acidity (potential of hydrogen).
RSL = Regional Screening Level.
SWMU = Solid Waste Management Unit
TPH = Total petroleum hydrocarbon.
VOC = Volatile organic compound.

Table 20
Construction Details for Main Post Landfill No. 3 Monitoring Wells

Monitoring Well	Location Brass Cap (UTM, meters, NAD83)		Elevation Brass Cap (NAVD88) (feet)	Elevation TOC (NAVD88) (feet)	Total Well Depth (feet bgs)	Elevation Screened Interval (NAVD88) (feet)
	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
0065-MW09	3579534.93	362671.78	4092.87	4095.22	230	3887.3–3867.3
0065-MW10	3579454.69	363208.28	4064.29	4066.62	216	3873.0–3853.0
0065-MW11	3579192.75	363204.66	4054.70	4056.95	216	3863.4–3843.4
0065-MW12	3579032.12	363202.30	4047.88	4049.89	211	3861–3841

bgs = *Below ground surface.*
MW = *Monitoring well.*
NAD83 = *North American Datum of 1983.*
NAVD88 = *North American Datum of 1988.*
No. = *Number.*
TOC = *Top of casing.*
UTM = *Universal transverse mercator.*

Table 21
Field Parameters at From the Main Post Landfill No. 3 Sampling Events (August - September 2013)

Monitoring Well	Sample Date	Temperature (°C)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	pH	Depth to Water (feet btoc)
0065-MW09	9/4/2013	25.71	0.586	7.84	1.58	7.84	220.09
0065-MW10	9/4/2013	25.45	0.635	7.57	2.63	6.88	200.71
0065-MW11	9/3/2013	26.54	0.774	9.01	1.38	7.24	197.35
0065-MW12	8/29/2013	24.81	0.678	7.52	1.71	7.25	194.65

°C = *Degrees Celsius.*
µS/cm = *MicroSiemens per centimeter.*
btoc = *Below top of casing.*
mg/L = *Milligrams per liter.*
MW = *Monitoring well.*
No. = *Number.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*

Table 22
Analytical Results of Sampling at the Main Post Landfill No. 3 (August - September 2013)

Constituents	Screening Level	Screening Level Reference	Location ID:	0065-MW09	0065-MW10	0065-MW11	0065-MW12	0065-MW12
			Sample Date:	9/4/13	9/4/13	9/3/13	8/29/13	8/29/13
			Unit					
Diesel Range Organics	400	NMED TPH Guidance Table 6-2 [a]	µg/L	<100	112	<100	<100	<100
Organics								
Acetone	21,780	NMED Tap Water [b]	µg/L	<15	<15	<15	5.49J	<15
Benzoic Acid	58,000	EPA RSL Tap Water [c]	µg/L	6.2BJ	6.66B	12B	7B	10B
Metals								
Barium	1,000	NMWQCC [d]	µg/L	78.4	85.9	89.7	75.9	78.2
Barium, Dissolved	1,000	NMWQCC [d]	µg/L	76.4	85	85.6	77.5	75.2
Calcium Metal	NE	NE	µg/L	26,900	29,400	42,100	40,000	39,900
Calcium, Dissolved	NE	NE	µg/L	27,700	31,400	43,000	43,000	42,200
Chromium	50	NMWQCC [d]	µg/L	<6	<6	<6	3.33J	<6
Magnesium	NE	NE	µg/L	6,680	6,900	5,550	5,410	4,990
Magnesium, Dissolved	NE	NE	µg/L	6,650	6,970	5,310	4,730	4,550
Mercury, Dissolved	2	NMWQCC [d]	µg/L	0.0652J	0.0664J	<0.2	<0.2	<0.2
Potassium	NE	NE	µg/L	1,700	1,560	1,600	1,580	1,590
Potassium, Dissolved	NE	NE	µg/L	1,710	1,580	1,590	1,610	1,580
Sodium	NE	NE	µg/L	20,700	21,000	23,700	22,800	24,300
Sodium, Dissolved	NE	NE	µg/L	20,700	21,500	22,600	22,600	21,700
Water Quality Parameters								
Alkalinity, Total (as $CaCO_3$)	NE	NE	µg/L	74,300	74,200	94,700	89,400	89,600
Chloride (Cl)	250,000	NMWQCC [d]	µg/L	15,200	16,700	18,200J	18,000J	17,800
pH	6-9	NMWQCC [d]	pH Units	7.45	7.17	7.79	7.81	7.77
Sulfate	600,000	NMWQCC [d]	µg/L	48,300	58,400	47,500J	42,200	42,200
Total Organic Carbon	NE	NE	µg/L	<1,000	444J	<1,000	<1,000	<1000

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] *NMED potable groundwater screening level for diesel, TPH guidance Table 6-2. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

[b] *NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.*

[c] *EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.*

[d] *NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.*

< = *Less than the indicated laboratory reporting limit.*
µg/L = *Micrograms per liter.*
B = *Analyte detected in the associated method blank.*
$CaCO_3$ = *Calcium carbonate.*
EPA = *U.S. Environmental Protection Agency.*
ID = *Identification.*
J = *Estimated value. The analyte concentration was less than the Limit of Quantitation.*
mg/L = *Milligrams per liter.*
MPL = *Main Post Landfill.*
MW = *Monitoring well.*
NE = *Not established.*
NMAC = *New Mexico Administrative Code.*
NMED = *New Mexico Environment Department.*
NMWQCC = *New Mexico Water Quality Control Commission.*
No. = *Number.*
pH = *Measure of acidity (potential of hydrogen).*
RSL = *Regional Screening Level.*
TPH = *Total petroleum hydrocarbon.*

Table 23
Construction Details and Monitoring Status at Former Sewage Treatment Plant Percolation Ditches Monitoring Wells

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

[a] All wells are 4-inch-diameter polyvinyl chloride.

[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.
mg/L = Milligrams per liter.
NAD83 = North American Datum of 1983.
NAVD 88 = North American Datum of 1988.
RCRA = Resource Conservation and Recovery Act.
UTM = Universal transverse mercator.

Table 24
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 turbidity meter	NA	NA	NA
	Total Alkalinity pH Total Dissolved Solids Specific Conductance	SM2320B-1997 9040C SM2540-C-1997 120.1	1-L 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	SM2540-D-1997			
Dissolved Ions	Chloride Fluoride Sulfate	300 SM4500-F-C-1997	250-mL polyethylene	28 days	Field filter Chill to 4°C
Nutrients	Ammonia-Nitrogen Nitrate/Nitrite Orthophosphate	350.1 353.2 SM4500	500-mL polyethylene	28 days	H_2SO_4, pH<2 Chill to 4°C

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Table 24 (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	SW846-6010B SW846-6020	500-mL polyethylene	6 months	HNO_3, pH<2 Chill to 4°C
	Mercury		SW846-7470A		28 days	
Cyanide	Total, free, and amenable Cyanide		9014-9010C SM4500-CN-I SM4500-CN-C,G-1999	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 applicable.*
NaOH = *Sodium hydroxide.*
ORP = *Oxidation-reduction potential.*
pH = *Measure of acidity (potential of hydrogen).*
RCRA = *Resource Conservation and Recovery Act.*
TAL = *Target analyte list metal.*
VOA = *Volatile organic analysis.*

Table 25
Former Sewage Treatment Plant Percolation Ditches Depth to Water
(May 2013)

Monitoring Well	Depth To Water (feet btoc)	Length of Casing (feet)	Ground Elevation (feet)	Groundwater Elevation (feet)
B02	dry	2	4,020.38	n/a
B03	215.94	2	4,024.44	3,810.50
B04	213.09	2	4,018.77	3,807.68
B05	195.74	2	3,998.26	3,804.52
B10	309.21	2	4,172.42	3,865.21
B51	151.22	2	3,950.12	3,800.90
MPL01	205.64	1.97	4,012.56	3,808.89
MPL02	199.03	2.91	4,004.55	3,808.43
MPL03	192.75	1.97	3,997.75	3,806.97
MPL04	188.82	2.27	3,993.50	3,806.95
MPL05	186.26	1.98	3,991.90	3,807.62
MPL06	172.25	2.08	3,975.97	3,805.80
MPL07	179.56	2.09	3,983.39	3,805.92
MPL08	248.06	1.98	4,058.48	3,812.40
MPL10	241.59	1.96	4,050.06	3,810.43
MPL-11	246.16	1.67	4,120.92	3,876.43
MPL-12	208.90	1.72	4,080.64	3,873.46
MPL13	218.61	1.82	4,027.02	3,810.23
MPL14	205.81	1.68	4,012.89	3,808.76
MPL15	243.13	1.7	4,053.93	3,812.50
MPL16	235.06	1.35	4,045.74	3,812.03
MPL17	177.06	1.14	3,980.52	3,804.60
MPL18	172.06	1.55	3,976.61	3,806.10
MPL19	194.35	1.59	3,995.53	3,802.77
MPL20	193.33	1.56	3,996.72	3,804.95
MPL21	190.27	1.2	3,992.38	3,803.31
MPL22	189.50	1.58	3,993.15	3,805.23
MPL23	243.58	2.37	4,046.48	3,805.27
MPL24	239.11	1.42	4,048.12	3,810.43

Table 25 (continued)
Former Sewage Treatment Plant Percolation Ditches Depth to Water
(May 2013)

Monitoring Well	Depth To Water (feet btoc)	Length of Casing (feet)	Ground Elevation (feet)	Groundwater Elevation (feet)
MPL25	257.13	1.85	4,077.88	3,822.60
MPL26	217.77	1.85	4,097.89	3,881.97
MPL27	256.75	1.74	4,065.84	3,810.83
MPL28	184.94	2.53	3,988.12	3,805.71
MPL29	215.83	2.3	4,021.02	3,807.49
MPL30	200.64	2.58	4,002.18	3,804.12
SMW01	212.25	2.5	4,082.98	3,873.23
SMW02	257.14	2.5	4,073.46	3,818.82
SMW03	258.47	2.46	4,073.47	3,817.46
SMW04	254.69	2.5	4.068.53	3,816.34
T11	281.14	1.5	4,092.11	3,812.47
T29	208.98	1.9	4,018.24	3,811.16
T34	199.64	1.6	4,006.90	3,808.86
T35	216.62	1.8	4,025.70	3,810.88
T37	220.61	1.35	4,029.93	3,810.67
T40	128.91	2.44	3,968.26	3,841.79
T42	125.05	2.04	3,921.53	3,798.52

bgs = Below ground surface.
btoc = below top of casing.
n/a = Not applicable.

Table 26
Field Parameters from the Former Sewage Treatment Plant Percolation Ditches Sampling Event

Monitoring Well	Sample Date	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	5-29-13	24.24	55.6	0.351	7.04	6.35	7.79	8.0	0.01
MPL01	10-30-13	22.7	240.1	0.4317	7.60	95.0	8.28	8.0	0.02
MPL02	5-24-13	24.36	93.6	0.538	7.65	6.48	7.70	10.0	0.12
MPL02	11-1-13	22.4	278.2	0.564	7.63	7.56	8.08	10.0	0.03
MPL03	5-29-13	24.77	102.4	0.587	6.16	3.34	7.61	16.0	0.06
MPL03	11-1-13	22.2	282.3	0.680	7.61	4.07	7.84	8.0	0.02
MPL04	5-24-13	23.66	108.6	0.761	7.25	2.04	7.32	12.0	0.10
MPL04	11-1-13	19.4	295.9	0.753	7.99	8.01	7.64	14.0	0.03
MPL05	5-29-13	23.62	36.0	0.380	7.07	0.49	7.59	14.0	0.04
MPL05	11-7-13	22.5	238.2	0.4479	7.73	2.13	8.01	10.0	0.04
MPL06	5-22-13	25.73	5.3	0.329	5.13	0.10	7.50	12.0	0.07
MPL06	10-30-13	22.1	173.8	0.3328	7.65	3.01	7.87	10.0	0.06
MPL07	5-31-13	25.80	141.4	0.809	5.63	0.44	7.24	16.0	0.14
MPL07	11-7-13	21.0	290.6	0.894	7.89	2.65	7.56	16.0	0.10
MPL10	5-30-13	25.36	59.9	0.464	4.35	2.70	7.92	10.0	0.04
MPL10	10-31-13	21.6	270.8	0.529	7.75	2.63	8.18	10.0	0.03
MPL13	6-4-13	23.84	40.7	0.357	7.30	1.88	7.99	14.0	0.04
MPL13	10-30-13	21.7	238.8	0.395	7.65	3.17	7.97	10.0	0.02
MPL16	6-5-13	25.66	1.3	0.460	7.74	1.06	7.56	16.0	0.03
MPL16	11-5-13	22.4	250.6	0.4927	7.64	4.94	8.32	8.0	0.01
MPL17	5-31-13	25.38	25.6	0.411	6.01	2.33	7.56	12.0	0.02
MPL17	10-31-13	22.5	230.9	0.4749	7.54	2.15	7.95	10.0	0.02
MPL18	5-30-13	26.37	13.5	0.280	6.01	1.56	7.74	8.0	0.04
MPL18	10-30-13	22.5	176.5	0.3184	7.54	2.79	7.77	8.0	0.04
MPL19	5-22-13	26.54	-5.3	0.334	5.37	0.28	8.13	16.0	0.05
MPL19	11-13-13	18.7	196.4	0.2495	8.22	4.78	8.30	6.0	0.04
MPL20	5-22-13	27.86	50.9	0.684	5.04	0.28	7.76	12.0	0.06
MPL20	11-14-13	22.5	192.1	0.642	7.56	33.8	7.99	12.0	0.06
MPL21	5-28-13	27.55	17.4	0.292	4.34	0.79	7.65	6.0	0.03
MPL21	11-8-13	22.4	201.1	0.3204	7.58	3.97	7.94	8.0	0.04

Table 26 (continued)
Field Parameters from the Former Sewage Treatment Plant Percolation Ditches Sampling Event

Monitoring Well	Sample Date	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	5-28-13	28.05	-10.6	0.220	2.14	1.57	8.37	8.0	0.09
MPL22	11-12-13	18.7	224.8	0.226	8.15	3.23	7.53	8.0	0.07
MPL23	5-21-13	24.32	20.7	0.306	5.00	0.30	7.87	8.0	0.04
MPL23	11-12-13	19.2	213.8	0.2501	8.14	2.08	7.88	10.0	0.04
MPL24	5-21-13	27.01	27.3	0.454	7.70	0.40	7.86	14.0	0.00
MPL24	11-13-13	12.2	190.1	0.2089	9.52	3.66	8.46	12.0	0.00
MPL25	5-23-13	29.40	6.8	0.522	6.25	0.45	7.41	8.0	0.05
MPL25	11-14-13	24.8	138.7	0.2839	7.32	4.36	8.20	8.0	0.00
MPL26	6-5-13	27.64	-10.0	1.453	9.25	13.53	7.22	14.0	0.27
MPL26	11-5-13	22.3	222.1	1.492	7.51	14.38	7.47	12.0	0.08
MPL28	5-30-13	29.37	120.4	0.725	5.69	0.51	7.72	18.0	0.08
MPL28	10-31-13	19.4	284.9	0.728	7.98	5.22	7.97	12.0	0.02
MPL29	6-5-13	26.33	59.5	0.693	6.72	2.08	7.49	20.0	0.00
MPL29	11-7-13	22.1	238.5	0.726	7.73	14.32	8.15	18.0	0.01
MPL30	6-4-13	28.22	61.1	0.667	1.61	9.78	8.16	10.0	0.07
MPL30	11-5-13	21.3	283.3	0.669	7.72	6.22	7.86	10.0	0.02
SMW01	5-27-13	27.06	10.8	0.361	10.94	0.32	6.90	22.0	0.02
SMW01	11-15-13	18.7	183.0	0.349	8.19	2.15	7.46	12.0	0.01
SMW04	5-23-13	29.27	-17.8	0.399	8.21	0.32	7.28	18.0	0.02
SMW04	11-15-13	18.6	176.5	0.263	8.20	3.52	8.32	16.0	0.02
T40	6-4-13	24.99	0.1	0.372	6.32	1.90	7.67	14.0	0.06
T40	10-31-13	18.9	177.9	0.3755	8.16	3.08	7.77	16.0	0.00

°C = *Degrees Celsius.*
mg/L = *Milligrams per liter.*
mS/cm = *MilliSiemens per centimeter.*
mV = *Millivolts.*
NTU = *Nephelometric turbidity unit.*
pH = *Measure of acidity (potential of hydrogen).*
Temp = *Temperature.*

Table 27
Analytical Results of Sampling at the Sewage Treatment Plant Percolation Ditches (May 2013)

Parameter	Units	Screening Level	Screening Level Reference	MPL-001 5/29/13	MPL-002 5/24/13	MPL-003 5/29/13	MPL-004 5/24/13	MPL-005 5/29/13	MPL-006 5/22/13	MPL-007 5/31/13	MPL-010 5/30/13	MPL-013 6/4/13	MPL-016 6/5/13	MPL-017 5/31/13	MPL-018 5/30/13	MPL-019 5/22/13
Ammonia	mg/L	NE	NE	<0.100	0.0625J	<0.100	<0.100	0.0591J	0.115	0.0752J	0.0599J	0.0531J	0.165	0.105	0.0518J	0.0736J
Chloride	mg/L	250	NMWQCC [a]	32.7	53.9	61.6	61.0	44.0	20.0	110	43.2	30.5	40.6	47.0	13.2	14.7
Fluoride	mg/L	1.6	NMWQCC [a]	0.951	<0.100	0.900	<0.100	1.04	0.172	<1.00	0.966	0.748	0.972	0.960	0.530	0.194
Nitrate / Nitrite	mg/L	10	NMWQCC [a]	6.46	7.37	8.69	8.89	7.93	2.59	13.6	7.01	5.04	5.64	5.68	1.84	2.66
Orthophosphate	mg/L	NE	NE	0.142	0.203	0.0995	0.394	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Sulfate	mg/L	600	NMWQCC [a]	44.5	71.9	114	139	53.2	38.1	139	86.8	49.9	68.8	56.8	34.9	49.7
Total Alkalinity	mg/L	NE	NE	94.3	93.6	94.8	134	76.2	86.9	120	71.4	71.3	90.2	72.9	86.4	77.7
Total Dissolved Solids	mg/L	1000	NMWQCC [a]	234	252	362	336	282	506	590	288	248	334	280	192	262
Total Organic Carbon	mg/L	NE	NE	1.03	0.682	1.24	0.893J	1.40	<1.00	0.820J	1.35	0.569J	0.672J	0.576J	0.513J	<1.00
Total Suspended Solids	mg/L	NE	NE	<5.00	6.50	<5.00	<5.00	<0.500	<5.00	<5.00	<0.500	<5.00	<5.00	<5.00	<5.00	<5.00
pH	standard units	6.0 - 9.0	NMWQCC [a]	7.97	8.11	7.81	7.87	7.83	7.73	7.41	8.10	8.08	7.81	7.84	7.88	7.60
Total Antimony	mg/L	0.0146	NMED Tap Water [b]	<0.00100B	<0.00100	<0.00100B	<0.00100	<0.00100B	<0.00100B	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100B
Total Arsenic	mg/L	0.1	NMWQCC [a]	0.00152	0.00639	0.00289	0.00637	0.00147	0.00176	0.0119	0.00317	0.00230	0.00242	0.00286	0.00197	0.00193
Total Barium	mg/L	1	NMWQCC [a]	0.117	0.0648	0.0524	0.0634	0.114	0.116	0.0604	0.117	0.0930	0.0692	0.0753	0.137	0.0808
Total Beryllium	mg/L	0.073	NMED Tap Water [b]	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Total Cadmium	mg/L	0.01	NMWQCC [a]	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.00600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600
Total Calcium	mg/L	NE	NE	41.9	57.8	68.2	90.4	45.9	34.4	97.6	53.2	41.2	51.1	47.5	34.1	33.4
Total Chromium	mg/L	0.05	NMWQCC [a]	0.00417	0.00243	0.00239	0.00222	0.00275	0.00355	0.00214	0.00215	0.00249	0.00173J	0.00173J	0.00373	0.00295
Total Cobalt	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Copper	mg/L	1	NMWQCC [a]	<0.00200	0.00105J	<0.00200	<0.00200	<0.00200	<0.00200	0.00103J	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Total Lead	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Magnesium	mg/L	NE	NE	8.12	10.7	13.5	17.7	8.65	6.63	18.2	10.6	7.03	8.16	8.01	6.07	5.78
Total Manganese	mg/L	NE	NE	0.00404	0.00580	0.00430	0.00127J	<0.00200	0.00300	0.00223	0.00211	0.00478	0.00106J	<0.00200	0.00111J	<0.00200
Total Mercury	mg/L	0.002	NMWQCC [a]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Nickel	mg/L	0.2	NMWQCC [a]	<0.00400	0.00311	0.00379J	0.00440	0.00210J	0.00220J	0.00686	0.00212J	<0.00400	<0.00400	0.00278J	<0.00400	<0.00400
Total Potassium	mg/L	NE	NE	2.41	2.79	2.54	3.31	2.62	1.88	3.28	2.30	2.14	3.13	2.40	1.91	2.06
Total Selenium	mg/L	0.05	NMWQCC [a]	0.00600	0.0121	0.0132	0.0267	0.00487	0.00278	0.0266	0.0142	0.00707	0.00787	0.00574	0.00183	0.00247
Total Silver	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Sodium	mg/L	NE	NE	22.0	28.9	29.9	34.5	22.6	20.2	45.4B	26.4	21.1	27.2B	27.2	22.6	20.5
Total Thallium	mg/L	0.000365	NMED Tap Water [b]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Tin	mg/L	9.3	EPA RSL Tap Water [c]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Total Vanadium	mg/L	0.183	NMED Tap Water [b]	0.00804J	<0.0100	0.00800J	<0.0100	0.00902J	0.00688J	0.00630JB	0.00874J	0.00865J	0.00814J	0.00550JB	0.0105	0.00738J
Total Zinc	mg/L	10	NMWQCC [a]	<0.0200	<0.0200	<0.0200	0.0121J	<0.0200	0.0357	<0.0200	0.0225	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200
Total Cyanide	mg/L	0.2	NMWQCC [a]	0.187	0.268	0.407	0.311	0.0709	0.00572J	0.368	0.336	0.173	0.0944	0.0439	<0.0100	<0.0100
Amenable Cyanide	mg/L	0.2	NMWQCC [a]	0.185	0.264	0.201	0.310	0.0680	<0.0100	0.364	0.334	0.357	0.0932	0.0417	<0.0100	<0.0100
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC [a]	0.0222	0.0273	0.0358	0.0407	0.0125	<0.0100	0.00974J	0.0328	0.0195	0.0118	<0.0100	<0.0100	<0.0100

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Table 27 (continued)
Analytical Results of Sampling at the Sewage Treatment Plant Percolation Ditches (May 2013)

Parameter	Units	Screening Level	Screening Level Reference	MPL-020 5/22/13	MPL-021 5/28/13	MPL-022 5/28/13	MPL-023 5/21/13	MPL-024 5/21/13	MPL-025 5/23/13	MPL-026 6/5/13	MPL-028 5/30/13	MPL-029 6/5/13	MPL-030 6/4/13	T-40 6/4/13	SMW-01 5/23/13	SMW-04 5/23/13
Ammonia	mg/L	NE	NE	0.0628J	<0.100	0.123	0.104	0.130	0.0503	0.0675J	<0.100	0.0897J	<0.100	<0.100	0.0774J	0.0621J
Chloride	mg/L	250	NMWQCC [a]	71.9	12.1	13.9	12.4	32.8	48.0	154	82.8	53.6	61.7	27.9	18.2	23.2
Fluoride	mg/L	1.6	NMWQCC [a]	0.0747J	0.234J	0.292J	0.193	0.0884J	0.0992J	<2.00	1.15	0.888	0.948	0.660	0.194	0.194
Nitrate / Nitrite	mg/L	10	NMWQCC [a]	7.58	1.80	1.36	1.76	6.38	5.71	8.82	9.74	7.75	9.30	2.54	3.15	3.24
Orthophosphate	mg/L	NE	NE	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	0.132	<0.0500	<0.0500
Sulfate	mg/L	600	NMWQCC [a]	92.0	48.3	29.8	49.8	57.4	46.5	488	125	122	108	35.0	61.2	56.9
Total Alkalinity	mg/L	NE	NE	69.5	79.1	58.5	63.0	68.8	91.3	80.1	37.8	140	96.9	113	78.4	95.1
Total Dissolved Solids	mg/L	1000	NMWQCC [a]	252	210	152	114	212	310	1,090	464	456	354	276	256	228
Total Organic Carbon	mg/L	NE	NE	<1.00	0.509J	0.556J	<1.00	<1.00	0.902J	0.760J	0.966J	0.816	0.851J	0.555J	0.743J	0.870J
Total Suspended Solids	mg/L	NE	NE	9.00	<5.00	<5.00	<5.00	<5.00	<5.00	28.0	<5.00	<5.00	8.00	<5.00	<5.00	<5.00
pH	standard units	6.0 - 9.0	NMWQCC [a]	7.51	7.88	6.78	8.11	8.06	7.97	7.38	7.72	7.61	8.17	7.82	7.35	7.65
Total Antimony	mg/L	0.0146	NMED Tap Water [b]	<0.00100B	<0.00100	<0.00100	<0.00100B	<0.00100B	<0.00100B	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100B	<0.00100B
Total Arsenic	mg/L	0.1	NMWQCC [a]	0.00318	0.00262	0.00809	0.00179	0.00168	0.00122	0.00218	0.00506	0.00456	0.00511	0.00312	0.000550J	0.000693J
Total Barium	mg/L	1	NMWQCC [a]	0.0677	0.0577	0.0969	0.0211	0.104	0.0672	0.0700	0.0813	0.0498	0.103	0.142	0.0696	0.0785
Total Beryllium	mg/L	0.073	NMED Tap Water [b]	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Total Cadmium	mg/L	0.01	NMWQCC [a]	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600
Total Calcium	mg/L	NE	NE	68.8	33.4	21.8	29.8	44.7	50.7	198	76.8	81.7	70.3	40.2	31.9	35.0
Total Chromium	mg/L	0.05	NMWQCC [a]	0.00158J	0.00427	<0.00200	0.00387	0.00183J	<0.00200	0.0159	0.00262	0.00202	0.00451	0.00652	<0.00200	0.0117
Total Cobalt	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	0.00104	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Copper	mg/L	1	NMWQCC [a]	0.00126J	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	0.00422	<0.00200	0.00128J	0.00230	<0.00200	<0.00200	0.00124J
Total Lead	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	0.000553J	<0.00100	<0.00100	0.00105	<0.00100	<0.00100	0.000546J	<0.00100	<0.00100	<0.00100
Total Magnesium	mg/L	NE	NE	12.5	5.21	2.44	3.85	8.33	11.1	48.1	15.1	15.8	13.8	7.34	7.78	8.62
Total Manganese	mg/L	NE	NE	0.00104J	<0.00200	0.00221	0.0104	0.00255	0.00286	0.0338	0.00116J	0.00169J	0.00854	0.00380	0.00137J	0.00164J
Total Mercury	mg/L	0.002	NMWQCC [a]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Nickel	mg/L	0.2	NMWQCC [a]	0.00262J	<0.00400	<0.00400	<0.00400	<0.00400	<0.00400	0.00583	0.00287J	0.00374J	0.00305J	0.00530	<0.00400	0.0694
Total Potassium	mg/L	NE	NE	2.73	2.31	1.87	2.19	2.30	2.69	4.14	2.53	3.16	3.43	3.46	2.06	2.26
Total Selenium	mg/L	0.05	NMWQCC [a]	0.0130	0.00196	0.00221	0.00196	0.00646	0.00455	0.0121	0.0217	0.0154	0.0148	0.00399	0.00249	0.00277
Total Silver	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Sodium	mg/L	NE	NE	32.8	21.2	18.9	26.2	26.5	30.1	50.4B	31.3	39.8B	31.5B	19.2B	25.2	27.0
Total Thallium	mg/L	0.000365	NMED Tap Water [b]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Tin	mg/L	9.3	EPA RSL Tap Water [c]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Total Vanadium	mg/L	0.183	NMED Tap Water [b]	<0.0100	0.00896J	0.0218	0.00869J	0.00520J	0.0142	0.0157	0.0117	0.00854J	0.0134	0.0102	0.0108	0.0111
Total Zinc	mg/L	10	NMWQCC [a]	<0.0101J	<0.0200	<0.0200	<0.0200	0.0116J	0.0129J	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	0.0237	0.0238
Total Cyanide	mg/L	0.2	NMWQCC [a]	0.343	<0.0100	<0.0100	0.214	0.147	<0.0100	<0.0100	0.436	0.293	0.357	<0.01	<0.0100	<0.0100
Amenable Cyanide	mg/L	0.2	NMWQCC [a]	0.338	<0.0100	<0.0100	0.212	0.140	<0.0100	<0.0100	0.213	0.291	0.156	0.172	<0.0100	<0.0100
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC [a]	0.0303	<0.0100	<0.0100	0.00518J	0.0167	<0.0100	<0.0100	0.0496	0.0216	0.0256	<0.01	<0.0100	<0.0100

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.

[b] NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.

[c] EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.

< = Less than the indicated laboratory reporting limit.
B = Analyte detected in the associated method blank.
Bold = Analyte concentration exceeded the screening level.
EPA = U.S. Environmental Protection Agency.
J = Estimated; analyte concentration was less than the limit of quantitation.
mg/L = Milligrams per liter.
NMAC = New Mexico Administrative Code.
NE = None established.
NMED = New Mexico Environment Department.
pH = Measure of acidity.
NMWQCC = New Mexico Water Quality Control Commission.
RSL =Regional Screening Level

Table 28
Analytical Results of Sampling at the Sewage Treatment Plant Percolation Ditches (November 2013)

Parameter	Units	Screening Level	Screening Level Reference	MPL-001 10/30/13	MPL-002 11/1/13	MPL-003 11/1/13	MPL-004 11/1/13	MPL-005 11/7/13	MPL-006 10/30/13	MPL-007 11/7/13	MPL-010 10/31/13	MPL-013 10/30/13	MPL-016 11/5/13	MPL-017 10/31/13	MPL-018 10/30/13	MPL-019 11/13/13
Ammonia	mg/L	NE	NE	<0.100	0.0932J	0.199	0.414J	<0.100N	<0.100	<0.100N	<0.100	<0.100	0.139	<0.100	<0.100	<0.100
Chloride	mg/L	250	NMWQCC [a]	32.7	53.9	59.9	62.9	44.3	21.3	111	43.1	32	42.7	48	13.7	14.9
Fluoride	mg/L	1.6	NMWQCC [a]	<1.00	<1.00	<1.00	<1.00	0.402	0.302	<1.00	<1.00	0.336J	0.233	<1.00	0.305	0.284
Nitrate / Nitrite	mg/L	10	NMWQCC [a]	5.84	6.88	7.86	9.06	5.28	2.47	13.7	5.56	4.82	48.4	5.51	2	2.27
Orthophosphate	mg/L	NE	NE	<0.0500	0.184	0.097J	0.324	<0.0500	<0.0500	<0.0500	<0.0500	0.146J	<0.0500	<0.0500	<0.0500	0.0399J
Sulfate	mg/L	600	NMWQCC [a]	41.4	74	110	147	51	39.9	136	93.5	51.5	80.4	54.6	37.2	51.9
Total Alkalinity	mg/L	NE	NE	91.1	90	110	128	89.2	101	120	175	82.8	85.6	80.4	111	73.2
Total Dissolved Solids	mg/L	1000	NMWQCC [a]	256	270	368	520	282	196	642	326	218	22	276	180	144
Total Organic Carbon	mg/L	NE	NE	1.1	1.33	1.54	1.46	1.2	1.27	1.7	1.64	1.32	1.55	1.51	1.41	1.18
Total Suspended Solids	mg/L	NE	NE	132	31.5	<5.00	4J	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	13.5
pH	standard units	6.0 - 9.0	NMWQCC [a]	8.95	7.47	7.81	7.69	8.23	7.95	7.69	8.03	7.74	8.24	7.62	7.88	7.69
Total Antimony	mg/L	0.0146	NMED Tap Water [b]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Arsenic	mg/L	0.1	NMWQCC [a]	0.00256	0.00789	0.00687	0.00661	0.00172	0.00174	0.00835	0.00467	0.00117	0.00291	0.00183	0.00203	0.0013
Total Barium	mg/L	1	NMWQCC [a]	0.138	0.0632	0.0455	0.0636	0.0964	0.118	0.053	0.114	0.0904	0.0638	0.0725	0.132	0.0445
Total Beryllium	mg/L	0.073	NMED Tap Water [b]	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Total Cadmium	mg/L	0.01	NMWQCC [a]	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600
Total Calcium	mg/L	NE	NE	47.7	61.1	72.1	81.1	46.3	35.7	101	54.7	46.5	53	51.3	35.9	23.8
Total Chromium	mg/L	0.05	NMWQCC [a]	0.00821	0.00253	0.00191J	0.0026	0.00251	0.00376	0.00163J	0.00205	0.00207	0.00155J	0.00188J	0.0035	0.00405
Total Cobalt	mg/L	0.05	NMWQCC [a]	0.00173	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Copper	mg/L	1	NMWQCC [a]	0.00602	0.00129J	<0.00200	0.00125J	<0.00200	<0.00200	0.00118J	<0.00200	<0.00200	0.00117J	0.00131J	<0.00200	0.00285
Total Lead	mg/L	0.05	NMWQCC [a]	0.00473	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	0.00123
Total Magnesium	mg/L	NE	NE	10	11.3	13.6J	16	8.26	6.62	18.7	10.3	7.43	8.69	8.36	6.25	4.59
Total Manganese	mg/L	NE	NE	0.0737	0.00975	0.00184	0.0035	0.00232	0.00463	0.00329	0.00125J	0.0013J	0.00824	0.00165J	0.00288	0.0186
Total Mercury	mg/L	0.002	NMWQCC [a]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Nickel	mg/L	0.2	NMWQCC [a]	0.00497	0.00316J	0.00379J	0.0042	<0.00400	<0.00400	0.00476	<0.00400	0.0022J	0.00266J	<0.00400	<0.00400	0.00216J
Total Potassium	mg/L	NE	NE	4.1	2.76	2.83	2.92	2.41	1.91	3.06	2.31	2.43	3.13	2.5	2.23	1.98
Total Selenium	mg/L	0.05	NMWQCC [a]	0.00751	0.0312	0.0272	0.0263	0.00513	0.00224	0.0352	0.018	0.00337	0.0105	0.00485	0.00198	0.0019
Total Silver	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	0.000712J	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Sodium	mg/L	NE	NE	24.4	30.1	31.1	29.5	22.7	19.5	43.6	26.8	22.7	24.7	26.2	19.6	24.2
Total Thallium	mg/L	0.000365	NMED Tap Water [b]	0.000112J	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Tin	mg/L	9.3	EPA RSL Tap Water [c]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Total Vanadium	mg/L	0.183	NMED Tap Water [b]	0.0153	<0.0100	<0.0100	<0.0100	0.00529J	0.00994J	<0.0100	<0.0100	0.0106	<0.0100	0.00554J	0.0113	<0.0100
Total Zinc	mg/L	10	NMWQCC [a]	0.0862	0.0104J	0.0106J	<0.0200	<0.0200	<0.0200	<0.0200	0.0101J	<0.0200	<0.0200	0.0134J	<0.0200	0.0235
Total Cyanide	mg/L	0.2	NMWQCC [a]	0.257	0.205	0.406	0.372	0.0736	<0.0100	0.373	0.324	0.15	0.134	0.0603	<0.0100	<0.0100
Amenable Cyanide	mg/L	0.2	NMWQCC [a]	0.257	0.205	0.406	0.372J	0.0736J	<0.0100	0.372	0.324	0.148	0.133	0.0518	<0.0100	<0.0100
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC [a]	0.0183	0.0301	0.0255J	0.0282	0.0106	<0.0100	0.0408	0.027	0.0165	0.0154	0.00686J	<0.0100	<0.0100

Table 28 (continued)
Analytical Results of Sampling at the Sewage Treatment Plant Percolation Ditches (November 2013)

Parameter	Units	Screening Level	Screening Level Reference	MPL-020 11/14/13	MPL-021 11/8/13	MPL-022 11/12/13	MPL-023 11/12/13	MPL-024 11/13/13	MPL-025 11/14/13	MPL-026 11/5/13	MPL-028 10/31/13	MPL-029 11/7/13	MPL-030 11/5/13	SMW-01 11/15/13	SMW-04 11/15/13	T-40 10/31/13
Ammonia	mg/L	NE	NE	0.0564J	<0.100	<0.100N	<0.100N	<0.100	<0.100	0.185	<0.100	<0.100N	0.172	<0.100	0.0634J	<0.100
Chloride	mg/L	250	NMWQCC [a]	74.9	12.5	13.9	12.7	38.3	51.2	161	80.6	54.7	63.8	18.5	23.8	27.3
Fluoride	mg/L	1.6	NMWQCC [a]	<1.00	0.319	0.374	0.296	0.242J	<1.00	0.216	0.18J	<1.00	0.204	0.293	0.276	<0.600
Nitrate / Nitrite	mg/L	10	NMWQCC [a]	7.73	1.53	1.37	1.61	4.22	4.85	6.77	9.18	7.86	7.95	2.86	3.08	2.45
Orthophosphate	mg/L	NE	NE	<0.0500	<0.0500	<0.0500	<0.0500	0.035J	<0.0500	<0.0500	0.0285J	0.0791	<0.0500	0.0481J	0.0334J	0.100
Sulfate	mg/L	600	NMWQCC [a]	97.3	48.3	30.9	53.6	65.5	50	517	124	122	109	62.7	58.2	32.3
Total Alkalinity	mg/L	NE	NE	84.4	108	72.8	86.4	53.5	97.2	70.4	92.1	144	99.6	84.9	88.2	117
Total Dissolved Solids	mg/L	1000	NMWQCC [a]	346	216	166	148	240	276	1,020	482	462	400	238	212	254
Total Organic Carbon	mg/L	NE	NE	1.17	0.734	1.22	0.7J	1.69	0.679	0.793	1.92	1.72	1.62	0.775J	0.788J	1.62
Total Suspended Solids	mg/L	NE	NE	3J	<5.00	<5.00	<5.00	107	3J	10	<5.00	26.5	<5.00	<5.00	<5.00	<5.00
pH	standard units	6.0 - 9.0	NMWQCC [a]	7.62	7.68	8.37	7.81	7.66	7.65	7.12	7.62	8.26	7.48	6.62	7.12	7.77
Total Antimony	mg/L	0.0146	NMED Tap Water [b]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Arsenic	mg/L	0.1	NMWQCC [a]	0.00464	0.00293	0.00795	0.000806J	0.00127	0.000951J	0.00155	0.00545	0.00428	0.00745	0.00282	0.00106	0.00285
Total Barium	mg/L	1	NMWQCC [a]	0.0722	0.0524	0.0829	0.0319	0.0325	0.0645	0.0627	0.0788	0.0532	0.0974	0.0704	0.0708	0.134
Total Beryllium	mg/L	0.073	NMED Tap Water [b]	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Total Cadmium	mg/L	0.01	NMWQCC [a]	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600	<0.000600
Total Calcium	mg/L	NE	NE	70.6	34.8	21.5	19.7	14.7	36.5	180	86.3	81	77.9	29.6	38	45.4
Total Chromium	mg/L	0.05	NMWQCC [a]	0.00197J	0.00352	<0.00200	0.00174J	<0.00200	0.0018J	0.00926	0.0025	0.00214	0.00361	<0.00200	0.0062	0.00571
Total Cobalt	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	0.00083J	<0.00100	0.000608J	<0.00100	<0.00100	<0.00100	<0.00100
Total Copper	mg/L	1	NMWQCC [a]	0.00349	<0.002	0.00126J	0.00442	0.00399	0.00335	0.00352	0.00109J	0.0028	0.00211	<0.00200	0.00233	<0.00200
Total Lead	mg/L	0.05	NMWQCC [a]	0.000591J	<0.00100	<0.00100	0.00121	<0.00100	0.00147	0.00081J	<0.00100	0.000791J	<0.00100	<0.00100	<0.00100	<0.00100
Total Magnesium	mg/L	NE	NE	12.5	5.01	2.48	3.38	2.95	7.68	48	15.7	15	13.6	8.23	8.34	7.3
Total Manganese	mg/L	NE	NE	0.0094	<0.00200	0.00161J	0.00553	0.0057	0.0197	0.0231	0.00119J	0.0184	0.00284	0.00467	0.00765	0.00219
Total Mercury	mg/L	0.002	NMWQCC [a]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Nickel	mg/L	0.2	NMWQCC [a]	0.00247J	<0.00400	<0.00400	<0.00400	<0.00400	<0.00400	0.0105	0.00303J	0.00567	0.0047	<0.00400	0.0343	0.0053
Total Potassium	mg/L	NE	NE	2.78	2.27	1.6	1.41	1.59	2.11	3.94	2.94	2.88	3.51	1.95	1.96	3.58
Total Selenium	mg/L	0.05	NMWQCC [a]	0.0189	0.00169	0.00195	0.00141	0.00118	0.00261	0.0111	0.02	0.0162	0.0268	0.0113	0.00435	0.00337
Total Silver	mg/L	0.05	NMWQCC [a]	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Total Sodium	mg/L	NE	NE	32.3	19.7	18.7	26.6	29.8	29	45.9	33.1	36.1	31.9	24.9	25.5	19.1
Total Thallium	mg/L	0.000365	NMED Tap Water [b]	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Total Tin	mg/L	9.3	EPA RSL Tap Water [c]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Total Vanadium	mg/L	0.183	NMED Tap Water [b]	<0.0100	0.00875J	0.0225	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	0.00701J
Total Zinc	mg/L	10	NMWQCC [a]	0.0162J	<0.0200	<0.0200	0.017J	0.0133J	0.031	<0.0200	0.0145J	0.0127J	<0.0200	0.0238	0.0274	0.0224
Total Cyanide	mg/L	0.2	NMWQCC [a]	**0.402**	<0.0100	<0.0100	<0.0100	**0.237**	0.00567J	<0.0100	0.0816	**0.306**	**0.298**	<0.0100	<0.0100	<0.0100
Amenable Cyanide	mg/L	0.2	NMWQCC [a]	0.114	<0.0100	<0.0100	<0.0100	0.0138	<0.0100	<0.0100	0.0813	<0.0100	**0.298**	<0.0100	<0.0100	<0.0100
Weak Acid Dissolved Cyanide	mg/L	0.2	NMWQCC [a]	0.0937	<0.0100	<0.0100	<0.0100	0.0327	<0.0100	<0.0100	0.0623	0.0261	0.022	<0.0100	<0.0100	<0.0100

Note: Complete analytical results for this site as well as historic data are available in Appendix C of this Report.

[a] NMWQCC Standard for groundwater of 10,000 mg/L total dissolved solid concentration or less, 20.6.2.3103 NMAC.

[b] NMED Tap Water Standard, Table A-1, Tap Water column. 2012 NMED Risk Assessment Guidance for Site Investigations and Remediation, Updated June 2012.

[c] EPA RSL Tap Water Standard, http://www.epa.gov/region9/superfund/prg/, Updated November 2013.

< = Less than the indicated laboratory reporting limit.
Bold = Analyte concentration exceeded the screening level.
EPA = U.S. Environmental Protection Agency.
J = Estimated; analyte concentration was less than the limit of quantitation.
mg/L = Milligrams per liter.
N = Non-target analyte tentatively detected.
NMAC = New Mexico Administrative Code.
NE = None established.
NMED = New Mexico Environment Department.
pH = Measure of acidity.
NMWQCC = New Mexico Water Quality Control Commission.
RSL =Regional Screening Level.

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

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
Analytical Data and Field Documentation (on CD 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: 3-5-2013 **Inspector:** B DAVIS, A. JENNESS

	Yes	No
1. Gate closed?	☑	☐
2. Gate locked?	☑	☐
3. If gate not locked, is lock present?	☐	☐
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: _____

Re-inspection date, if necessary: _____

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

Date of Inspection: 3-5-2013 **Inspector:** B. DAVIS, A. JENNESS

Comments:

- RUTTING/RILLING OCCURING ON SE BOUNDARY (SEE MAP). MAY NEED TO BE FILLED IN ORDER TO PRESERVE FENCE INTEGRITY
- TUMBLE WEED ACCUMULATION ALONG FENCELINE NEEDS TO BE CLEARED THROUGHOUT THE SITE.
- RUTTING (SEVERE) ON THE SOUTHWEST SIDE NEEDS TO BE REPAIRED WITH GRAVEL (MAY NEED MORE GRAVEL)
- RILLING OCCURRING IN SLOPES OF RETENTION POND

Actions Taken:

- SOME EXPOSED LINER IN SWALE

- ✓ 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 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: 8-21-2013 **Inspector:** Bradley J 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	☑	☐
g. Trash on cap	☑	☐

Inspector's Signature: Brad Davis

Re-inspection date, if necessary: _____

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

Date of Inspection: 8-21-13 **Inspector:** Brad Davis

Comments: Rutting evident along Southern boundary of borrow pit and northern boundary. Engineered Channels (rock lined) undercut - need repair. Evidence of strong water flow over Summer due to rain activity. - Some exposed liner along edges of swale. Minor animal burrowing.

Actions Taken:

- ✓ 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 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.

2013
Rhodes Canyon Cap Repair

White Sands Missile Range (WSMR) has the requirement to continue cap inspections at the Rhodes Canyon Landfills (SWMU 114 and 115) and ensure that the site has restricted access. If the cap inspections note areas of concern that could eventually expose landfill material, WSMR is required to complete repairs. During the August 2013 cap inspection, personnel noted a few deficiencies that need to be addressed. Zia mobilized (26 November 2013) to the Rhodes Canyon (SWMU 114-115) cap with suitable rock and construction equipment to complete required repairs noted during the cap inspection. The following repairs were conducted:

- Used 8 inch size rock (rip rap) to repair the 2 under-cut channels. Added rock to channels as noted in the August 2013 cap inspection. See photos below.

Rock Lined Channels Prior to Repair.

Rock Lined Channels During Repair.

Repairing Rock Lined Channel.

Repairing Rock Lined Channels.

Repaired Channel.

- Repaired using 8 inch rock (rip rap) gulley forming on North side of swale/borrow pit. Used large rock to slow down water flow to prevent further erosion.

Before and After Repair of Gulley.

- Backfilled gullies forming on slope of borrow area with soil and ¾ inch gravel. See photo below.

New Gullies Prior to Repair.

Gullies Repaired.

- Shoveled gravel from center of swale to cover exposed liner along sides of swale. See photo below.

Exposed Liner Along Swale.

Covered Exposed Liner Along Swale

- Backfilled animal burrows with shovel and soil from burrow.

- Filled new larger gulley with 8 inch rock and soil.

Newly Formed Large Gulley.

Filling with 8 Inch Rock.

Repaired Gulley.

- Repaired small gullies forming on road along southern fence line.

Example Gulley Forming on Road Along Southern Fence Line.

Re-Bladed and Wheel Rolled Road Along Southern Fence Line.

PHOTO LOG

March 2013

PHOTO 1: Front gate and signage.

PHOTO 2: Erosion along southern fence line.

PHOTO 3: Erosion rills and gullies.

PHOTO 4: Erosion rills and gullies.

PHOTO 5: Erosion rills and gullies.

PHOTO 6: Erosion rills and gullies.

PHOTO 7: Dead vegetation along fence line.

PHOTO 8: Minor erosion rill on landfill cover.

PHOTO 9: Landfill cover adjacent to fence line.

PHOTO 10: Landfill cover.

PHOTO 11: Erosion gullies.

PHOTO 12: Erosion rills.

PHOTO 13: Erosion rills and gullies.

PHOTO 14: Rodent burrows.

PHOTO 15: Drainage swale.

PHOTO 16: Drainage swale.

PHOTO 17: Erosion gully forming adjacent to drainage swale.

PHOTO 18: Erosion rills within drainage swale.

PHOTO 19: Washed out riprap and exposed underlying geotextile.

PHOTO 20: Landfill cover.

PHOTO 21: Landfill cover.

PHOTO 22: Landfill cover.

PHOTO 23: Landfill cover.

PHOTO 24: Landfill cover.

PHOTO 25: Drainage swale.

PHOTO 26: Drainage swale.

PHOTO 27: Erosion of drainage swale.

PHOTO LOG

August 2013

PHOTO 1: Erosional gully developing along east side of borrow pit.

PHOTO 2: Erosional gully forming on north side of borrow pit.

PHOTO 3: Erosional gully forming on northwest side of borrow pit.

PHOTO 4: Erosional rills on landfill cover.

PHOTO 5: Erosional rills on landfill cover.

PHOTO 6: Erosion developing on south side road along fence line.

PHOTO 7: Erosion within drainage channel.

PHOTO 8: Drainage swale looking north.

PHOTO 9: Drainage swale looking south.

PHOTO 10: Vegetation on landfill cover.

PHOTO 11: Water ponding in borrow pit.

PHOTO 12: Landfill vegetation on cover.

PHOTO 13: Ponding within borrow pit.