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Date: APR 24 2015
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APR 24 2015
NMED
Hazardous Waste Bureau

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

Subject: Submittal of the Semiannual Progress Report for Corrective Measures Evaluation/Corrective Measures Implementation for Consolidated Unit 16-021(c)-99

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Semiannual Progress Report for Corrective Measures Evaluation/Corrective Measures Implementation for Consolidated Unit 16-021(c)-99.

If you have any questions, please contact Kent Rich at (505) 665-4272 (krich@lanl.gov) or Woody Woodworth at (505) 665-5820 (lance.woodworth@nnsa.doe.gov).

Sincerely,

Dave McInroy, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

Christine Gelles, Acting Manager
Environmental Management
Los Alamos Field Office

DM/CG/KR/TG:sm

Enclosures: Two hard copies with electronic files – Semiannual Progress Report for Corrective Measures Evaluation/Corrective Measures Implementation for Consolidated Unit 16-021(c)-99 (EP2015-0084)

Cy: (w/enc.)
Woody Woodworth, DOE-EM-LA, MS A316
Kent Rich, ADEP ER Program, MS M992
Public Reading Room (EPRR)
ADESH Records

Cy: (Letter and CD and/or DVD)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-DOE-OB, MS M894
Tim Goering, ADEP ER Program (w/ MS Word files on CD)
PRS Database

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LA-UR-15-22641
April 2015
EP2015-0084

Semiannual Progress Report for Corrective Measures Evaluation/Corrective Measures Implementation for Consolidated Unit 16-021(c)-99

Prepared by the Environmental Programs Directorate

EP2015-0084

Semiannual Progress Report for Corrective Measures Evaluation/ Corrective Measures Implementation for Consolidated Unit 16-021(c)-99

April 2015

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
Kent Rich		Project Manager	Environmental Remediation	4/22/15

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Randall Erickson	for R. ERICKSON	Acting Associate Director	Environmental Programs	4/23/15

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
Christine Gelles		Acting Manager	DOE-EM-LA	4/23/15

EXECUTIVE SUMMARY

Significant achievements accomplished during this reporting period include submitting the CdV-16-4ip interim measures source removal report, completing drilling activities at perched-intermediate wells CdV-9-1(i) and R-63i and regional aquifer well R-47, conducting two rounds of quarterly groundwater sampling at Technical Area 16 (TA-16) 260 monitoring group locations, and planning project activities for fiscal year 2015 and beyond. The planned project activities will provide data to be used for analysis of corrective action alternatives for groundwater contamination at TA-16 and to support development of the groundwater corrective measures evaluation for Consolidated Unit 16-021(c)-99.

CONTENTS

Figure

1.0 INTRODUCTION

This report serves as the semiannual progress report for the corrective measures evaluation (CME)/ corrective measures implementation (CMI) for Consolidated Unit 16-021(c)-99. It summarizes activities Los Alamos National Laboratory (LANL or Laboratory) completed from October to March of fiscal year (FY) 2015 on the CME/CMI for Consolidated Unit 16-021(c)-99, the Technical Area 16 (TA-16) 260 Outfall.

2.0 SURFACE CMI

2.1 Best Management Practices

Inspection of best management practices (BMPs) associated with Consolidated Unit 16-021(c)-99 is completed under the Individual Storm Water Permit, pursuant to the requirements of National Pollutant Discharge Elimination System (NPDES) Permit No. NM0030759 (hereafter, the Individual Permit), as authorized by the U.S. Environmental Protection Agency (EPA). Current BMPs, called controls in the Individual Permit, include a low-permeability cap consisting of a 20-in.-thick crushed tuff/bentonite cap installed on top of the former settling pond, five earthen berms and one rock check dam installed to control run-on/runoff, riprap within the former channel to control runoff, and established vegetation to control erosion from the site. Controls are inspected annually and following a significant rain event of 0.25 in. or greater within 30 min, as measured at rain gage RG257, per the Individual Permit.

During the period from October 1, 2014, to March 30, 2015, no significant rain events were recorded at rain gage RG257. No BMP maintenance or repairs resulted from the 2014 annual inspection, completed on October 17, 2014. Per the Individual Permit, if several storms exceeding the intensity threshold occur over a period not to exceed 15 d from the first event, a single inspection is sufficient to achieve compliance (hence the number of events differs from the number of inspections). Inspection results are reported in the “Storm Water Individual Permit Annual Report, Reporting Period: January 1–December 31, 2014,” which was submitted to the EPA Region 6 Enforcement Division as well as to the New Mexico Environment Department (NMED) Surface Water Quality Bureau on February 27, 2015 (LANL 2014, 254067).

2.2 Hydrogeologic Investigations

Hydrogeologic investigations include periodic water sampling as outlined in the 1998 Resource Conservation and Recovery Act facility investigation report (LANL 1998, 059891) as well as continuing investigations delineated in the 1998 corrective measures study plan (LANL 1998, 062413). The current groundwater sampling program is conducted per the Laboratory’s Interim Facility-Wide Groundwater Monitoring Plan (LANL 2014, 256728).

Two groundwater sampling campaigns were conducted in the Cañon de Valle watershed in November 2014 and in January and February 2015. Data from the sampling campaigns will be included in upcoming periodic monitoring reports.

The November 2014 sampling event included sampling of regional monitoring well R-18, the recently reconfigured monitoring well CdV-R-37-2, and the new regional monitoring well R-47. The January–February 2015 sampling event included sampling of all TA-16 260 monitoring group locations, except for base-flow location Cañon de Valle below MDA P (E256), which was frozen; CdV-16-1(i), which was inaccessible because of road conditions; and SWSC Spring, FLC-16-25280, and MSC-16-06294, which were dry. New monitoring wells R-63i and CdV-9-1(i) were not sampled during the January–February 2015 sampling event because they had not been fully developed and they did not have sampling systems installed.

2.3 CMI Activities – October 2014 to March 2015

The Cañon de Valle pilot permeable reactive barrier (PRB) remains nonoperational because of post–Las Conchas fire flooding, which destroyed the capture wall for the PRB. Continued risks of flooding preclude reinstalling the PRB at this time. The current location of the PRB is not feasible for reinstalling the barrier because of the deep scouring of the alluvial sediment in that area.

The carbon-filtration treatment systems at Burning Ground, SWSC, and Martin Springs remain in place but are not operational because of NPDES permitting requirements. During the period from October 2014 to March 2015, discussions were held internally at the Laboratory regarding the regulatory path forward to begin operation of the carbon-filtration treatment systems installed at Burning Ground Spring, SWSC Spring, and Martin Spring. No consensus was achieved regarding the regulatory path forward.

3.0 SUBSURFACE CME

3.1 CME for Deep Groundwater

Key tasks accomplished during this reporting period include completion of the Interim Measures Report for Source-Removal Testing at Well CdV-16-4ip (LANL, 2014, 262526), and installation of three monitoring wells.

The CdV-16-4ip source removal report was submitted to NMED on October 22, 2014 (LANL 2014, 262526). The results from the testing are summarized below.

- **CdV-16-4ip Source-Removal Testing for RDX in Groundwater:** The source-removal testing conducted at deep perched-intermediate well CdV-16-4ip consisted of a 60-d extended pumping test and recovery monitoring at well CdV-16-4ip. The pumping was conducted from June 5 to August 4, 2014, followed by recovery monitoring until August 25, 2014. The primary objectives of the work were to determine whether source removal from this zone can be conducted to limit potential migration of RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) and other constituents to the underlying regional aquifer and to determine if long-term pumping in the perched-intermediate zone is a viable source-removal option. An additional objective included refining the conceptual model regarding the spatial extent and hydraulic characteristics of deep perched-intermediate groundwater.

  A total of 472,684 gal. (1789 m^3) of water was pumped during the test. Concentrations of RDX in the pumped water ranged from approximately 143 µg/L to approximately 170 µg/L, trending upward during the test. The pumped water was treated using a granular activated carbon treatment system, and a total of 0.27 kg (0.6 lb) of RDX was removed through treatment during the 2 mo of pumping at CdV-16-4ip.

  Based on the test results, it was determined that long-term pumping at CdV-16-4ip with the sole objective of removing mass from the deep perched groundwater is not cost-effective because of the relatively low yield of this well (3 gallons per minute) and the limited mass of RDX that would be produced. The extended source-removal test at CdV-16-4ip demonstrated that long-term pumping at the well would remove RDX from the deep perched-intermediate aquifer at TA-16 at a rate of approximately 1 kg/yr (2.3 lb/yr).

Additional activities completed during the period from October 2014 to March 2015 include the following.

- **Monitoring Well Installation:** Three new wells were drilled in the TA-16 area, including perched-intermediate wells CdV-9-1(i) and R-63i, and regional aquifer well R-47 (Figure 3.1-1). Planning is underway to install regional aquifer well R-58 later this year. Details on these activities are summarized below.
    - ❖ Monitoring well CdV-9-1(i) (LANL 2013, 239226) was completed on January 19, 2015, in deep perched-intermediate groundwater. The well is located north of Cañon de Valle, approximately 0.1 mi northeast of CdV-16-1(i) (Figure 3.1-1). Data from this well will be used to refine the understanding of the northern portion of RDX-contaminated groundwater in the deep perched zone. A 72-h aquifer test was conducted on CdV-9-1(i) in March 2015; the results are currently being analyzed and will be included in the CdV-9-1(i) well completion report.
    - ❖ Monitoring well R-63i (LANL 2013, 235924) was completed on November 10, 2014, at a location near regional well R-63 (Figure 3.1-1). The well is completed in deep perched-intermediate groundwater in a zone with very low yield, posing challenges for well development and design of the dedicated sampling system. On March 27, 2014, the Laboratory submitted a request to extend the well completion report deliverable date from April 9, 2015, to September 30, 2015, to allow additional time to evaluate a sampling system for possible deployment in this low-yield environment (LANL 2015, 600319). NMED approved the extension on April 7, 2015 (NMED 2015, 600339).
    - ❖ Regional monitoring well R-47 (LANL 2012, 232340) was completed on September 14, 2014, north of Cañon de Valle (Figure 3.1-1). The objective of this well is to better define the RDX distribution within the regional aquifer north of Cañon de Valle and to monitor for high explosives and other contaminants in the aquifer downgradient of the 260 Outfall and beneath infiltration pathways associated with Cañon de Valle and deep perched groundwater in the area. No deep perched groundwater was observed during drilling of R-47, and RDX was not detected in the first regional groundwater samples collected from this well. The well completion report for R-47 was submitted to NMED on November 25, 2014 (LANL 2014, 600043).
    - ❖ Regional well R-58 (LANL 2012, 212117) is scheduled to be drilled later this year, with mobilization planned for late August and installation completed by October 30, 2015. The well will be drilled north of S-Site Canyon (Figure 3.1-1). Data from R-58 will be used to monitor contaminants downgradient of potential contaminant breakthrough locations for S-Site and Fishladder Canyons and may provide information on perched-intermediate groundwater in that area.
- **Tracer Deployment:** On December 19, 2014, an extension request was submitted to NMED requesting an extension from the December 31, 2014, date to deploy tracers at Consolidated Unit 16-021(c)-99 to a new date of December 31, 2015 (LANL 2014, 600098). NMED granted an extension to deploy the tracers by September 30, 2015 (NMED 2015, 600126).

4.0 REGULATORY, PUBLIC, AND STAKEHOLDER INVOLVEMENT

No public meetings or meetings with stakeholders were held between October 2014 and March 2015.

5.0 PROBLEMS ENCOUNTERED/ACTIONS TO RECTIFY PROBLEMS

The hydrologic system in Cañon de Valle was strongly impacted by the August 2011 and September 2013 floods because of severe damage to the watershed caused by the Las Conchas wildfire. Two long-term alluvial wells were destroyed in this flooding, and the PRB capture wall was severely damaged. At this point, the Laboratory sees little value in replacing the pilot PRB and alluvial wells because nearby alluvial wells show similar contaminant concentrations and trends and are adequate for monitoring alluvial groundwater in the area. In addition, Cañon de Valle remains prone to flooding, and any new PRBs or alluvial monitoring wells would be at risk for future flooding.

The TA-16 storm filters in springs have not been turned on because of issues with the NPDES permit. However, meetings with NMED to address a path forward for the alluvial system are planned and will be scheduled in the future.

6.0 WORK PLANNED FOR THE NEAR FUTURE

6.1 Surface CMI

6.1.1 BMPs

- Continue to inspect existing BMPs following significant precipitation events

6.1.2 Hydrogeologic Investigations

- Check for the presence and levels of water in the Cañon de Valle alluvial system
- Continue precipitation monitoring

6.1.3 Surface CMI Activities

- Meet with NMED personnel to review spring RDX data and to determine a path forward for the PRB and storm filters

6.2 Subsurface CME

- Install dedicated sampling systems at CdV-9-1(i) and at R-63i, if conditions allow.
- Conduct hydrologic testing at CdV-9-1(i) to refine the conceptual model regarding spatial extent, hydraulic characteristics, and hydraulic connection between deep perched-intermediate groundwater occurrences potentially contaminated with RDX.
- Update the tracer test work plan (LANL 2012, 210352) to incorporate the installation of recent monitoring wells in the area and deploy tracers before the September 30, 2015, regulatory deadline. The tracers should provide useful information regarding possible flow paths between perched-intermediate and regional groundwater and hydrologic characteristics that may influence contaminant transport.
- Update the RDX conceptual model, incorporating an in-depth analysis and review of available geologic data, geochemical data, and geohydrologic data (see section 7.0).
- Reevaluate the estimate of RDX distributions in alluvial groundwater, in the vadose zone, in perched-intermediate groundwater, and in regional groundwater and incorporate recent analytical data, including data from the new monitoring wells.

- Conduct RDX degradation studies, including a review of monitoring data, to establish correlations between RDX and degradation products and conduct RDX treatability studies to determine if enhanced bioremediation techniques can be used to degrade RDX under site-specific conditions at TA-16.
- Develop a three-dimensional numerical model simulating groundwater flow and transport at the site, including within the saturated and unsaturated portions of the vadose zone and the regional aquifer. The model will be used to evaluate corrective action alternatives for the groundwater CME and to predict future contaminant concentrations in perched-intermediate and regional groundwater.
- Install regional monitoring well R-58.

6.3 Public and Stakeholder Involvement

- Meet with NMED personnel to discuss closing out the surface CMI activities and plans for the groundwater CME.

7.0 RECOMMENDATIONS

Recommendations for the TA-16 260 Outfall subsurface CME and surface CMI include the following.

- Activities relevant to the groundwater CME should be given priority in light of recent observations in deep groundwater. These observations include persistent elevated RDX concentrations in CdV-4ip (at ~150 µg/L) and increasing RDX concentrations in regional well R-18 (at ~2 µg/L) and in deep perched-intermediate well CdV-16-2(i). RDX concentrations in CdV-16-2(i) have doubled during the 10 yr since well installation, increasing from ~50 µg/L to ~100 µg/L. Elevated RDX concentrations have also been detected in perched-intermediate groundwater north of Cañon de Valle; RDX concentrations in screening samples from CdV-9-1(i) range from ~250 µg/L to ~80 µg/L.
- Considerable planning effort has been undertaken to scope activities that will provide sufficient data to complete the groundwater CME for Consolidated Unit 16-021(c)-99. These activities include tracer deployment; an in-depth technical evaluation of all geology, geochemistry, and geohydrology data to update the conceptual model for contamination at TA-16; a reassessment of the RDX inventory based on recent analytical data from new wells; development of a three-dimensional flow and transport model for the area; completion of hydrologic testing at CdV-9-1(i); and installation of regional well R-58.
- Successful completion of these activities over the next few years should provide the data needed to analyze the corrective action alternatives for groundwater contamination at TA-16 and to complete the groundwater CME.
- The Laboratory recommends regular meetings between the Laboratory project team and NMED technical staff to review the planned RDX project activities and to build consensus on the technical approach to complete the groundwater CME.
- The Laboratory recommends focusing on activities necessary to successfully complete the groundwater CME. With NMED concurrence, the Laboratory recommends combining the surface CMI and groundwater CME efforts into one technical and regulatory approach, culminating in a groundwater CME report upon completion of the work.

- The activation of the spring treatment units installed at Burning Ground Spring, SWSC Spring, and Martin Spring is still strongly recommended, although RDX concentrations in surface water and alluvial groundwater downgradient of the springs appear to show decreasing trends with time, even without the spring treatment units turned on. Other alternatives to treat the spring discharge will be evaluated as part of the activities discussed above.

8.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), September 1998. "RFI Report for Potential Release Site 16-021(c)," Los Alamos National Laboratory document LA-UR-98-4101, Los Alamos, New Mexico. (LANL 1998, 059891)

LANL (Los Alamos National Laboratory), September 1998. "CMS Plan for Potential Release Site 16-021(c)," Los Alamos National Laboratory document LA-UR-98-3918, Los Alamos, New Mexico. (LANL 1998, 062413)

LANL (Los Alamos National Laboratory), January 2012. "Work Plan for a Tracer Test at Consolidated Unit 16-021(c)-99, Technical Area 16," Los Alamos National Laboratory document LA-UR-12-0440, Los Alamos, New Mexico. (LANL 2012, 210352)

LANL (Los Alamos National Laboratory), November 2012. "Drilling Work Plan for Regional Aquifer Well R-47," Los Alamos National Laboratory document LA-UR-12-26098, Los Alamos, New Mexico. (LANL 2012, 232340)

LANL (Los Alamos National Laboratory), December 2012. "Drilling Work Plan for Regional Aquifer Well R-58," Los Alamos National Laboratory document LA-UR-12-26784, Los Alamos, New Mexico. (LANL 2012, 212117)

LANL (Los Alamos National Laboratory), February 2013. "Drilling Work Plan for Well R-63i," Los Alamos National Laboratory document LA-UR-13-20150, Los Alamos, New Mexico. (LANL 2013, 235924)

LANL (Los Alamos National Laboratory), April 2013. "Drilling Work Plan for Well CdV-9-1(i)," Los Alamos National Laboratory document LA-UR-13-20779, Los Alamos, New Mexico. (LANL 2013, 239226)

LANL (Los Alamos National Laboratory), March 2014. "Storm Water Individual Permit Annual Report, Reporting Period: January 1–December 31, 2013, NPDES Permit No. NM0030759," Los Alamos National Laboratory document LA-UR-14-20839, Los Alamos, New Mexico. (LANL 2014, 254067)

LANL (Los Alamos National Laboratory), May 2014. "Interim Facility-Wide Groundwater Monitoring Plan for the 2015 Monitoring Year, October 2014–September 2015," Los Alamos National Laboratory document LA-UR-14-23327, Los Alamos, New Mexico. (LANL 2014, 256728)

LANL (Los Alamos National Laboratory), October 2014. "Interim Measures Report for Source-Removal Testing at Well CdV-16-4ip," Los Alamos National Laboratory document LA-UR-14-27065, Los Alamos, New Mexico. (LANL 2014, 262526)

LANL (Los Alamos National Laboratory), November 2014. "Completion Report for Regional Aquifer Well R-47," Los Alamos National Laboratory document LA-UR-14-28638, Los Alamos, New Mexico. (LANL 2014, 600043)

LANL (Los Alamos National Laboratory), December 19, 2014. "Request for Extension to Deploy Tracers at Consolidated Unit 16-021(c)-99," Los Alamos National Laboratory letter (ADESH-14-157) to J. Kieling (NMED-HWB) from M.T. Brandt (LANL) and P. Maggiore (DOE-NA-LA), Los Alamos, New Mexico. (LANL 2014, 600098)

LANL (Los Alamos National Laboratory), March 27, 2015. "Request for Extension to Submit the Well Completion Report for R-63i," Los Alamos National Laboratory letter (ADESH-15-051) to J. Kieling (NMED-HWB) from A.M. Dorries (LANL) and C. Gelles (DOE-EM-LA), Los Alamos, New Mexico. (LANL 2015, 600319)

NMED (New Mexico Environment Department), January 2, 2015. "Fifth Extension Request to Deploy Tracers at Consolidated Unit 16-021(c)-99," New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 600126)

NMED (New Mexico Environment Department), April 7, 2015. "Sixth Extension Request to Submit Well Completion Report for R-63i," New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 600339)

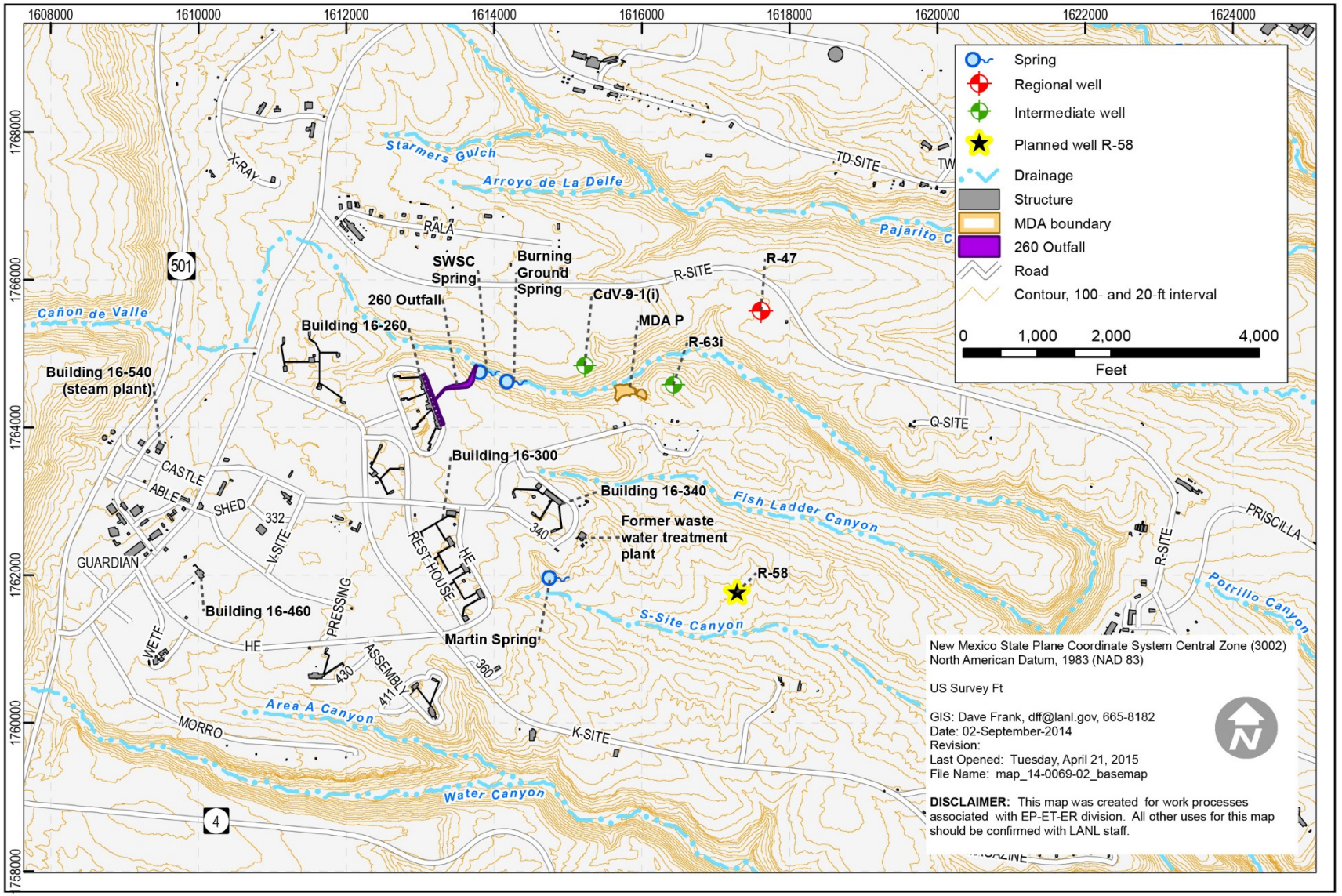

Figure 3.1-1 Locations of wells CdV-9-1(i), R-63i, and R-47 and planned well R-58