

DEPARTMENT OF ENERGY Environmental Management Los Alamos Field Office (EM-LA)

Los Alamos, New Mexico 87544

EMLA-2022-BF097-02-001

Mr. Rick Shean Bureau Chief Hazardous Waste Bureau New Mexico Environment Department 2905 Rodeo Park Drive East, Building 1 Santa Fe, NM 87505-6313



Subject: Submittal of the 2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Revision 1, and Comment Response

Dear Mr. Shean:

Enclosed please find two hard copies with electronic files of the "2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Revision 1." Enclosure 1 includes an electronic copy of a redline strikeout version of the report that incorporates all changes made in response to the New Mexico Environment Department's review comments dated March 28, 2022 (Enclosure 2). This report summarizes activities completed from August 2020 to July 2021 related to monitoring and maintenance of the Technical Area 16 260 Outfall former settling pond cap; monitoring of the surge bed water levels; monitoring of water quality at select springs and alluvial seep; and monitoring of alluvial groundwater and surface water quality at select locations within Cañon de Valle, S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon.

If you have any questions, please contact Patrick McGuire at (505) 709-7918 (patrick.mcguire@emla.doe.gov) or Cheryl Rodriguez at (505) 414-0450 (cheryl.rodriguez@em.doe.gov).

Sincerely,

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Arturo Q. Duran Compliance and Permitting Manager U.S. Department of Energy Environmental Management Los Alamos Field Office Enclosure(s):

- Two hard copies with electronic files (including a redline strikeout version) 2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Revision 1 (EM2022-0231)
- Response to New Mexico Environment Department Review, 2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Dated March 28, 2022 (EM2022-0230)

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May 2022 EM2022-0231

2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Revision 1



Newport News Nuclear BWXT-Los Alamos, LLC (N3B), under the U.S. Department of Energy Office of Environmental Management Contract No. 89303318CEM000007 (the Los Alamos Legacy Cleanup Contract), has prepared this document pursuant to the Compliance Order on Consent, signed June 24, 2016. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, Revision 1

May 2022

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1.0 INTRODUCTION

On March 28, 2022, the U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office (EM-LA) received comments from the New Mexico Environment Department (NMED) on the "2021 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area" (N3B 2021, 701683) (hereafter, the Long-Term Monitoring and Maintenance Report) within Technical Area 16 (TA-16) at Los Alamos National Laboratory (LANL or the Laboratory), which follows the Long-Term Monitoring and Maintenance Plan requirements specified in Appendix A to the "Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99" (hereafter the Corrective Measures Implementation [CMI] Remedy Completion Report) (LANL 2017, 602597). The purpose of this revision is to address NMED comments concerning the 2021 Annual Long-Term Monitoring and Maintenance Report (N3B 2021, 701683).

This annual Long-Term Monitoring and Maintenance Report covers the reporting period from August 2020 to July 2021 and typically includes information from two semiannual sampling events, one in August and the second in March. However, the August 2020 event was rescheduled to July 2020 and was reported in the "2020 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area" (N3B 2020, 701053) to replace the event that was postponed in March 2020. From March 1 to March 23, 2020, approvals to use portable electronic devices (PEDs) in the TA-16 area were pending. On March 24, 2020, EM-LA transitioned to essential mission critical activities (EMCA) status in response to the COVID-19 pandemic. NMED was notified of the transition to EMCA status on March 31, 2020 (DOE 2020, 700826). As a result of the EMCA status, the March 2020 sampling operations were paused. The second semiannual sampling event was conducted in July 2020 and was reported in the previous report. This report includes data from the March 2021 sampling event only.

The former 260 Outfall area consists of the high-explosives- (HE-) machining building (building 16-260) and associated sumps, drainlines, and troughs that discharged into the 260 Outfall drainage channel. The 260 Outfall drainage channel consists of the outfall, a former settling pond, and the lower portion of the drainage channel leading to Cañon de Valle (Figure 1.0-1). Historically, HE-contaminated water from the outfall entered the former settling pond and drained into the 260 Outfall drainage channel.

Corrective measures were implemented to address HE associated with the 260 Outfall, including Royal Demolition Explosive (RDX) and barium (a byproduct of processing HE Baratol), which are the primary contaminants addressed in the CMI remedy completion report (LANL 2017, 602597) and discussed in this report. Other compounds associated with the 260 Outfall include Her Majesty's Explosive (HMX); 2,4,6-trinitrotoluene (TNT); volatile organic compounds (VOCs); metals; and HE byproducts and degradation products. As part of the Long-Term Monitoring and Maintenance Plan, other analytes measured include semivolatile organic compounds (SVOCs), general inorganics, nitrogen-15/oxygen-18 isotopes in nitrate, and radionuclides. Where appropriate, these compounds are screened in accordance with the criteria established by the 2016 Compliance Order on Consent (Consent Order), and any compounds exceeding their respective screening levels are further discussed in this report. Additionally, field parameters (e.g., dissolved oxygen, oxidation-reduction potential [ORP], pH, specific conductance, temperature, and turbidity) were collected at select locations, and measurement results are provided.

This report discusses the monitoring and maintenance of the Outfall 260 former settling pond cap; monitoring of the surge bed water levels; monitoring of water quality at Sanitary Wastewater Systems Consolidation (SWSC) Spring, Burning Ground Spring, Martin Spring, and the permeable reactive barrier (PRB) alluvial seep (16-61439); and monitoring of groundwater and surface water (base flow) quality at select locations within Cañon de Valle, S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon.

1.1 Regulatory Context

Long-term monitoring and maintenance activities follow the approach put forth in the CMI remedy completion report for corrective measures at Consolidated Unit 16-012(c)-99 (LANL 2017, 602597). The long-term water quality monitoring activities complement and integrate with the "Interim Facility-Wide Groundwater Monitoring Plan for the 2020 Monitoring Year, October 2019–September 2020" (IFGMP) (N3B 2019, 700451) and the "Interim Facility-Wide Groundwater Monitoring Plan for the 2021 Monitoring Year, October 2020–September 2021" (N3B 2020, 700927) for groundwater and surface water monitoring. Newport News Nuclear BWXT-Los Alamos, LLC (N3B) has implemented the IFGMP in accordance with Section XII of the Consent Order. The Long-Term Monitoring and Maintenance Plan was included in the CMI remedy completion report, Appendix A (LANL 2017, 602597). NMED approved the CMI remedy completion report on November 27, 2017 (NMED 2017, 602758).

Monitoring of groundwater from springs (including SWSC, Burning Ground, Bulldog, and Martin), alluvial wells, and intermediate and regional wells in the vicinity and downgradient of the 260 Outfall has historically been conducted as part of the TA-16 260 monitoring group activities conducted under the IFGMP. With the completion of surface CMI activities at Consolidated Unit 16-021(c)-99 and NMED's approval of the "Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99," including the Long-Term Monitoring and Maintenance Plan (LANL 2017, 602597; NMED 2017, 602758), the monitoring of surface water, alluvial groundwater, and springs has been incorporated into the IFGMP.

1.2 Conceptual Model for Transport of RDX and Barium

RDX and barium were the primary chemicals of potential concern (COPCs) in alluvial groundwater during the surface CMIs from 1999 to 2010 (LANL 2007, 098192). RDX is the most significant COPC within Cañon de Valle and Water Canyon (LANL 2017, 602597). RDX is a mobile compound that does not sorb strongly to environmental media and is readily transported in water. RDX dissolved in groundwater will partition between dissolved RDX and sorbed RDX. RDX sorbs minimally to tuff and sediment, with greater sorption if organic carbon is present. RDX can be degraded both biologically (i.e., microbial degradation) and chemically (hydrolysis) (LANL 2017, 602597). Long-term reduction of RDX is anticipated because of source removal (i.e., the elimination of the original outfall source of RDX with the cessation of National Pollutant Discharge Elimination System [NPDES] discharges into Cañon de Valle [1996], surface removal activities conducted in 2001, and the surface CMI in 2009 and 2010) and from naturally occurring degradation processes.

A review of the concentrations of RDX detected in alluvial monitoring wells indicates RDX is either below the 9.66- μ g/L screening level or concentrations show statistically significant long-term decline. The CMI remedy completion report (LANL 2017, 602597) reported that the majority of detections of RDX in alluvial wells in Cañon de Valle were near or below the screening level of 9.66 μ g/L. There have been higher concentrations of RDX observed in alluvial monitoring wells downstream of the 260 Outfall in the past 20 yr.

Although the majority of RDX concentrations in discharges from SWSC, Burning Ground, and Martin Springs and 16-61439 (PRB alluvial seep) from 2000 to 2020 were above the 9.66-µg/L screening level, concentrations measured between August 2020 and July 2021 are either less than when first detected or are declining, likely because of the RDX source-reduction actions implemented at Outfall 260 that began with the cessation of the wastewater discharge in 1996. (LANL 2017, 602597). At Bulldog Spring, RDX concentrations remained below the 9.66-µg/L screening level. In March 2021, RDX was detected above the 9.66-µg/L screening value at Burning Ground Spring, Martin Spring, and 16-61439. No concentrations are reported for SWSC Spring; samples could not be collected because the location was dry.

Consistent with the description in the CMI remedy completion report (LANL 2017, 602597), the March 2021 concentrations of RDX detected in the springs are considered protective of nearby surface water and alluvial groundwater because the concentrations decrease dramatically as the distance increases away from the source. The objective of long-term monitoring at each spring is to ensure concentrations remain low or stable with time and the regional aquifer is protected.

Barium was targeted for removal in addition to RDX during Outfall 260 source-removal activities. With the cessation of discharge from Outfall 260 to Cañon de Valle, the estimated inventory of barium has been significantly reduced (LANL 2002, 073706); however, elevated barium concentrations in Cañon de Valle alluvial groundwater and surface water persist (LANL 2017, 602597).

Barium mobility is controlled by sorption and the dynamics of surface and alluvial hydrology. Barium continues to be mobilized by fluctuating water levels in the alluvium. Barium is also irreversibly removed from groundwater when barite (barium sulfate) precipitates; however, because witherite (barium carbonate) is also present and dissolves when wet, barium concentrations in alluvial groundwater remain elevated, buffered by the geochemical processes (LANL 2017, 602597).

Barium is more persistent in shallow groundwater within Cañon de Valle and, to a lesser extent, in Martin Spring in S-Site Canyon; however, barium is not likely to migrate to perched-intermediate groundwater or the regional aquifer given its sorptive characteristics, making it considerably less mobile than RDX in oxidizing groundwater. Although barium is well buffered in the near-surface system, natural sorptive processes slowly remove it from the system. Barium is elevated only in the surface and alluvial systems, and its mobility is limited by conditions in near-surface soils and alluvial groundwater. In addition to flushing dissolved barium from pore water and desorbing any reversibly sorbed barium, higher alluvial groundwater levels can dissolve barium minerals, primarily witherite, present in the unsaturated zone (Reid et al. 2005, 093660). Alternatively, declining alluvial groundwater levels will precipitate barium minerals partially buffers barium concentrations in surface waters and significantly buffers barium concentrations in alluvial waters (Reid et al. 2005, 093660).

Barium concentrations in alluvial groundwater within Cañon de Valle continue to be elevated. Concentrations in spring water are generally less than the 2000-µg/L screening level. Barium concentrations show a long-term decline in alluvial groundwater samples collected from location CDV-16-02656, upgradient of the former PRB, suggesting a diminishing source; however, location CDV-16-611923, upstream of the former PRB cutoff wall, showed a significant spike in barium concentrations after the PRB was installed in 2010. After the cutoff wall was installed, water levels in the alluvium above the cutoff wall rose, saturating sediments that likely contained witherite, which is the mobile fraction of barium. As the witherite dissolved, barium concentrations in groundwater spiked. The elevated barium eventually dissipated after flooding breached the cutoff wall in 2011.

Surface water and alluvial groundwater include a mix of spring water and water from upgradient locations and sources. Barium concentrations at surface water (i.e., Cañon de Valle below MDA P) have declined to below the 2000-µg/L screening level when last sampled in 2019, while barium concentrations in alluvial groundwater have been steadily declining. At Burning Ground Spring and SWSC Spring, barium concentrations remain below the 2000-µg/L screening level. Barium concentrations at 16-61439 (alluvial seep) remain above the screening level.

The CMI performance objectives were to reduce concentrations of barium and RDX in alluvial groundwater to prevent their migration to deeper groundwater. The Long-Term Monitoring and Maintenance Plan established performance-monitoring points as follows: the five existing alluvial wells in Cañon de Valle, three existing alluvial wells in S-Site Canyon, two surface-water sampling points along

the perennial surface water reach of Cañon de Valle, one surface-water sampling point in S-Site Canyon, and at the springs.

1.3 Monitoring Objectives

Key objectives of the long-term monitoring program include the following:

- monitoring effectiveness of the low-permeability cap and surge-bed grouting to ensure infiltrating water does not encounter and mobilize residual COPCs in the outfall area and underlying shallow vadose zone
- monitoring the long-term trend in COPC concentrations (primarily HE and barium) in springs, surface water, and alluvial groundwater to ensure historically declining and/or stable concentrations persist

2.0 LONG-TERM MONITORING AND MAINTENANCE SAMPLING AND RESULTS

Section 2.0 presents the data collected for this 2021 annual Long-Term Monitoring and Maintenance Report. The focus of the discussion is RDX and barium, identified as the primary COPCs targeted in the corrective measures implemented at former 260 Outfall. Other constituents are monitored as part of long-term monitoring and maintenance, and sampling results for all constituents monitored in the 2021 long-term monitoring and maintenance program are provided in this report. The results are screened against their respective screening levels, and the constituents that exceed their screening levels are discussed in more detail in this report.

2.1 Sampling

The purpose of the long-term monitoring activities is to assess the long-term effectiveness of the CMI for Consolidated Unit 16-021(c)-99, to monitor the long-term trends in COPC concentrations, and to support continuous evaluation of the conceptual model for the fate and transport of residual COPCs in nearby springs, surface water, and alluvial groundwater.

Sampling of groundwater, surface water, and springs for the TA-16 260 monitoring group is conducted semiannually (LANL 2017, 602406); however, as stated in section 1.0, the timing of the semiannual sampling events was interrupted by PED approvals and COVID-19 restrictions. In the CMI remedy completion report, Appendix A (LANL 2017, 602597), the analytes and sampling frequencies proposed in the IFGMP (N3B 2018, 700000) for alluvial groundwater, surface water, and springs for the TA-16 260 monitoring group were adapted as the long-term monitoring requirements for the former 260 Outfall area. Table 2.1-1 summarizes the monitoring locations (i.e., TA-16 260 monitoring group); parameters measured; and sampling frequencies for the springs, alluvial groundwater, and surface waters that make up the 2021 long-term monitoring program. The suite of compounds measured includes HEXMOD (i.e., RDX, HMX, TNT, and degradation byproducts), per- and polyfluoroalkyl substances (PFAS), VOCs, metals, SVOCs, general inorganics, low-level tritium, radionuclides, and nitrogen-15/oxygen-18 isotopes in nitrate. Table 2.1-2 provides a list of the field parameters and measurement results. Appendix A provides the field forms associated with sample collection.

2.2 Results

This section presents the results for the primary COPCs associated with the Outfall 260 drainage channel (i.e., RDX and barium) and the concentrations measured in the springs, surface water, and alluvial groundwater in Cañon de Valle, S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon. The other constituents monitored as part of the Long-Term Monitoring and Maintenance Plan are screened against their respective screening levels, and any exceedances identified are further discussed in this section. All validated analytical results are provided in Appendix B (on CD included with this document).

To present and evaluate the results from the sampling events, the data are organized by canyon, beginning with the most upgradient sample location and moving downgradient within each canyon (Figure 1.0-1), as follows:

- Cañon de Valle segment 1
 - CDV-16-02656 (background)
 - ✤ CDV-16-02657r
 - SWSC Spring
 - Burning Ground Spring
- Cañon de Valle segment 2
 - 16-61439 (PRB alluvial seep)
 - CDV-16-611923
 - ✤ CDV-16-611937
 - Cañon de Valle below MDA P
 - ✤ CDV-16-02659
- S-Site Canyon
 - Martin Spring
 - ✤ MSC-16-06293
 - ✤ MSC-16-06294
- Pajarito Canyon
 - Bulldog Spring
 - Pajarito below S&N Ancho E Basin Confluence (Confluence)
- Water Canyon
 - Between E252 and Water at Beta
 - ✤ Water at Beta
- Fishladder Canyon
 - ✤ FLC-16-25280

As described above, the Long-Term Monitoring and Maintenance Plan prescribes the sampling of spring water, surface water, and alluvial groundwater performed in March 2021. The 2021 Long-Term Monitoring and Maintenance Plan sampling events were performed in March 2021. Table 2.2-1 presents the RDX

results by canyon or canyon segment. Barium levels are monitored in filtered samples collected from spring water, surface water, and alluvial groundwater. Table 2.2-2 presents the barium results by canyon or canyon segment.

Analytes, other than barium or RDX, with screening levels were screened against those levels. Any exceedances are discussed in section 4, and Table 2.2-3 presents the analytes that exceeded their respective screening levels.

2.3 Deviations

Sampling at Water Canyon/Cañon de Valle (TA-16 260 monitoring group included) for the second quarter of monitoring year (MY) 2020 was canceled because groundwater field crews were unable to access Weapons Facilities Operations security areas from March 1 to March 23; approvals to use PEDs in the TA-16 area were pending. Then, beginning on March 24, 2020, EM-LA transitioned to EMCA status in response to the COVID-19 pandemic. NMED was notified of the transition to EMCA status on March 31, 2020 (DOE 2020, 700826). As a result of the EMCA status, the March 2020 sampling operations were paused. The second semiannual sampling event was conducted in July 2020, and all data were reported in the previous "2020 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area" (N3B 2020, 701053). The July 2020 event was scheduled to replace both the March and August sampling events for 2020.

Regarding the omission of the polychlorinated biphenyls (PCBs) and dioxin/furan data from the 2020 annual Long-Term Monitoring and Maintenance Report, the following discussion is provided. When the sampling campaign was implemented in July 2020, following the EMCA shutdown, many of the locations to be sampled were dry or did not have sufficient water to enable collection of a sample. Where there was sufficient water for sample collection in July 2020, PCBs and dioxins/furans were analyzed, but the results are only partially included in Appendix B of the 2020 annual Long-Term Monitoring and Maintenance Report. While PCB and dioxin/furan analyses were performed on samples collected from Burning Ground Spring, 16-61439, CDV-16-611937, Martin Spring, Bulldog Spring, and Between E252 and Water at Beta in July 2020, the PCB and dioxin/furan sampling results were inadvertently excluded from the 2020 annual Long-Term Monitoring and Maintenance Report. This information was reported and discussed in the "Response to Draft New Mexico Environment Department's Comments on the 2020 Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Former 260 Outfall Area, September 2020, LANL-20-064, Dated February 10, 2021," dated March 2021 (N3B 2021, 701345).

Another deviation to the Long-Term Monitoring and Maintenance Plan requirements resulted from the lack of water at eight sampling locations. Either the location was dry or there was insufficient water for sampling. These locations include the following:

- CDV-16-02657r
- SWSC Spring
- CDV-16-611923
- Cañon de Valle below MDA P
- MSC-16-06293
- MSC-16-06294
- Water at Beta
- FLC-16-25280

Tables 2.1-2, 2.2-1, and 2.2-2 present this information and indicate whether the location was dry or had insufficient water for sampling.

3.0 INSPECTION AND MAINTENANCE

Sections 3.1 and 3.2, respectively, discuss (1) the inspection and maintenance approach for the low-permeability cap on the former settling pond and (2) monitoring of the surge bed monitoring well installed to monitor the effectiveness of the injection grouting.

3.1 Low-Permeability Cap

The objective of the low-permeability cap on top of the former settling pond is to prevent surface water run-on and infiltration into the outfall area and underlying shallow vadose zone that contain residual RDX. The low-permeability cap is inspected semiannually for evidence of settling, cracking, erosion, water ponding, undesirable vegetation growth, and animal intrusion. Each year, inspections are conducted in March or April to check for damage that may be associated with winter and snowmelt conditions and in September to monitor for damage from summer rainfall runoff.

In the September 2020 inspection of the low-permeability cap, no erosion, cracking, settlement, or ponding water was observed. Although there was no evidence of burrowing animals, two ponderosa pines were removed from the cap, and the slopes were observed to be adequate for water runoff. No maintenance items were identified during the inspection.

In the March 2021 inspection of the low-permeability cap, no erosion, cracking, settlement, or ponding water was observed. There was no evidence of burrowing animals, and the slopes were observed to be adequate for water runoff. One ponderosa pine was removed from the cap. No maintenance items were identified during the inspection. The inspection forms used to document the fall and spring inspections are provided in Appendix C.

Storm water run-on and runoff controls are in place to prevent erosion of the low-permeability cap and to prevent runoff and sediment from moving farther down the 260 Outfall drainage channel. Monitoring and maintenance of the storm water control structures at the former 260 Outfall area continue under NPDES Permit No. NM0030759 (Individual Permit or Permit), issued by the U.S. Environmental Protection Agency, Region 6, on September 30, 2010 (EPA 2010, 213450) and authorizing discharge of storm water associated with historical industrial activities at the Laboratory. Storm water controls installed at the site under the Individual Permit currently include vegetation, earthen berms, curbing, riprap, a rock check dam, and the low-permeability cap; therefore, an additional inspection of the low-permeability cap is performed when these controls are inspected as required by the Permit. An inspection of the storm water control structures, including the low-permeability cap at former 260 Outfall area, was performed on July 22, 2021. The inspection form is provided in Appendix C.

3.2 Surge Bed Monitoring Well

The surge bed monitoring well was installed to evaluate the effectiveness of the grout injected into the subsurface surge bed and of the low-permeability cap by monitoring for the appearance of water in the surge bed. Observations of water levels in the surge bed monitoring well during semiannual inspections have confirmed no detectable volume of water within the well. Additionally, throughout the MY 2021 season, water levels have been monitored by a dedicated in-well transducer; no water has been detected in the surge bed monitoring well. The raw transducer data are provided in Appendix D.

4.0 DISCUSSION AND CONCLUSIONS

This section discusses the RDX and barium results from the March 2021 sampling event and how the results compare with the historical trends (January 2001 through January 2021) and support the conceptual model. When appropriate, RDX and barium concentration trends were analyzed using the Mann-Kendall method. Appendix E provides a description of the methods used and the results. In addition, this section describes other analytes (e.g., iron, manganese, and boron) detected above their respective screening levels and how these relate to the conditions in the alluvial groundwater.

4.1 RDX

The complete RDX data records for Cañon de Valle segments 1 and 2 are presented in Figures 4.1-1 and 4.1-2, respectively. These figures provide a comprehensive review of the RDX concentrations in waters in each segment and how the RDX sample results compare with the historical data trends. Based on a review of these data from locations that have not been dry for several sampling events, RDX concentrations in alluvial groundwater remain below the 9.66- μ g/L screening level or show a long-term decline. CdV-16-02659 shows a statistically significant decline in RDX concentrations (Appendix E, Figure E-1), with the last sample result below the 9.66- μ g/L screening level. Burning Ground Spring (the only spring that was not dry) and location 16-61439 (PBR Alluvial Seep) had concentrations above the screening level of 9.66 μ g/L. It can be concluded that the conditions in the surface water, alluvial groundwater, and springs are consistent with the concept that RDX concentrations vary across the canyon, but most locations have RDX concentrations below the 9.66- μ g/L screening level.

Plate 1 shows the spatial distribution of RDX across Cañon de Valle since the completion of the CMI.

The S-Site Canyon RDX data record is shown in Figure 4.1-3, and the spatial distribution of RDX detected since the corrective measures is provided on Plate 1. The Martin Spring water RDX concentrations remain above the screening level, although the sample results from the period of record (Figure 4.1-3) are consistent with the conclusion that RDX levels continue to decline over time. A Mann-Kendall trend analysis was performed on the RDX data from the period of record and shows a statistically significant decreasing trend at the 95% confidence level (Appendix E, Figure E-2). Both MSC-16-06293 and MSC-16-06294 were dry during the last sampling event. Plate 1 shows RDX concentrations across the canyon with no impacts to surface water downgradient of Martin Spring, suggesting the RDX concentration in Martin Spring is a localized condition.

The Pajarito Canyon locations include a spring location at Bulldog Spring and a surface water location at the Confluence. Figure 4.1-4 presents the data record for both locations. Bulldog Spring water RDX concentrations are consistently below the screening level, including the result of the samples collected in March 2021. At the Confluence surface water location, the RDX results are consistent with past data— concentrations are below 9.66 µg/L. Plate 1 shows the spatial distribution of RDX across the canyon.

The Water Canyon RDX data record is presented in Figure 4.1-5. Figure 4.1-5 demonstrates that the samples are consistent with historical results, which indicate RDX is well below the screening level or not detected. Samples from the March 2021 sampling event were not available for Water Canyon at Beta because the location was dry at the time of sampling; however, Between E252 and Water at Beta was sampled and sample results were nondetected for RDX. Plate 1 shows the spatial distribution of RDX across the canyon.

Figure 4.1-6 presents the data record for the Fishladder Canyon. In March 2021 results were not available because the location was dry at the time of sampling. However, the historical record indicates no impacts to Fishladder Canyon alluvial groundwater above the RDX screening level.

The sample results support the conceptual model for RDX by demonstrating the following:

- Concentrations of RDX in alluvial monitoring wells continue to be below the 9.66-µg/L screening level.
- Most alluvial wells in Cañon de Valle are near or below the screening level of 9.66 μg/L.
- RDX concentrations for the March 2021 sampling result in water from Martin Spring are above the 9.66-µg/L screening level but are steadily declining.
- The current concentrations of RDX detected in the springs suggest the water is not impacting alluvial groundwater, as concentrations indicate a dramatic decrease away from the source but may influence surface water RDX concentration during unusually wet years.

The sample results are consistent with past RDX concentration results and do not indicate a change to the RDX conceptual site model. In addition, the monitoring and observations support the conclusion that the low-permeability cap and the stabilized surge bed remedies continue to be effective.

4.2 Barium

Barium concentration data records for the Cañon de Valle segments 1 and 2 are presented in Figures 4.2-1 and 4.2-2, respectively. These figures provide a comprehensive review of barium impacts to each segment since the start of the IFGMP program and a comparison of the sample barium results with the existing data trends. A review of these data indicate that the temporal and spatial trends, and conditions in the surface water, alluvial groundwater, and springs, are consistent with conditions described in the CMI remedy report (LANL 2017, 602597); therefore, these conditions are still considered protective of the regional groundwater.

Plate 2 shows the spatial distribution of barium across Cañon de Valle segments 1 and 2 since the completion of the early phase (i.e., cessation of the Outfall 260 discharge and first phase of soil removal) of the CMI. In general, barium concentrations at each location are detected above the screening level; however, the barium results indicate that barium concentrations are declining at alluvial well locations where barium concentrations exceed the screening level. Mann-Kendall trend analyses performed on all the alluvial wells show decreasing trends, with CdV-16-02656 and CdV-16-6611937 resulting in barium concentration below the 2000- μ g/L screening level. Alluvial wells CdV-16-62656, CdV-16-02659, CdV-16-611923, and CdV-16-611937 all have decreasing barium concentration trends based on Mann-Kendall trend analysis. Appendix E Figures E-3 through E-6 provide the Mann-Kendall trend analysis for each location.

In S-Site Canyon, Pajarito Canyon, Water Canyon, and Fishladder Canyon, barium is not detected above the 2000-µg/L screening level, which is consistent with the historical data record as seen in Figure 4.2-3 (S-Site Canyon), Figure 4.2-4 (Pajarito Canyon), Figure 4.2-5 (Water Canyon), and Figure 4.2-6 (Fishladder Canyon). Plate 2 shows the spatial distribution of barium across the canyons.

Based on the sample results and comparison with the existing barium data records, the following observations support the conceptual model:

- Concentrations in springs are less than the 2000-µg/L screening level, except at 16-61439 (PRB alluvial seep).
- Barium concentrations at both CdV-16-06259 and 16-61439 remain above 2000 $\mu g/L$ but continue to show long-term decline.
- Except for Cañon de Valle, the other canyons in the Long-Term Monitoring and Maintenance Plan sampling program are not impacted with barium above the screening level.

As the sample results are consistent with past barium concentration results and the conceptual site model, no change to the conceptual model is indicated. The barium results are congruent with the RDX results and support the finding of the continued effectiveness of the low-permeability cap and the stabilized surge bed.

4.3 Other Analytes Exceeding their Respective Screening Levels

All the analytes monitored as part of the Long-Term Monitoring and Maintenance Plan sampling program were screened against their respective screening levels. Based on these results, iron, manganese, and boron were identified as compounds exceeding screening levels. Table 2.2-3 presents the analytes exceeding their respective screening levels. Note that in the 2020 Annual Long-Term Monitoring and Maintenance Report, aluminum and perchloroethylene were listed as analytes exceeding their respective screening levels; however, their results from the March 2021 sampling event did not indicate exceedances. Therefore, aluminum and perchloroethylene are not presented in Table 2.2-3, nor are they discussed in this report.

During the March 2021 sampling event, iron and manganese exceeded their respective screening levels (1000 µg/L and 200 µg/L) with maximum concentrations of 1200 µg/L and 321 µg/L, respectively, in one sample collected at CDV-16-611937 (CAWA-21-218613). Alluvial groundwater conditions at sample location CVD-16-611937 were reducing during the sampling event. In March 2021, the dissolved oxygen concentration was measured at 1.49 mg/L, and the ORP was measured at 96.4 mV, indicating reducing conditions. Reducing conditions at CVD-16-611937 were likely due to the lack of fresh water flushing the groundwater at this location.

One reason for these exceedances is the redox-sensitive nature of these analytes, as localized conditions become more reduced in the alluvial groundwater and the anaerobic bacteria convert iron and manganese into their more reduced (and more soluble) forms. The detection of iron and manganese above their screening levels in March 2021 correlates well with the localized reducing conditions in the alluvial groundwater at this location.

The March 2021 sampling results showed all locations sampled contained iron, with a range from $30.0 \ \mu\text{g/L}$ to $1200 \ \mu\text{g/L}$ in filtered samples. Iron concentrations did not exceeded $1000 \ \mu\text{g/L}$ at any sampling location other than CVD-16-611937.

Boron also exceeded its screening level (750 μ g/L) with a maximum concentration of 1270 μ g/L detected at Martin Spring during the March 2021 sampling event. Elevated concentrations of boron in Martin Spring water are well documented and relate to historical Laboratory releases at TA-16 (LANL 2018, 602963).

4.4 Conclusions

The CMI objectives were to reduce the concentrations of barium and RDX in alluvial groundwater to prevent the migration of these compounds into deeper groundwater. The Long-Term Monitoring and Maintenance Plan was implemented to (1) monitor the performance of the CMI in terms of these objectives to evaluate the effectiveness of the low-permeability cap and surge-bed grouting in ensuring that infiltrating water does not encounter and mobilize residual RDX in the outfall area and underlying shallow vadose zone and (2) monitor the long-term trend in concentrations of RDX and barium in springs, surface water, and alluvial groundwater to ensure historically declining and/or stable concentrations persist. The 2021 sampling and inspection program has met these objectives.

5.0 RECOMMENDATIONS

Based on the results from the March 2021 semiannual sampling event and the inspections of the low-permeability cap and surge-bed grouting addressed in this report, EM-LA recommends that the Long-Term Monitoring and Maintenance Plan continue through MY 2022. Sampling and inspection will be continuous to evaluate the effectiveness of the low-permeability cap and surge-bed grouting and monitor the long-term trends in COPC (RDX and barium) concentrations. Alluvial groundwater, surface water, and spring water are anticipated to continue showing stable or declining concentrations of RDX and barium. If the data show a significant increase in COPC concentrations over time, the conditions in the vicinity of former 260 Outfall will be reassessed to identify the cause and evaluate whether additional corrective action is necessary.

Inspections of the low-permeability cap and surge bed will continue on a semiannual basis. If maintenance items are identified, they will be promptly addressed and reported in the subsequent annual report.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. ERIDs were assigned by Los Alamos National Laboratory's (the Laboratory's) Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above).

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Reid, K.D., S.L. Reneau, B.D. Newman, and D.D. Hickmott, August 2005. "Barium and High Explosives in a Semiarid Alluvial System, Cañon de Valle, New Mexico," *Vadose Zone Journal*, Vol. 4, pp. 744–759. (Reid et al. 2005, 093660)

6.2 Map Data Sources

Hillshade; Los Alamos National Laboratory, ER-ES, As published; \\slip\gis\Data\HYP\LiDAR\2014Bare_Earth\BareEarth_DEM_Mosiac.gdb; 2014.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Unpaved road; Los Alamos National Laboratory, ER-ES, As published, GIS projects folder; \\slip\GIS\Projects\14-Projects\14-0062\project_data.gdb; digitized_site_features; digitized_road; 2017.

Paved Road Arcs; Los Alamos National Laboratory, FWO Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Drainage Channel; Los Alamos National Laboratory, ER-ES, As published, GIS projects folder; \\slip\GIS\Projects\11-Projects\11-0108\\gdb\gdb_11-0108 generic.mdb; drainage; 2017.

TA-16 260 Outfall, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\ polygon\outfall_260

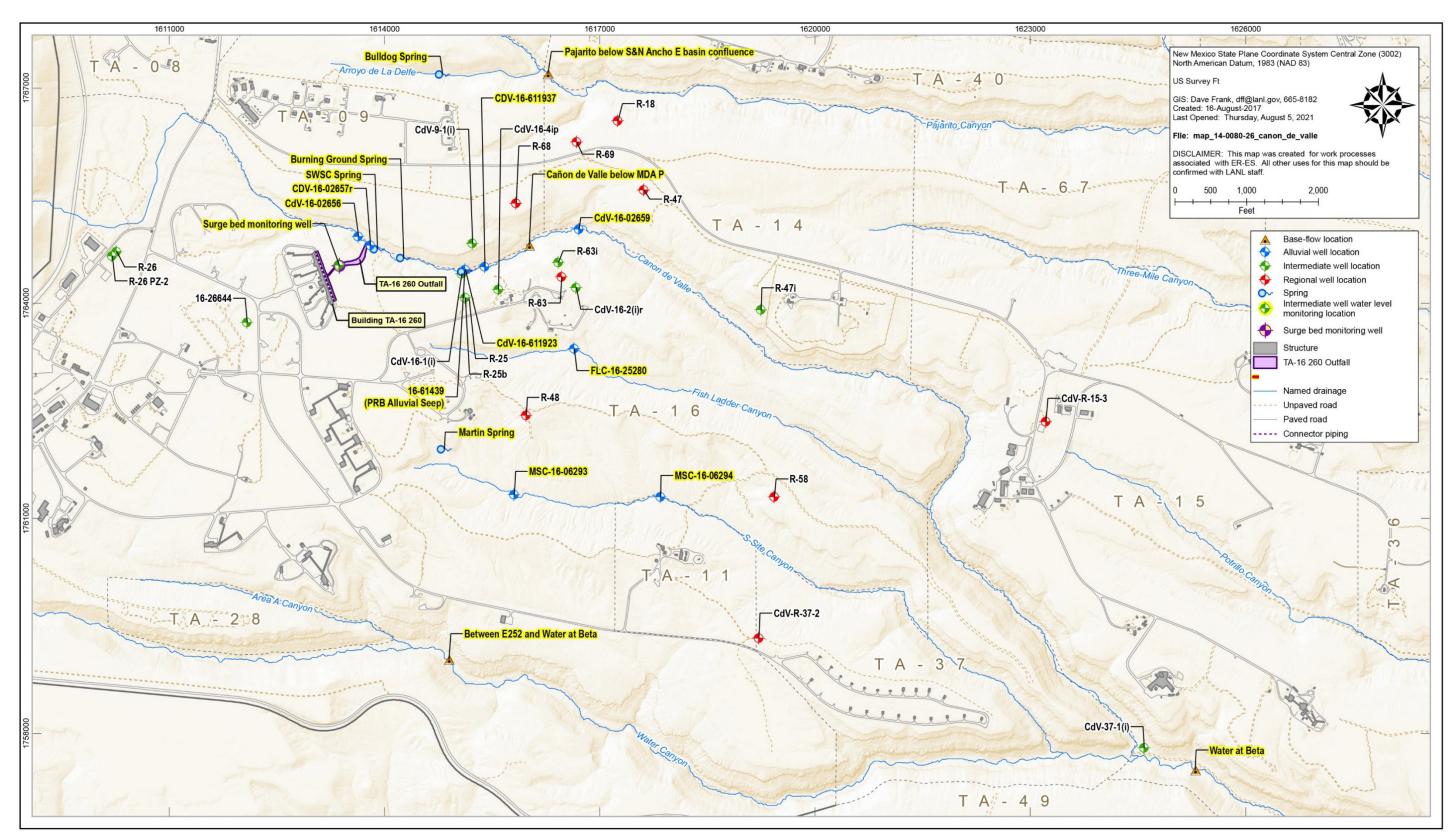
M Wall-PRB, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\line\wall_PRB

Connector piping, As Published, GIS project folder: Q:\14-Projects\14-0080\project_data.gdb\line\connector_piping

Tech areas; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Boundaries\PUB.tecareas

Tech Areas line; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Boundaries\PUB.tecareas line

PUB.prs_all_reg_admin; Los Alamos National Laboratory, Database Connections\GIS.PUB.PRD1.sde\PUB.Regulatory\PUB.prs_all_reg_admin



Note: Yellow highlights indicate locations of interest in this report.

Figure 1.0-1 Long-Term Monitoring and Maintenance Plan locations

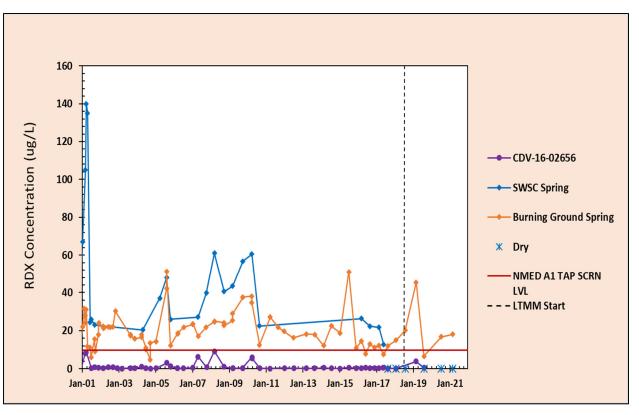


Figure 4.1-1 Cañon de Valle segment 1 RDX data record

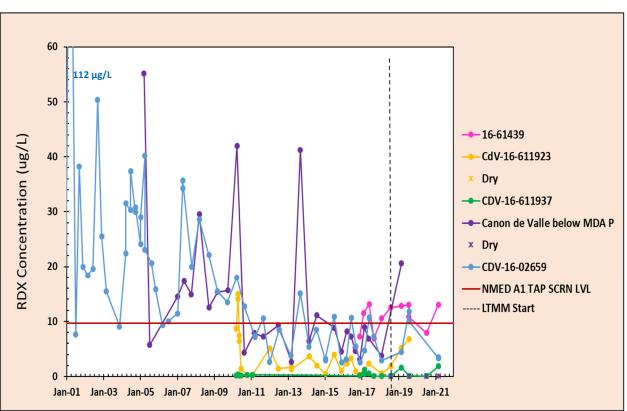


Figure 4.1-2 Cañon de Valle segment 2 RDX data record

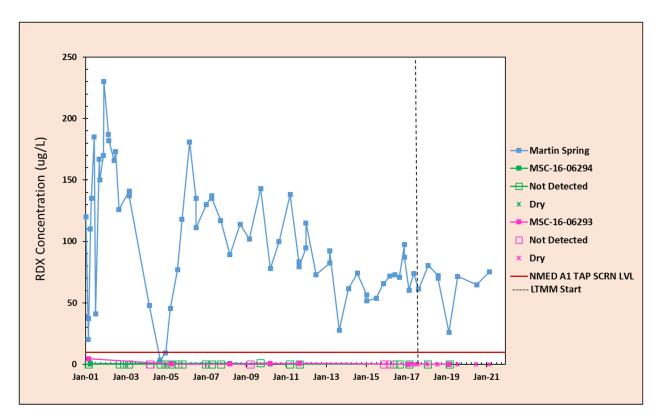


Figure 4.1-3 S-Site Canyon RDX data record

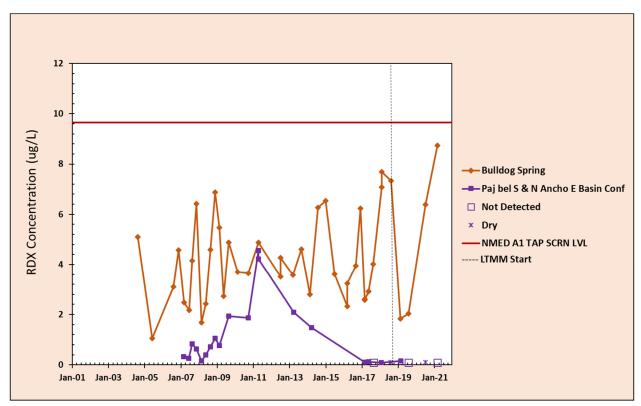


Figure 4.1-4 Pajarito Canyon RDX data record

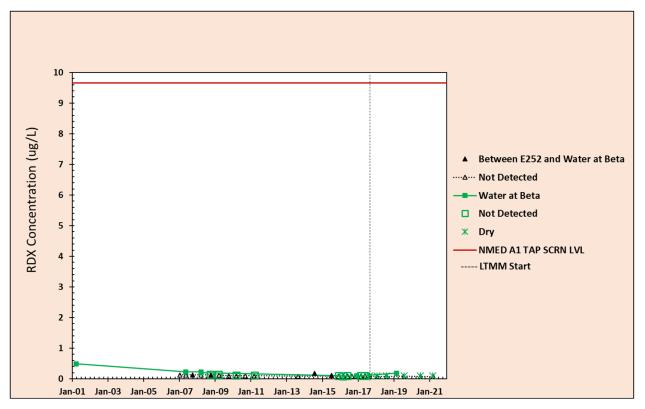


Figure 4.1-5 Water Canyon RDX data record

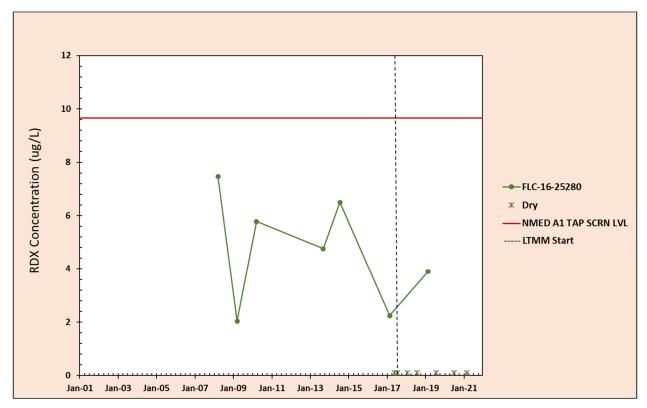


Figure 4.1-6 Fishladder Canyon RDX data record

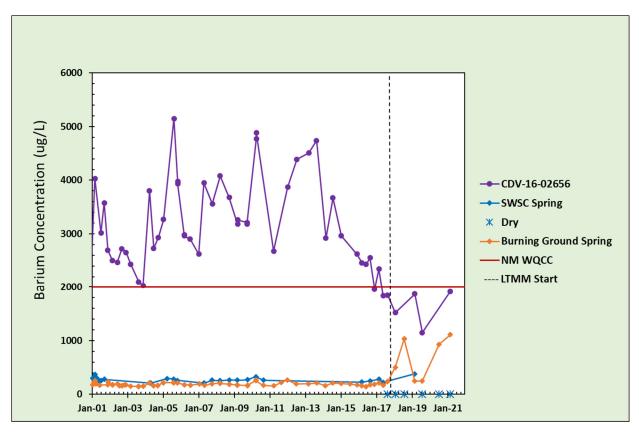


Figure 4.2-1 Cañon de Valle segment 1 barium data record

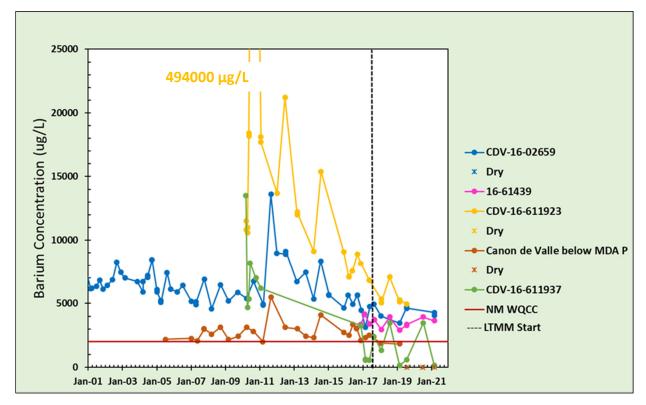


Figure 4.2-2 Cañon de Valle segment 2 barium data record

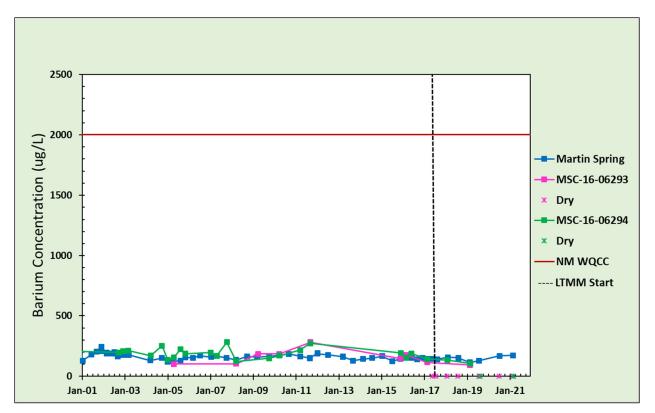


Figure 4.2-3 S-Site Canyon barium data record

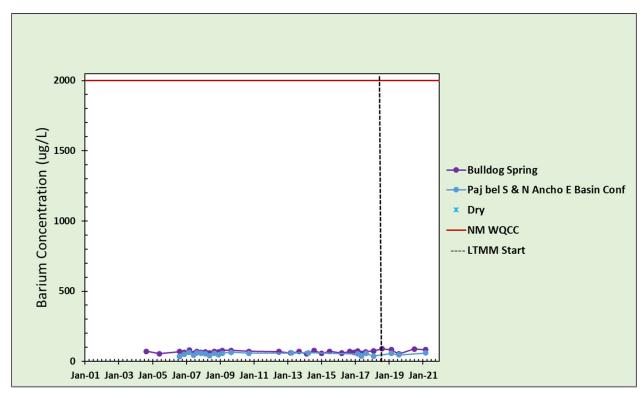


Figure 4.2-4 Pajarito Canyon barium data record

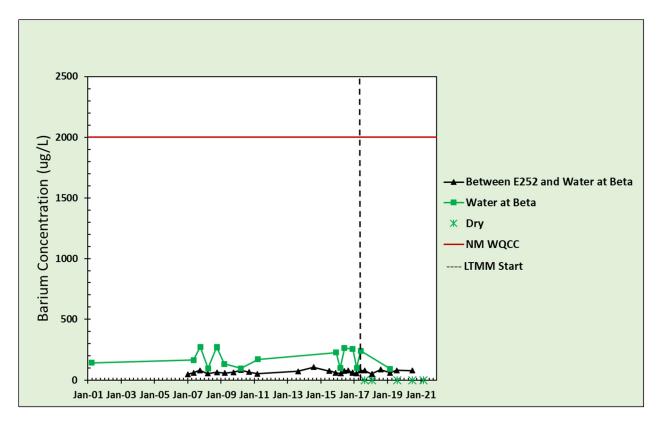


Figure 4.2-5 Water Canyon barium data record

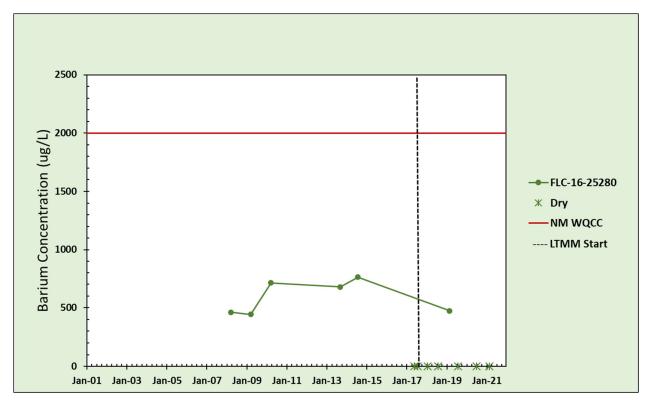


Figure 4.2-6 Fishladder Canyon barium data record

Table 2.1-1 Monitoring Locations, Analytes, and Frequency

Canyon	Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	HEXMOD	Radionuclides	Low-Level Tritium	General Inorganics	15N/18O Isotopes in Nitrate	PFAS
Cañon de	CDV-16-02656	Alluvial	S ^a	S	B ^b	S	В	NM ^c	S	NM	Ad
Valle 1	CDV-16-02657r	Alluvial	S	S	В	S	В	NM	S	NM	А
	SWSC Spring	Spring	S	S	В	S	В	NM	S	А	А
	Burning Ground Spring	Spring	S	S	В	S	В	А	S	А	А
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	Spring	S	S	В	S	В	NM	S	NM	A
	CDV-16-611923	Alluvial	S	S	В	S	В	NM	S	NM	А
	CDV-16-611937	Alluvial	S	S	В	S	В	NM	S	NM	А
	Cañon de Valle below MDA P	Base flow	S	S	В	S	В	NM	S	NM	A
	CDV-16-02659	Alluvial	S	S	В	S	В	NM	S	NM	А
S-Site Canyon	Martin Spring	Spring	S	S	В	S	В	А	S	А	А
	MSC-16-06293	Alluvial	S	S	В	S	В	NM	S	NM	А
	MSC-16-06294	Alluvial	S	S	В	S	В	NM	S	NM	А
Pajarito	Bulldog Spring	Spring	S	S	В	S	В	NM	S	А	А
Canyon	Pajarito below S&N Ancho E Basin Confluence	Base flow	S	S	В	S	В	NM	S	NM	A
Water Canyon	Between E252 and Water at Beta	Base flow	S	S	В	S	В	NM	S	NM	A
	Water at Beta	Base flow	S	S	В	S	В	NM	S	NM	А
Fishladder Canyon	FLC-16-25280	Alluvial	S	S	В	S	В	NM	S	NM	A
n/a ^e	Surge Bed Monitoring Well	Surge Bed (Intermediate)	S	S	S	S	NM	NM	S	NM	A

^a S = Semiannual (two times per yr).

^b B = Biennial (one time per 2 yr).

^c NM = Not measured. This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

^d A = Annual.

^e n/a = Not applicable.

 Table 2.1-2

 Long-Term Monitoring and Maintenance Plan Sampling Program Field Parameters

Watershed	Location	Sampling Date	Screen Top Depth (ft)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)		pH (SU ^a)	Specific Conductance (µS/cm)	Temperature (deg C)	Turbidity (NTU⁵)	Comments
Cañon de Valle 1	CDV-16-02656	3/13/2021	3	4.46	137.4	6.67	3	320.6	4.7	4.99	
	CDV-16-02657r	3/13/2021	1.35	NS℃	NS	NS	١	NS	NS	NS	Insufficient water for sampling
	SWSC Spring	3/13/2021	n/a ^d	NS	NS	NS	٦	NS	NS	NS	Insufficient water for sampling
	Burning Ground Spring	3/13/2021	n/a	8.21	NM ^e	6.68	3	309.1	9.9	0.49	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	3/15/2021	n/a	8.99	NM	6.33	2	274.2	6.4	9.49	
	CDV-16-611923	3/15/2021	3.2	NS	NS	NS	١	NS	NS	NS	Location dry
	CDV-16-611937	3/15/2021	3	1.49	96.4	5.88	1	199.9	3.5	17	
	Cañon de Valle below MDA P	3/15/2021	n/a	NS	NS	NS	١	NS	NS	NS	Insufficient water for sampling
	CDV-16-02659	3/15/2021	1.7	8.41	223.8	6.66	2	256.7	5.6	6.03	
S-Site Canyon	Martin Spring	3/10/2021	n/a	8.14	NM	6.84	4	133.4	7.4	3.76	
	MSC-16-06293	3/8/2021	2	NS	NS	NS	١	NS	NS	NS	Location dry
	MSC-16-06294	3/19/2021	2.5	NS	NS	NS	١	NS	NS	NS	Location dry
Pajarito Canyon	Bulldog Spring	3/16/2021	n/a	8.92	NM	7.51	3	316.7	7.6	6.43	
	Pajarito below S&N Ancho E Basin Confluence	3/16/2021	n/a	10.66	NM	6.62	2	231.7	6.7	2.46	
Water Canyon	Between E252 and Water at Beta	3/29/2021	n/a	10.24	NM	7.43	1	146	4	5.29	
	Water at Beta	3/19/2021	n/a	NS	NS	NS	١	NS	NS	NS	Location dry
Fishladder Canyon	FLC-16-25280	3/8/2021	n/a	NS	NS	NS	١	NS	NS	NS	Insufficient water for sampling

^a SU = Standard unit.

^b NTU = Nephelometric turbidity unit(s).

^c NS = Not sampled.

^d n/a = Not applicable.

^e NM = Not measured. This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Canyon	Location	Sample	Depth to Top of Screen (ft)	Sampling Date	Field Prep	Field QC ^a Type	Result (µg/L)	NMED Screening Level ^b	Comments
Cañon de Valle 1	CDV-16-02656	CAWA-21-218596	3	3/13/2021	UF°	REG ^d	0.4	9.66	
	CDV-16-02657r	NS ^e	1.35	3/13/2021	NS	NS	NS	9.66	Insufficient water for sampling
	SWSC Spring	NS	n/a ^f	3/13/2021	NS	NS	NS	9.66	Insufficient water for sampling
	Burning Ground Spring	CAWA-21-218378	n/a	3/13/2021	UF	REG	18.1	9.66	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	CAWA-21-218389	n/a	3/15/2021	UF	REG	13	9.66	
	CDV-16-611923	NS	3.2	3/15/2021	NS	NS	NS	9.66	Location dry
	CDV-16-611937	CAWA-21-218614	3	3/15/2021	UF	REG	1.87	9.66	
	Cañon de Valle below MDA P	NS	n/a	3/15/2021	NS	NS	NS	9.66	Insufficient water for sampling
	CDV-16-02659	CAWA-21-218602	1.7	3/15/2021	UF	REG	3.34	9.66	
		CAWA-21-218616	1.7	3/15/2021	UF	FD ^g	3.44	9.66	
S-Site Canyon	Martin Spring	CAWA-21-218385	n/a	3/10/2021	UF	REG	75.2	9.66	
	MSC-16-06293	NS	2	3/8/2021	NS	NS	NS	9.66	Location dry
	MSC-16-06294	NS	2.5	3/19/2021	NS	NS	NS	9.66	Location dry
Pajarito Canyon	Bulldog Spring	CAPA-21-218370	n/a	3/16/2021	UF	REG	8.74	9.66	
	Pajarito below S&N Ancho E Basin Confluence	CAPA-21-218367	n/a	3/16/2021	UF	REG	0.0889 (ND ^h)	9.66	
Nater Canyon	Between E252 and Water at Beta	CAWA-21-219608	n/a	3/29/2021	UF	REG	0.08 (ND)	9.66	
	Water at Beta	NS	n/a	3/19/2021	NS	NS	NS	9.66	Location dry
ishladder Canyon	FLC-16-25280	NS	n/a	3/8/2021	NS	NS	NS	9.66	Insufficient water for sampling

 Table 2.2-1

 RDX Concentrations in Groundwater, Surface Water, and Springs

^a QC = Quality control.

^b NMED tap water screening levels are specified in the June 2019 Table A-1 of "Risk Assessment Guidance for Site Investigations and Remediation" (NMED 2019, 700550).

^c UF = Unfiltered sample.

^d REG = Regular sample.

^e NS = Not sampled.

^f n/a = Not applicable.

^g FD = Field duplicate.

 h ND = Not detected. The method detection limit is 0.087.

 Table 2.2-2

 Barium Concentrations in Groundwater, Surface Water, and Springs

Canyon	Location	Sample	Depth to Top of Screen (ft)	Sampling Date	Field Prep	Field QC ^a Type	Result (µg/L)	Screening Level ^b	Comments
Cañon de Valle 1	CDV-16-02656	CAWA-21-218595	3	3/13/2021	F°	REG ^d	1920	2000	
	CDV-16-02657r	NS ^e	1.35	3/13/2021	NS	NS	NS	2000	Insufficient water for sampling
	SWSC Spring	NS	n/a ^f	3/13/2021	NS	NS	NS	2000	Insufficient water for sampling
	Burning Ground Spring	CAWA-21-218377	n/a	3/13/2021	F	REG	1110	2000	
Cañon de Valle 2	16-61439 (PRB Alluvial Seep)	CAWA-21-218388	n/a	3/15/2021	F	REG	3650	2000	
	CDV-16-611923	NS	3.2	3/15/2021	NS	NS	NS	2000	Location dry
	CDV-16-611937	CAWA-21-218613	3	3/15/2021	F	REG	148	2000	
	Cañon de Valle below MDA P	NS	n/a	3/15/2021	NS	NS	NS	2000	Insufficient water for sampling
	CDV-16-02659	CAWA-21-218601	1.7	3/15/2021	F	REG	4290	2000	
		CAWA-21-218615	1.7	3/15/2021	F	FD ^g	4050	2000	
S-Site Canyon	Martin Spring	CAWA-21-218384	n/a	3/10/2021	F	REG	174	2000	
	MSC-16-06293	NS	2	3/8/2021	NS	NS	NS	2000	Location dry
	MSC-16-06294	NS	2.5	3/19/2021	NS	NS	NS	2000	Location dry
Pajarito Canyon	Bulldog Spring	CAPA-21-218369	n/a	3/16/2021	F	REG	82.8	2000	
	Pajarito below S&N Ancho E Basin Confluence	CAPA-21-218366	n/a	3/16/2021	F	REG	60.1	2000	
Water Canyon	Between E252 and Water at Beta	CAWA-21-218381	n/a	3/29/2021	F	REG	47	2000	
	Water at Beta	NS	n/a	3/19/2021	NS	NS	NS	2000	Location dry
Fishladder Canyon	FLC-16-25280	NS	n/a	3/8/2021	NS	NS	NS	2000	Insufficient water for sampling

^a QC = Quality control.

^b New Mexico Water Quality Control Commission groundwater standards.

^c F = Filtered.

^d REG = Regular sample.

^e NS = Not sampled.

^f n/a = Not applicable.

^g FD = Field duplicate.

Table 2.2-3
Analytes Exceeding Screening Levels

Canyon	Location	Sample	Depth to Top of Screen (ft)	Sampling Date	Field QC ^a Type	Analyte	Result (µg/L)	Screening Level ^b	Field Prep Code
Cañon de Valle 2	CDV-16-611937	CAWA-21-218613	3	3/15/2021	REG ^c	Iron	1200	1000	F ^d
	CDV-16-611937	CAWA-21-218613	3	3/15/2021	REG	Manganese	321	200	F
S-Site Canyon	Martin Spring	CAWA-21-218384	n/a ^e	3/10/2021	REG	Boron	1270	750	F

^a QC = Quality control.

 $^{\rm b}$ New Mexico Water Quality Control Commission groundwater standards.

^c REG = Regular sample.

^d F = Filtered.

^e n/a = Not applicable.

Appendix A

Field Forms Associated with Sample Collection

March 2021 Field Forms

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

	129	jel.	103
05/29	Izuri ar alt	Between E252 & Water Beta	
	/_	Spring/Surface Water Sampling Field Data Sheet	
	Site name: Bath me	Erse & Waker Brin Date: 03/29/2021 Onsite time: 0920	
		per reference doc. on pg. 3 Weather: Smny, 405	
	Sampling crew:	3 Morgan, J. Meyer, A. Vigil, D. Srandle, M. Stasmy	
	Two-minute safety	drill: Hiking oneven suffaces	
	Meters calibrated	at (location) 570 by (whom) M. Stastmy at (time) 080	50
	Multimeter numbe	110 (-10) 37.8.8	_
2	Sample Retrieval	Date: 03/29/201 Time: 0930 Method: PP	
10	Sample Event ID:	2.2.2	
8		FIELD PARAMETERS	
8	pH (su): 7.42	Turbidity (NTIN) 620	
	Temperature (°C):	4,0 DO (mg/L): /0.24 Q (gpm): 34.11	he.
	Explanation of Q m	nethod, including calculations: T = 0.076 cfs × 447.83 = 34.11 gpm Note: To convert cfs to gpm, multiply cfs by	448.83
	0.18	SITE DESCRIPTION (circle all that apply)	
and the	Madia tupo	Spring Baseflow (persistent flow)	
2	Media type:	Bank Wading Station Gage: at / above / belo	ow
2	Sample location:	Midstream natural feature Other (specify):	
			her
2	Description of		
1	Sampling Site:	Written description: Sampling midsheum off peacer slab	
	Substrate:	Section Contrette Contrette Contrette	Mud
1	Stage Conditions:	Stable: formar / low / high Falling Rising Other (specify):	
1	Hydraulic Event:	Routine Snowmelt Flood Drought Other (specify):	
-	Stream Color:	Brown Clear Green Blue Gray Other (specify):	
-	Description of		her
	flow:	Written description:	-
	1	Photos and GPS	
	GPS point #1:	Name: NA Coordinates: NA Units: NA	
1	GPS point #2:	Name: V Coordinates: V Units: V	
	Photo #1:		67 11 0
+1			4
34	Photo #2:	OFFICAN	
	Photo #3:	- vort State (1)	/-
	Other notes: A .		QAS/
	Offsite time: \0	00 Relinquish samples at SMO, care of <u>Hat Popula</u> at (time) 100	<u> </u>
	Objectives met?	Y25	
			gtr
A DECEMBER		/m	
and the second s		Y25	

34 ^ ^m /	3/13/14-1					
3)2021		6rome ?	Sering			
	Spring/	Surface Water	Sampling Field	Data Sheet		
Site name: Burn	ing ground Spring	Date: 0313	17021	Onsite time: 0	930	
Objective: Sump	le per documentation	n on pg.3	Weather: S			
Sampling crew:	J. Meyer, K. Reid,	D. Jaramillo, J.	Anterson k	NMED (Ken	in B)	
Two-minute safet		ues, weir	hazard	 • 		
Multimeter numb	at (location) 50		the second	ssa Stastal	at (time)	
Sample Retrieval	Date: 0936				, 218379, 218380, 2205; od: DD 2183	
Sample Event ID:	the second se	ample ID Number	Time: 3/13/20 s: 166103		od: PP 2183	
			RAMETERS			
pH (su): 6.68		the second s	/cm): 309.10	D Tur	bidity (NTU): 0.49	(*******************************
Temperature (°C):	9.9 nethod, including calcula act (7) 0.423	DO (mg/L):	8.21	and the second se	pm): 5.08	
55			egal bosed			
Media tura:	2c © 5se	E DESCRIPTION (c	ec Im.M	Note: To convert	cfs to gpm, multiply cfs by 448.83	
Media type: Sample location:	ic Gse Str	E DESCRIPTION (cl	ec I m.N ircle all that appl	Note: To convert Y) Baseflo	cfs to gpm, multiply cfs by 448.83 w (persistent flow)	
Media type: Sample location:	ec 5se SIT Bank	E DESCRIPTION (c	ec 1 m.M ircle all that appl Wading	Note: To convert y) Baseflo Station (cfs to gpm, multiply cfs by 448.83	
Sample location: Description of	ic Gse Str	E DESCRIPTION (c	ec I m.N ircle all that appl	Note: To convert y) Baseflo Station (fy):	cfs to gpm, multiply cfs by 448.83 w (persistent flow)	
Sample location: Description of	EC 5 SE SIT Bank (Midstream na	E DESCRIPTION (c spring atural feature Riffle	ec I m.M ircle all that appl Wading Other (specif	Note: To convert y) Baseflo Station (fy):	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below	
Sample location: Description of Sampling Site:	EC 55E SIT Bank Midstream na	E DESCRIPTION (c spring atural feature Riffle	ec I m.M ircle all that appl Wading Other (specif	Note: To convert y) Baseflo Station (fy):	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below)
Sample location: Description of Sampling Site: Substrate: Stage Conditions:	EC 550 SIT Bank Midstream na Pool Written description	E DESCRIPTION (c spring atural feature Riffle n: Concrete	ec I m.M ircle all that appl Wading Other (specif Edd	Note: To convert y) Baseflo Station (fy): y Di	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Sage: at / above / below ffuse Other	>
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event:	EC 55E SIT Bank Midstream na Pool Written descriptio Bedrock	E DESCRIPTION (c spring atural feature Riffle n: Concrete w / high Snowmelt	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood	Note: To convert y) Baseflo Station (fy): y Di Gravel	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other	>
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color:	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do	E DESCRIPTION (c) Spring atural feature Riffle n: Concrete w / high	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify):	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown	E DESCRIPTION (c spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood en Blue Recirculati	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify):	> >
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow:	EC 552 SIT Bank Midstream na Pool Written descriptio Bedrock Stable normal to Routine Brown Turbulent	E DESCRIPTION (c Spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar	ec I m.M. ircle all that appl Wading Other (specif Edd Cobble Falling Flood en Blue Recirculati	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify):	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1:	EC 552 SIT Bank Midstream na Pool Written descriptio Bedrock Stable normal to Routine Brown Turbulent	E DESCRIPTION (c Spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar	ec I m.M. ircle all that appl Wading Other (specif Edd Cobble Falling Flood en Blue Recirculati Surce Food and GPS	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other	>
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2:	EC 552 SIT Bank Midstream na Poo Written description Bedrock Stable normal to Routine Brown Turbulent Written description Name: NA Name: NA	E DESCRIPTION (c) Spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar n: Flow a + Se Photos	ec I m.M. ircle all that appl Wading Other (specification Edd Cobble Falling Flood en Blue Recirculati	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other	>
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2: Photo #1:	EC 558 SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown Turbulent Written description Name: NA Name: NA Name: Space	E DESCRIPTION (c spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar D: Flow a + So Photos Coordinates:	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood en Blue Recirculati Surce The Sl Pacific St Facing: S	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Sage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other Units: NA Units: V	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2: Photo #1: Photo #2:	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown Turbulent Written description Name: NA Name: NA Name: Soce Description: Soce	E DESCRIPTION (c spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar D: Flow a + So Photos Coordinates: Coordinates:	ec I mM ircle all that appl Wading Other (specif Edd Cobble Falling Flood en Blue Recirculati and GPS NA Facing: S Facing: S	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag 13/24 L	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other Units: V Units: V	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2: Photo #1: Photo #3:	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown Turbulent Written description Name: NA Name: NA Name: Soce Description: Soce Description: Below	E DESCRIPTION (c) Spring atural feature Riffle n: Concrete W / high Snowmelt Clear Gre Laminar D: Flow a + Se Photos Coordinates: Coordinates: Coordinates: Source	ec I mM ircle all that appl Wading Other (specif Edd Cobble Falling Flood en Blue Recirculati Cobble A Facing: S Facing: S Facing: N	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag 13/24 Cool Time: 1003 Time: 1003 Time: 1003	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other Units: V Taken by: S.Muyer Taken by: Taken by:	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2: Photo #1: Photo #2: Photo #3: Dther notes: J,N	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown Turbulent Written description Name: NA Name: NA Name: NA Name: NA Description: Sauce Description: Sauce Description: Balaw	E DESCRIPTION (c) Spring atural feature Riffle n: Concrete w / high Snowmelt Clear Gre Laminar Coordinates: Coordinates: Coordinates: Coordinates: Coordinates:	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood en Blue Recirculati Surce I M 31 Surce	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag 13)24 POOL Time: \003 Time: \003 Time: \003	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other Units: V Taken by: S.Muyer Taken by: Taken by:	
Sample location: Description of Sampling Site: Substrate: Stage Conditions: Hydraulic Event: Stream Color: Description of flow: GPS point #1: GPS point #2: Photo #1: Photo #3:	EC 55E SIT Bank Midstream na Pool Written description Bedrock Stable normal Do Routine Brown Turbulent Written description Name: NA Name: NA Name: NA Name: NA Description: Sauce Description: Sauce Description: Balaw	E DESCRIPTION (c) Spring atural feature Riffle n: Concrete W / high Snowmelt Clear Gre Laminar D: Flow a + Se Photos Coordinates: Coordinates: Coordinates: Source	ec I m.M. ircle all that appl Wading Other (specific Edd Cobble Falling Flood en Blue Recirculati Surce I M 31 Surce	Note: To convert y) Baseflo Station (fy): y Di Gravel Rising Drought Gray ng Stag 13)24 POOL Time: \003 Time: \003 Time: \003	cfs to gpm, multiply cfs by 448.83 w (persistent flow) Gage: at / above / below ffuse Other Sand Mud Other (specify): Other (specify): Other (specify): nant Other Units: V Taken by: S.Muyer Taken by:	

SW 03/10/2						77
Spring and S	urface Water Sampli	ng	Document No.: Revision: Effective Date:	0 4/15/201		
Reference			Page:	15 of 18		
		ATTACH Page	<u>IMENT 1</u> 1 of 1			
			ampling Field Da			
Site name: Mavtu		Date: 03 10		ite time: 07		
Objective: Sample	documentation		Weather: Sun	ny; High	of 48°P	
Sampling crew: A	Vigil, M. Stastni	1. B. Morge	'n			
Two-minute safety d Meters calibrated at	Irill: Steep Stopes, (location) SMO	Slippery Su by (w	hom) M. Stas	ny	at (time)	07:00
Multimeter number:			erial number: n			
Sample Retrieval	Date: 03/10/202	1	Time: 0856 0	113 Method	1: Geo Pu	mp
Sample Event ID:			CAWA -21-211			
			AMETERS	,	,	
pH (su): ७, १५		Sp. Cond. (µS/o	cm): 4334	Turbi	dity (NTU): 3	.76
Temperature (°C):	7 24	DO (mg/L): 🤉	. 14		m): 0.24	
Explanation of Q met	thod, including calculation	ons:		0.12gd x	60520 = 0.2 1 min = 0.2	4 gpm
0.12 gil 2n	1. 0.11 al 3rd. 0.1 30 sec 3rd. 30	2 gal 0.11+0.	3 DIL GIL	Note: To convert cl	s to gpm, multiply	
aken wy graduate	1	-				
,	SITE		cle all that apply)	Deseller	(
Media type:	Develo	Spring	Wadiag		r (persistent flo	
Sample location:	Bank	ural facture	Wading		age: at / above	
De station of	Midstream nat		(Other (specify):	Weir (V- Diff		Other
Description of Sampling Site:	Pool	Riffle	Eddy		use	Other
	Written description:		0		(Sand)	(Adud)
Substrate:	Bedrock	Concrete	Cobble	Gravel	(Sand)	Mud
Stage Conditions:	Stable: (normal)/ low		Falling	Rising	Other (specify	
Hydraulic Event:	Routine	Snowmelt	Flood	Drought	Other (specify	
Stream Color:	Brown	(Clear) Gree		Gray	Other (specify	
Description of	Turbulent	Laminar	Recirculating	Stagn	ant	Other
flow:	Written description	.1				
CDC	1 -		and GPS		Linite: 1	
	ame: n/a	Coordinates:	na		Units: n/a	
·	ame: 🌡	Coordinates:	V Facial control of	Times - Arts	Units:	
	escription Source			Time: 6943	Taken by B	Morgan
	escription: abuve s		Facing: 🦿	Time: 0943	Taken by:	
	escription below		ی Facing:	Time: 0943	Taken by:	v
Other notes: A. Vig	il performs HE :	spot test; new	gative ; Vigil	preserves	M. Stast	ny QAs
Offsite time: (D 1	5 Relinquish sa	mples at SMO, ca	re of L. Tov	ver	_at (time))	
Objectives met? Ye	-S					BM Oslie
						GM
					/	

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

De	ename: FRB-16 ojective: Sample Re mpling crew: J. M ro-minute safety drill eters calibrated at (In ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6	4 di 439 r Applicable dou eyer, J. Anderson : Uneven sofface beation) 50 SN 50 Date: 1146 03/1 28 Sample 4 d, including calculations: <u>750ml</u> 3 30 Scc 3 SITE DES	ace Water S Date: $03 15 $ 15 15 15 15 15 15 15 15 by (1 Turbidimeter 15 2021 e ID Number FIELD PA Sp. Cond. (μ S DO (mg/L): $150 n^{1} \times 11$ 30 sic 1000000000000000000000000000000000000	2021 Weather: whom) <u>3</u> A serial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. & 99	ndeson r: 16610 10 Ma 1-218388, -2 20 20 1 X COSEE 1 X COSE) 5)5 at (time)81.0
De	pjective: Sample Piece mpling crew: J. M vo-minute safety dril eters calibrated at (li ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q method $\frac{750 \text{ m}}{30 \text{ scc}}$	4 d, including calculations:	Date: $03 15 $ yre 1/14+jun yre 1/14+jun yre 1/24+jun yre 1/24-jun yre 1/24-jund $yre 1/24-jundyre 1/24-jund yre 1/24-jundyre 1/24-jund$	2021 Weather: whom) $3 \cdot A$ rserial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. 8-99 274. 8-99 274.	Onsite time: Sunny 40 16600 16000 1-218388, -2 2000 $1 \times \frac{100522}{1000}$ $1 \times \frac{100522}{1000}$	1115)s at (time) <u>0310</u> 3287 ethod: PP U8389, -218390 Turbidity (NTU): 9.49 Q (gpm): 0.40
De	pjective: Sample Piece mpling crew: J. M vo-minute safety dril eters calibrated at (li ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q method $\frac{750 \text{ m}}{30 \text{ scc}}$	4 d, including calculations:	Date: $03 15 $ yre 1/14+jun yre 1/14+jun yre 1/24+jun yre 1/24-jun yre 1/24-jund $yre 1/24-jundyre 1/24-jund yre 1/24-jundyre 1/24-jund$	2021 Weather: whom) $3 \cdot A$ rserial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. 8-99 274. 8-99 274.	Onsite time: Sunny 40 16600 16000 1-218388, -2 2000 $1 \times \frac{100522}{1000}$ $1 \times \frac{100522}{1000}$	1115)s at (time) <u>0310</u> 3287 ethod: PP U8389, -218390 Turbidity (NTU): 9.49 Q (gpm): 0.40
De	pjective: Sample Piece mpling crew: J. M vo-minute safety dril eters calibrated at (li ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q method $\frac{750 \text{ m}}{30 \text{ scc}}$	4 d, including calculations:	Date: $03 15 $ yre 1/14+jun yre 1/14+jun yre 1/24+jun yre 1/24-jun yre 1/24-jund $yre 1/24-jundyre 1/24-jund yre 1/24-jundyre 1/24-jundyre 1/24-jund yre 1/24-jundyre 1/24-jund$	2021 Weather: whom) $3 \cdot A$ rserial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. 8-99 274. 8-99 274.	Onsite time: Sunny 40 16600 16000 1-218388, -2 2000 $1 \times \frac{100522}{1000}$ $1 \times \frac{100522}{1000}$	1115)s at (time) <u>0310</u> 3287 ethod: PP U8389, -218390 Turbidity (NTU): 9.49 Q (gpm): 0.40
De	pjective: Sample Piece mpling crew: J. M vo-minute safety dril eters calibrated at (li ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q method $\frac{750 \text{ m}}{30 \text{ scc}}$	r Applicable docu eyer, J. Anderson : Uneven sorface bate: 1146 03/1 28 Sample 4 d, including calculations: <u>150m</u> 30 Sta SITE DES	une ηtation , D. Jong S, ICe MD by (Turbidimeter NG)2021 e ID Number FIELD PA Sp. Cond. (μS DO (mg/L): : : : : : : : : : : : : :	Weather: mMO whom) <u>J. A.</u> rserial number Time: 114 s: C AWA-21 ARAMETERS /cm): 274. 8.99 L <u>J. 1141</u> 200 ML 3.789	Sunny 40 ndeson 15: 16010 16 Ma 1-218388, -2 20 120 120 120 120 120 120 120	at (time) <u>0810</u> 3287 ethod: PP U8389, -218390 Turbidity (NTU): 9.49 Q (gpm): 0.40
Sar Tw Me Sar Sar Sar PH Ter Exp () Me Sar Sar De	mpling crew: $\int M$ ro-minute safety dril eters calibrated at (li ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q metho $\frac{150 \text{ m}^{1}}{30 \text{ scc}}$	eyer, J. Anderson : Uneven surface (action) SOSM 50 Date: 146 03/1 28 Sample 4 d, including calculations: <u>750ml</u> 3 SITE DES SITE DES	$\frac{D}{100} = \frac{D}{100} = \frac{D}$	whom) <u>J. A.</u> rserial number Time: 114 s: C AWA - 21 ARAMETERS /cm): 27 4. 8.99 L <u>x 1941</u> 200 ML <u>3.78</u>	ndeson r: 16610 10 Ma 1-218388, -2 20 20 1 X COSEE 1 X COSE	at (time) <u>0810</u> 3287 ethod: PP 218389, -218390 Turbidity (NTU): 9.49 Q (gpm): 0.40
Tw Me Sau Sau PH Ter Exp () Me Sau De	ro-minute safety dril eters calibrated at (1 ultimeter number: mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q metho) $\frac{750 \text{ m}^{1}}{30 \text{ scc}}$ (2) edia type:	Uneven surface ication) 50 SN 50 Date: 1146 03/1 28 Sample 4 d, including calculations: <u>150m</u> ¹ <u>305cc</u> <u>3</u> SITE DES S	S, ILe by ($Turbidimeter$ 1612021 e ID Number FIELD PA Sp. Cond. (μ S DO (mg/L): 150×1 30 scl 10 SCRIPTION (c	whom) <u>3</u> A serial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. 8_99 L <u>1141</u> 200 ML 3.789	$\frac{16600}{100}$ $\frac{100}{100}$ $\frac{100}{1-218388}, -2$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{100}{100}$ $\frac{100}{100}$ $\frac{100}{100}$ $\frac{100}{100}$	3287 e thod: PP L18389, -218390 Turbidity (NTU): <i>9.49</i> Q (gpm): 0.40
Mu San PH Ter Exp Û Me San De	ultimeter number: mple Retrieval mple Event ID: 135 1(su): 6.33 mperature (°C): 6 planation of Q method $\frac{750 \text{ m}}{30 \text{ scc}}$	$\frac{50 \text{ SM}}{50}$ $\frac{50 \text{ SM}}{50}$ $\frac{50 \text{ SM}}{28}$ $\frac{146 \text{ Sample}}{28}$ $\frac{4}{305cc}$ $\frac{150 \text{ M}}{305cc}$ $\frac{51\text{ EDEs}}{5}$	$\frac{1}{2} \frac{1}{2} \frac{1}$	r serial number Time: 114 s: C AwA - 21 ARAMETERS /cm): 274. 8-99 L <u>1141</u> 200m 3.789	$\frac{16600}{100}$ $\frac{100}{100}$ $\frac{100}{1-218388}, -2$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{200}{100}$ $\frac{100}{100}$ $\frac{100}{100}$ $\frac{100}{100}$ $\frac{100}{100}$	3287 e thod: PP L18389, -218390 Turbidity (NTU): <i>9.49</i> Q (gpm): 0.40
San San PH Ter Exp () Me San De	mple Retrieval mple Event ID: 135 (su): 6.33 mperature (°C): 6 planation of Q metho) <u>750 m</u> 1 30 scc 6)	Date: $1146 031$ 28 Sample 4 d, including calculations: $\frac{150m^{1}}{305cc}$ 3 $\frac{1}{3}$ SITE DES	Sp. Cond. (µS Sp. Cond. (µS DO (mg/L):	Time: (14 s: C AwA-2(ARAMETERS /cm): 274. 8-99 L x 194) DOUML 3.789	100 Ma 1-218388, -2 20 1 20 1 20 1 1 20 1	e thod: PP L18389, -218390 Turbidity (NTU): <i>9.49</i> Q (gpm): 0.40
Sar PH Ter Exp () Me Sar De	mple Event ID: 135 (su): $(3,3,3)$ mperature (°C): $(3,3,3)$ planation of Q method) $\frac{750 \text{ m}^{1}}{30 \text{ scc}}$ (2) edia type:	28 Sample 4 d, including calculations: <u>750 m</u> 30 Str. 3 <u>17</u> SITE DES	e ID Number FIELD PA Sp. Cond. (μS DO (mg/L): 50 Λ 1 Λ 1 30 scc 10 SCRIPTION (c	s: C AWA-21 ARAMETERS /cm): 274. 8-99 L <u>4 1141</u> 200m 3.789	10 Ma 1-218388, -2 20 1 20 1 1 1 1 1 1 1 1 1 1 1 1 1	e thod: PP L18389, -218390 Turbidity (NTU): <i>9.49</i> Q (gpm): 0.40
pH Ter Exp ① Me San De	$\begin{array}{rcl} (su): & 6.33 \\ \text{mperature (°C): } & 6 \\ \text{planation of Q method} \\ \frac{750 \text{ m}}{30 \text{ scc}} & 6 \\ \end{array}$	4 d, including calculations: <u>750 ml</u> 30 Sec SITE DES	FIELD PA Sp. Cond. (μS DO (mg/L): 50 Δ ¹ Δ <u>1</u> 30 scc 10 SCRIPTION (C	ARAMETERS /cm): 274. 8.99 L x <u>194</u> 1 200m x 3.78	200 (() X () X () X () Note: To con	Turbidity (NTU): <i>今. 49</i> Q (gpm): <i>0. 4</i> 0
Ter Exp Me Sau De	mperature (°C): 6 planation of Q metho) <u>750 m 1</u> 30 sc c édia type:	4 d, including calculations: <u>750 ml</u> 30 Str. 3 <u>31</u> SITE DES	Sp. Cond. (μS DO (mg/L): 150 <u>κ</u> 1 <u>λ</u> 30 scc 1(SCRIPTION (C	/cm): 274. 8.99 L x <u>19</u> 41 200mL 3.785	L LAIN SL Note: To con	Q (gpm): 0.40
Ter Exp Me Sau De	mperature (°C): 6 planation of Q metho) <u>750 m 1</u> 30 sc c édia type:	4 d, including calculations: <u>750 ml</u> 30 Str. 3 <u>31</u> SITE DES	DO (mg/L): 150 m ¹ x <u>1</u> 30 scc 10 SCRIPTION (c	8.99 <u>1941</u> 00ml 3.785	L LAIN SL Note: To con	Q (gpm): 0.40
Exp Me Sau De	planation of Q metho) <u>750 m</u> l 30 sc L Edia type:	d, including calculations: <u>150m</u> <u>305c</u> SITE DES	30 scc 10	L × 1941 000 mL 3.785	X Inin SL Note: To con	
() Me Sau De) <u>750 m</u> 1 (2) 30 sc.c. (2) edia type:	<u>750m</u> (305cl (3) <u>1</u> SITE DES	30 SCC 10			vert cfs to gpm, multiply cfs by 448.83
Sau De	1000 C C C C C C C C C C C C C C C C C C	SITE DES	SCRIPTION (C			
Sau De	1000 C C C C C C C C C C C C C C C C C C	<u>s</u>		ircle all that a	pply)	
Sau De	1000 C C C C C C C C C C C C C C C C C C	the second se	pring		Der	
De	inple location.	CBallk		Wading		eflow (persistent flow)
		Midstream natura	l foaturo	Other (sp		on Gage: at / above / below
	scription of	Pool	Riffle		Eddy	Diffuse Other
	mpling Site:	(-/				
Su	bstrate:	Written description: G Bedrock Co	oncrete	Cobble	Grave	(Sand) (Mud)
and the second second	age Conditions:	Stable normal/ low / h		Falling	Rising	Other (specify):
	draulic Event:	Routine	Snowmelt	Flood	Drought	Other (specify):
1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	ream Color:			een Blu	the second	Other (specify):
	escription of	Turbulent	(Laminar)	Recircu		Stagnant Other
	w:		Seep 100	and the second		
				s and GPS		
GP	S point #1: Nar	ie: NA	Coordinates:			Units: NA
GP	PS point #2: Nar	1	Coordinates:			Units:
Ph	oto #1: Des	ription: Same		Facing: S	Time: 14	y Taken by: J. Meyer
Ph	loto #2: Des	ription: Sa UPSt	ream	Facing: S		Taken by:
Ph	oto #3: Des	ription: dawnstream	the second secon	Facing: 🔊) · Time: 🗸	Taken by:
Ot	her notes: D. Joram	lo conducts HESP	or tes ; h	reactive :) Anderson	Preserves; D Dorantilo QAS
Of	fsite time: 1247	Relinquish samp	oles at SMO, o	care of Kut	Popova	at (time) 1410
Ob	ojectives met?	e5				
						/

3/13/2021 CdV-16-02656	
MST 0700 B. Morgan Conducts H + S Tailgate @ SMO;	
0730 M. Stastny calibrates YSI#60; see logbook TPMC-LA-16-043 for	details
0933 Crew (B Morgan, A. Vigil, M. Stastny) on site @ CdV-16-02656 w escort F. Munoz	/
2-min safety: wind creating changing conditions, hiking uneven weather: partly cloudy; 30s	i terrain
Objective: purga + sample Cav-16-02656 per all applicable SOPS +	
vef. documents found on p. 3 of this logbook	
0937 DIW= 7.74'Broc AVG DTW = 7.67'Broc	
0940 DTW = 7.67' Broc MTD = 11.05' Broc	
- 0943 DTW = 7.59' Broc	
WC = (TD - DTW) = 3.38'	
$2^{"}$ ID 1CV = (0.163 gal/H)(WC) = 0.55 gal	
3 CV = 1.65 gal	
0955 Pump on, water to surface @ 0.05, m(man meas ufgraduated a	(4)
0956 Flow through cell full, Begin logging parameters on YSI #60	~~ f)
(file name: Cdv 16 02656, data 10= My2021 @2), GW Sampling Log. # 1 (B. Morgan)	+ i Pdd
1009 Pause pump; prepare to sample	
1012 Pump on; Begin Sampling (>1 CV purged + parameters stable)
1045 Pause pump to allow for recharge	1
1048 Pumpon; Resume Sampling	
1050 Pause pump to abov for recharge	
1058 Pumpon: Resume sampling	
1059 Pump off; (prioritized) sampling complete	
note: K. Reid performs HE spot Test; negative	
note: K. Reid preserves samples; J. Meyer QAs	
- Summary Objective met to purge + sample Cdv-16-02656 per all applicable	
Sops + ref. documents found on p. 3 of this logbook. See p. 54-56	2
for Gw Sampling Log, compliance checklist + GW Level Field Forn	h
1120 Crew offsite	и
1300 Relingnish samples to SMO (10 K. Popova	
Event 10: 13528	
Sample IDS - CAWA-21-218595; -218596, -218597, -220514	
SM U2/13/21	

Appendix E Field Documentation Water/CdV Watershed MY2021 O2 and other Field Activities from March 9-April 5, 2021

	4	03/12	p.		cdv-	16-	02656				
		Ba			Gro	undwat	ter Samp	ling Lo	g		
	IFWGMP I		- 1	LSD:	. 6	ft. mei 🛛 ۱	Vell Diameter:	2		in.	Date: 03 13 2021
2	Watambar	a: , , ,	2	7443 Water Level:	ft	mei 1	Top of Screen: ft. msl				Notes:
/	Weil:	ater Icdi		TD.	IA	RTH I					I begins in screened interval
	CdV-16-02656 Sampling Device:						Vater Column:		Broc	310/11 ft.	
	Measuring	PP Point: , BTO		Drop Pipe: N		gal. /	CV:	3.3		gai.	Packer Pressure N A
	Completio	n Depth:		Pipi: N	<u>Ą</u>		CV:	1.65		- gal.	Before: psi
		TÇ				Note:	MP height (sti		OTTO for	2.30 M	Actuation: pst
	(* fj. STOC	C/ BTIC / BGS/ I			200000000000000000000000000000000000000				L.	0.10	Opening: pei .
			Di	DTW = (LSD - Wa rop pipe = (TD/Pun = (Water Column x	ter Level) V np Intake x Dr : Well Diamet	Vater Colur op Pipe Dis er Multilier)	nn (TD - DTW) ameter Multipli 3 CV = (1 C	er) V x 3)			After: y pel
			T*	SPEC COND	DO	Turb			Water	1	
	MST/DST	pH SU	TEMP	µ#/cm	sng/l	NTU	HACH	ORP	Level*	Discharge Rate	NOTES
	Stability:	s 0.2 STU variance	••	± 3% (>100) ± 6% (≤ 100)	≤ 0.3 mg/i variance	<10 or ± 10%	Yes or No		Broc	(GPM)	
	- are			uter to s		. Q 1	2=0.05		mann	ted Cur	
	0155	7.86	5.3	312.2	5.46	16.04	N	3100	7.96	0.05	clear, no oclor
	0956		5,0	312.0	4.64	7.84		90.4	8.14	0 05	checked Q; same vate
	0957	7.05	4,9	312.0	4.75	7.18			8.25	0.05	clear, no odor
	1002	6.83		316.7	4.70	5.59		122.4		0.07	checked W; Q=0.07
	1005	6.72	4.8		4.46	4.99		(0.07	clear, no odor
P M	1008 10:09 10:09	6.67	_	320.6				1.2 1. 1		V	
וגרבורב	1.7/	Fause		1		amp	L				3
	10:12			egin Sav							>
_	10:45		pum		W YEC	narg	¢	-			0.87
	10:48	Pump			ampli	py al					
		Pause	pump	5		recha	ryc				
	10:58	-	en j	Resume					2		
	10-59	Pump	offi	Prioritiza	20)10	impl	ng co	nje	ę.	-	
2						-	-	-			
			BM 03	3 2021					• •	1	
	-		BUL								
		H column = HA	CH Turbid	imeter# N	Pi Us	ed because	NA				
ſ	Contact Wat			gei. Drum#:	Sec.	icipal	Nr				Final Water Level: 10.88 BTOC ft.
,	*Purge Wate	and the second	B arsh	^b 'gal. Drum#:			4. 225	'n.			*Purge: Formation water purged prior to sampling (excluding drop
	Total Waste		13-3.2		Pendin	g con	solidati	оп			pipe water and sampling water)
	3					,					

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

				0			5
			Cdv.	-16-02656			
	/ -			pliance Checklist	t		
84 B3/13/2	/						
ENT N	/ell Name:	CdV-16-0.	2656	24 - 240		-	
D	ate:	12/01/20				_	
	Discharge	Coloulated	Dura Dia	Purge Water	CV's Purged		Comments
	Calculation Method	Calculated Volumes (gal)	Drop Pipe Volume (gal)	Volume Purged (gal)	Before Sampling	Minimum Purge Met?	
	Flow Meter	Drop Pipe: N A				10	none
	Manual	3 CVs:	NR	0.78	1.42	(Y) N	None
		Stable for three consecutive readings?					
(Parameters collected at proper intervals? (HH:MM)	pH ≤ 0.2 STU Variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3 % (>100) ± 5 % (≤ 100)	Turbidity < 10 NTU or ± 10%	Comment:	× 2
	0:02	6.83	4.75	312.0	7.68		
	10:05	6.72	4.70	316.7	5.59		
	0:08	6.67	4.46	320.6	4.99		
		Highest:	Highest:	Median:	Median:	none	2
		6.83	4.75	214.7	5.59		
		Lowest:	Lowest:	Median + <u>3</u> %	Median + <u>NA</u> %		
La	lculations:	6.67	4.46	326.20	<10		
		Difference:	Difference:	Median - <u>3</u> %	Median - <u>NA</u> %		
		0.19	0.29	306.70	<10		
(ŶN	(Y) N	(Y) N	(Y) N	(Y) N		
Rec	SOP quirements Met?	Comments:			X)		
(ŶN	V	lone				
						13/21	
						en 03/13/21	
							2

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

56		e:		
	/	16-02656		
1/3/2	+	Groundwater Level Field Fo	om	
12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PART 1: Well Site Information Well Name :	Date. T me onsite /MST!	Activity	
	CdV-16-02656	63/13/21 0933	Manual I for Samplin Cable Length (1): Cable SN:	ng -
/	B. Morgan, A. Vigil,	M. startny	NA NA	_
<u>.</u>	NA NA	○ NA	Memory % remaining Battery % remain	
	Connect Time: NA	Transcuper SN N A	Log Note Memory % Log Note Battery	
<u>(</u>	Water Level (h)	F (psi) NA NA	Stop Test, Ves + No Change Descan Yes + No - N/	
	Last Start Date	Data File Name: N A		
	PART 2: Manual Measurements Measuring Point TOO (top outer casing:	TiC (inner) Stick-up Measure	d on Ste Previous MP Used	
	Time (MST) 0937	Water Level Meter Senal No 782342	Notes:	_
	7 13 U DTW (#1044): 1.74	Measurements in feet	V ROGINS IM	
	TIME (MST) 0940	LSD# 7443 18 MS1	I Begins in Screened	-
	-200 BTOC 3/13/2 CTW (1604) 7.47	MP Height R. 2 30	interval	
Py	Time (MST) 0943	MP Elevation = 7445.48		
·	2101 DTW ADAMP; 7.59	DTW: - 7.17		-
	Time (MST: 0944	Grouncwater Exevation (GWE) Reference Level 7437. 81 mst		
	PART 3: Replacement Transducer	Reference Level 19 51.01 MSI	Zip Tie on Ketim's Grip: NA	_
	Transducer 3N NA	Cal stat on Date NA	New LT PSI Rating Manufacture Dat NA NA	e:
	Memory % remaining:	Battery % remain.ng		
	Transducer Performance and Programming PART 4: Transducer Error/Drift Acceptance	PART 5: Programming & Final Readings		_
	WL (transducer read rag) (ft);	Progamming Time:	Time (MST) Reading	
	GWE from MM;	New Test Narre:		
	Difference -n value:	Reference Level :		
	Error tolerance of transducer	Current Depth		
	Notes:	Meas interva		
	UNESON ENTY TOWING	Start Time:	•	
	15 POHO 031 X POHE 07 9 JOE POHE 23 1 50			_
			2A. Elate and in:	cal
	- /			
				-/
			/	/
				_



N3B-Form-6156

Groundwater Level Field Form

		Groundv	vater Level Field Fo	orm			
PART 1: Well Site In	formation						
Well Name :		Date:	17	1.			
COV-16 -	-02657c	03/13/2021	Time onsite (MST). 0919	Activity bu sampling			
Personnel	-20016	1 objection		Du san	reling		
J.May	er, J. Anders	En, K. Reid Full Transducer.	D. Jargmillo	Cable Length(ft):	Cable SN:		
Telemetry: Yes I	No	Pull Transducer.	Yes: No	Memory % remaining	Battery % remaining		
Connect Time:		Transoucer SN	Am 3/13/221	Log Note Memory	Log Note Battery %:		
Water Level (ft):		F (psi)	(C):	Stop Test: Yes 1 No	Change Desicant Yes No NA		
Last Stan Date		Data File Name:			154 - 10 - 105		
		and a second second second					
PART 2: Manual Me	OCULTOR AND IN						
		<u></u>					
Measuring Point: TO	I top outer casing: (TIC (inner) Water Level Meter Se	Stick-up Measure		revious MP Used		
-	0920			Notes:			
Time (MST)	0120	7819	68				
DTW (ft bMP);	7.22'BAC	Measure	ements in feet	Dry			
Time (MST)	/	LSD ft.	7430.22 msi				
DTW (A BMP);		MP Height ft.	- 3,64	1			
Time (MST)	3/13/2021		= 7433.86'ms1				
DTW (A BAP)			. 7.22 BTIC				
The (MST)		Groundwater Elevation (GWE)	7426.64				
TD (AL BAMP):		Reference Level		Zip Tie on Kelitn's Grip:	ALLA		
PART 3: Replaceme	nt Transducer				10175		
Transduper SN		Caloraton Date		New LT PSI Rating	Manufacture Date:		
Viemory % remaining:		Barraty % remaining:					
Fransducer Performan	ce and Programming	2					
PART 4: Transdecer E	rror Drift Acceptance	PART 5: Programmin	a & Final Readings				
WL (transducer			a w man meanings				
reading) (ft);	13/13/201	Progamming Time:		Time (MST:	Reading		
GWE from Mil.		New Test Name:			10		
Difference in value:		Reference Level :	311312021				
Effor tolerance of transducer		Current Depth:					
Notes:		Meas. Intervat					
Whith Error Tolerance	/	Start Date:					
Cuttor Error Tolerance		Start Time:					
	87 1 100 PSI-0 23 1 50	N FSF1.16 F.	Synch Clocks Yes 1 No				

N3B-Form-6156, Rev. 0 Effective Date: 6/20/19 Implementing Procedures: N3B-SOP-ER-3001; N3B-SOP-ER-6001 2A' Date and Inizal

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

	60	
	03 15 2021	COLV-16-02459
	A 010	B. Morgan conducts H+S Tailgate @ SMO
	0700	M. Stastny calibrates YSI# 60 @ SMO, see logbook TPMC-LA-14-04:
		for details
r	1144	crew (B. Morgan, A. Vigil, M. Stastny) onsite @ cdv-12-02159 w/
2		escort M. Livesay and K. Reid
	nute	Dalayed start due to burning activities @ Burning Grounds
1		JEV TA-16 ACO
-		2-min safety: changed conditions due to winds overnight; ICE!
		weather: sunny 40-50s
<u>9</u>		Objective: Purge + Sample Cdv-10-02659 per all applicable SOPS +
<u></u>		ref. documents found on p-2 of this logbook
		DTW = 8.50' Broc Water level meter SN: 782342
34	1149	DTW = 8.50' BTOC MTD = 10.89' BTOL
		$W\varepsilon = TD - DTW = 2.39'$
~	4"10	1 cv = (0.653 9"/H) WC= 1.56 gal
<u></u>		3 CV = 4 V8 gul
<u>-</u>	1154	Pumpon; waser to surface @ Q=0 of (man mass uf graduated cup)
	1157	Flow through cen full; Begin logging parameters on YSI # 60 (he name
<u></u>		(dv 10 02659 MY2021 Q2); GW sampling Log + iPad # 1 (B. Movgan)
<u></u>	1222	
<u></u>	1223	Pump on; Begin Sampling > ICV purged + parameters stable
<u></u>		Sampling complete; Pump oft
8	Summary	Objective met to purge + Sample CdV-16-02659 per all applicable
34	J	Sors + ref documents. See p. 61-63 for GW Sampling Log, compliance
		checklist + GW Level Field Form
	inote	. K. Reid performs HE spot Test; negative
	note	: K. Reid preserves Samples; B. Morgan OAs
4	1325	Cvew offsite
÷	1555	Relinguish Samples to SMO clo K. Popova
		Event 1D: 13528
		Sample 105: CAWA-21-218601; -218602; -218615; -218603;
4		-218614
		310 07 15 21
1		
15		

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	/			Gr	oundwa	ter Sam	pling I	Jog			
IFWGR	1PMY: Q 2021	2	LSD: 730	0.50	ft. msi	Well Diamete	ar: 	0	in.	Date:	12021
Waters		JV	Water Level:	IA I	ft. msi	Top of Scree	in;		ain ft. onsi	Notes:	
Well:	-16-026		то: = mTD= 1		togs Bioc	Bottom of Screen: 9.94 Stoc				I h	ed interv
Samplin	a Device:	P	DTW: 8.50)	11. Dats 11. Dats 3. To C	Water Colum	m: 2.		ft.	Screen	ed interva
Measuri	ng Point:	TOC	Drop Pipe: N		gal.	1CV:	1.56		gal.	Packer Press	NA
Comple	tion Depth: MT					3CV:	4.68		- gal.	Before:	psi
(* ft. 87	DC/ BTIC / BGS				Note	: MP height (a		OC/TIC for Alluviate	3.24 tt.	Actuation:	psi
-			DTW = (LSD - W	ater Level)	Water Colu	mn (TD - DTW	1)			Opening:	psi
-		1CV	DTW = (LSD - W rop pipe = (TD/Pu = (Water Column	mp intake x C x Well Diame	ter Multilier)	ameter Multip 3 CV = (1	dier) CV x 3)			After: .	v psi
MST/ DST) pH SU	TEMP	SPEC COND µe/om	DO mg/i	Turb NTU	НАСН	ORP	Water Level*	Discharge		
Stability	≤ 0.2 STU variance	°C	± 3% (>100) ± 8% (≤ 100)	≤ 0.3 mg/i variance	<10 or ± 10%	Yes or No	mV	HL BTOC	Rate (GPM)		NOTES
1156	Pump	in; u	later to	SLIV Fac	200	= 0.07	gpm				
1157	1.70	4.3	200.2	8.52	3.03	N	202.8	8.58	0.07	clear, n checked	10 odor
1200	6.85	5.6	2564	8.50	3.08		2193	8.58	0.07	dischur	ge rute
1203	6.70	5.5	256.6	2.47	3.17		221.9	8.58	0.07	clear,	needur
1206	6.03	5.5	256.4	8.45	3.27		222.7	8,58	0.07	0	
1209	6.64	5.6	256.6	8.43	3.84	_	222.1	8.58	0.08	rate inc.	to 0,08 ypm
1212	6.63	5.6	256.5	8.42	4.67		223.1	8.58	0.08	clear,	no oder .
1215	5 نا. نا	5.5	256.6	8.42	4.82	_	223.1	8.58	0.08		*
1218	6.05		154.5	8.42	4.95	_	223.4	8.58	0-08		
1221	6.66		256.7	8.41	6.03		223 2	8.58	0.08	. 1	,
1222		Pump	Prepar			2					•
1223	Pumpe	wj Be	gin San	npling	,						
1315	Pump of	it; Sa	weling	Cump	Ict ?		3				
			eter# NA								
Yes in HACH	eiumn = HAC	1.1.1	Drum#		because	VA			- 1	Final Water	050
*Purge Water:	1.0 1	1.81 1.5	B Drum#:	Munic		1: 210	· · ·			*Purge: Form	8.58 Broch
Total Waste W	1201	35 1	gal.]	Paulin	Carbo	ci idat		-		prior to samp	ling (excluding drop nd sampling water)

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 202

- BM 93/15/21	/	Com	pliance Checklist	5. 		
61						
Well Name:	CdV-16	- 02659	- San		a. ∼	
Date:	03/15/20	21			e	
Discharge Calculation Method	Calculated Volumes (gal)	Drop Pipe Volume (gal)	Purge Water Volume Purged (gal)	CV's Purged Before Sampling	Minimum Purge Met?	Comm
Flow Meter	Drop Pipe: N A	NA	1.88 1.87 3/1	1.21	$(\mathbf{y})_{\mathbf{N}}$	n
Manual	3 CVs: 4, 68	NA	1.31	1.10	0.	
		T	Benjutri	Pomopht21	1	
	Stable for three consecutive readings?			5		
Parameters collected at		Dissolved	Specific		Comment:	
proper intervals?	pH ≤ 0.2 STU Variance	Oxygen ≤ 0.3 mg/l variance	Conductivity ± 3 % (>100) ± 5 % (≤ 100)	Turbidity < 10 NTU or ± 10%		
(HH:MM) 	6.45	8.42	256.6	4.82		
12:18	6.65	8.42	256.5	4.95		
2:21	6.66	8-41	256.7	6.03	noue	2
	Highest:	Highest:	Median:	Median:	1	
	444	8.42	31512 256.6	4.95		
_	Lowest:	Lowest:	Median + <u>3</u> %	Median + <u>NA</u> %	1	
Calculations:	4.45	8.41	264.30	< 10		
	Difference:.	Difference:	Median - <u>3</u> %	Median - <u>NA</u> %	1	
	0.01	0 - 01	248.90	<10		
Y N	(Y) N	(Y) N	(Y) N			
SOP	Comments:					
Requirements Met?	-	none				
(Y) N			5			
					Pitter	512

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2/5/21		Groundv	vater Level Field I	Form		
PART 1: Well Site Int	omation					
We Name :		Date.	T me onsite (MGT)	Activity		
Personnel	02659	03/15/21		Manual I		ient
	A. Vigil, M.	Stestny, K.	reid	Cable Length ft)	Cable SN NA	
Telemetry: Ves : [h	NA	Full Transcuper	Yes (No)	NA Memory % remaining	Battery 12 rema	ia = ng
Connect Time:		Transcuper SN		Log Note Memory %	Log Note Satte	erv %
Water Level (ft)			NA			
traier Lever (h,		F (psi)	TICE NA	Stop Testy Mes + No	Crange Des ca Yes 1 No 1 1	NA
Last Stan Date	V	Data File Name:				
PART 2: Manual Me	surements		NA			
Measuring Post fo	Wenn a bas analism	TiC (inner)	Stickp Measu	irec or Ste	Previous MP Used	R
Tone (MST)	1449-1146	Water Level Mater Se 7823		Notes:		
BIN STOL KTOC	0 50			-		
PT DTW (toMP)	2.50	Measure	ments in feet	I Beg	ins in	1
Time (MST)	1149	LSD ft	7300.50	Screen	ins in ed interva	al
BIOC BIOC	8.50	MP Height ñ.	. 3.24			-
Time (M3T)		MP Erevation	= 1303.74			7
DTW (A BMP)		DTM	TH 8.50			-
	11110	Grouncwater	- 12 0.30			
Time (MST)	1149	Elevation (GWE) Reference Level	7295.24			
PART 3: Replacement	10.89	.verence Lever		Zip Tie on Kelom's Grip	NA	
Transducer SN	it mansudder	Cal pration Date		New LT PSI Rating	Manufacture Da	ata:
Memory ** remaining.		Battery % remaining:		184		
Transducer Performan	ce and Programming				/	-
PART 4: Transducer E	the second s	PART 5: Programmi	ng & Floal Readings			
WL (transducer read sg) (ft);		Progamming Time				
		New Test Name:		Time (MST)	Reading	
GWE from MM:						
Difference in value:		Reference Level				-
Error tolerance of transducer		L Furtert Dept				
Notes:	BW 021	Meas, interval:				
	BW	Start Date:		/		
		Start Time:			-	
	T 1 100 PSHC 23 1 500	2011 16 P	Synch Clocks Yes \ No	1		
/			and the reading		2A Date and In	m:cal
V						$ \land $
					_ /	/
	-				/	
					/	
				14	/	
				53/13×		_
				2N		
				201		
				/		
				A		



N3B-Form-6156

Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information				
Vet Name :	Date:	Tene onsite (MST)	Activity	
CdV-16-6192?	03/15/2021	1100	GW S	Cashe SN:
J. Meyer, D	Joramilo, J.A	necson	Cable Length(#):	Cable SN:
Telemetry: Yes No	Pull Transducer.	Ves No	Memory % remain	Do Sattery % remaining
Connect Time:	Transcuser SN		Log Note Memory	% Log Note Battery %:
Water Level (ft):	F (psi)	T (C):	Stop Test: Yes	No Change Desicant Yes \ No \ NA
Last Start Date 31151	2) Data File Name:			
PART 2: Manual Measurements	Service and the service of the servi			
Measuring Porst. TOC (top outer	casing) (TiC (inner))	Stick-up Measure	dan Site 17	Previous MP Used
	Water Level Meter S 7819	enal No.	Notes:	Previous MP Used
DTW (# BMP): 8,15 K	able .	ements in feet	Pry	
7me (MST) 1113	LSD ft.	7376.43	water 1	
DTW (11 BMP) 8.15	しうし MP Height it	. 0.00	0.05'	from
Time (MST) 1116	MP Elevation	= 7376.43	Sump	
DTW (7. 6MP) 8,15	DTK DTW	- 8,15 0+16	N.	
Time (MST)	Envator (GWE)			
TO (A DMP): 3115/2		7368.28	Zip Tie on Ketim's C	Brip: NLA
ART 3: Replacement Transduc ransducer SN	Name and Address of the second design of the second s			the second second
	Calibration Date:		New LT PSI Rates	Manufacture Date:
Memory % remaining:	Battery % remaining:			/
Transducer Performance and Prog	ramming			/
PART 4: Transducer Error/Drift Acc	peptance PART 5: Programmi	ing & Final Readings		
WL (transducer reading) (ft):	Progamming Tome	1	Time (MST)	Reading
GWE from MM:	New Test Name:			Reading
Difference in value:	Reference Level :	0/3/15/202	·	
Error tolerance of transducer	Current Depter			
Notes;	Meas, Intervai:			
With Error Tolerance	Start Date:			
0xttoe Enor Tolerance 5 POH-0.0371 30 PSH-0.07.21 100 PS	Start Time: 10231. 500 P0H1.15 ft.			
	A CONTRACTOR OF THE	Synch Clocks: Yes 1 No		
				QA' Date and Impail

N3B-Form-6156, Rev. 0 Effective Date: 6/20/19 Implementing Procedures: N3B-SOP-ER-3001; N3B-SOP-ER-6001



N3B-Form-6156

Groundwater Level Field Form

Groundwater Level Field Form

1.5.85	onnation				
MSC -16	-0629-	UB119/221	Time onsite (MST) 1055	Activity Ge Same	eling
	yer, K. Reid	, J. Anderso	~	Cable Length(ft):	Cable SN:
elemeny: Yes \ N	0	Pull Transducer,	Ves 1 No	Mensiny % remaining	Battery % remaining:
onnect Time:		Transcucer SN		Log Note Memory %	Log Note Battery %:
Vater Level (ft):		P (ps.)	T (C):	Stop Test: Mes + No	Change Desicant Yes 1 No 1 NA
ast Star: Date		Data File Name:			_
ART 2: Manual Mea	surements				
leasuring Point TO		Tic (inner)	Stick-up Measu		
	and a start of the	Water Level Meter Se	sal No	Notes:	Previous MP Used
Time (MST)	1058	782347	2.		257
DTW (ft bMP);	10.55 DHC	Measure	ements in feet	Dry	
Time (MST)	1035th 1101	LSD ft.	7288.44		
DTW (# 6MP);	10.55 6416	MP Height ft.	-3.07		
Time (MST).	1104	MP Elevation			
DTW (ft bMP).	10.55	DTW:	10.55	-	
Time (MST)	1105	Groundwater Elevation (GWE)	7274.82		
7D (ft bMP):	11.11	Reference Level	10.	Zip T⊯ on Ketim's Grip:	NIA
ART 3: Replaceme ransducer SN	nt Transducer	12			
		Calibration Date:		New LT PSI Rateg	Manufacture Bate:
Aemory % remaining.	and the second				/
	ce and Programming			/	
PART 4: Transducer E	mon'Drift Acceptance	PART 5: Programmi	ng & Final Readings	/	
WL (transducer reading) (ft);		Progamming Time:		Time (MST)	Reading
GWE from MM;		New Test Name:	an		
Difference in value:		Reference Level :	3/19/21		
Error tolerance of transducer	1	Current Deptic			
Notes:		Meas, Interval:			
Whith Error Tolerance	/	Start Date:			
Cuttoe Entr Tolerance		Start Time:			
I PSHODE X PSHO	00 PSHC 23 1 50	0 PSH1.16 ft	Synch Clocks Yes No	D	

N3B-Form-6156, Rev. 0 Effective Date: 6/20/19 Implementing Procedures: N3B-SOP-ER-3001; N3B-SOP-ER-6001

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

	65
07 15 2021	CaV-16-611937
21 M og	
DST 1346	seep 60 of this logbook for morning activities
121 1249	crew ousite C cdv-16-611927
	2-min Safety: hiking uneven terrain
	weather: partly cloudy, 40s
	Objective: purget sample (dv-16-6/1937 per appricable vet. daments
	+ SOPs found on p. 3 of this logbook.
1349	DIW= 6.22 / BTIC WE SN: 782342
1352	DTW= 4.22' bTIC mTD= 11.58 F+ bTIC
	WC = TD - DTW = 5.36
2" ID	$1 (v = (0.163)^{\alpha}/4)(wc) = 0.87 qcl$
	3(v = 2.02 g d)
1359	Promotion in the start of the pass of the last of the last
1400	Pumpon, water to surface & G=0.08 gpm (man meas w/ graduted cup)
	Flow through cell full; Begin logging parameters on YSI # 60, (File nume =
1419 HZT	edv 16 611937, MY2021 Q2), GW sampting Log
	Pause pump; prepare to sample (> 1 CV purged, parameters stable)
19 21	Pump on; Begin sampling
note:	K. Reid preserves samples, M. Startny GAS
note:	A. Vigil performes the spot test; negative
Summary	- Objective met to purget sample Cdv-16-611937 per all approaches
	ref. documents + SOPs found on p. 3 of this logboon. See p. 66-68
	for Gw Sampling Log, compliance checklist + Gw Level Field Form
1502	crew off site
100000	25.0
	Relinquish Samples to SMO do K. Popova
	Event ID: 13528
	SamplelDs; CAWA-21-218613; -218614; -218614
	20m 03/15/21
	Dur offi
1	
1	

/				Gro	undwa	ter Samp	ling Lo	Dg									
PIPWOMP	MY: Q: L021	2	LSD: 7359.5	59	ft. msl \	Well Diameter:	2		in.	Date: 03 15 2021							
Matambar			Water Level:	ft	C255259577 - 11 1/15	fop of Screen:	- " ? e' e	59 (6.0	ft. mai BTIL)	Notes:							
Weil:			TD: = mTD = 1	1.58 -	H. bgs	Bottom of Scre Water Column:	en: 7351,	59 (11.1	ft. mal	I begins in screened interva							
Sampling	16-61193 Device: Pi		DTW:	enter Alter	ft. bgs	Water Column:	5.3	6	ft.								
Measuring			Drop Pipe: N P		gal. 1	ICV:	0.8		gal.	Packer Pressure N A							
Completion	n Depth: T		107	·	1.12	ICV:			- gal.	Before: ps							
(* # BTOC	/ BTIC / BGS/				Note:	MP height (sti	ckup) of T	DC/TIC for	3.0 *	Actuation: ps							
((),) ()				tor Level)						Opening: ps							
	28	1CV	DTW = (LSD - Wa rop pipe = (TD/Pun = (Water Column x	np intake x Di Well Diamet	rop Pipe Dir er Multilier)	ameter Multipli 3 CV = (1 C	er) V x 3)			After: V ps							
TIME	pH SU	Τ.	SPEC COND	DO mg/l	Turb NTU	НАСН	насн	HACH	НАСН	HAC	Turb 5 NTU 9	ите насн	Tunb HA NTU C	HAC	Water Level*	Discharge	
Stability:	≤ 0.2 STU variance	- TEMP °C	± 3% (>100) ± 6% (≤ 100)	≤ 0.3 mg/i variance	<10 or ± 10%	Yes or No	ORP mV	ft. BTIC	Rate (GPM)	NOTES							
1359	Pump	h. u	later to s	invface	00	= 0.08	grm										
- 1400	7.22	5,9	206.3	3.52	43.69	N	\$5.9	6.51	0.08	cloudy brownish a							
1400	6.07	4.7	202.5	2.01	26:37	T	114.9	6.40	0.08	notador							
- 1406	5.92	42	202.0	1.87	21.01		123.0	6.67	0.09	checked Q, discharg rate inc. to 0 09 gpm							
- 1409	5.91	3.8	20 3 8	1.97	18.60		129.2	6.12	0.09	slightly cloudy, bri							
- 1412	5.90	3.4	201.4	1.44	16.50		127.5	6.75	0.09	ish color, no odov							
	5.90	2.4	201.0	1.54	16.93		113.5	V.71	0.09								
	5.91	3.5	199.9	1.49	17.00	V	94.4	6.79	0.09								
- 1419	Pause	DIAMP	For prep	to sai	mule					<u>1</u>							
- 1421 -	Pump	1		molin			24		5								
- 1451	Phase	offis	AMOLING	-													
_	- Arrest		1	1).											
									-								
_						/											
_			02/15/21	~				1									
_		600						•									
Yes in HACH	column = HA	CH Turbidi	meter#N	A Um	id because	NA	L										
Contact Wast		Birt	²⁴ gal. Drum#:	Mun	icipal					Final Water Level: 6.73 STIC							
	shit oto	11.65	gel. Drum#:			, 2259 Consolie				*Purge: Formation water purg prior to sampling (excluding dr pipe water and sampling wate							
*Purge Water:		4444	the second second				1.1-	10		pipe water and sampling wate							

Appendix E Field Documentation Vater/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

Well Name: $Cdv - 14 - U(1/3)^2$ Date: $o3[15]_{21}$ Date: $o3[15]_{21}$ Discharge CalculationCalculated Volume (gal)Drop Pipe (gal)Purge Water Volume Purged (gal)Winimum Before Before H44Minimum Additive Additive StabilityManual $2.U2$ NA 1.465 H44 1.447 W NWinimum Purge Met?Comments Additive StabilityManual $2.U2$ NA 1.465 H44 1.447 W NWinimum W NComments Stability (twrb)Parameters consecutive readings?Dissolved Owygen S0.2 STU S0.3 mg/lSpecific Conductivity Turbidity < 10 MTU or 2.02 Comment:Parameters consecutive readings?Dissolved S0.3 mg/lSpecific Conductivity < 10 MTU or 2.02 Comment:Parameters collected at proper printervals?Dissolved S0.2 STU $S0.3 mg/l$ Specific Conductivity < 10 MTU or 2.02 Comment:If 112 5.9° 1.447 201.6 $1.4.93$ Comment:If 1412 5.38 1.449 201.6 $1.6.93$ No 1.943 If 1413 5.38 1.449 201.0 $1.6.93$ No 1.94 If 1413 5.38 1.449 201.0 16.93 No 1.94 Calculations: 5.90 0.10 $1.94.73$ Nedian 10.9% No $1.94.72$ V NY N Y N Y N Y NSOP Requirements $Merineme$	_/		Com	pliance Checklist			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Well Name:	Cdv-16-	UI 937	6. B			
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Y				Ϊ.	-	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		1	Drop Pipe			Minimum	
How MeterNA1.651.90More than the state of t	Method						OV purged
Stable for three consecutive readings?Comment:Parameters collected at proper intervals?Dissolved Oxygen $\leq 0.2 STU$ $\leq 0.3 mg/l$ Specific Conductivity $\pm 3 \% (>100)$ Comment:(HH:MM)Variance $2 0.3 mg/l$ $\pm 5 \% (\leq 100)$ $\pm 10\%$ $\pm 10\%$ 10% (HH:MM)Variance $2 0.3 mg/l$ $\pm 3 \% (>100)$ $\pm 10\%$ $\pm 10\%$ $\pm 10\%$ (HH:MM)Variance $2 0.3 mg/l$ $\pm 3 \% (>100)$ $\pm 10\%$ $\pm 10\%$ $\pm 10\%$ $\pm 10\%$ (H) $5 . 9 0$ 1.94 $2 01.0$ $1 0.50$ ± 0.92 $1 0.44$ $2 01.0$ $1 0.50$ $1 0.93$ (H) $5 . 9 0$ 1.94 $2 01.0$ $2 0.1 0$ $1 0.93$ $1 0.93$ $1 0.00$ $1 0.93$ $1 0.93$ (alculations: $5 . 9 0$ 1.54 $2 01.0$ $1 0.93$ 1.94 $1 0.93$ $2 01.0$ $1 0.93$ $1 0.93$ Calculations: $5 . 9 0$ 1.54 $2 01.0$ $1 0.93$ 1.94 $2 01.07$ $1 0.93$ $1 0.92$ Calculations: $5 . 9 0$ 0.92 0.10 $1 9 / 9 1 1.94$ $2 01.07$ $1 0.93$ $1 0.92$ VNVNVNSOP Requirements Met?Comments:SOP Requirements Met?Comments:		NA 3 CVs:	NA		1.91	(Y) N	stability
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		2.66		3/15	3/15/21		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		consecutive					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	collected at proper intervals?	рН ≤ 0.2 STU	Oxygen ≤ 0.3 mg/l	Conductivity ± 3 % (>100)	< 10 NTU or	Comment:	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1412	5.90	1.44				
Highest:Highest:Median:Median: $5,90$ 1.54 $201, 0$ 16.93 Lowest:Lowest:Median + 3% Median + 10% 207.03 18.42 Difference:Difference:Median - 10% 0.02 0.10 194.97 15.23 Y NY NY NY NY NSOP Requirements Met?Comments:	1415	5.90	1.54	201 0	16.93	Nov	le l
Calculations: $ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1418		the second se				
Calculations:Lowest: $\varsigma . \ell g$ Lowest: 1.44 Median + 3 % 207.03 Median + 10 % 18.42 Difference:Difference:Median - 1 % Median - 10 % 0.02 0.10 194.97 15.23 Y NY NY NY NSOP Requirements Met?Comments: howe				Median:			
Calculations: S. P.8 1.44 207.03 18.62 Difference: Difference: Median - 10 % 0.02 0.10 194.97 15.23 Y N Y N Y N Y N Y N Y N SOP Requirements Met? Comments: Howe	-						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Calculations						
0.02 0.10 194.97 15.23 Y N Y N Y N Y N SOP Comments: Requirements hone	culculations		1-44	207.03	18.62		
Y N Y N Y N Y N SOP Requirements Met? Mone	_	Difference:	Difference:	Median - <u></u> %	Median - <u>10</u> %		
SOP Requirements Met? how		0.02	0.10	194 97	15.23		
Requirements Met? hone	Y N	YN	Ý N	Y N	(Y) N		
Met? hone		Comments:					
	Met?	ho	ne				89.
							1.2

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

	/					
1	_ /		Groundw	ater Level Field F	om	
1	Wet Name :	mation			1	
- NSP	Cdv-16-61 Personnel	1937	Date.	Time onsite (MST) (346	Actuity Manual I in	reasurement
Som sales (2)	Personnel B. Mov gav Telemeny Yes No	A. Vigil, K.	Reid, M. Sta	stny	Cable Length(ft): N A	Cable SN: NA
	Telemetry: Yes (No	NA		Ves (N) NA	Memory % remaining	Battery % remaining:
*	Connect Time:	Í	Transcucer SN	NA	Log Note Verrory *.	Log Note Battery %:
(¹	Water Level (fi)			T(C): NA	Stop Test, Yes + No	Change Desidant Yes I No V NA
	Last Start Date	V	Data File Name:	NA		
Č	PART 2: Manual Mea					
	Measuring Post TOC		TIC (inner) Water Level Meter Se	Stick-up Measur nal No	ecioniSte □ P Notes:	Previous MP Used
	Time (MST)	(349	7823	42	-	
\	BW PIN (H PN)	6.22	Measure	ments in feet	J Beg	ins in d interval
	Time (MST) BM bilic	1352	LSD ft.	7359.59	Screene	d interval
\	IN UTW (A BAP)	6.22	MP Height ft.	- 3.00		
	2)15/21 Time (MST)	1352-NA	MP Elevation	= 7362.59	-	
	DTW (A BMP).	NA	DTW:	- 6.22	4	
	Time (MST)	1352	Grouncwater Elevation (GWE) Reference Level	7356.37		
<u></u>	S)(S)" TO (R SMP) PART 3: Replacemen	11.58 It Transducer	Reference Level	1.500.94	Zip Tie on Kelim's Grip:	NA
<u></u>	Transducer Siv		Calibration Date		New LT PSI Rating	Manufacture Date:
	Memory % remaining.		Battery % remaining:			
	Transducer Performant PART 4: Transducer Er		PART 5: Programmi	ng & Final Readings		
	WL (transducer read rg) (ft);		Progamming Time:		Time (MST)	Reading
	GWE from MM.		New Test Name:			
	Difference -s value:		Reference Level :			
	Error tolerance of transducer		Current Deport			
	Notes		Meas, Interval			
	White Error Talerance	BWStist	Start Date:			
	04246 END TO STAR	02.4 100 201-0 23 1 50	Start Time: 3 PSH1.16 ft	Synch Clocks Yes \ No		
						DA Date and Inical
					. 4	22
					62	
					Som	
					/	

Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 202

10.10	VV	ater/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021
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	58	
	03 13 2021	16-612309 (Surge Bed Monitoring Well)
-		le offest (surge Bea Monitoring Well)
	MST 0902	Crew on site @ 16-612309
5	0907	DTW = 22.84 BAC (DRY TD)
3	note	Location dry to total depth + well canceled due to
2		insufficient water (CANW)
e	0620	crew off site 16-612309
1	note	see p. 53 for morning activities
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Appendix E Field Documentation Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021

Coundwater Level Field Form RATE 1: Well Site Information Reference Na Reference Na Reference NA Reference NA Reference NA Reference NA Reference NA Reference NA Reference NA Reference NA NA NA NA NA <th cols<="" th=""><th></th><th></th><th>16-6</th><th>12309</th><th></th><th></th></th>	<th></th> <th></th> <th>16-6</th> <th>12309</th> <th></th> <th></th>			16-6	12309		
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Appendix E **Field Documentation** Water/CdV Watershed MY2021 Q2 and other Field Activities from March 9-April 5, 2021 87 STN Ancho E Basin Confluence 03/2021/16 Below Spring/Surface Water Sampling Field Data Sheet Site name: Pa). below StN Ancho E Basin Date: 03/10/2011 Onsite time: 1100 Objective: Sumple per applicable ioRs + Dolomans Weather: Sunny, 405 Sampling crew: J. Meyer, D Jergmillo, J. Anderson, NMED Kevin B. Two-minute safety drill: Hiking Hazards, wild Fe Meters calibrated at (location)_ 50 SMD by (whom) J. Anderson at (time) 0800 Multimeter number: 50 Turbidimeter serial number: 10010 3287 Sample Retrieval Date: 03/14/2021 Time: 1120 Method: PP Sample Event ID: 13528 Sample ID Numbers: CAPA - 21-218 366 218 367, 218368 **FIELD PARAMETERS** pH (su): Sp. Cond. (µS/cm): 231. 70 6.62 Turbidity (NTU): 2.46 Temperature (°C): 6.7 DO (mg/L): 10,66 Q (gpm): 4 49 Explanation of Q method, including calculations: 3" modified Parisnell fume O US 6HT 2010 CFS = 0.010 CFS × 449.83 = 4.49 gpr Note: To convert cfs to gpm, multiply cfs by 448.83 SITE DESCRIPTION (circle all that apply) Media type: Spring (Baseflow (persistent flow) Sample location: Bank Wading Station Gage: at / above / below Midstream natural feature Other (specify): Description of Pool Riffle Eddy Diffuse Other Sampling Site: Written description: NA Substrate: Bedrock Concrete Cobble Gravet Sand Mud Stage Conditions: Stable normal / low / high Falling Rising Other (specify): Hydraulic Event: Routine Snowmelt Flood Drought Other (specify): Stream Color: Brown Clear Green Blue Grav Other (specify): Description of Turbulent) Laminar Recirculating Stagnant Other flow: Written description: Stream Siow / Algen Rich Photos and GPS GPS point #1: NA Name: Coordinates: NA Units: GPS point #2: Name: Coordinates: Units: Photo #1: Description: Some Facing: 🔪 Time: 1\25 Taken by: J. Meyer Photo #2: Description: Facing: W UPStram Time: Taken by: Photo #3: Description: Downstream Facing: SE Time: Taken by: Other notes: HE Spot test: Negative J. Ancerson Preserves ; J. Meyer QA's Offsite time: 1150 Relinquish samples at SMO, care of Kat Poowa at (time) **Objectives met?** Yes 2:2/10/11

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6 ¹	ul						
lu(zurl	Buildag	Spring					
	0	J					
	227 10						
Site name: Vian	Spring	Surface Water					
Site name: BWN Objective: C	lay String	Date: 03 16	2021	Onsite time:	1200		
Sampling crew:	le per ref. docs t	SOPs on pg.3	Weather: S	ionny, 405			
Two-minute safe	J. Meyer, D. Jacamill	D. J. Hunderson	NMED	Kevin B.	·		-6
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		FIELD PA	RAMETERS	19504, 21037	218371	218372	-
pH (su): 7.5			/cm): 316.70	, Tur	rbidity (NTU): 🎸	43	<u>N</u>
Temperature (°C)	7.6	DO (mg/L):			gpm): 0.13		-
1) 250 ml 30 sec	250 ML &				t cfs to gpm, multiply	y cfs by 448.83	
	S	TE DESCRIPTION (ci	rcle all that app	ly)			
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	Ban		Wading	the second	Gage: at / above	e / below	
Description of	Pool	natural feature	Other (speci				
Sampling Site:		Riffle on: Poci belan :	Edd	ly D	liffuse	Other	
Substrate:	Bedrock	Concrete		\sim			
Stage Conditions:	Stable: normal / l		Cobble	Gravel	Sand	Mud	-
Hydraulic Event:	Routine		Falling	Rising	Other (specif	The second	
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and the second se	Description: Belaw	C JUNE	Facing: SE	Time:	Taken by:		1
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	JEDT HEST NO	amples at SMO, car	eof Kart	nti. C	Losun Preser at (time) 14		

Appendix B

Analytical Suites and Results (on CD included with this document)

Appendix C

Inspection Forms

Cap and BMP Inspection Forms

Inspection Report Corrective Measures at Consolidation Unit 16-021(c)-99

Date/Time:	9-	17-1	202	6

Report Number: 6

Weather: 55'F clear

Personnel: <u>Caleb Cyati</u> <u>Ashley Kowalcusk</u> <u>Robert Seminario</u>

Low-Permeability Cap Inspection

	Yes	No	Comments
Is there evidence of new settlement?		X	
Is there evidence of cracking?		X	
Is there evidence of erosion/rutting?		X	
Is there evidence of ponding?		X	
Is there evidence of burrowing animals?		X	
Is there evidence of undesirable vegetative growth?		X	
Are the slopes adequate for surface water drainage?	Å		
Is there evidence of soil movement/slope instability? (example: cracks in the soil running parallel to the slope or soil sloughing)		X	- 2 panderoser pines growing

Are there any additional conditions during the inspections that require attention?



Signature: ARALLA KMALLA

Inspection Report Corrective Measures at Consolidation Unit 16-021(c)-99

Date/Time:	04/08/2021/	′ 4:30 pm –

Report Number: 7

Weather: Partly cloudy 66° F

Personnel: M. Adam Ullom

Low-Permeability Cap Inspection

	Yes	No	Comments
Is there evidence of new settlement?		x	
Is there evidence of cracking?		x	
Is there evidence of erosion/rutting?		x	
Is there evidence of ponding?		x	
Is there evidence of burrowing animals?		x	
Is there evidence of undesirable vegetative growth?		x	Removed small Ponderosa saplings from Site.
Are the slopes adequate for surface water drainage?		x	
Is there evidence of soil movement/slope instability? (example: cracks in the soil running parallel to the slope or soil sloughing)		x	

Are there any additional conditions during the inspections that require attention?

NI

A

Signature: M. Adam Zlon, CIStc

Tasks



Work Order BMP-87277

Ind Permit BMP Insp & Maint Printed 8/4/2021 - 12:10 PM

	: 7/21/2021 9:36:16 AM Post Storm Control Measures Inspection Form (N3B-SOP-5002 CMI)	Target: Priority/Type:	8/3/2021 Normal / Inspection	☐ IP ♣ RG257 ♣ V006 ★ CDV-SMA-2
Last PM:	6/30/2021			
Project:	IP Rain Event on July 20, 2021 (P-BMP-6088)			Contact: Phone:
Reason: If	P Rain Event on July 20, 2021			
Special Ins	tructions: Route 4, V006-13-0	006-177-CDV2-	-R8.	

Description Meas. Yes No **CONTROL MEASURE REVIEW** Established Vegetation [V00602040013] Is BMP Operating effectively on arrival? If no, 20 describe existing or installed backup control. Established Vegetation [V00602040013] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. 30 X Earthen Berm [V00603010006] Is BMP Operating effectively on arrival? If no, describe existing 40 or installed backup control. Earthen Berm [V00603010006] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. X 🗆 50 Earthen Berm [V00603010007] Is BMP Operating effectively on arrival? If no, describe existing 60 or installed backup control. **~** Earthen Berm [V00603010007] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. 70 X 🗆 Earthen Berm [V00603010008] Is BMP Operating effectively on arrival? If no, describe existing 80 or installed backup control. Earthen Berm [V00603010008] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. 90 X 🗆 Earthen Berm [V00603010009] Is BMP Operating effectively on arrival? If no, describe existing 100 or installed backup control. Earthen Berm [V00603010009] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. X 110 Earthen Berm [V00603010010] Is BMP Operating effectively on arrival? If no, describe existing 120 or installed backup control. Earthen Berm [V00603010010] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. i 🕺 130 Rip Rap [V00604060003] Is BMP Operating effectively on arrival? If no, describe existing or installed backup control. 140 **1** Rip Rap [V00604060003] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) 💢 🗔 150 and describe the maintenance recommendation. Rock Check Dam [V00606010002] Is BMP Operating effectively on arrival? If no, describe 160 existing or installed backup control. Rock Check Dam [V00606010002] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation. 170

https://www.maintenanceconnection.com/mcv18/mapp_v80/default.asp?z=&s=34B3B746866800134E561993B07F29930D4257FC58B072879BA87D... 1

8/4/2021

Work Orders (No Grouping)

180	Rock Cap [V00608020012] Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		
190	Rock Cap [V00608020012] Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or modification) and describe the maintenance recommendation.	×	
MAP I	REVIEW		
210	Have you changed the location of a BMP on the Site Map?	×	
220	Have you ammended the Site Map in any other way?	×	
SMA a	and SITE REVIEW		
240	Is there evidence of floatable waste, floatable garbage, or floatable debris within the SMA that could be discharged to receiving waters?	×	
250	Is there evidence of dust generation or evidence of off-site vehicle tracking of raw, final, or waste materials or sediments?	×	
260	Is there evidence of the introduction of raw, final, or waste material to the SMA?	×	
270	Has there been a significant increase in erosion potential at the SMA since the last inspection?	×	
280	Industrial or sanitary wastewater treatment at 16-260 [16-021(C)] Has there been an increase in erosion potential at the Site since the last inspection?	×	

Labor-

Labor	Work Date	Reg Hrs	OT Hrs	Other Hrs
Jonathan Romero	7/22/2021	1	0	0
Shendo, Maurice	7/22/2021	1	0	0

Labor Report

7/22/2021

Completed: 8:20:52 AM

Report:

-Images

Jordhar Romenu-

Appendix D

Surge Bed Monitoring Well Transducer Data (on CD included with this document)

Appendix E

Mann-Kendall Trend Analysis

Analytical data used for statistical analysis at Technical Area 16 (TA-16 260) monitoring group locations were pulled from the Environmental Information Management (EIM) database as described below.

The following data were included:

- Regular (REG) and field duplicate (FD) results
- Sample type WG (groundwater) results
- Best value Y (yes) results

The following data were excluded:

- Laboratory quality assurance/quality control (QA/QC) results, field trip blank (FTB), field blank (FB), performance equipment blank (PEB), and equipment rinsate blank (EQB) results
- Results that are not representative or are of questionable representativeness as qualified by sample type W (i.e., waste characterization sampling of development purge water, aquifer testing, or sampling qualified as reducing conditions)
- Sample type WS (base-flow) results
- Best value N (no) results
- Data that are R-qualified (results rejected and thus unusable because of analytical problems and/or noncompliance with QA/QC criteria during independent validation)

If a regular sample and FD sample were collected during the same sampling event at a specific location, an average of the results was calculated and used in statistical analysis. No other results were averaged and therefore, seasonality is not included in the analysis.

Mann-Kendall trend analysis of Royal Demolition Explosive (RDX) and barium trends was performed, as appropriate, using the statistical program ProUCL Version 5.1.002 (EPA 2015, 601724; EPA 2015, 601725). The Mann-Kendall analysis is a nonparametric test in which the probability distribution of the data is not assumed and therefore is valid for any probability distribution. The analysis does not require a time or event interval, and the concentrations are ordered by measurement dates and assigned a generated index. The Mann-Kendall test statistic, M-K test value (S), compares sample concentrations with each subsequent measurement, and all distinct pairs of data are considered. The tabulated critical levels, tabulated *p*-values, determine the lowest value for which the null hypothesis would be rejected using the sample results. Statistical significance of an increasing or decreasing trend is determine the magnitude of the trend. The Mann-Kendall trend analysis was performed using a confidence level of 95%. This user-defined level is the most commonly used as well as the default setting within ProUCL Version 5.1.002.

The trend analysis was performed using the statistical methods described in the ProUCL technical guidance (EPA 2015, 601724) and in Chapter 14 of the "ProUCL Version 5.1 User Guide" (EPA 2015, 601725). Figures E-1 through E-6 present the analysis results.

REFERENCES

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. ERIDs were assigned by Los Alamos National Laboratory's (the Laboratory's) Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by Newport News Nuclear BWXT-Los Alamos, LLC (IDs 700000 and above).

- EPA (U.S. Environmental Protection Agency), October 2015. "ProUCL Version 5.1.002 Technical Guide," Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations, EPA/600/R-07/041, Office of Research and Development, Washington, D.C. (EPA 2015, 601724)
- EPA (U.S. Environmental Protection Agency), October 2015. "ProUCL Version 5.1.002 User Guide," Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations, EPA/600/R-07/041, Office of Research and Development, Washington, D.C. (EPA 2015, 601725)

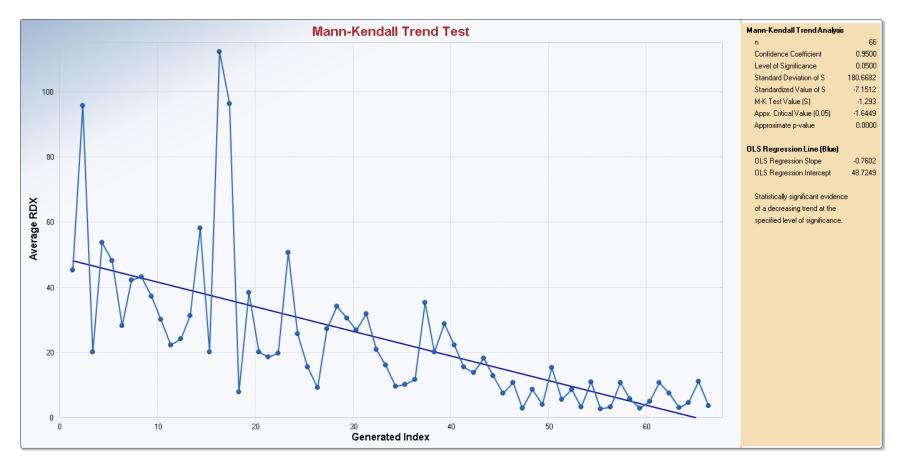


Figure E-1 CdV-16-02659 RDX Mann-Kendall trend analysis results

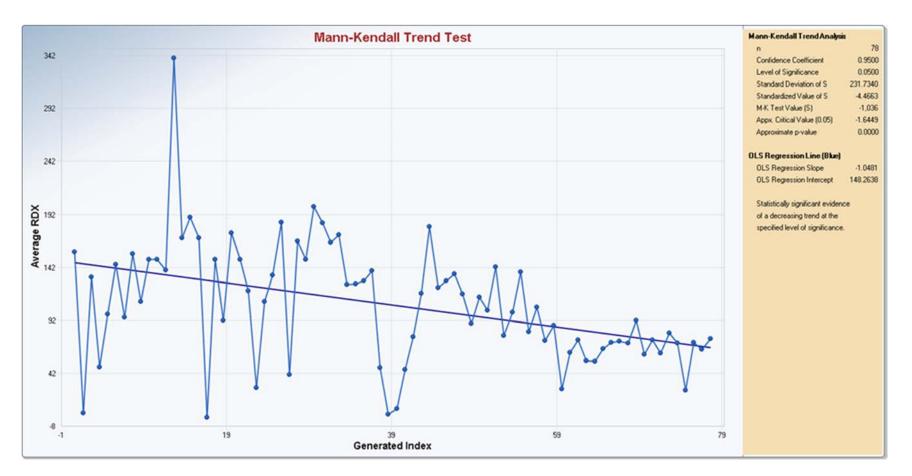


Figure E-2 Martin Spring RDX Mann-Kendall trend analysis results

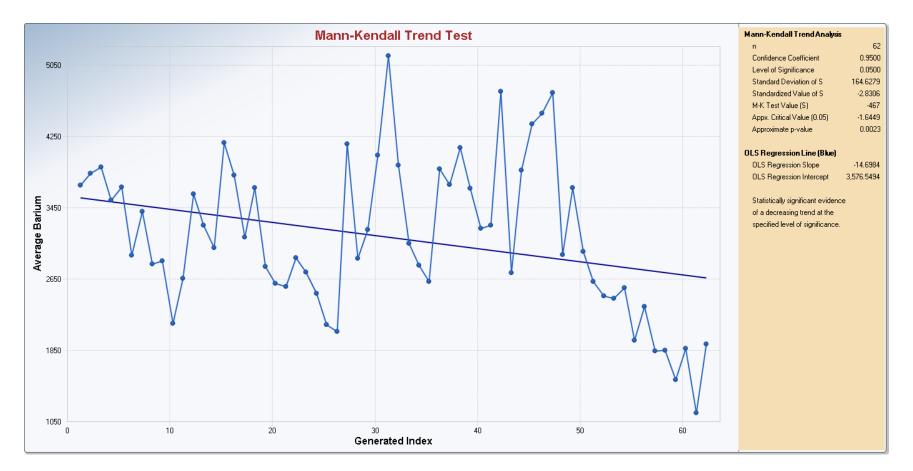


Figure E-3 CdV-16-62656 barium Mann-Kendall trend analysis results

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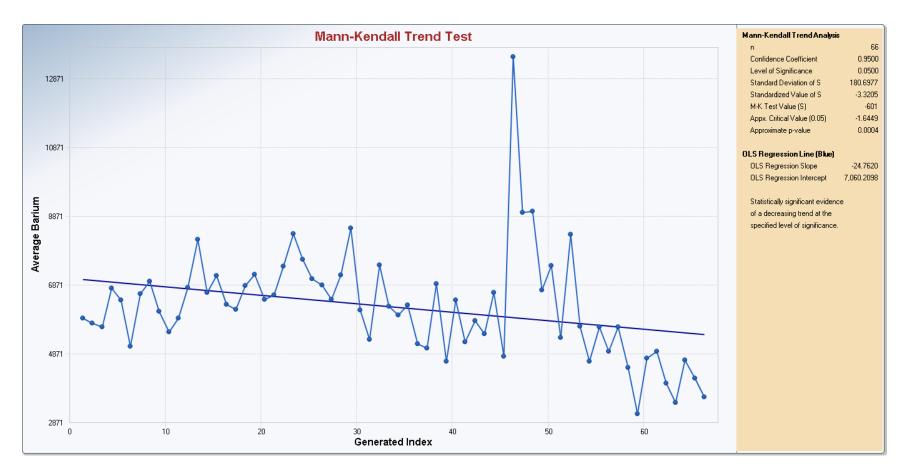


Figure E-4 CdV-16-02659 barium Mann-Kendall trend analysis Results

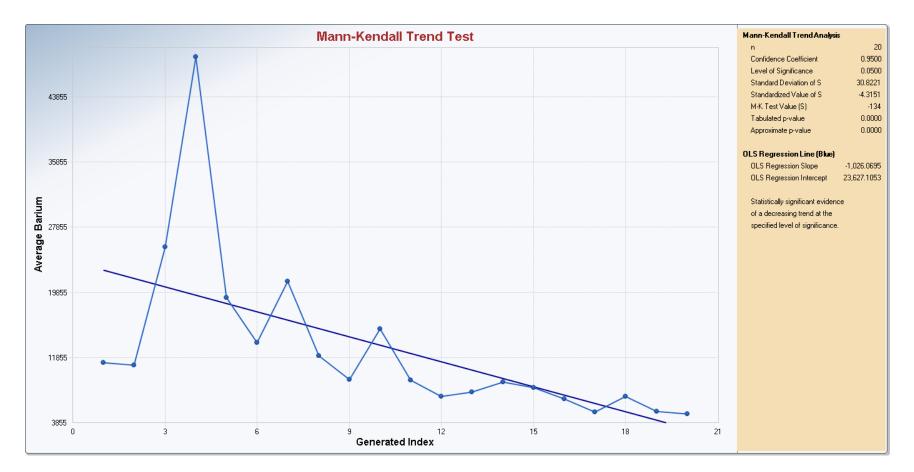


Figure E-5 CdV-16-611923 barium Mann-Kendall trend analysis results

E-7

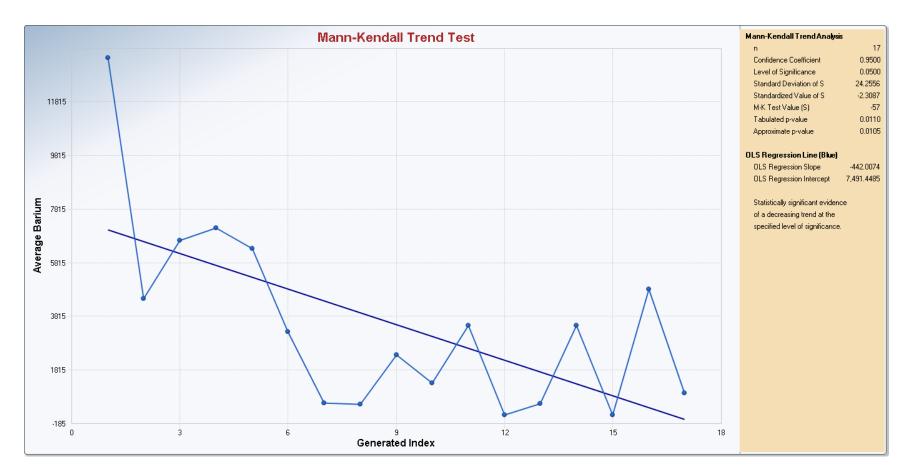
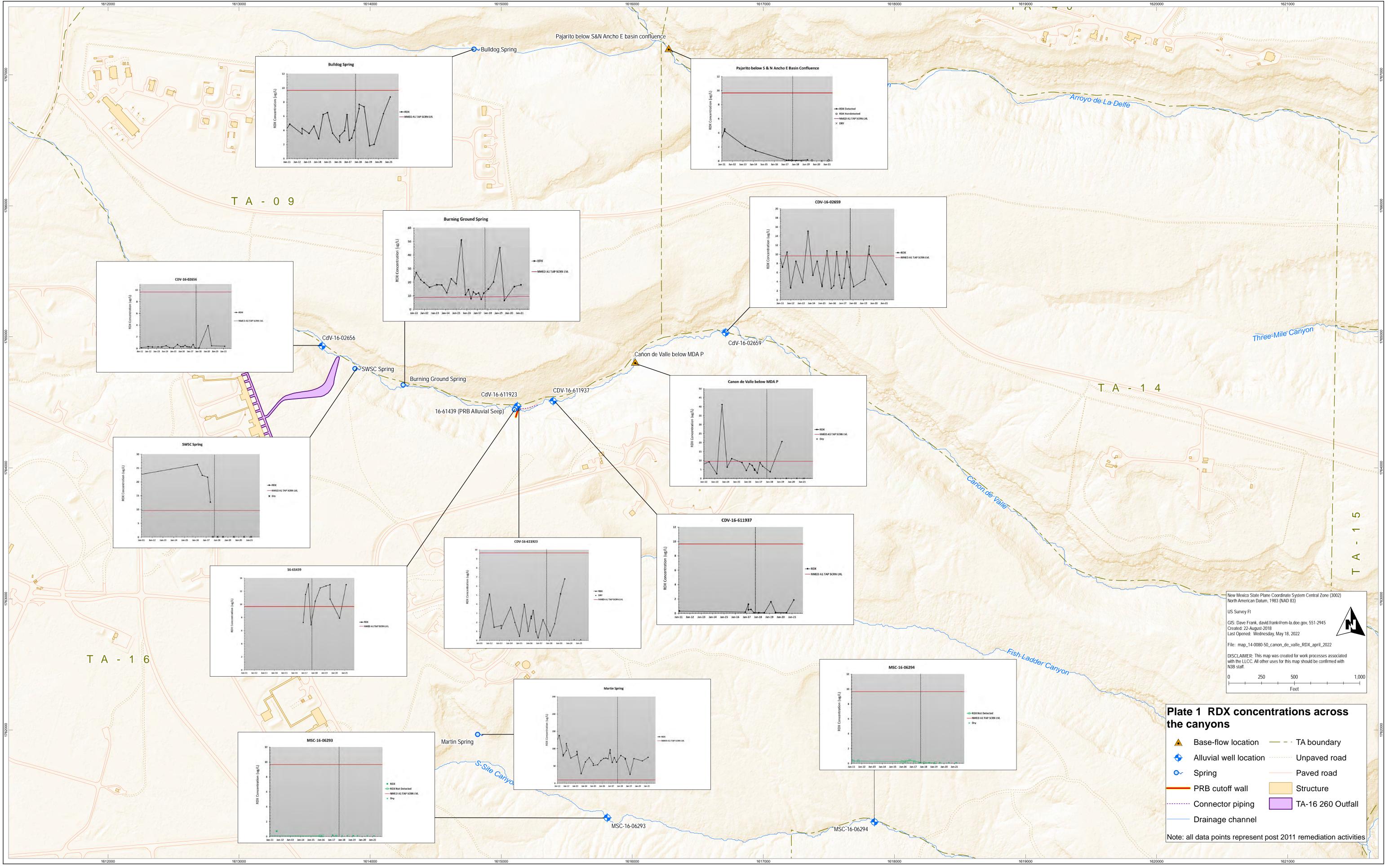
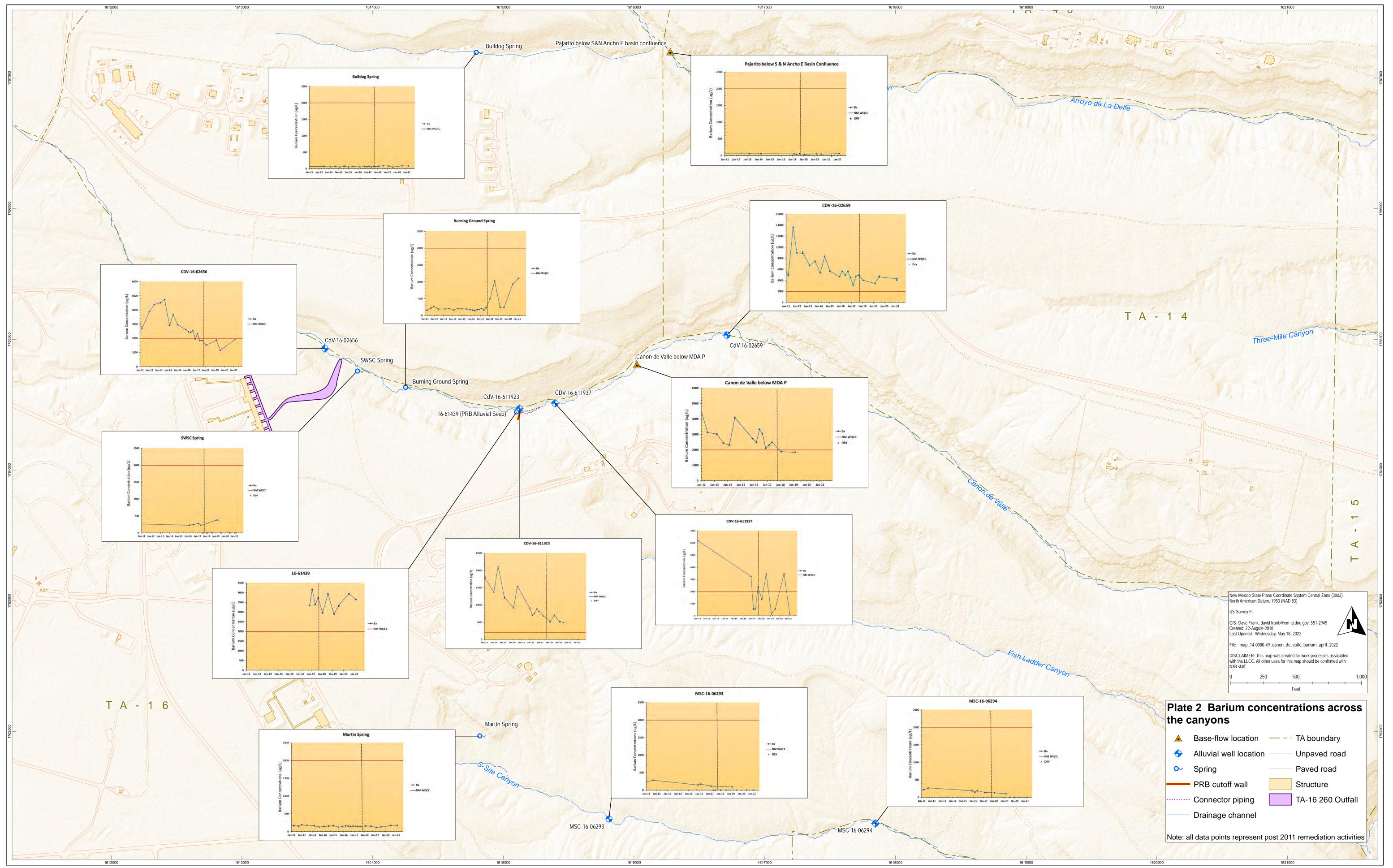


Figure E-6 CdV-16-611937 barium Mann-Kendall trend analysis results



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