EMID-700089

DEPARTMENT OF ENERGY
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

SEP 27 2018

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

Dear Mr. Kieling:

Subject: Submittal of the First Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Consolidated Unit 16-021(c)-99

Enclosed please find two hard copies with electronic files of the First Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Consolidated Unit 16-021(c)-99. This report is being submitted to fulfill Fiscal Year 2018 Milestone 14 in Appendix B of the 2016 Compliance Order on Consent.

If you have any questions, please contact Patrick McGuire at (315) 420-5629 (patrick.mcguire@em-la.doe.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Arturo Q. Duran
Designated Agency Manager
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Enclosures:
1. First Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Consolidated Unit 16-021(c)-99 (EM2018-0033)

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First Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Consolidated Unit 16-021(c)-99

N3B Los Alamos

EM2018-0033

First Annual Long-Term Monitoring and Maintenance Report for the Corrective Measures Implementation at Consolidated Unit 16-021(c)-99

September 2018

Responsible program director:

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CONTENTS

Figures

Tables

Appendixes

Plates

1.0 INTRODUCTION

This first annual long-term monitoring and maintenance report for the corrective measures implementation (CMI) at Consolidated Unit 16-021(c)-99 within Technical Area 16 (TA-16) at Los Alamos National Laboratory (LANL or the Laboratory) follows the Long-Term Monitoring and Maintenance Plan requirements included as Appendix A to the "Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99,"(LANL 2017, 602597). This annual long-term monitoring and maintenance report covers the reporting period from October 2017 through July 2018.

Consolidated Unit 16-021(c)-99 consists of the high explosives– (HE-) machining 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.

The CMI was implemented to address HE associated with the 260 Outfall, including RDX (hexahydo-1,3,5-trinitro-1,3,5-triazine) 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 HMX (octahydo-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), TNT (2,4,6-trinitrotoluene), 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, $^{15}N/^{18}O$ isotopes in nitrate, and radionuclides. Where appropriate, these compounds are screened in accordance with the criteria set forth by the 2016 Compliance Order on Consent, and any compounds exceeding their respective screening levels are further discussed in this report. Additionally, field parameters (i.e., dissolved oxygen, oxidation-reduction potential [ORP], pH, specific conductance, temperature, and turbidity) were collected at select locations and measurement results are provided.

This annual long-term monitoring and maintenance 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 SWSC Spring, Burning Ground Spring, Martin Spring, and permeable reactive barrier (PRB) alluvial seep; and monitoring of groundwater and surface water 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 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 (IFGMP) for groundwater and surface water monitoring (LANL 2017, 602597). The Laboratory has implemented the IFGMP in accordance with Section XII of the 2016 Compliance Order on Consent. The Long-Term Monitoring and Maintenance Plan was included in the CMI remedy completion report, Appendix A (LANL 2017, 602597). The New Mexico Environment Department (NMED) approved the CMI remedy completion report on November 27, 2017 (NMED 2017, 602758).

Monitoring of groundwater from springs (including SWSC, Burning Ground, 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 Contaminant Transport of RDX and Barium

RDX and barium were the primary contaminants in alluvial groundwater during the surface CMIs from 1999 to 2010 (LANL 2007, 098192). RDX is the most significant contaminant within Cañon de Valle and Water Canyon (LANL 2017, 602597). RDX is a mobile contaminant 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).

A review of the concentrations of RDX detected in alluvial monitoring wells indicates long-term declines. 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 value of 7.02 µg/L. Although RDX concentrations in discharges from SWSC, Burning Ground, and Martin Springs from 2000 to 2017 were above the 7.02 µg/L screening level, concentrations are declining, likely because of the RDX source reduction actions that were implemented at Outfall 260 (LANL 2017, 602597).

The decrease in RDX concentrations in shallow water reflects multiple factors, including the elimination of the original outfall source of contamination with cessation of National Pollutant Discharge Elimination System (NPDES) discharges into Cañon de Valle, surface removal activities conducted in 2001 and during the surface CMI in 2009 and 2010, and long-term reduction of RDX from the system from natural degradation processes.

Concentration trends for HE compounds have been variable and range from generally declining to stable for an extended period of time. As described in the CMI remedy completion report (LANL 2017, 602597), the current 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 the long-term monitoring at each of the springs is to ensure concentrations remain low or stable with time and ensure the protection of the regional aquifer.

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, barium concentrations in Cañon de Valle alluvial groundwater and surface water persist (LANL 2017, 602597).

Barium mobility, which is controlled by sorption and by the dynamics of surface and alluvial hydrology, continues to be mobilized by fluctuating water levels in the alluvium. Barium is also irreversibly removed from groundwater when barite precipitates. However, because witherite 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 it is well buffered in the near-surface system, natural sorptive processes slowly remove barium 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. The presence of 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 less than the 1000 µg/L screening level. Barium concentrations show a long-term decline in alluvial groundwater samples collected from location CDV-16-02656, located 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. RDX concentrations at surface water and alluvial monitoring locations have been steadily declining and are currently low and stable with some seasonally driven variability. Barium concentrations at surface and alluvial monitoring locations are steadily declining, except at CDV-16-02659 where barium levels are below the screening value.

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: at 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 contamination in the outfall area and underlying shallow vadose zone.
- Monitoring the long-term trend in contaminant 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 presents the data collected for this first annual long-term monitoring and maintenance report. The focus of the discussion is RDX and barium, identified as the primary contaminants targeted in the corrective measures implemented at Consolidated Unit 16-021(c)-99. Other constituents are monitored as part of the long-term monitoring and maintenance, and sampling results for all constituents monitored in the monitoring year (MY) 2018 long-term monitoring and maintenance program are provided in this report. The results are screened against their respective screening values, and the constituents that exceed their screening value 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 contaminant concentrations, and to support continuous evaluation of the conceptual model for the fate and transport of residual contamination 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). In the CMI remedy completion report, Appendix A (LANL 2017, 602597), the analytes and sampling frequencies proposed in the MY 2018 IFGMP (LANL 2017, 602406) for alluvial groundwater, surface water, and springs for the TA-16 260 monitoring group have been adapted as the long-term monitoring requirements for Consolidated Unit 16-021(c)-99. 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 MY 2018 long-term monitoring program. The suite of compounds measured includes HEXMOD (i.e., RDX, HMX, TNT, and degradation byproducts), VOCs, metals, SVOCs, radionuclides, general inorganics, and $^{15}N/^{18}O$ isotopes in nitrate. In addition, field parameters (i.e., dissolved oxygen, ORP, pH, specific conductivity, temperature, and turbidity) were also collected. 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 contaminants 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 value, and any exceedances identified are further discussed in this section. All validated analytical results are provided in Appendix B.

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, 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

The Long-Term Monitoring and Maintenance Plan prescribes the sampling of spring water, surface water, and alluvial groundwater on a semiannual frequency. The MY 2018 Long-Term Monitoring and Maintenance Plan sampling events were performed in August/September 2017 and February 2018. Table 2.2-1 presents the RDX results by canyon or canyon segment. Barium levels are monitored in filtered and unfiltered samples collected from spring water, surface water, and alluvial groundwater. Table 2.2-2 presents the barium results by canyon or canyon segment.

The Long-Term Monitoring and Maintenance Plan prescribes monitoring spring water, surface water, and alluvial groundwater for other constituents besides RDX and barium. Table 2.1-1 provides a list of compounds monitored in the MY 2018 sampling events. For the analytes that have a screening value, they were screened against that value, if the value is exceeded they are discussed in section 4.3. Table 2.2-3 presents the analytes that exceeded their respective screening values.

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 residual contamination in the outfall area and underlying shallow vadose zone. The low-permeability cap is inspected semiannually for evidence of settling, cracking, erosion, water ponding, 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.

Since the remedy completion report was not issued until September 2017 (LANL 2017, 602597), no September inspection was conducted during the time period covered by this report (October 2017 through July 2018). The March/April 2017 inspection of the low-permeability cap was performed and no

erosion, cracking, settlement, or ponding water was observed on the low-permeable cap. There was no evidence of burrowing animals or undesirable vegetative growth on the cap, and the slopes were observed to be adequate for water runoff. No maintenance items were identified during the inspection. The inspection form used to document the spring inspection is 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 Consolidated Unit 16-021(c)-99 continue under the Laboratory's Individual Permit, issued by the U.S. Environmental Protection Agency, Region 6, on September 30, 2010 (LANL 2017, 602284). 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 Consolidated Unit 16-021(c)-99 was performed on July 25, 2018. 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 volume of water within the well. Additionally, throughout the MY 2018 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 August/September 2017 and February 2018 sampling events and how they compare with the historical trends and support the conceptual model. In addition, this section describes iron, manganese, and boron detections and how these relate to the geochemical 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, it can be concluded 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) and are still considered protective of the regional groundwater.

Plate 1 shows the spatial distribution of RDX across Cañon de Valle since the completion of the CMI. This plate illustrates a continued decline in RDX concentration since the completion of the corrective measures. Plate 1 shows the RDX concentrations detected along the sampling locations. As the graphs on the plate indicate, the concentration of RDX extending downgradient from Burning Ground Spring declines with distance from the source, supporting the conclusion that RDX concentrations continue to decline across the canyon.

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 value, although the sample results are consistent with the conclusion that RDX levels continue to decline over time. Plate 1 shows declining levels of RDX across the canyon with no impacts to surface water downgradient of Martin Spring, suggesting the RDX concentration in Martin Spring is a localized condition. Alluvial groundwater RDX results continue to be below detection levels.

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. Historically, Bulldog Spring water RDX concentrations are near or below the screening value, as demonstrated in the results of the sample collected in August 2017. The February 2018 RDX concentrations at Bulldog Spring water were slightly above 7.02 µg/L but are consistent with the historic record. At the Confluence surface water location, the RDX results are consistent with past data; concentrations are below 7.02 µg/L and support the sharply decreasing trend in RDX concentration to levels near or below detection.

The Water Canyon RDX data record is presented in Figure 4.1-5 and demonstrates that the samples are consistent with historic results, which indicate RDX is well below the screening level or not detected.

Figure 4.1-6 presents the data record for the Fishladder Canyon. Samples were not available because of insufficient water at the time of sampling; however, the historic record indicates no impacts to Fishladder alluvial groundwater above the RDX screening value except in January 2008, when the RDX concentration was slightly above the RDX screening value.

The sample results are consistent with recent RDX concentration data trends and support the conceptual model for RDX by demonstrating the following:

- Concentrations of RDX in alluvial monitoring wells continue to show long-term declines.
- Most alluvial wells in Cañon de Valle are near or below the screening level value of 7.02 µg/L.
- RDX concentrations in water from Burning Ground and Martin Springs are above the 7.02-µg/L screening value, but concentrations are declining.
- Concentration trends for RDX are variable but are generally declining or stable for an extended period of time.
- The current concentrations of RDX detected in the springs suggests the water is recovering from RDX concentrations and is not impacting nearby surface water and alluvial groundwater, as concentrations indicate a dramatic decrease away from the source.

The sample results are consistent with past RDX concentration results and do not indicate a change to the 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 segment 1 and segment 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 since the completion of the CMI. Barium concentrations at each location are detected above the screening value except for samples collected from Burning Ground Spring; however, results support the conclusion that barium levels are declining at each location along the canyon where the barium concentrations exceed the screening value.

In S-Site Canyon, Pajarito Canyon, and Water Canyon, barium is not detected above the 1000-µg/L screening value, which is consistent with the historical data record as seen in Figure 4.2-3 (S-Site Canyon), Figure 4.2-4 (Pajarito Canyon), and Figure 4.2-5 (Water Canyon). Samples were not available at Fishladder Canyon sampling locations because of insufficient water at the time of sampling; however, Figure 4.2-6 shows the historical data record.

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 1000-µg/L screening value.
- Barium concentrations in Cañon de Valle show a long-term decline in surface water and alluvial groundwater.
- The other canyons in the Long-Term Monitoring and Maintenance Plan sampling program are not impacted with barium above the screening value.

As the sample results are consistent with past barium concentration results and the conceptual site model, no change to the conceptual model is indicated by these results. 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 Value

All the compounds monitored as part of the Long-Term Monitoring and Maintenance Plan sampling program were screened against their respective screening values. Based on these results, iron, manganese, and boron were identified as compounds exceeding screening values (Table 2.2-3). Table 2.1-2 presents the field parameters collected during the sampling event. Alluvial groundwater conditions at sample location CVD-16-611937 were reducing in September 2017 and February 2018. In September 2017 dissolved oxygen concentration was measured at 0.76 mg/L and ORP was measured at -8.4 mV. In February 2018 dissolved oxygen and ORP were measured at 0.66 mg/L and -6.5 mV, respectively, indicating reducing conditions. Reducing conditions at CVD-16-611937 in September 2017 and February 2018 are likely due to the lack of fresh water flushing the groundwater at this location. A review of water levels at CDV-16-611937 in September 2017 and February 2018 (N3B 2018, 700068)) indicates declining or stagnant water levels, suggesting no recharge of fresh water into this groundwater sampling location.

Samples collected from Cañon de Valle location CVD-16-611937 in September 2017 (CAWA-17-142865) and February 2018 (CAWA-18-29) exceeded the iron and manganese screening values of 1000 µg/L and 200 µg/L, respectively. One reason for these detections is the redox-sensitive nature of these compounds, 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. Therefore, the detection of iron and manganese above their screening values in the September 2017 and February 2018 samples correlates well with the reducing conditions in the alluvial groundwater at this localized location.

An additional compound that exceeded its screening value was boron, as detected in the February 2018 sample collected at Martin Spring (984 µg/L). 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 contaminants 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 contamination in the outfall area and underlying shallow vadose zone and (2) monitor the long-term trend in contaminant concentrations (primarily RDX and barium) in springs, surface water, and alluvial groundwater to ensure historically declining and/or stable concentrations persist. The MY 2018 sampling and inspection program has met these objectives.

5.0 RECOMMENDATIONS

Newport News Nuclear BWXT – Los Alamos, LLC (N3B) recommends that the Long-Term Monitoring and Maintenance Plan be continued through MY 2019 to continue to evaluate the effectiveness of the low-permeability cap and surge-bed grouting and monitor the long-term trends in contaminant concentrations. Alluvial groundwater, surface water, and spring water are anticipated to continue showing stable or declining concentrations of RDX and barium. However, if the data show a significant increase in contaminant concentrations over time, the conditions in the vicinity of Consolidated Unit 16-021(c)-99 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 directly 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. This information is also included in text citations. ERIDs were assigned by 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). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.

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LANL (Los Alamos National Laboratory), May 2017. "Interim Facility-Wide Groundwater Monitoring Plan for the 2018 Monitoring Year, October 2017–September 2018," Los Alamos National Laboratory document LA-UR-16-24070, Los Alamos, New Mexico. (LANL 2017, 602406)

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LANL (Los Alamos National Laboratory), March 2018. "Compendium of Technical Reports Related to the Deep Groundwater Investigation for the RDX Project at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-18-21326, Los Alamos, New Mexico. (LANL 2018, 602963)

N3B (Newport News Nuclear BWXT – Los Alamos, LLC), August 2018. "Annual Periodic Monitoring Report for the Technical Area 16 260 Monitoring Group," Newport News Nuclear BWXT – Los Alamos, LLC, document EM2018-0026, Los Alamos, New Mexico. (N3B 2018, 700068)

NMED (New Mexico Environment Department), November 27, 2017. "Approval with Modifications, Remedy Completion Report for Corrective Measures Implementation at Consolidated Unit 16-021(c)-99," New Mexico Environment Department letter to D. Hintze (DOE-NA-LA) and B. Robinson (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2017, 602758)

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

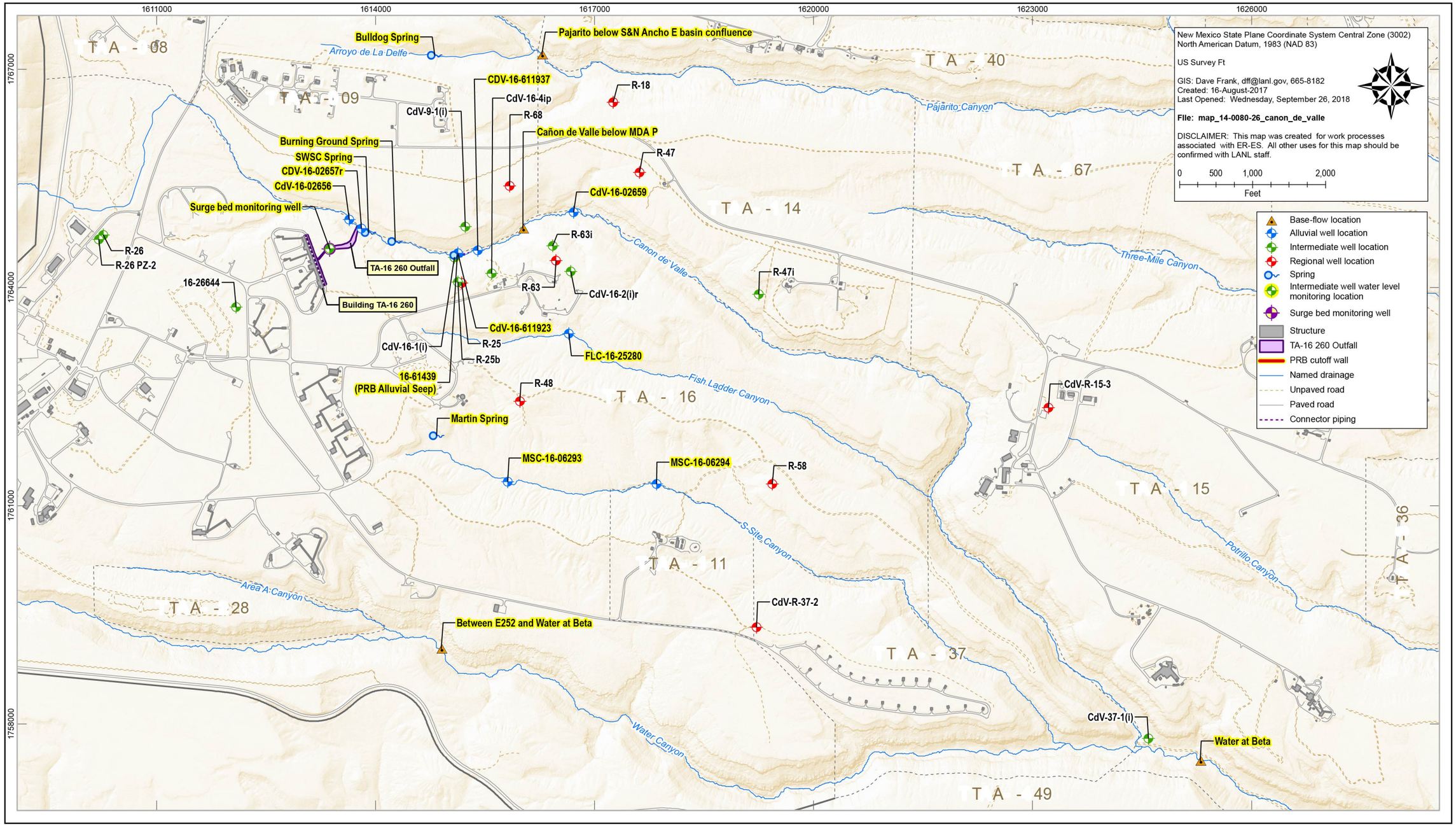


Figure 1.0-1 Consolidated Unit 16-021(c)-99 and Long-Term Monitoring and Maintenance Plan locations

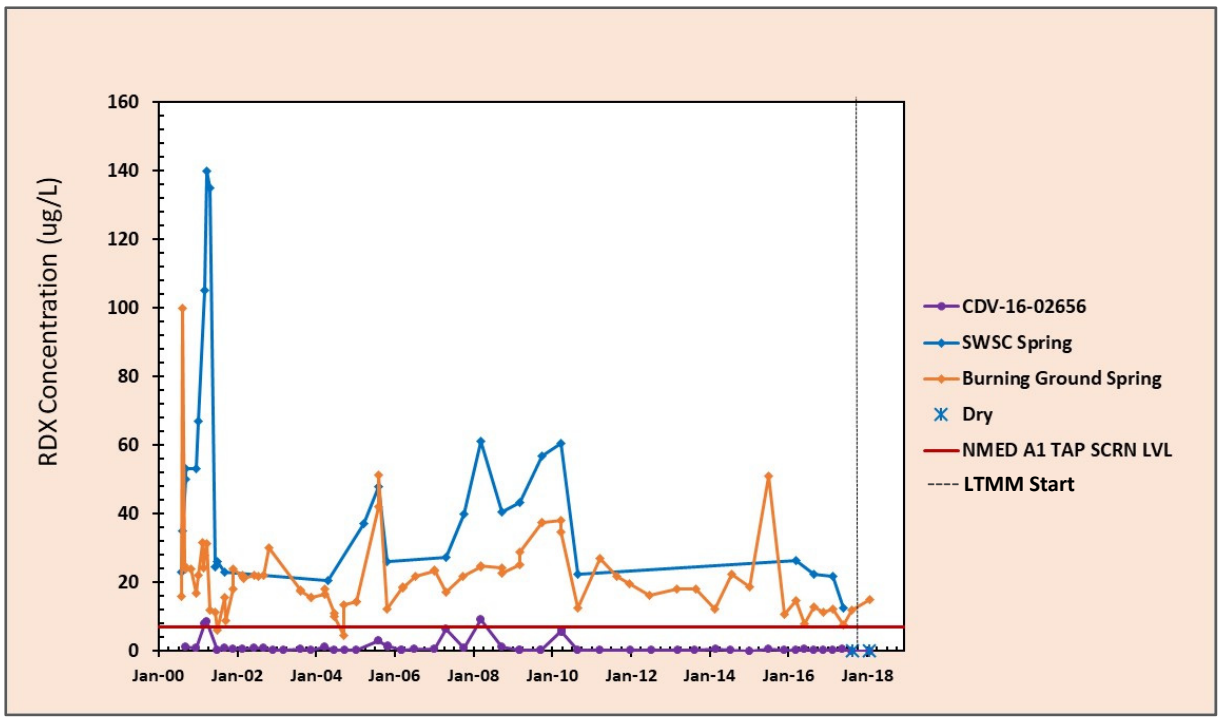


Figure 4.1-1 Cañon de Valle segment 1 RDX data record

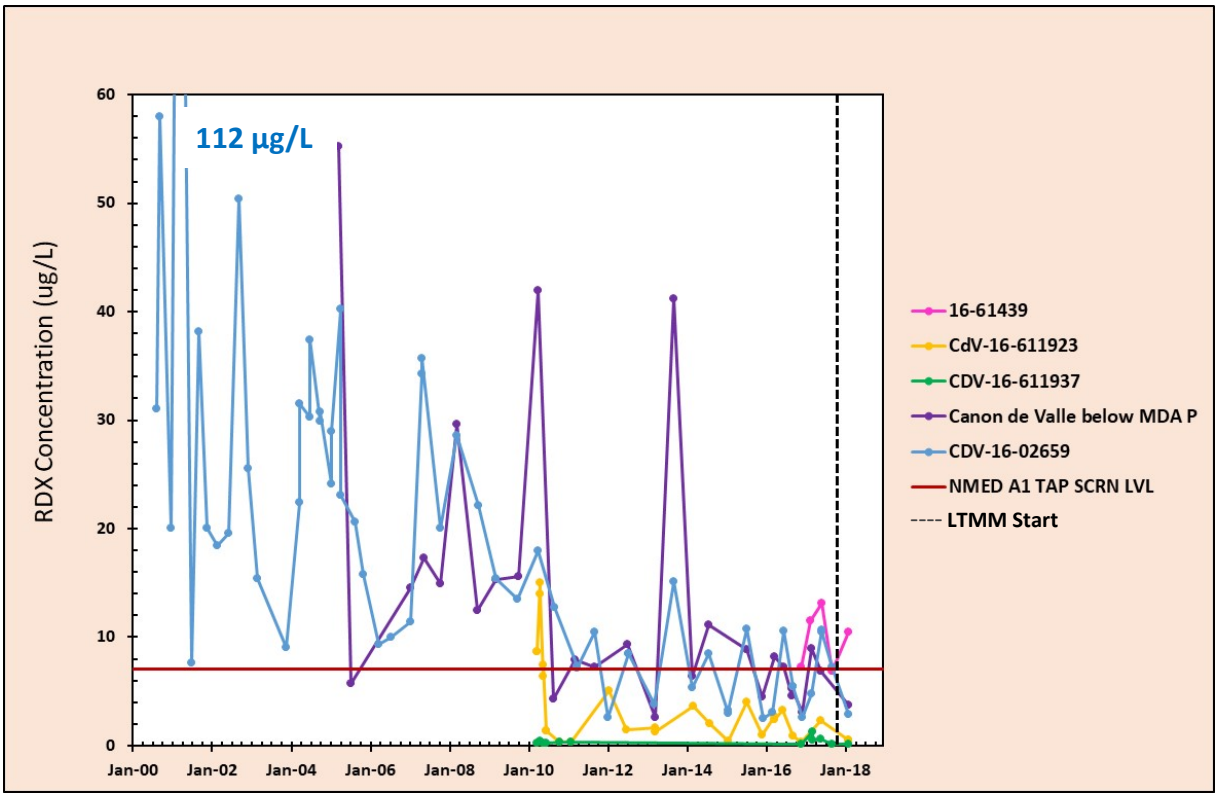


Figure 4.1-2 Cañon de Valle segment 2 RDX data record

Figure 4.1-3 S-Site Canyon RDX data record

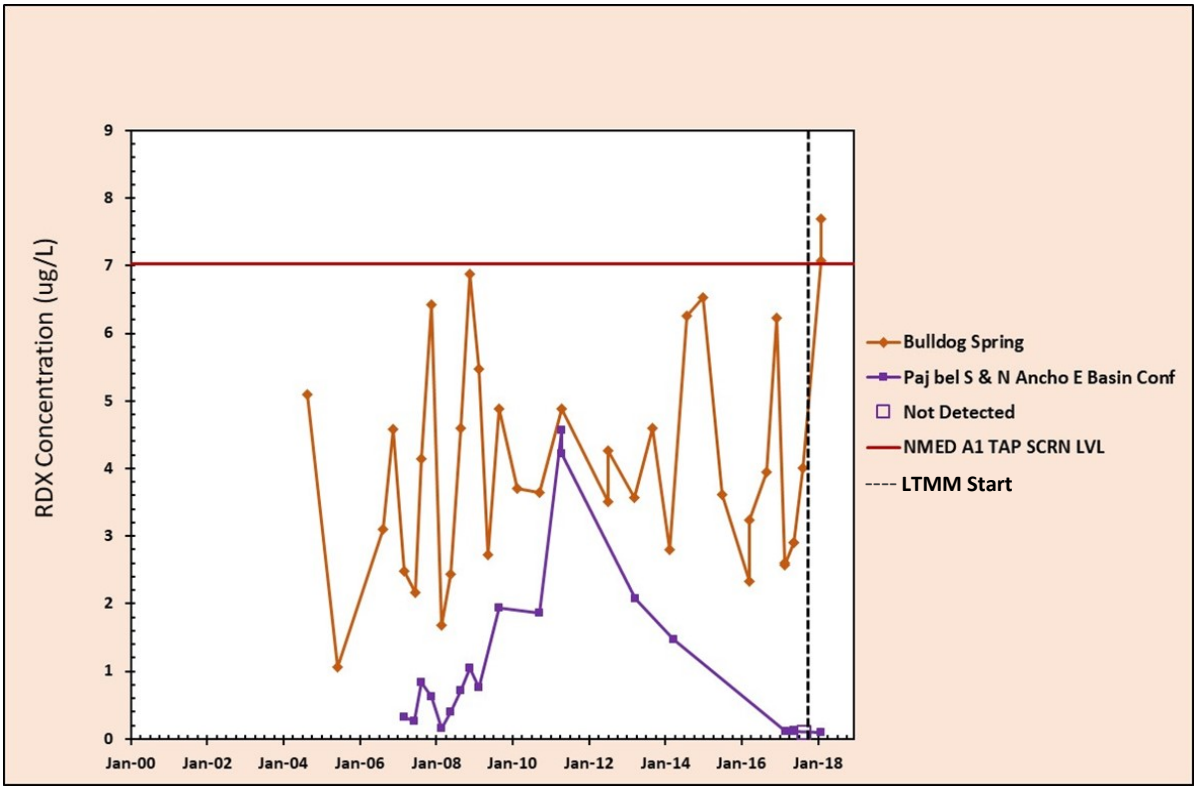


Figure 4.1-4 Pajarito Canyon RDX data record

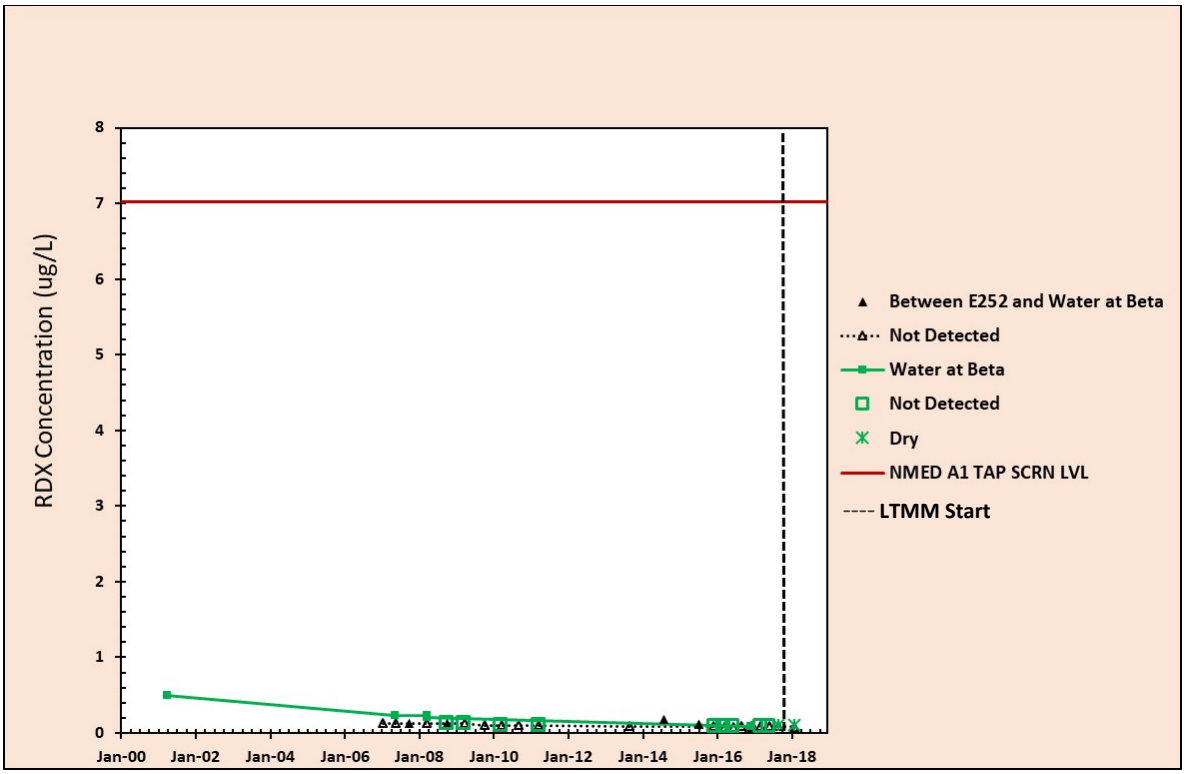


Figure 4.1-5 Water Canyon RDX data record

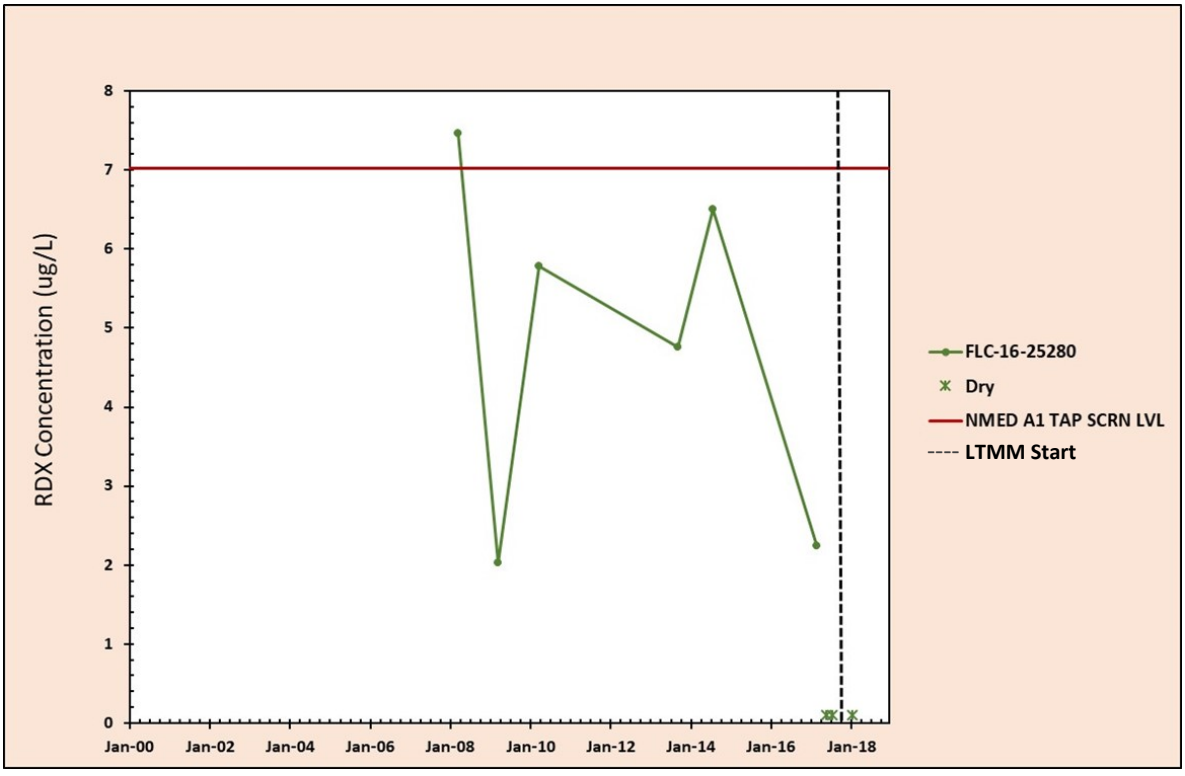


Figure 4.1-6 Fishladder Canyon RDX data record

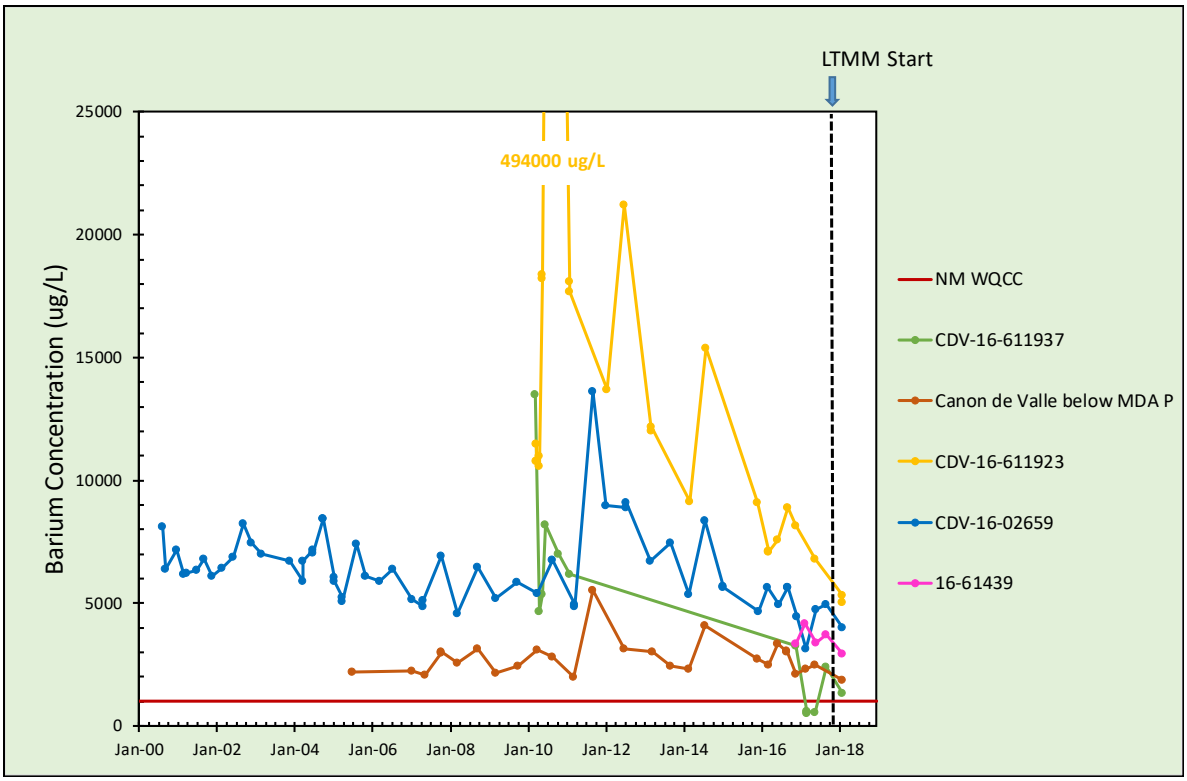


Figure 4.2-1 Cañon de Valle segment 1 barium data record

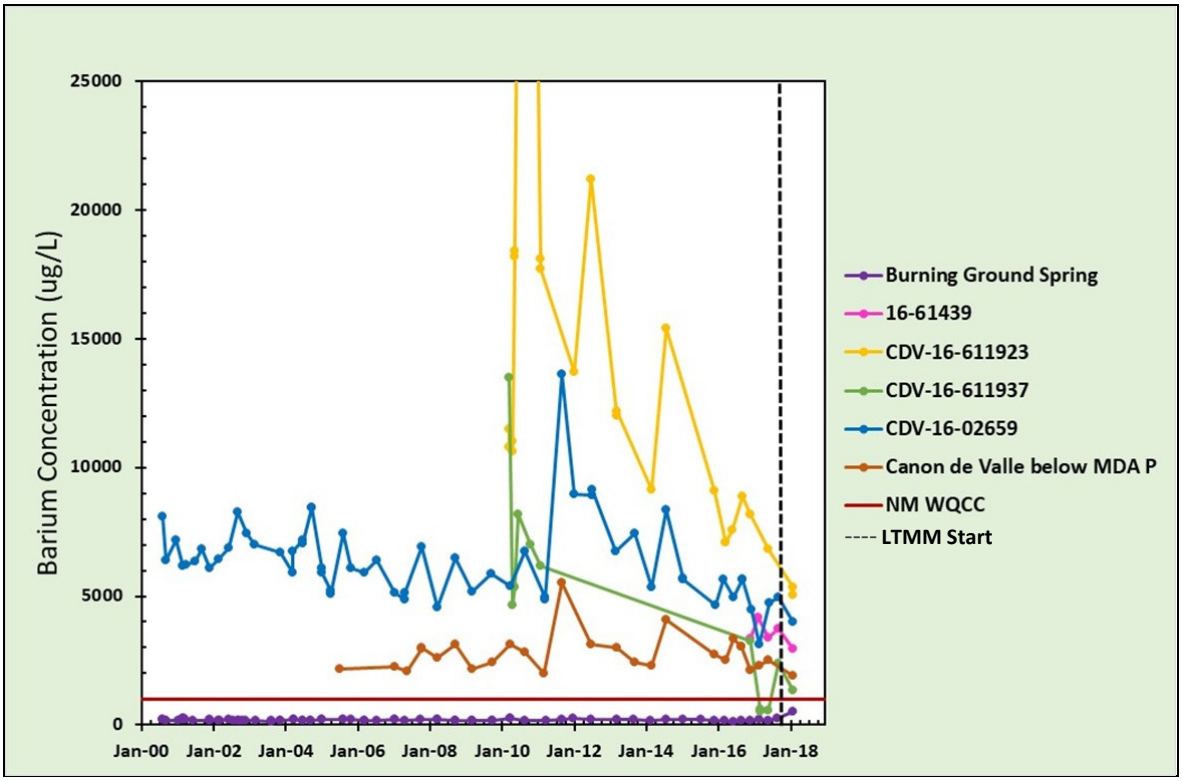


Figure 4.2-2 Cañon de Valle segment 2 barium data record

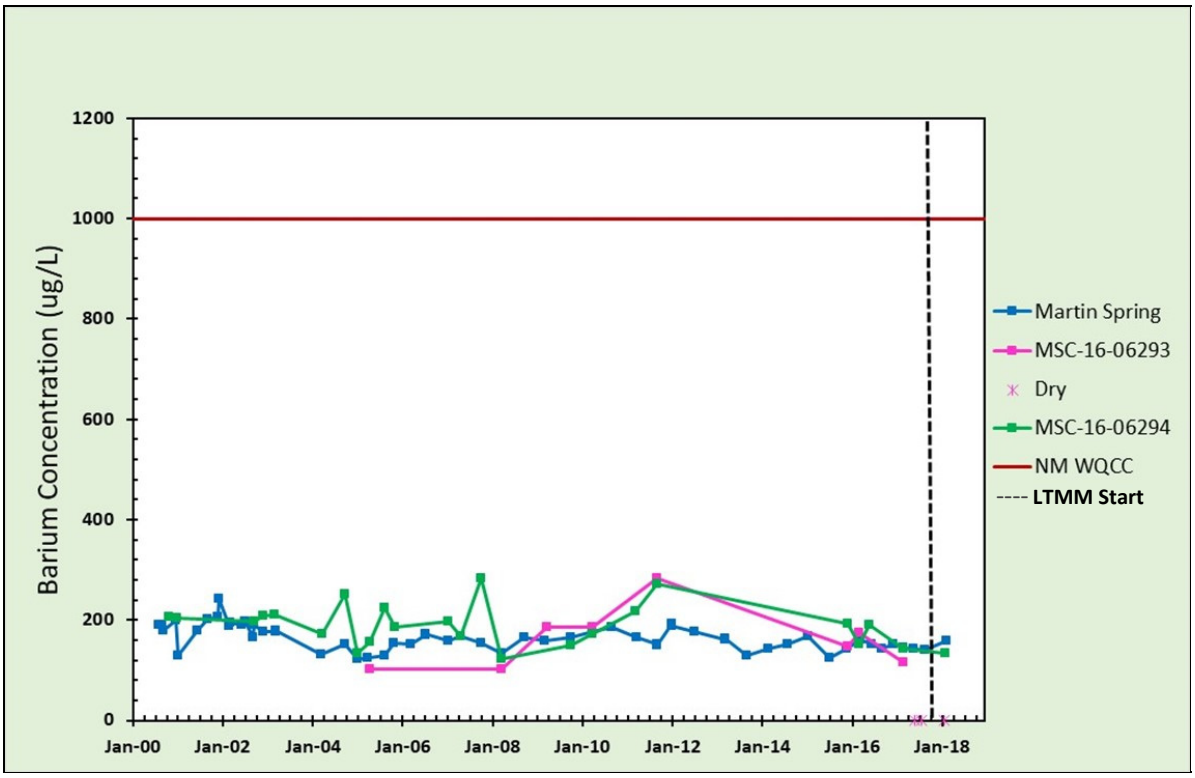


Figure 4.2-3 S-Site Canyon barium data record

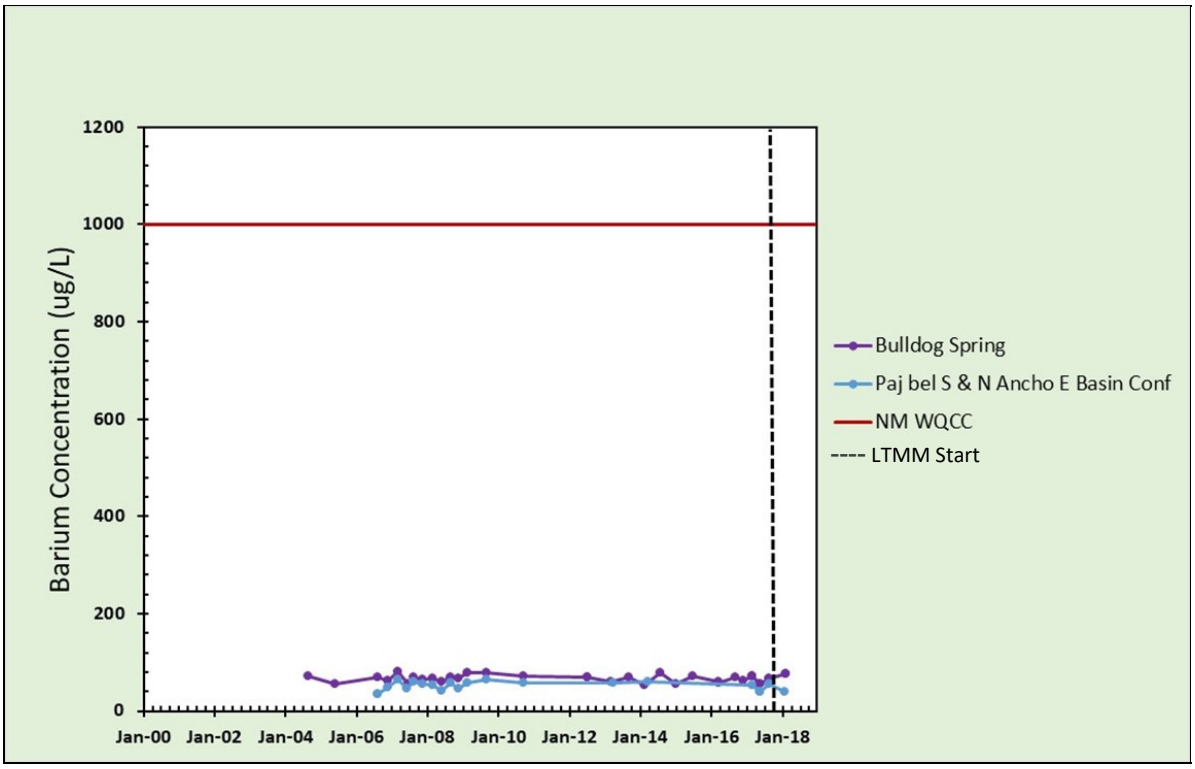


Figure 4.2-4 Pajarito Canyon barium data record

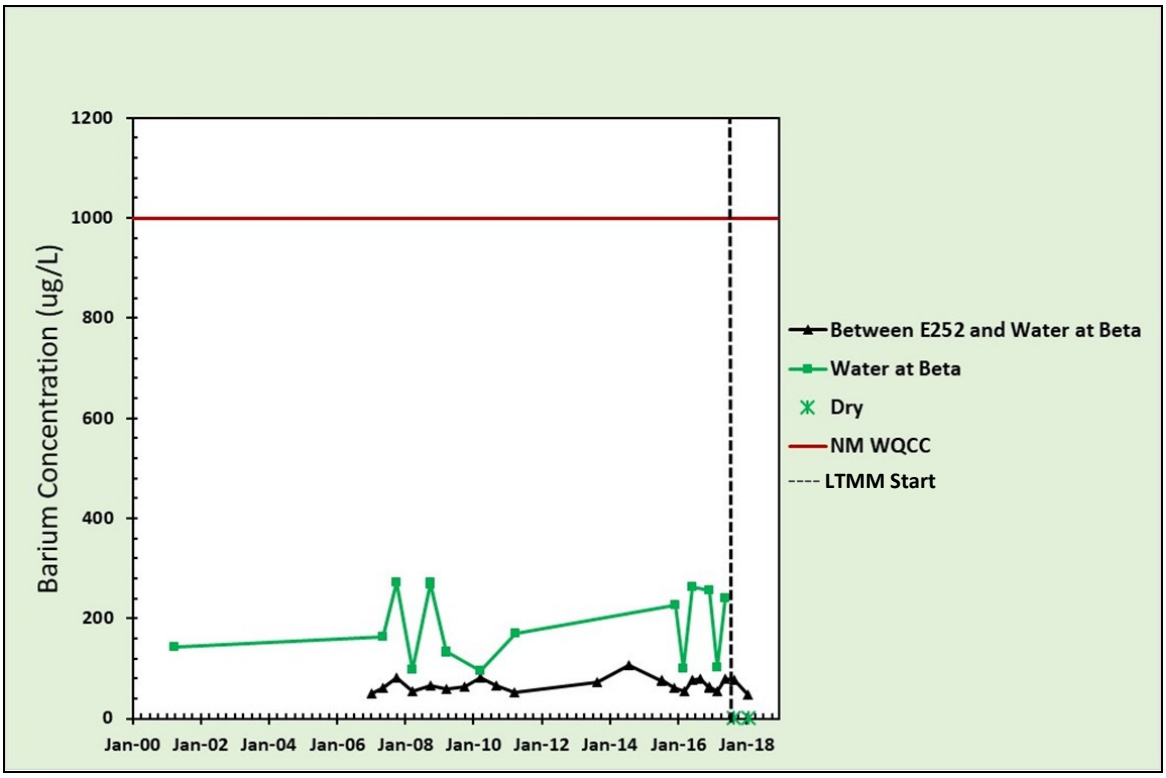


Figure 4.2-5 Water Canyon barium data record

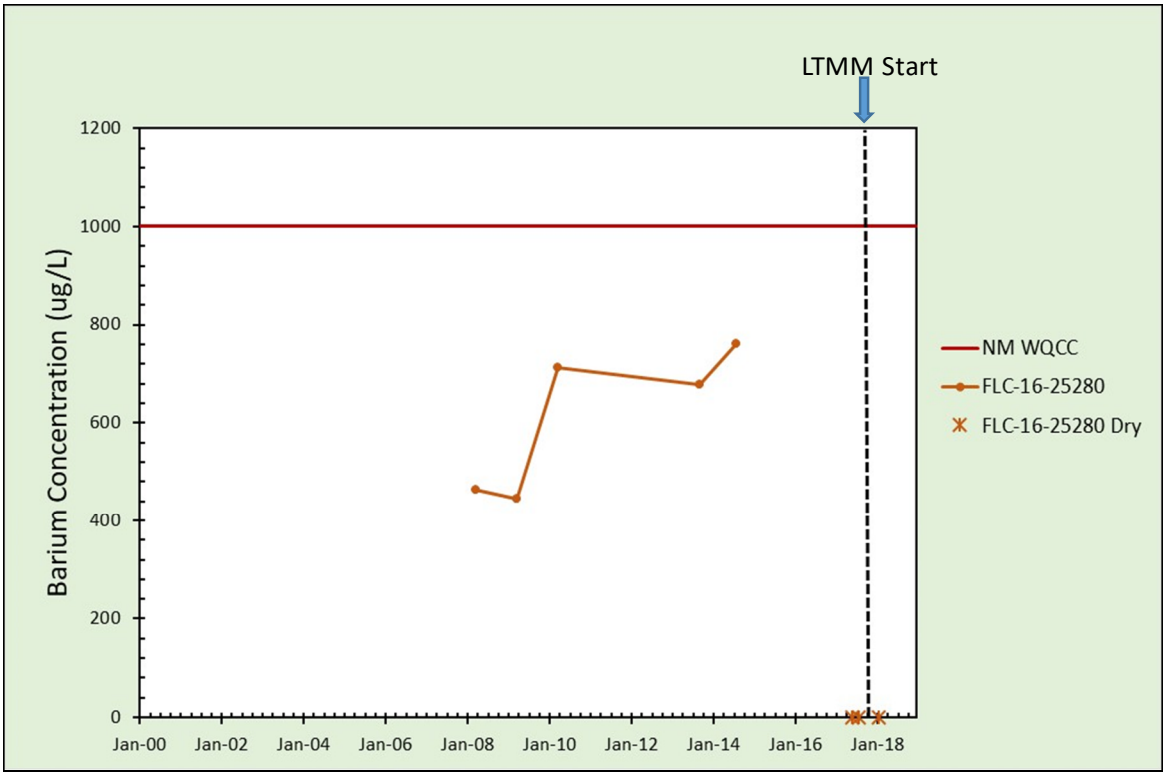


Figure 4.2-6 Fishladder Canyon barium data record

Table 2.1-1
2019 Monitoring Locations and Analytes

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

[a] S = Semiannual (two times per year).

[b] B = Biennial (one time per 2 years).

[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	Date	Screen Top Depth (ft)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH (SU[a])	Specific Conductance (µS/cm)	Temperature (deg C)	Turbidity (NTU[b])	Comments
Cañon de Valle 1	CDV-16-02656	09/01/2017	3	1.84	180.2	6.49	185.6	14.5	5.8	
		02/10/2018	3	6.66	189.9	6.63	169.2	5.4	8.7	
	CDV-16-02657r	09/01/2017	1.35	NS[c]	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/10/2018	1.35	NS	NS	NS	NS	NS	NS	Location dry
	SWSC Spring	09/01/2017	n/a[d]	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/10/2018	n/a	NS	NS	NS	NS	NS	NS	Location dry
	Burning Ground Spring	09/01/2017	n/a	8.32	NM[e]	7.23	193.8	13.1	1.7	
		02/10/2018	n/a	8.41	NM	7.57	203.6	10.2	2.3	
Cañon de Valle 2	Burning Ground Spring	09/01/2017	n/a	8.32	NM	7.23	193.8	13.1	1.7	
		02/10/2018	n/a	8.41	NM	7.57	203.6	10.2	2.3	
	16-61439	09/15/2017	n/a	7.43	NM	6.62	214.5	13.1	8.7	
		02/16/2018	n/a	9.27	NM	7.1	193.3	5.9	4.9	
	CDV-16-611923	08/02/2017	3.2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/16/2018	3.2	2.88	55.6	6.57	203.7	5.1	9.5	
	CDV-16-611937	09/12/2017	3	0.76	-8.4	6.51	221.8	12.9	4.9	
		02/16/2018	3	0.66	-6.5	6.41	235.8	6	10.4	
	Cañon de Valle below MDA P	09/01/2017	n/a	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/10/2018	n/a	9.62	NM	7.62	210.4	6.1	1.1	
	CDV-16-02659	09/14/2017	1.7	6.12	259.5	6.59	302	13.2	1.6	
		02/10/2018	1.7	8.25	210.3	6.68	229.1	6.4	2.8	

Table 2.1-2 (continued)

Watershed	Location	Date	Screen Top Depth (ft)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH (SU[a])	Specific Conductance (µS/cm)	Temperature (deg C)	Turbidity (NTU[b])	Comments
S-Site Canyon	Martin Spring	08/29/2017	n/a	7.34	NM	7.4	329.9	18.7	6.4	
		02/23/2018	n/a	7.91	NM	6.85	350.8	7.8	3.1	
	MSC-16-06293	08/02/2017	2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/02/2018	2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
	MSC-16-06294	09/11/2017	2.5	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/10/2018	2.5	3.47	138.4	6.14	177.4	5.4	37.8	
Pajarito Canyon	Bulldog Spring	08/29/2017	n/a	8.24	n/a	7.68	251.4	13.7	3.9	
		02/21/2018	n/a	9.24	NM	7.75	269.3	6.7	2.9	
	Pajarito below S-N Ancho E Basin Confluence	09/06/2017	n/a	6.43	NM	7.88	189.7	16.8	2.3	
		02/13/2018	n/a	10.71	NM	7.86	142.5	5.4	7.7	
Water Canyon	Between E252 and Water at Beta	09/07/2017	n/a	7.68	NM	8.22	198.2	18.7	0.9	
		02/08/2018	n/a	11.28	NM	7.75	143.4	0	8.6	
	Water at Beta	09/08/2017	n/a	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/09/2018	n/a	NS	NS	NS	NS	NS	NS	Location dry
Fishladder Canyon	FLC-16-25280	08/02/2017	2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling
		02/02/2018	2	NS	NS	NS	NS	NS	NS	Insufficient water for sampling

[a] SU = Standard unit.

[b] NTU = Nephelometric turbidity unit.

[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.

Table 2.2-1
RDX Concentrations in Groundwater, Surface Water, and Springs

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	NMED Screening Value	Comments
Cañon de Valle 1	CDV-16-02656	CAWA-17-142894	3	09/01/2017	UF[b]	REG[c]	ND[d] (0.087)	7.02	
		CAWA-18-16	3	02/10/2018	UF	REG	ND (0.087)	7.02	
	CDV-16-02657r	NS[e]	1.35	09/01/2017	NS	NS	NS	7.02	Insufficient water for sampling
		NS	1.35	02/10/2018	NS	NS	NS	7.02	Location dry
	SWSC Spring	NS	n/a[f]	09/01/2017	NS	NS	NS	7.02	Insufficient water for sampling
		NS	n/a	02/10/2018	NS	NS	NS	7.02	Location dry
	Burning Ground Spring	CAWA-17-142892	n/a	09/01/2017	UF	REG	12	7.02	
		CAWA-18-10	n/a	02/10/2018	UF	REG	15	7.02	
Cañon de Valle 2	16-61439	CAWA-17-142890	n/a	09/15/2017	UF	REG	6.89	7.02	
		CAWA-18-28	n/a	02/16/2018	UF	REG	10.5	7.02	
	CDV-16-611923	NS	n/a	08/02/2017	NS	NS	NS	7.02	Insufficient water for sampling
		CAWA-18-22	3.2	02/16/2018	UF	REG	0.49	7.02	
		CAWA-18-125	3.2	02/16/2018	UF	FD[g]	0.53	7.02	
	CDV-16-611937	CAWA-17-142900	3	09/12/2017	UF	REG	ND (0.089)	7.02	
		CAWA-18-30	3	02/16/2018	UF	REG	0.09 J	7.02	
	Cañon de Valle below MDA P	NS	n/a	09/01/2017	NS	NS	NS	7.02	Insufficient water for sampling
		CAWA-18-2	n/a	02/10/2018	UF	REG	3.77	7.02	
	CDV-16-02659	CAWA-17-142895	1.7	09/14/2017	UF	REG	7.21	7.02	
		CAWA-18-20	1.7	02/10/2018	UF	REG	2.9	7.02	
S-Site Canyon	Martin Spring	CAWA-17-142905	n/a	08/29/2017	UF	REG	61.1	7.02	
		CAWA-18-12	n/a	02/23/2018	UF	REG	80.4	7.02	

Table 2.2-1 (continued)

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	NMED Screening Value	Comments
S-Site Canyon (cont.)	MSC-16-06293	NS	2	08/02/2017	NS	NS	NS	7.02	Insufficient water for sampling
		NS	2	02/02/2018	NS	NS	NS	7.02	Insufficient water for sampling
	MSC-16-06294	NS	2.5	09/11/2017	NS	NS	NS	7.02	Insufficient water for sampling
		CAWA-18-26	2.5	02/10/2018	UF	REG	ND (0.092)	7.02	
Pajarito Canyon	Bulldog Spring	CAPA-17-142933	n/a	08/29/2017	UF	REG	4.01	7.02	
		CAPA-18-2	n/a	02/21/2018	UF	REG	7.69	7.02	
		CAPA-18-12	n/a	02/21/2018	UF	FD	7.08	7.02	
	Pajarito below S&N Ancho E Basin Confluence	CAPA-17-142953	n/a	09/06/2017	UF	REG	ND (0.085)	7.02	
		CAPA-18-14	n/a	02/13/2018	UF	REG	0.09 J	7.02	
Water Canyon	Between E252 and Water at Beta	CAWA-17-142891	n/a	09/07/2017	UF	REG	ND (0.086)	7.02	
		CAWA-18-4	n/a	02/08/2018	UF	REG	ND (0.083)	7.02	
	Water at Beta	NS	n/a	09/08/2017	NS	NS	NS	7.02	Insufficient water for sampling
		NS	n/a	02/09/2018	NS	NS	NS	7.02	Location dry
Fishladder Canyon	FLC-16-25280	NS	2	08/02/2017	NS	NS	NS	7.02	Insufficient water for sampling
		NS	2	02/02/2018	NS	NS	NS	7.02	Insufficient water for sampling

Note: (0.087) = Method detection limit.

[a] QC = Quality control.

[b] UF = Unfiltered sample.

[c] REG = Regular.

[d] ND = Not detected.

[e] NS = Not sampled.

[f] n/a = Not applicable.

[g] FD= Field duplicate.

Table 2.2-2
Barium Concentrations in Groundwater, Surface Water, and Springs

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC Type[a]	Result (µg/L)	Screening Value	Comments
Cañon de Valle 1	CDV-16-02656	CAWA-17-142859	3	09/01/2017	F[b]	REG[c]	1850	1000	
		CAWA-18-15	3	02/10/2018	F	REG	1520	1000	
	CDV-16-02657r	NS[d]	1.35	09/01/2017	NS	NS	NS	1000	Insufficient water for sampling
		NS	1.35	2/10/2018	NS	NS	NS	1000	Location dry
	SWSC Spring	NS	n/a[e]	09/01/2017	NS	NS	NS	1000	Insufficient water for sampling
		NS	n/a	02/10/2018	NS	NS	NS	1000	Location dry
	Burning Ground Spring	CAWA-17-142857	n/a	09/01/2017	F	REG	236	1000	
		CAWA-18-9	n/a	02/10/2018	F	REG	502	1000	
Cañon de Valle 2	16-61439	CAWA-17-142855	n/a	09/15/2017	F	REG	3730 J[f]	1000	
		CAWA-18-27	n/a	02/16/2018	F	REG	2960	1000	
	CDV-16-611923	NS	3.2	08/02/2017	NS	NS	NS	1000	Insufficient water for sampling
		CAWA-18-21	3.2	02/16/2018	F	REG	5050	1000	
		CAWA-18-122	3.2	02/16/2018	F	FD[g]	5340	1000	
	CDV-16-611937	CAWA-17-142865	3	09/12/2017	F	REG	2390	1000	
		CAWA-18-29	3	02/16/2018	F	REG	1340	1000	
	Cañon de Valle below MDA P	NS	n/a	09/01/2017	NS	NS	NS	1000	Insufficient water for sampling
		CAWA-18-2	n/a	02/10/2018	UF[h]	REG	1910	1000	
		CAWA-18-1	n/a	02/10/2018	F	REG	1890	1000	
	CDV-16-02659	CAWA-17-142860	1.7	09/14/2017	F	REG	4940	1000	
		CAWA-18-19	1.7	02/10/2018	F	REG	4010	1000	
S-Site Canyon	Martin Spring	CAWA-17-142870	n/a	08/29/2017	F	REG	141	1000	
		CAWA-18-11	n/a	02/23/2018	F	REG	158	1000	
	MSC-16-06293	NS	2	08/02/2017	NS	NS	NS	1000	Insufficient water for sampling
		NS	2	02/02/2018	NS	NS	NS	1000	Insufficient water for sampling
	MSC-16-06294	NS	2.5	09/11/2017	NS	NS	NS	1000	Insufficient water for sampling
		CAWA-18-25	2.5	02/10/2018	F	REG	134	1000	

Table 2.2-2 (continued)

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field Prep	Field QC[a] Type	Result (µg/L)	Screening Value	Comments
Pajarito Canyon	Bulldog Spring	CAPA-17-142931	n/a	08/29/2017	F	REG	68	1000	
		CAPA-18-1	n/a	02/21/2018	F	REG	75.4	1000	
		CAPA-18-10	n/a	02/21/2018	F	FD	75.6	1000	
	Pajarito below S&N Ancho E Basin Confluence	CAPA-17-142952	n/a	09/06/2017	F	REG	56.2	1000	
		CAPA-17-142953	n/a	09/06/2017	UF	REG	57.5	1000	
		CAPA-18-13	n/a	02/13/2018	F	REG	38.5	1000	
		CAPA-18-14	n/a	02/13/2018	UF	REG	41	1000	
Water Canyon	Between E252 and Water at Beta	CAWA-17-142891	n/a	09/07/2017	UF	REG	76.3	1000	
		CAWA-17-142856	n/a	09/07/2017	F	REG	78.3	1000	
		CAWA-18-4	n/a	02/08/2018	UF	REG	52.1	1000	
		CAWA-18-3	n/a	02/08/2018	F	REG	48.9	1000	
	Water at Beta	NS	n/a	09/08/2017	NS	NS	NS	1000	Insufficient water for sampling
		NS	n/a	02/09/2018	NS	NS	NS	1000	Location dry
Fishladder Canyon	FLC-16-25280	NS	2	08/02/2017	NS	NS	NS	1000	Insufficient water for sampling
		NS	2	02/02/2018	NS	NS	NS	1000	Insufficient water for sampling

[a] QC = Quality control.

[b] F = Filtered sample.

[c] REG = Regular.

[d] NS = Not sampled.

[e] n/a = Not applicable.

[f] J = Analyte detected, concentration value is expected to be more uncertain than usual.

[g] FD = Field duplicate.

[h] UF = Unfiltered sample.

Table 2.2-3
Analytes Exceeding Screening Values

Canyon	Location	Sample	Depth to Top of Screen (ft)	Date	Field QC[a] Type	Analyte	Analyte Code	Result (µg/L)	MDL[b]	RDL[c]	Screening Value	Field Prep Code	Reporting Level Code	Result/Screening Value
Cañon de Valle 2	CDV-16-611937	CAWA-18-29	3	02/16/2018	REG[d]	Iron	Fe	11,700	30	100	1000	F[e]	NMWQCC[f]	11.7
	CDV-16-611937	CAWA-17-142865	3	09/12/2017	REG	Iron	Fe	4690	30	100	1000	F	NMWQCC	4.69
	CDV-16-611937	CAWA-18-29	3	02/16/2018	REG	Manganese	Mn	1880	2	10	200	F	NMWQCC	9.4
	CDV-16-611937	CAWA-17-142865	3	09/12/2017	REG	Manganese	Mn	1850	2	10	200	F	NMWQCC	9.25
S-Site Canyon	Martin Spring	CAWA-17-142870	n/a[g]	8/29/2017	REG	Boron	B	934	15	50	750	F	NMWQCC	1.267
	Martin Spring	CAWA-18-11	n/a	02/23/2018	REG	Boron	B	984	15	50	750	F	NMWQCC	1.312

[a] QC = Quality control.

[b] MDL = Method detection limit.

[c] RDL = Report detection limit.

[d] REG = Regular.

[e] F = Filtered.

[f] NMWQCC = New Mexico Water Quality Control Commission.

[g] n/a = Not applicable.

Appendix A

Field Forms Associated with Sample Collection

August/September 2017 Field Forms

9-7-2017 Between E25z & Water at Beta

159

ATTACHMENT 2

SOP-5224.2

9-7-2017

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Between E25z & water @ Beta	**Date:** 9-7-2017	**Onsite time:** 0920 MST
Objective: Sample per documentation found on Pg. 3		**Weather:** Partly cloudy; Temp: in 70's
Sampling crew: T. Bonham, K. Tow & M. Shendo		
Two-minute safety drill: Poison Ivy, uneven & loose hiking surfaces		
Meters calibrated at (location) SMO	**by** (whom) K. Tow	**at** (time) 0630
YSI Meter number: 60	**Turbidimeter serial number:** NA	
Sample Retrieval Date: 9-7-2017	Time: 9/7/17TB FB 0931	Method: PP
Sample Event ID: 11390	**Sample ID Numbers:** CAWA-17-142891, 143010 & 142856	

FIELD PARAMETERS

pH (su): 8.22	Sp. Cond. (µS/cm): 198.2	Turbidity (NTU): 0.9
Temperature (°C): 18.7	DO (mg/L): 7.68	Q (gpm): 13.46

Explanation of Q method, including calculations: 3" Modified Parshall Flume

GHT = 0.10 = 0.030 cfs × [448.83] = 13.46 GPM

Note: To convert cfs to gpm, multiply cfs by 448.83

Contact waste: ½ gal

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): NA				
Description of Sampling Site:	Pool	Riffle	Eddy	Diffuse	Other	
	Written description: NA					
Substrate:	Bedrock	Concrete	Cobble	Gravel	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	Gray	Other (specify):
Description of flow:	Turbulent	Laminar	Recirculating	Stagnant	Other	
	Written description: NA					

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓			Units: ↓
Photo #1:	Description: Upstream	Facing: SW	Time: 0930	Taken by: T. Bonham	
Photo #2:	Description: down stream	Facing: SE	Time: ↓	Taken by:	
Photo #3:	Description: Source	Facing: SW	Time: ↓	Taken by:	

Other notes: M. Shendo conducts HE spot test: Results Negative
M. Shendo QA's samples; T. Bonham QA's

Offsite time: 1010 **Relinquish samples at SMO**, care of M. ~~Englert~~ 9-7-17TB Montoya at (time) 1115

Objectives met? Yes

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos NATIONAL LABORATORY

Site name: Burning Ground Spring	**Date:** 9-1-17	**Onsite time:** 0900 MST
Objective: Sample per applicable documentation and SOP		**Weather:** 70's and sunny
Sampling crew: T. Vander Vis, M. Shendo		
Two-minute safety drill: Safe driving, hiking on uneven surfaces		
Meters calibrated at (location) SMO	**by** (whom) T. Vander Vis	**at** (time) 0630
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval	**Date:** 9-1-17	**Time:** 0919	**Method:** PP
Sample Event ID: 11390	**Sample ID Numbers:** CAWA-17-142857, -142892, -143012	

FIELD PARAMETERS

pH (su): 7.23	Sp. Cond. (µS/cm): 193.8	Turbidity (NTU): 1.7
Temperature (°C): 13.1	DO (mg/L): 8.32	Q (gpm): 4.42gpm

Explanation of Q method, including calculations: manually with a graduated cup

$\frac{4.18L}{15sec} \times 4 = \frac{16.72L}{1\,min} \times \frac{1\,gal}{3.785L} = 4.42\,gpm$

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): pool at source			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other
	Written description: none				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(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	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: none				

Photos and GPS

GPS point #1:	Name:	Coordinates: TV 9-1-17		~~Units:~~
~~**GPS point #2:**~~	~~Name:~~ TV 9-1-17	Coordinates:		Units:
Photo #1:	Description: Downstream	Facing: ~~SW~~ NE TV 9-1-17	Time: 0915	Taken by: TV
Photo #2:	Description: Source	Facing: NE	Time: ↓	Taken by: ↓
Photo #3:	Description: upstream	Facing: SW	Time: ↓	Taken by: ↓

Other notes: HE spot test yields negative results

Offsite time: 1000 MST	**Relinquish samples at SMO**, care of M. Englert at (time) 1206 TV 9-1-17
Objectives met? yes	

144

TV 8-29-17

Martin Spring

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos NATIONAL LABORATORY

Site name: Martin Spring	**Date:** 8-29-17	**Onsite time:** 1202 MST
Objective: sample site per SOPs and applicable docs.		**Weather:** 70's, sunny
Sampling crew: T. VanderVis, D. Jaramillo, W. Pryce		
Two-minute safety drill: safe hiking, uneven surfaces		
Meters calibrated at (location) TV 8-29-17 50 SMO **by** (whom) K. Tow		**at** (time) 0630 MST
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 8-29-17	**Time:** 1241 MST	**Method:** PP
Sample Event ID: 11390	**Sample ID Numbers:** CAWA-17-142870, -142905, -143013	

FIELD PARAMETERS

pH (su): 7.40	Sp. Cond. (µS/cm): 329.9	Turbidity (NTU): 6.4
Temperature (°C): 18.7	DO (mg/L): 7.34	Q (gpm): 0.71

Explanation of Q method, including calculations: manually measured from flow from weirbox with graduated cup

$(450\,mL/10\,secs)(6) = (2700\,mL/min)(\frac{1\,gal}{3785\,mL}) = 0.71\,gpm$

Contactwaste: 1/2 gal

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): weirbox			
Description of Sampling Site:	Pool	Riffle	Eddy	Diffuse	(Other)
	Written description: weirbox				
Substrate:	Bedrock	Concrete	Cobble	Gravel	(Sand) (Mud)
Stage Conditions:	Stable: (normal) / low / high		Falling	Rising	Other (specify): NA
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify): NA
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify): NA
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: none				

Photos and GPS

GPS point #1:	Name:	Coordinates: TV 8-29-17		Units:
GPS point #2:	~~Name:~~	Coordinates:		Units:
Photo #1:	Description: Source	Facing: E	Time: 1219	Taken by: TV
Photo #2:	Description: downstream	Facing: S	Time: ↓	Taken by: ↓
Photo #3:	Description: upstream	Facing: E	Time: ↓	Taken by: ↓

Other notes: HE test yields negative results, received FTB with broken custody seal, sample was approved by SMO personel to use.

Offsite time: 1300 MST **Relinquish samples at SMO**, care of M. Montoya at (time) 1330 MST

Objectives met? yes

TV 8-29-17

114

Groundwater Sampling Log

IFWO: MY2017 Q: 4	LSD: 7443.18 ft. msl	Well Diameter: 2 inches	Date: 9-1-2017	
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 5.30 ft. BTOC	Notes:	
Well: CdV-16-02656	*TD: = mTD = 11.0' BTOC	Bottom of Screen: 11.0 ft BTOC	NONE	
Sampling Device: PP	*DTW: 7.18' BTOC	Water Column: 3.82 ft.		
Measuring Point: ft. BTOC	Drop Pipe: NA gal.	1CV: 0.62 gal.	Packer Pressure	
* Completion Depth: TD		3CV: 1.86 gal.	Before: ______ psi	
[ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	2.30 ft.	Actuation: ______ psi	
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: ______ psi	
			After: ______ psi	

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTOC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
~~0958~~ 1000	Pump on water to Surface @ Q=0.066PM									
1002	6.69	15.1	200.9	3.71	588.1	N	66.7	7.38	0.06	dark orange w/ Particulate matter & odorless
1005	6.51	14.5	193.6	2.30	315.1			71.3	7.47	0.06	
1008	6.50	14.7	187.8	2.08	53.0		132.4	7.55	0.06	cloudy w/ slight orange hue & odorless
1011	6.50	14.6	186.0	2.00	12.5		153.0	~~7.76~~ 7.60	0.06	slightly cloudy & odorless
1014	6.49	14.6	185.6	1.89	8.1		162.8	7.65	0.06	clear & odorless
1017	6.49	14.5	185.6	1.82	6.5		171.4	7.70	0.06	
1020	6.49	14.5	185.6	1.84	5.8	↓	180.2	7.75	0.06	↓
1020	Pause pump; over 3cv's purged & Parameters stable									
1022	Pump on; begin sampling									
1058	Sample complete; pump off									

9-1-2017

Yes in HACH column = HACH Turbidimeter # NA used because NA		Final Water Level: 7.95 ft BTOC
Contact Waste: 1/2 gal.	Drum#: Municipal	
*Purge Water: 1.08 gal.	Drum#'s: 0980 HE NH/NR 1550 gallon Tank	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water: 1.10 gal.		

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

9-1-2017

Well Name: CdV-16-02656

Date: 9-1-2017

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / Manual	Drop Pipe: NA 3 CVs: 1.86	NA	1.08	1.74	(Y) N	Purged an extra 0.74 cv's for stability in Turbidity & SC

	Stable for three consecutive readings?				Comments:
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%,	
1014	6.49	1.89	185.6	6.1	
1017	6.49	1.82	185.6	6.5	
1020	6.49	1.84	185.6	5.8	
Calculations:	Highest: 6.49	Highest: 1.89	Median: 185.6	Median: 6.5	NONE
	Lowest: 6.49	Lowest: 1.82	Median + 3 %: 191.1	Median + N/A%: <10	
	Difference: 0.00	Difference: 0.07	Median - 3 %: 180.1	Median - N/A%: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NONE

9-1-2017

Groundwater Sampling Log

IFWGMP MY: 2017 Q: 4	LSD: 7300.50'msl ft. msl	Well Diameter: 4 inches	Date: 9-14-2017
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 4.94 ft. BToC	Notes:
Well: CdV-16-02659	*TD: = mTD = 10.85' BToC	Bottom of Screen: 9.94 ft. BToC	NONE
Sampling Device: PP	*DTW: 9.39' BToC	Water Column: 1.46 ft.	
Measuring Point: ft. BToC	Drop Pipe: NA gal.	1CV: 0.95 gal.	Packer Pressure
* Completion Depth: TD		3CV: 2.85 gal.	Before: _____ psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.24 ft.	Actuation: 9/14/2017 psi
DTW = (LSD - Water Level)..... Water Column = (TD - DTW)..... Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: _____ psi
			After: _____ psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BToC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0921	Pump on; water to surface @ 0.06 GPM									
0923	6.88	15.1	303.3	6.17	14.9	N	205.9	9.49	0.06	slightly cloudy & odorless
0926	6.63	13.4	302.0	~~6.17~~ 9/14/17 6.98	8.4		227.4	9.54		
0929	6.62	13.3	301.9	6.04	4.9		237.6	9.58		clear & odorless
0932	6.61	13.3	301.8	6.09	2.4		246.8	9.62		
0935	6.60	13.3	301.8	6.11	1.6		253.8	9.65		
0938	6.59	13.2	302.0	6.12	1.6		259.5	9.68		
0938	Pump paused; lcv purged & parameters stable (Prepare to sample)									
0939	Begin sampling pump on.									
1016	Sample complete; pump off									

9/14/2017

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2	gal.	Drum#: Municipal	
*Purge Water: 1.02	gal.	Drum#'s: 0980	1550 gallon tank
Total Waste Water: 1.04	gal.		

Final Water Level: 10.13 ft. BToC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

24

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

9/14/2017

Well Name: Cdv-16-02659

Date: 9-14-2017

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 2.85	NA	1.02	1.07	(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%,	Comments:
0932	6.61	6.09	301.8	2.4	
0935	6.60	6.11	301.8	1.8	
0938	5.59	6.12	302.0	1.6	
Calculations: Highest:	6.61	6.12	Median: 301.8	Median: 1.8	NONE
Lowest:	5.59	6.09	Median + 3 %: 310.8	Median + 10%: <10	
Difference:	0.02	0.03	Median - 3 %: 292.8	Median - 10%: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NONE

9/14/2017

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity:	
CdV-16-02659	9-14-2017	0855	Sample	
Personnel: T. Benham, N. Steele & D. Hughes			Cable Length(ft): 10 ft	Cable SN: 236863
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: 84
Connect Time: 0856	Transducer SN: 381373	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): 7294.33		P (psi): 0.56	T (C): 12.42	Stop Test: Yes \ (No)	Change Desicant: Yes \ (No) \ NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☒

Time (MST):	0906	Water Level Meter Serial No.: 34744		**Notes:** NA
DTW (ft bMP):	9.39' btoc	Measurements in feet		
Time (MST):	0909	LSD ft	7300.50' msl	
DTW (ft bMP):	9.39' btoc	MP Height ft.	+ 3.24'	
Time (MST): 9/14/17		MP Elevation	= 7303.74' msl	
DTW (ft bMP):		DTW:	- 9.39' btoc	
Time (MST):	0914	Groundwater Elevation (GWE) Reference Level	7294.35' msl	
TD (ft bMP):	10.85			
		Zip Tie on Keilin's Grip: NO		

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth: 9/14/2017			
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft 100 PSI-0.23 ft 500 PSI-1.16 ft		Synch Clocks: Yes \ (No)			
Deleted Tests: NA					QA Date and Initial:

12

Daniel Sarabia 9/11/17

Groundwater Sampling Log

IFWGMP MY: 2017 Q: Q4	LSD: 7288.94 ft. msl	Well Diameter: 4" Inches	Date: 9/11/17
Watershed: Water/CDV	Water Level: NA ft. msl	Top of Screen: 5.51 ft.BTIC	Notes:
Well: MSC-16-062514	*TD: MTD = 11.06 'BTIC	Bottom of Screen: 10.37 ft.BTIC	None
Sampling Device: PP	*DTW: 10.40 'BTIC	Water Column: 0.66' ft.	
Measuring Point: BTIC	Drop Pipe: NA gal.	1CV: 0.43 gal.	Packer Pressure
* Completion Depth: MTD		3CV: 1.29 gal.	Before: NA psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.07 ft.	Actuation: psi
DTW = (LSD - Water Level)..... Water Column = (TD - DTW)..... Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤0.3 mg/l variance	<10 or ± 10%					
0951	Pump on, Water to Surface								.06	
0954	6.43	15.9	196.9	2.44	234.8	N	-2.9	10.68	.06	cloudy/odor
0957	6.36	15.5	191.7	2.16	185.9		-12.2	10.99	.06	↓
0957	Pump paused / well purged dry							10.99	NA	well purged Dry
10:15	NA	NA	NA	NA	NA	N	NA	10.99	↓	checking for recharge
10:20	↓	↓	↓	↓	↓	↓	↓	10.99		↓
10:35								10.99		
10:45								10.99		
10:50								10:99		↓
10:57	↓	↓	↓	↓	↓	↓	↓	10.99	↓	NO observable recharge
				Daniel Sarabia 9/11/17						

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste:	1/2	gal.	Drum#: 1017907	75 gal	Final Water Level: 10.99 ft BTIC
*Purge Water:	0.36	gal.	Drum#'s: 0962	1550 gal	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water:	0.36	gal.			

Daniel Sarabia 9/11/17

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST)	Activity	
MSC-16-06294	9-11-2017	0925	Sample well	
Personnel: T. Bonham, D. Hughes, K. Tow, D. Jaramillo & C. Wilder			Cable Length(ft): 20	Cable SN: 236866
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN: NA	Memory % remaining: NA	Battery % remaining: 86
Connect Time: 0929	Transducer SN: 398461	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA / Log Note Battery %: NA
Water Level (ft): 2.46'		P (psi): 0.20	T (C): 14.32	Stop Test: Yes \ No / Change Desicant: Yes \ No \ NA
Last Start Date: NA		Data File Name: NA		

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) / TIC (inner) | Stick-up Measured on Site ☐ | Previous MP Used ☑

Time (MST)	0929	Water Level Meter Serial No. 34244	**Notes:** NA
DTW (ft bMP)	10.40' bTIC	Measurements in feet	
Time (MST)	0932	LSD ft: 7288.44' msl	
DTW (ft bMP)	10.40' bTIC	MP Height ft: + 3.07	
Time (MST)	9-11-17	MP Elevation: = 7291.51' msl	
DTW (ft bMP)		DTW: - 10.40' bTIC	
Time (MST)	0932	Groundwater Elevation (GWE) Reference Level: 7281.11' msl	
TD (ft bMP)	11.06' bTIC		
NA	NA	Zip Tie on Keilim's Grip: No	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name:			
GWE from MM		Reference Level: 9-11-2017			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests: NA					QA Date and Initial

146 KT 9/15/17

PRB Alluvial Seep

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

(16-61439)

Site name: PRB Alluvial Seep	**Date:** 9/15/17	**Onsite time:** 0836 MST	
Objective: Sample spring per SOPs + reference data		**Weather:** Sunny 70s	
Sampling crew: D. Hughes, K. Tow, M. Shendo, D. Jaramillo			
Two-minute safety drill: uneven ground, heavy equipment			
Meters calibrated at (location) ~~SMO~~ ~~SMO~~ KT 9/15/17 **by** (whom) M. Shendo **at** (time) 1230 PM 9/14/17			
YSI Meter number: 60	**Turbidimeter serial number:** #3		
Sample Retrieval **Date:** 9/15/17	**Time:** 0839	**Method:** PP	
Sample Event ID: 11390	**Sample ID Numbers:** CAWA-17-142890, 142855, 143021		

FIELD PARAMETERS

pH (su): 6.62	Sp. Cond. (µS/cm): 214.5	Turbidity (NTU): 8.7
Temperature (°C): 13.1	DO (mg/L): 7.43	Q (gpm): 0.44

Explanation of Q method, including calculations: timed measured volume in measuring cup

Contact waste: 1.0 gal

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):~~ KT 9/15/17			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other
	Written description: —				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(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	Gray Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: —				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name: ↓	Coordinates: ↓ 9/15/17			Units: ↓
Photo #1:	Description: Downstream	Facing: ~~SW~~ NE	Time: 0840	Taken by: D. Hughes	
Photo #2:	Description: Upstream	Facing: SW	Time: ↓	Taken by: ↓	
Photo #3:	Description: —	Facing: —	Time: —	Taken by: —	

Other notes: Hc spot test was negative, D. Jaramillo preserves all samples, M. Shendo QAs

Offsite time: 1207 **Relinquish samples at SMO**, care of M. Englert at (time) 1230

Objectives met? Yes

KT 9/15/17

17

09-12-2017

CdV-16-611937, pg. 1/3

Groundwater Sampling Log

IFWGMP MY: 2017 Q: 4	LSD: 7359.59 ft. msl	Well Diameter: 2 inches
Watershed: Water-CdV	Water Level: N/A ft. msl	Top of Screen: 6.0 ft. BTIC
Well: CdV-16-611937	*TD: = mTD = 11.55' BTIC	Bottom of Screen: 11.0 ft. BTIC
Sampling Device: PP	*DTW: 7.34' ~~7.30'~~ BTIC	Water Column: 4.21 ft.
Measuring Point: TIC	Drop Pipe: NA gal.	1CV: 0.69 gal.
* Completion Depth: mTD		3CV: 2.07 gal.

Date: 09-12-2017
Notes: IZ in Screened interval

Packer Pressure (struck through, DH 09-12-17)
Before: ___ psi
Actuation: ___ psi
Opening: ___ psi
After: ___ psi

[* ft. BTOC / BTIC / BGS / MSL] Note MP height (stickup) of TOC/TIC for Alluvials 3.0 ft.

DTW = (LSD - Water Level)......Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
12:44	Pump on; water to surface									
12:47	6.39	13.7	240.3	2.18	55.0	N	17.1	7.82	0.06	yellowish murk, slight odor
12:50	6.35	13.2	234.1	1.07	35.5	N	37.7	8.45	0.06	clearing, lessening of odor
12:53	6.35	13.3	232.2	1.09	22.0	N	44.4	8.82	0.06	odorless, clearing
12:56	6.37	13.3	234.4	1.11	16.0	N	12.2	8.93	—	|
12:59	6.43	13.1	234.5	1.00	10.6	N	0.5	9.15	0.06	odorless, clear
13:02	6.45	13.0	231.8	0.89	8.0	N	-3.5	9.24	—	|
13:05	6.49	12.9	227.1	0.81	6.2	N	-6.1	9.33	0.06	|
13:08	6.51	12.9	221.8	0.76	4.9	N	-8.4	9.40	|	|
13:09	Pause pump to begin sampling; ≥1 CV's purged + Parameters stable									
13:10	Begin sampling									
13:42	Sampling complete; pump off.									

DH 09-12-17

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 1/2 gal.	Drum#: munizipal	Final Water Level: 9.65 ft BTIC
*Purge Water: 1.50 gal.	Drum#'s: 1550-gal consolidation poly tank #0980 for HENH/NR @ Sigma	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
Total Waste Water: 1.55 gal.		

18

09-12-2017

CdV-16-611937, pg. 3/3

DTH 09-12-2017

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: CdV-16-611937

Date: 09-12-2017

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / (Manual)	Drop Pipe: NA 3 CVs: 2.07	NA	1.50	2.17	(Y) N	None

Parameters collected at proper intervals? (HH:MM)	Stable for three consecutive readings? pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
13:02	6.45	0.89	231.8	8.0	None
13:05	6.49	0.81	227.1	6.2	
13:08	6.51	0.76	221.8	4.9	
Calculations:	Highest: 6.51	Highest: 0.89	Median: 227.1	Median: 6.2	
	Lowest: 6.45	Lowest: 0.76	Median +3 %: 233.9	Median +44 %: <10	
	Difference: 0.06	Difference: 0.13	Median -3 %: 220.3	Median -44 %: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	None

DTH 09-12-2017

158
9-6-2017 Paj. Bel S&N Ancho E. Basin cont.

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY EST 1943

9-6-2017

Spring/Surface Water Sampling Field Data Sheet

Site name: Paj bel S&N Anc E basin cont	**Date:** 9-6-2017	**Onsite time:** 0952 MST
Objective: Sample per reference does. on pg. 3		**Weather:** Sunny & Temp in 70's
Sampling crew: T. Bonham, D. Jaramillo, M. Shenko & A. Stanfield		
Two-minute safety drill: Hiking on uneven surfaces & steep surfaces		
Meters calibrated at (location) SMO	**by** (whom) T. VanderVis	**at** (time) 0630
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 9-6-2017	**Time:** 0956	**Method:** PP
Sample Event ID: 11390	**Sample ID Numbers:** CAWA-17-143005, 142952, 142953 & 142958	

FIELD PARAMETERS

pH (su): 7.88	Sp. Cond. (µS/cm): 189.7	Turbidity (NTU): 2.3
Temperature (°C): 16.8	DO (mg/L): 6.43	Q (gpm): 17.95

Explanation of Q method, including calculations: 3" modified Parshall Flume
GHT = 0.12' = 0.040 CFS x [448.83] = [17.95 GPM]

Contact waste: 1/2 gal

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): NA			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: NA				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	(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	Gray Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA	
GPS point #2:	Name: ↓	Coordinates: ↓		Units: ↓	
Photo #1:	Description: VSPstream	Facing: W	Time: 1015	Taken by: T. Bonham	
Photo #2:	Description: Source	Facing: W	Time: ↓	Taken by:	
Photo #3:	Description: down stream	Facing: E	Time: ↓	Taken by:	

Other notes: D. Jaramillo conducts HE SPOT test Results negative
A. Stanfield Preserves; D. Jaramillo QA's

Offsite time: 1025 **Relinquish samples at SMO**, care of M. Englert at (time) 1140

Objectives met? Yes

9-6-2017

TV 8-29-17

Bulldog Spring

143

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Bulldog Spring (TV 8-29-17)	**Date:** 8-29-17	**Onsite time:** 0927 MST
Objective: Sample site per SOPs and applicable doc.		**Weather:** 70's Sunny
Sampling crew: T. VanderVis, D. Jaramillo, W. Pryce		
Two-minute safety drill: Safe hiking, snakes, uneven surfaces		
Meters calibrated at (location) SMO	**by** (whom) K. Tow	**at** (time) 0630 MST
YSI Meter number: 50	**Turbidimeter serial number:** NA	
Sample Retrieval	**Date:** 8-29-17	**Time:** 0935 MST **Method:** PP
Sample Event ID: 11390	**Sample ID Numbers:** CAPA-17 -142931, -142933, -143006	

FIELD PARAMETERS

pH (su): 7.68	Sp. Cond. (µS/cm): 251.4	Turbidity (NTU): 3.9
Temperature (°C): 13.7	DO (mg/L): 8.24	Q (gpm): 2.03gpm

Explanation of Q method, including calculations: 3" parshall flume channelized 90% of flow, timed flow into graduated cup

(1280mL/10sec) x6 = (7680mL/min x 1gal/3785mL) = 2.03gpm (TV 8-29-17)

Contact waste: 1/2 gal

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): Small, flowing pool below source				
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other	
	Written description: Small, flowing pool below source					
Substrate:	Bedrock	Concrete	Cobble	(Gravel)	(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	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other	
	Written description: NA					

Photos and GPS

GPS point #1:	Name:	Coordinates: TV 8-29-17		Units:
~~**GPS point #2:**~~	~~Name:~~	Coordinates:		Units:
Photo #1:	Description: Downstream	Facing: WE	Time: 0941	Taken by: TV
Photo #2:	Description: Upstream	Facing: S	Time: ↓	Taken by: ↓
Photo #3:	Description: Source	Facing: S	Time: ↓	Taken by: ↓

Other notes: HE spot test yeilds negative results, received FTB with broken custody seal, sample was approved by SMO personnel to use

Offsite time: 1035 MST **Relinquish samples at SMO**, care of M. Montoya at (time) 1330 MST

Objectives met? yes

TV 8-29-17

February 2018 Field Forms

CdV below MDA P 61

TV 2-13-18

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only — Los Alamos NATIONAL LABORATORY

Site name: CdV below MDA P	**Date:** 2-10-2018	**Onsite time:** 1320
Objective: Sample location per applicable documentation		**Weather:** partly cloudy, 40s
Sampling crew: M. Shendo, T. VanderVis, A. Vigil, K. Tow, W. Sanchez		
Two-minute safety drill: ice, safe hiking		
Meters calibrated at (location) SMO	**by** (whom) D. Jaramillo	**at** (time) 0730
YSI Meter number: 70	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** ~~1328~~ TV 2-10-18 2-10-18	**Time:** 1328	**Method:** PP
Sample Event ID: 11669	**Sample ID Numbers:** CAWA-18-2,-90,-1	

FIELD PARAMETERS

pH (su): 7.62	Sp. Cond. (µS/cm): 210.4	Turbidity (NTU): 1.1
Temperature (°C): 6.1	DO (mg/L): 9.62	Q (gpm): ~~0.21 gpm~~ TV 2-10-18 2.52 gpm

Explanation of Q method, including calculations:
manually in gal bag. 5 seconds $\frac{0.800L}{3.785} = 0.21 gpm \times 12$

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 Sampling Site:	Pool	Riffle	Eddy	Diffuse	Other
	Written description: ~~None~~ TV 2-10-18 pool in middle of flow				
Substrate:	Bedrock	Concrete	Cobble	Gravel	Sand Mud
Stage Conditions:	Stable: normal / low / high		Falling	Rising	Other (specify): NA
Hydraulic Event:	Routine	Snowmelt	Flood	Drought	Other (specify):
Stream Color:	Brown	Clear	Green	Blue	Gray Other (specify):
Description of flow:	Turbulent	Laminar	Recirculating	Stagnant	Other
	Written description: none				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA			Units: NA
GPS point #2:	Name:	Coordinates:			Units:
Photo #1:	Description: NA	Facing: NA	Time: NA		Taken by: NA
Photo #2:	Description:	Facing:	Time:		Taken by:
Photo #3:	Description:	Facing:	Time:		Taken by:

Other notes: Crew samples at location 20 ft. upstream of previous sample location due to ice. HE spot test results negative. T. VanderVis ~~QA~~ TV 2-13-18 preserves samples, A. Vigil QAs. Contact waste: ½ gal.

Offsite time: 1420 **Relinquish samples at SMO**, care of R. Unstatt at (time) 2940 2-13-18

Objectives met? Y/S

TV 2-13-18

Between EZ5Z & Water @ Beta

85

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos NATIONAL LABORATORY

Site name: Between EZ5Z & Water	**Date:** 2-8-2018	**Onsite time:** 1015 MST
Objective: Sample per SOPs on pg. 3		**Weather:** Sunny & clear w temps in 40-50's
Sampling crew: T. Bonham, M. Shenda, A. Stanford & T. Vander Vis		
Two-minute safety drill: Hiking on uneven surfaces		
Meters calibrated at (location): SMO	**by (whom):** T. Vander Vis	**at (time):** 0730
YSI Meter number: 70	**Turbidimeter serial number:** NA	
Sample Retrieval	**Date:** 2-8-2018	**Time:** 1025
Method: PP(Filtered), DC(Unfiltered)		
Sample Event ID: 11669	**Sample ID Numbers:** CAWA-18-4, 18-3 & 18-91	

FIELD PARAMETERS

pH (su): 7.75	Sp. Cond. (µS/cm): 143.4	Turbidity (NTU): 8.6
Temperature (°C): 0.0	DO (mg/L): 11.28	Q (gpm): 40.39

Explanation of Q method, including calculations: 3" Modified Parshall Flume

GHT = 0.20" = 0.090 CFS X 448.83 = 40.396 GPM

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): Had to break top layer of ice			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: NA				
Substrate:	(Bedrock)	Concrete	(Cobble)	(Gravel)	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	Gray / Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA
GPS point #2:	Name: NA	Coordinates: NA		Units: NA
Photo #1:	Description: Upstream	Facing: SW	Time: 1030	Taken by: T. Bonham
Photo #2:	Description: Down stream	Facing: SE	Time:	Taken by:
Photo #3:	Description: Sample location	Facing: SE	Time:	Taken by:

Other notes: Note! MShenda conducts HE spot test; Results = negative

T. Vander Vis Preserves samples / T. Bonham QA's

Offsite time: 1055 **Relinquish samples at SMO, care of** M. Enger **at (time):** 1340

Objectives met? Yes

77

Burning Ground Spring

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only

Los Alamos National Laboratory

Site name: Burning Ground Spring	**Date:** 2-10-2018	**Onsite time:** 0925 MST	
Objective: Sample per all applicable reference docs.		**Weather:** Sunny & Clear w/ temps in 30s	
Sampling crew: T. Bonham, A. Stocker & D. Jaramillo			
Two-minute safety drill: Hiking on uneven surfaces & PPE			
Meters calibrated at (location) SMO	**by** (whom) K. JTW	**at** (time) 0615	
YSI Meter number: 50	**Turbidimeter serial number:** NA		
Sample Retrieval	**Date:** 2-10-2018	**Time:** 0935	**Method:** PP
Sample Event ID: 11669	**Sample ID Numbers:** CAWA-18-10, 18-19 & 18-93		

FIELD PARAMETERS

pH (su): 7.57	Sp. Cond. (µS/cm): 203.6	Turbidity (NTU): 2.3
Temperature (°C): 10.2	DO (mg/L): 8.41	Q (gpm): 4.28

Explanation of Q method, including calculations:

$\frac{2.8L}{10sec} \times 6 = \frac{16.2L}{1min} \times \frac{1gal}{3.785L} = 4.28gal$

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): NA			
Description of Sampling Site:	(Pool)	Riffle	Eddy	Diffuse	Other	
	Written description: Small pool @ source					
Substrate:	Bedrock	Concrete	Cobble	(Gravel)	(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	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other	
	Written description: NA					

Photos and GPS

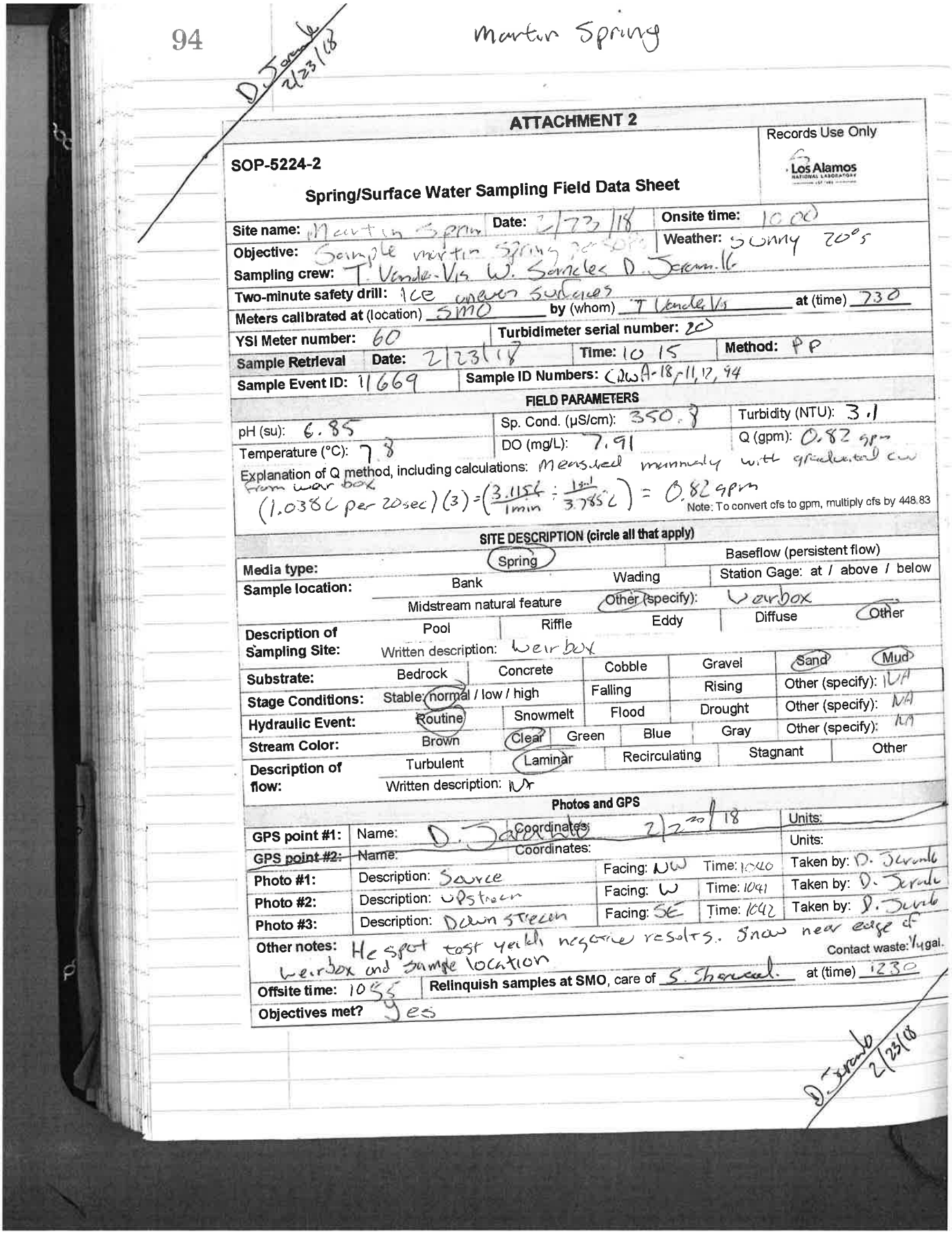
GPS point #1:	Name: NA	Coordinates: NA		Units: NA	
GPS point #2:	Name: ↓	Coordinates: ↓		Units: ↓	
Photo #1:	Description: Above Source	Facing: SW	Time: 0935	Taken by: T. Bonham	
Photo #2:	Description: Source	Facing: SW	Time: ↓	Taken by: ↓	
Photo #3:	Description: Below Source	Facing: NE	Time: ↓	Taken by: ↓	

Other notes: He spot test conducted by D. Jaramillo, Results = negative
Samples preserved by A. Stocker, QA by D. Jaramillo

Contact waste: ½ gal

Offsite time: 1010 **Relinquish samples at SMO**, care of S. Sherman at (time) 0935

Objectives met? Yes



94

Martin Spring

D. Jaramillo 2/23/18

ATTACHMENT 2

SOP-5224-2

Spring/Surface Water Sampling Field Data Sheet

Records Use Only — Los Alamos National Laboratory

Site name: Martin Spring	**Date:** 2/23/18	**Onsite time:** 1000	
Objective: Sample martin spring per SOP		**Weather:** sunny 20°s	
Sampling crew: T. Vande-Vis W. Sanchez D. Jaramillo			
Two-minute safety drill: ice uneven surfaces			
Meters calibrated at (location) SMO	**by** (whom) T Vande Vis	**at** (time) 730	
YSI Meter number: 60	**Turbidimeter serial number:** 20		
Sample Retrieval	**Date:** 2/23/18	**Time:** 1015	**Method:** PP
Sample Event ID: 11669	**Sample ID Numbers:** CdVA-18-11, 12, 94		

FIELD PARAMETERS

pH (su): 6.85	Sp. Cond. (µS/cm): 350.8	Turbidity (NTU): 3.1
Temperature (°C): 7.8	DO (mg/L): 7.91	Q (gpm): 0.82 gpm

Explanation of Q method, including calculations: Measured manually with graduated cup from weir box

$(1.038\text{L per } 20\text{sec})(3) = \left(\frac{3.115\text{L}}{1\text{min}} \div \frac{1\text{gal}}{3.785\text{L}}\right) = 0.82\text{ gpm}$

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): Weirbox)			
Description of Sampling Site:	Pool	Riffle	Eddy	Diffuse	(Other)
	Written description: Weirbox				
Substrate:	Bedrock	Concrete	Cobble	Gravel	(Sand) (Mud)
Stage Conditions:	Stable (normal) / low / high		Falling	Rising	Other (specify): NA
Hydraulic Event:	(Routine)	Snowmelt	Flood	Drought	Other (specify): NA
Stream Color:	Brown	(Clear)	Green	Blue	Gray	Other (specify): NA
Description of flow:	Turbulent	(Laminar)	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: D. Jaramillo	Coordinates: 2/23/18		Units:
GPS point #2: ~~Name:~~		Coordinates:		Units:
Photo #1:	Description: Source	Facing: NW	Time: 1040	Taken by: D. Jaramillo
Photo #2:	Description: upstream	Facing: W	Time: 1041	Taken by: D. Jaramillo
Photo #3:	Description: Downstream	Facing: SE	Time: 1042	Taken by: D. Jaramillo

Other notes: Hespot test yeild negative results. Snow near edge of weirbox and sample location

Contact waste: ½ gal.

Offsite time: 1055 **Relinquish samples at SMO**, care of S. Shroeal. **at** (time) 1230

Objectives met? yes

D. Jaramillo 2/23/18

ATTACHMENT 2

Records Use Only

SOP-5224-2

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: 16-61439 (PRB Alluvial Seep) **Date:** 2/16/18 **Onsite time:** 1115
Objective: Sample for SOPs on pz 3 using PP **Weather:** 40s, partly cloudy
Sampling crew: A. Stecke, D. Jaramillo, F. VanderVis
Two-minute safety drill: careful hiking
Meters calibrated at (location) SMO **by (whom)** D. Jaramillo **at (time)** 2/15/18
YSI Meter number: 60 **Turbidimeter serial number:**

Sample Retrieval **Date:** 2/16/18 **Time:** 1130 **Method:** Peristaltic Pump
Sample Event ID: **Sample ID Numbers:**

FIELD PARAMETERS

pH (su): 7.10 Sp. Cond. (µS/cm): 193.3 Turbidity (NTU): 4.90
Temperature (°C): 5.90 DO (mg/L): 9.27 Q (gpm): NA
Explanation of Q method, including calculations: Accurate Q rate not measurable

Note: To convert cfs to gpm, multiply cfs by ...

SITE DESCRIPTION (circle all that apply)

Media type:	Spring (Seep) [circled] Baseflow (persistent flow)
Sample location:	Bank Wading Station Gage: at / above / ... Midstream natural feature Other (specify): Pool/Seep
Description of Sampling Site:	(Pool) [circled] Riffle Eddy Diffuse Other; Written description:
Substrate:	Bedrock Concrete Cobble (Gravel) [circled] (Sand) [circled] Mud
Stage Conditions:	Stable: (normal) [circled] / low / high Falling Rising Other (specify):
Hydraulic Event:	(Routine) [circled] Snowmelt Flood Drought Other (specify):
Stream Color:	Brown (Clear) [circled] Green Blue Gray Other (specify):
Description of flow:	Turbulent (Laminar) [circled] Recirculating Stagnant Other; Written description:

Photos and GPS

GPS point #1: Name: NA Coordinates: NA Units: NA
GPS point #2: Name: NA Coordinates: NA Units: NA
Photo #1: Description: NA Facing: NA Time: NA Taken by: NA
Photo #2: Description: NA Facing: NA Time: NA Taken by: NA
Photo #3: Description: NA Facing: NA Time: NA Taken by: NA

Other notes: NONE

Contact waste: Y

Offsite time: 1218 **Relinquish samples at SMO**, care of N. Montoya at (time) 1500
Objectives met? Yes

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date	Time onsite (MST)	Activity
FLC-16-25280	2-2-2018	0850	PreSweep

Personnel	Cable Length(ft)	Cable SN
T. Bonham, A. Vigil, K. Tow & M. Shenolo	10	236867

Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:	Memory % remaining:	Battery % remaining:
		NA	NA	80

Connect Time	Transducer SN:	New LT PSI Rating:	Manufacture Date	Log Note Memory %	Log Note Battery %
0855	473706	NA	NA	NA	20

Water Level (ft)	P (psi):	T (C)	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
0.05'	0.02	4.70		

Last Start Date:	Data File Name:
NA	NA

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Stick-up Measured on Site Previous MP Used ☒

Time (MST)	0855	Water Level Meter Serial No. 34243	**Notes:** DTW = Dry to TD @ 7.29' BTOC
DTW (ft bMP)	7.29' BTOC	Measurements in feet	
Time (MST)	0858	LSD ft	7352.9' msl
DTW (ft bMP)	7.29' BTOC	MP Height ft	+ 2.62'
Time (MST)	2-2-2018	MP Elevation	= 7355.52' msl
DTW (ft bMP)		DTW	- 7.29' BTOC
Time (MST)	0858	Groundwater Elevation (GWE) Reference Level	DRY
TD (ft bMP)	7.29' BTOC		
		Zip Tie on Kellim's Grip:	NA

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time		Time (MST)	Reading
Wl. (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value.		Current Depth			
Error tolerance of transducer:		Meas. Interval			
☐ [illegible]		Start Date	2-2-2018		
☐ [illegible]		Start Time			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft 300 PSI-1.16 ft.		Synch Clocks Yes \ No			
Deleted Tests:					QA: Date and Initial

MS 2/10/18

CDV-16-02656

91

Groundwater Sampling Log

IFWGMP MY: 2018 Q: 2	LSD: 7443.18 ft. msl	Well Diameter: 2 inches	Date: 2/10/2018
Watershed: Water/CDV	Water Level: NA ft. msl	Top of Screen: 5.30 ft.bTOC	Notes: Pump off for Recharge
Well: CDV-16-02656	*TD: 11.0 bTOC	Bottom of Screen: 11.0 ft.bTOC	
Sampling Device: PP	*DTW: 7.02' btoc	Water Column: 3.98 ft.	
Measuring Point: bTOC	Drop Pipe: NA gal.	1CV: 0.64 gal.	Packer Pressure
* Completion Depth: CTD		3CV: 1.92 gal.	Before: NA psi
[* ft (BTOC) / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	2.30 ft.	Actuation: NA psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: NA psi
			After: NA psi

TIME (MST / DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or (No)	ORP mV	Water Level* ft. bTOC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1028	Pump on/water to Surface									
1029	7.56	5.3	168.6	7.20	8.3	N	183.2	7.85	0.085	water cloudy odorless
1031	7.07	5.1	169.3	7.34	19.0	N	185.9	7.87	0.085	
1034	6.69	5.3	168.5	6.92	16.4	N	184.1	8.02	0.085	
1037	6.68	5.3	168.5	6.90	14.5	N	183.9	8.45	0.085	
1039	6.68	5.3	168.5	6.89	12.1	N	183.7	8.60	0.085	
1042	6.66	5.4	168.5	6.83	14.9	N	183.2	8.67	0.085	
1042	Pump off/Recharge				Time 1045		Pump on			
1045	6.66	5.4	169.0	6.92	10.0	N	179.9	8.19	0.079	water slightly cloudy odorless
1048	6.65	5.3	169.1	6.91	8.3	N	180.9	8.37	0.079	
1051	6.64	5.4	168.9	6.73	8.2	N	181.6	8.65	0.079	
1051	Pump off/Recharge				Time 1055		Pump on			
1055	6.64	6.1	169.2	6.77	8.2	N	181.3	8.03	0.079	Particulate odorless
1058	6.64	5.4	169.2	6.75	8.2	N	181.7	8.34 MS 2/11/18 ~~8.03~~	0.079	
1101	6.63	5.4	169.2	6.66	8.7	N	189.9	8.60	0.079	
1108	Start Sampling				Time 1240		Sampling complete			

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste:	1/2 gal.	Drum#:	Municipal
*Purge Water:	2.0 gal.	Drum#'s:	NH/NR HE
Total Waste Water:	2.1 gal.	ID: 0980	1550 gal Tank

Final Water Level: 9.47 ft bTOC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

MS 2/10/18

92

CDV-16-02656

MS 2/10/18

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: CDV-16-02656

Date: 2/10/2018

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 1.92	NA	2.0	3	(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%,	Comments: none
1055	6.64	6.77	169.2	8.2	
1058	6.64	6.75	169.2	8.2	
1101	6.63	6.66	169.2	8.7	
Calculations:	Highest: 6.64	Highest: 6.77	Median: 169.2	Median: 8.2	
	Lowest: 6.63	Lowest: 6.66	Median + 3 %: 174.27	Median + 10%: NA	
	Difference: 0.01	Difference: 0.11	Median - 3 %: 164.13	Median - 10%: NA	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	none

MS 2/10/18

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity:	
CDV-16-02656	~~2/6~~ 2/10/18	9:14 am	Samplings	
Personnel: W. Sanchez, K. Tow, M. Sliendo			Cable Length(ft): 10 ft	Cable SN: 230870
Telemetry: Yes \ (No)	Pull Transducer Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: 93%
Connect Time: 9:14	Transducer SN: 472136	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft) 7438.19 ms		P (psi): 1.7	T (C)	Stop Test: Yes (No)	Change Desicant: Yes \ (No) \ NA
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: (TOC) (top outer casing) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☐

Time (MST):	9:25	Water Level Meter Serial No. 34243		**Notes:** NA
DTW (ft bMP):	7.02 btoc	Measurements in feet		
Time (MST):	9:28	LSD ft	7443.18 ms	
DTW (ft bMP):	7.02 btoc	MP Height ft.	+ 2.30	
Time (MST):	~~2/6/18~~ 2/10/18	MP Elevation	= 7445.48	
DTW (ft bMP):		DTW:	- 7.02 btoc	
Time (MST):	9:30	Groundwater Elevation (GWE) Reference Level	7438.46	
TD (ft bMP):	~~11.20~~			
	11.0	Zip Tie on Kellim's Grip:	NO	

Transducer Performance and Programming

Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval	2/10/18		
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:				QA Date and Initial:	

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity	
CdV-16-02657r	2-10-2018	1035	V Checks	
Personnel: T. Barham, A. Stoever & D. Jaramillo			Cable Length(ft): NA	Cable SN: NA
Telemetry: Yes \ (No) / Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA		Memory % remaining: NA	Battery % remaining: NA
Connect Time: NA / Transducer SN: NA	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: NA
Water Level (ft): NA	P (psi): NA	T (C): NA	Stop Test: Yes \ (No)	Change Desicant: Yes \ No \ (NA)
Last Start Date: NA	Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST):	1038	Water Level Meter Serial No. 34247	**Notes:** V @ TD = 7.20' BTIC
DTW (ft bMP):	7.20' BTIC	Measurements in feet	
Time (MST):	1041	LSD ft	
DTW (ft bMP):	7.20' BTIC	MP Height ft.	
Time (MST):		MP Elevation:	=
DTW (ft bMP):		DTW:	-
Time (MST):	1041	Groundwater Elevation (GWE) Reference Level	
TD (ft bMP):	7.20' BTIC		
		Zip Tie on Kellim's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time:		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name:			
GWE from MM		Reference Level			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval	2-10-2018		
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ (No)			
Deleted Tests:					QA Date and Initial

76

2-13-2018

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: CdV-16-02859

Date: 2-12-2018

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter Manual	Drop Pipe: NA 3 CVs: 4.47	NA	1.68	1.13	(Y) N	NONE

	Stable for three consecutive readings?				Comments:
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%.	
1319	6.69	8.28	229.0	2.7	
1322	6.68	8.28	229.1	2.5	
1325	6.68	8.25	229.1	2.8	
Calculations:	Highest: 6.69	Highest: 8.28	Median: 229.1	Median: 2.7	NONE
	Lowest: 6.68	Lowest: 8.25	Median + 3%: 235.9	Median +NA%: <10	
	Difference: 0.01	Difference: 0.03	Median - 3%: 222.3	Median - NA%: <10	
(Y) N	(Y) N	(Y) N	(Y) N	(Y) N	

SOP Requirements Met?	Comments:
(Y) N	NONE

2-13-2018

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

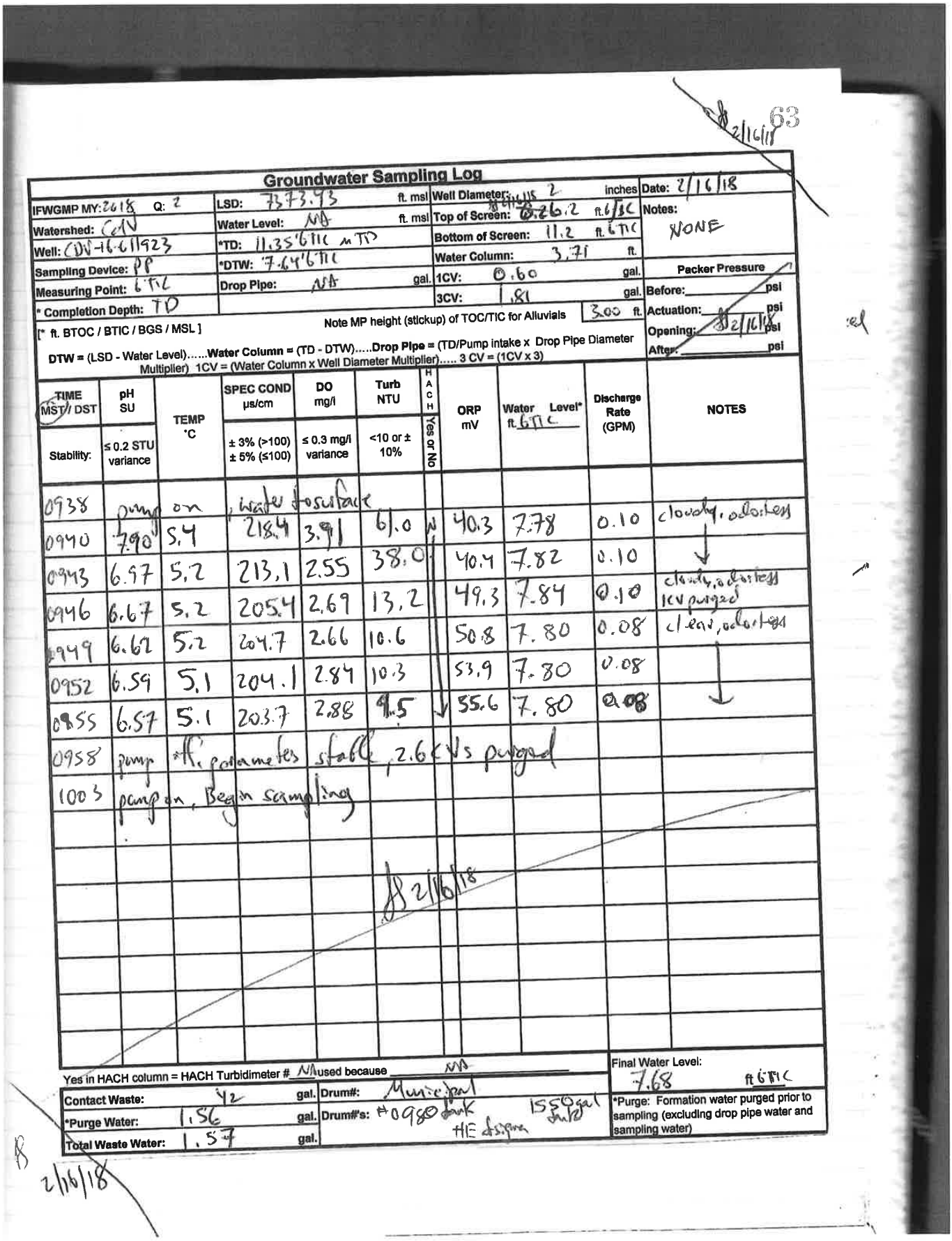
Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-02659		Date: 2-10-2018	Time onsite (MST): 1230	Activity: manual I Check	
Personnel: T. Bauham, D. Jaramillo & A. Stoctr				Cable Length(ft): [illegible]10	Cable SN: 236663
Telemetry: Yes \ No (circled No)	Pull Transducer Yes \ No (circled No)	New Transducer Needed: Yes \ No (circled No); New LT SN: NA		Memory % remaining: NA	Battery % remaining: 82
Connect Time: 1232	Transducer SN: 381373	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: 18
Water Level (ft): 7295.12		P (psi): 0.91	T (C): 5.89	Stop Test: Yes \ No (circled No)	Change Desicant: Yes \ No \ NA (circled NA)
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements				
Measuring Point: TOC (top outer casing) (circled) TIC (inner)		Stick-up Measured on Site ☐		Previous MP Used ☒
Time (MST):	1254	Water Level Meter Serial No. 34244		Notes: NONE
DTW (ft bMP):	8.62' btoc	Measurements in feet		
Time (MST):	1257	LSD ft	7300.50' msl	
DTW (ft bMP):	8.62' btoc	MP Height ft.	+3.24	
Time (MST):		MP Elevation	=7303.74' msl	
DTW (ft bMP):		DTW:	-8.62' btoc	
Time (MST):	1257	Groundwater Elevation (GWE) Reference Level	7295.12' msl	
TD (ft bMP):	10.90' btoc			
		Zip Tie on Kellim's Grip: NA		

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):	1232	Programming Time:		Time (MST):	Reading
WL (transducer reading) (ft):	7295.12' msl	New Test Name:	[illegible]		
GWE from MM	7295.12' msl	Reference Level:	18		
Difference in value:	0.00	Current Depth:	2.1[illegible]		
Error tolerance of transducer:	0.03	Meas. Interval:			
☒ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No (circled No)			
Deleted Tests: NA				QA Date and Initial:	



Groundwater Sampling Log

2/16/18 63

IFWGMP MY: 2018 Q: 2 | LSD: 7373.73 ft. msl | Well Diameter: 2 inches | Date: 2/16/18
Watershed: CdV | Water Level: NA ft. msl | Top of Screen: 0.26.2 ft. TIC | Notes: NONE
Well: CDV-16-611923 | *TD: 11.35'6 TIC mTD | Bottom of Screen: 11.2 ft. TIC
Sampling Device: PP | *DTW: 7.64'6 TIC | Water Column: 3.71 ft.
Measuring Point: 6 TIC | Drop Pipe: NA gal. | 1CV: 0.60 gal. | Packer Pressure
* Completion Depth: TD | 3CV: 1.81 gal. | Before: psi
[* ft. BTOC / BTIC / BGS / MSL] Note MP height (stickup) of TOC/TIC for Alluvials 3.00 ft. | Actuation: 2/16/18 psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3) | Opening: psi | After: psi

TIME (MST/ DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. TIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0938	pump on, water to surface									
0940	7.90	5.4	218.4	3.91	61.0	N	40.3	7.78	0.10	cloudy, odorless
0943	6.97	5.2	213.1	2.55	38.0		40.4	7.82	0.10	↓
0946	6.67	5.2	205.4	2.69	13.2		49.3	7.84	0.10	cloudy, odorless 1CV purged
0949	6.62	5.2	204.7	2.66	10.6		50.8	7.80	0.08	clear, odorless
0952	6.59	5.1	204.1	2.84	10.3		53.9	7.80	0.08	↓
0955	6.57	5.1	203.7	2.88	9.5	↓	55.6	7.80	0.08	
0958	pump off, parameters stable, 2.6 CVs purged									
1003	pump on, Begin sampling									

2/16/18

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste: 42 gal. | Drum#: Municipal
*Purge Water: 1.56 gal. | Drum#'s: #0980 tank 1550 gal tank
Total Waste Water: 1.57 gal. | HE dispo

Final Water Level: 7.68 ft. TIC
*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

2/16/18

64

2/16/18

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: CPV-16-61923

Date: 2/16/18

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / Manual	Drop Pipe: NA 3 CVs: 1.81	NA	1.56	2.6	Y N	Purged extra 1.6 CVs to get stability

Parameters collected at proper intervals? (HH:MM)	Stable for three consecutive readings? pH ≤ 0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
0949	6.62	2.66	204.7	10.6	NONE
0952	6.59	2.84	204.1	10.3	
0955	6.57	2.88	203.7	9.5	
Calculations:	Highest: 6.62	Highest: 2.88	Median: 204.1	Median: 10.3	
	Lowest: 6.57	Lowest: 2.66	Median + 3 %: 210.2	Median + 10 %: 11.6	
	Difference: 0.05	Difference: 0.22	Median - 3 %: 198.0	Median - 10 %: 9.00	
	Y N	Y N	Y N	Y N	Y N

SOP Requirements Met?	Comments:
Y N	All stable, SOPs met

2/16/18

Manual Groundwater Level Measurements	Document No.	ER-SOP-20243
	Revision:	1, IPC-1
Reference	Effective Date:	3/1/2017
	Page:	17 of 18

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name: CDV-16-611923	Date: 2/16/18	Time onsite (MST): 0900	Activity: GW Sampling
Personnel: A Stocker, T Vandervis, D Jaramillo			Cable Length(ft): / Cable SN:
Telemetry: Yes \ No (No circled)	Pull Transducer: Yes \ No (Yes circled)	New Transducer Needed: Yes \ No (No circled) New LT SN:	Memory % remaining: / Battery % remaining: AS 2/16/18
Connect Time: NA	Transducer SN:	New LT PSI Rating: / Manufacture Date:	Log Note Memory % / Log Note Battery %
Water Level (ft)		P (psi): / T (C)	Stop Test: Yes \ No / Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name: AS 2/16/18	

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner)) circled; Slick-up Measured on Site ☐ Previous MP Used ☐

Time (MST):	0908	Water Level Meter Serial No.		Notes:
DTW (ft bMP):	7.66'6 TIC	Measurements in feet		
Time (MST):	0912	LSD ft	7373.43	
DTW (ft bMP):	7.65'6 TIC	MP Height ft.	+ 3.00	
Time (MST):	~~7.6~~ 0915	MP Elevation	= 7376.43	
DTW (ft bMP):	7.64'6 TIC	DTW:	- 7.64	
Time (MST):	0918	Groundwater Elevation (GWE) Reference Level	7368.79	
TD (ft bMP):	7.64'6 TIC			
		Zip Tie on Kellim's Grip:		

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance — **Part 4: Programming & Final Readings**

				Time (MST):	Reading
WL Reading Time (MST):		Progamming Time:			
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:	AS 2/16/18		
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft., 30 PSI-0.07 ft., 100 PSI-0.23 ft., 500 PSI-1.18 ft.		Synch Clocks: Yes \ No			

Deleted Tests:

QA Date and Initial:

Manual Groundwater Level Measurements	Document No.	ER-SOP-20243
	Revision:	1, IPC-1
	Effective Date:	3/1/2017
Reference	Page:	17 of 18

ATTACHMENT 1

Page 1 of 1

Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name: CdV-16-611923		Date: 2-2-2018	Time onsite (MST): 1006	Activity: PreSweep	
Personnel: T. Bonham, M. Shwda, A. Vigil & K. Tow				Cable Length (ft): 12	Cable SN: 227809
Telemetry: Yes \ No (circled No)	Pull Transducer: Yes \ No (circled No)	New Transducer Needed: Yes \ No (circled No); New LT SN: NA		Memory % remaining: NA	Battery % remaining: 82
Connect Time: 1007	Transducer SN: 165126	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: 18
Water Level (ft): 0.49'		P (psi): 0.21	T (C): 5.37	Stop Test: Yes \ No (circled No)	Change Desicant: Yes \ No \ NA (circled No)
Last Start Date: NA		Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (circled) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☒

				Notes:
Time (MST)	1007	Water Level Meter Serial No. 34243		Dry to top of pump but well not dry
DTW (ft bMP)	7.80' BTOC TOP of PUMP	Measurements in feet		
Time (MST)	1010	LSD ft	7376.23' msl	
DTW (ft bMP)	7.80' BTOC	MP Height ft	+ ~~0.00~~ 2.35' BTOC	
Time (MST)	NA 2-2-2018	MP Elevation	= ~~7376.23~~ msl	
DTW (ft bMP)		DTW	- 7378.58' msl	
Time (MST)		Groundwater Elevation (GWE) Reference Level	TOP of Pump	
TD (ft bMP)		Zip Tie on Kellem's Grip: NA		

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Programming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level	NA 2-2-2018		
Difference in value		Current Depth			
Error tolerance of transducer		Meas. Interval			
☐		Start Date			
☐		Start Time			
15 PSI-0.03ft 30 PSI-0.07 ft 100 PSI-0.23 ft 500 PSI-1.16 ft		Synch Clocks Yes \ No (circled No)			

Deleted Tests: NA

QA: Date and Initial

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date	Time onsite (MST)	Activity	
MSC-16-06273	2-2-2018	1100	Pre Sweep	
Personnel: T. Bonham, A. Vigil, M. Shanto & K. Tow			Cable Length(ft): 16	Cable SN: 227806
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN: NA	Memory % remaining: NA	Battery % remaining: 96
Connect Time: 1103	Transducer SN: 494495	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: 4
Water Level (ft): 0.22'	P (psi): 0.10	T (C): 6.64	Stop Test: Yes \ No	Change Desiccant: Yes \ No \ NA
Last Start Date: NA	Data File Name: NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) / TIC (inner) | Stick-up Measured on Site | Previous MP Used: X

Time (MST)	1103	Water Level Meter Serial No. 34243	**Notes:** NONE
DTW (ft bMP)	10.40' BTIC	Measurements in feet	
Time (MST)	1106	LSD ft: 7370.79' msl	
DTW (ft bMP)	10.40' BTIC	MP Height ft: + 2.59' BTIC	
Time (MST)	2-2-2018 TB	MP Elevation: = 7373.38' msl	
DTW (ft bMP)	2-2-2018	DTW: - 10.40' BTIC	
Time (MST)		Groundwater Elevation (GWE) Reference Level: 7362.98' msl	
TD (ft bMP)	10.76' BTIC		
		Zip Tie on Kellim's Grip: NA	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Programming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value		Current Depth	2-2-2018		
Error tolerance of transducer		Meas. Interval			
		Start Date			
		Start Time			
15 PSI-0.03ft 30 PSI-0.07 ft. 100 PSI-0.23 ft 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			

Deleted Tests: NA

QA Date and Initial

71

2/10/18

MSC-16-06294

Groundwater Sampling Log

IFWGMP MY: 2018 Q: 2	LSD: 7288.94 ft. msl	Well Diameter: 4 inches	Date: 2/10/18
Watershed: Water/CdV	Water Level: NA ft. msl	Top of Screen: 5.51 ft. BTIC	Notes: WL starts in screened interval
Well: MSC-16-06294	*TD: 11.10' BTIC	Bottom of Screen: 10.37 ft. BTIC	
Sampling Device: PP	*DTW: 6.86' BTIC	Water Column: 4.24 ft	Packer Pressure
Measuring Point: BTIC	Drop Pipe: NA gal.	1CV: 2.77 gal.	Before: NA psi
* Completion Depth: NTD		3CV: 8.31 gal.	Actuation: psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	3.07 ft.	Opening: psi
DTW = (LSD - Water Level)..... Water Column = (TD - DTW)..... Drop Pipe = (TD/Pump Intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			After: psi

TIME (MST / DST)	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
0931	7.58	6.3	229.3	4.38	124.8	N	-26.3	7.04	0.05	cloudy, colorless
Note:	0928	Pump	on; Water to surface				pump pulsed to clear debris			
0929	Pump	on;	Water to surface				Q = 0.05 gpm			
0934	6.73	5.9	208.5	3.28	69.0	N	-10.3	≤ 2/6/18 7.67.10	0.04	slightly cloudy, colorless
0937	6.45	5.7	188.4	3.72	55.6		26.7	7.18	0.04	slightly cloudy, colorless
0940	6.34	5.6	179.3	3.90	47.0		46.7	7.29		
0943	6.30	5.6	175.8	3.99	54.0		60.7	7.41		
0946	6.26	5.5	172.9	4.07	85.0		71.9	7.52		
0949	6.23	5.4	171.5	4.02	70.5		79.7	7.60		
0952	6.20	5.3	170.7	3.80	43.0		88.9	7.73	↓	
0955	6.19	5.4	170.9	3.76	43.3		96.3	7.89	0.05	
0958	6.18	5.3	171.9	3.71	41.5		103.4	8.02	↓	
1001	6.17	5.3	172.6	3.64	43.3		106.8	8.13	0.06	
1004	6.16	5.4	172.4	3.63	36.2		113.3	8.24		
1007	6.15	5.3	173.3	3.58	33.9		118.3	8.38		
1010	6.14	5.3	174.5	3.55	33.6		121.9	8.50	↓	↓

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste:	1/2 gal.	Drum#:	1017907	75 gal
*Purge Water:	2.89 gal.	Drum#'s:	930	1550 gal tank
Total Waste Water:	2.89 gal.			

Final Water Level: 11.05 ft BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

2/10

72

2/10/18

MSC-16-06294

Groundwater Sampling Log

IFWGMP MY: 2018 Q: 2	LSD: ft msl	Well Diameter: inches	Date: 2/10/18
Watershed: Water/CdV	Water Level: ft msl	Top of Screen: ft	Notes: 2/10/18
Well: MSC-16-06294	*TD: 2/10/18	Bottom of Screen: ft	
Sampling Device: PP	*DTW:	Water Column: 2/10/18 ft	
Measuring Point:	Drop Pipe: gal.	1CV: gal.	Packer Pressure
* Completion Depth:		3CV: gal.	Before: NA psi
[* ft. BTOC / BTIC / BGS / MSL]	Note MP height (stickup) of TOC/TIC for Alluvials	NA ft.	Actuation: psi
DTW = (LSD - Water Level).....Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)			Opening: psi
			After: psi

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft BTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1013	6.13	5.3	175.5	3.51	33.2	N	123.2	8.62	0.06	slightly cloudy, odorless
1016	6.13	5.4	175.4	3.48	33.5		126.7	8.74		
1019	6.14	5.3	176.3	3.52	34.2		129.7	8.89		
1022	6.14	5.4	176.4	3.51	35.0		131.7	9.07		
1025	6.14	5.4	177.4	3.47	37.8		138.4	9.18		
1026	Pump paused; >1CV purged + parameters stable									
1030	Pump on; Begin sampling									
1103	Well purged dry; Pump paused; Crew waits for recharge									
1135	Well has not recharged, per K. Reid crew just collects									
	Prioritized suite									

2/10/18

Yes in HACH column = HACH Turbidimeter # NA used because NA

Contact Waste:	1/2	gal.	Drum#:	1017907	75 gal
*Purge Water:	2.89	gal.	Drum#'s:	480	1,550 gal tank
Total Waste Water:	2.89	gal.			

Final Water Level: 11.05 ft BTIC

*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)

2/10/18

2/10/18

MSC-16-06294

73

ER-SOP-20032 IPC-6

Attachment 3

Compliance Checklist

Well Name: MSC-16-06294

Date: 2/10/18

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter (Manual)	Drop Pipe: NA 3 CVs: 8.31	NA	2.89	1.04	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%,	Comments: None
1019	6.14	3.52	176.3	34.2	
1022	6.14	3.51	176.4	35.0	
1025	6.14	3.47	177.4	37.8	
Calculations:	Highest: 6.14	Highest: 3.52	Median: 176.4	Median: 35.0	
	Lowest: 6.14	Lowest: 3.47	Median + 3%: 181.69	Median + 10%: 38.5	
	Difference: 0.00	Difference: 0.05	Median - 3%: 171.11	Median - 10%: 31.5	
Y N	Y N	Y N	Y N	Y N	

SOP Requirements Met?	Comments:
Y N	None

2/10/18

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
MSC-16-06294	2/10/18	0912	Sample Well

Personnel:	Cable Length(ft):	Cable SN:
A. Stanfield, A. Vigil, T. Vander Vis		

Telemetry: Yes \ (No)	Pull Transducer Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN:	Memory % remaining:	Battery % remaining:
		NA		2/10/18

Connect Time:	Transducer SN:	New LT PSI Rating:	Manufacture Date:	Log Note Memory %:	Log Note Battery %
				2/10/18	

Water Level (ft)	P (psi):	T (C)	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
2/10/18				

Last Start Date:	Data File Name:
	NA

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) (TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST):	0914	Water Level Meter Serial No.	34244	**Notes:** NA
DTW (ft bMP):	6.86' BTIC	Measurements in feet		
Time (MST):	0917	LSD ft	7288.44' msl	
DTW (ft bMP):	6.86' BTIC	MP Height ft.	+ 3.07	
Time (MST): 2/10/18		MP Elevation	= 7291.51' msl	
DTW (ft bMP):		DTW:	- 6.86' BTIC	
Time (MST):	0918	Groundwater Elevation (GWE) Reference Level	7284.65' msl	
TD (ft bMP):	11.10' BTIC			
NA	NA	Zip Tie on Kellim's Grip:	NO	

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:	2/10/18		
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ (No)			
Deleted Tests: NA					QA Date and Initial:

68

Groundwater Sampling Log

IFWGMP MY: 2018 Q: 2	LSD: 7359.59 ft. msl	Well Diameter: 2 inches	Date: 2/16/18
Watershed: CdV	Water Level: NA ft. msl	Top of Screen: 6.0 ft. bTIC	Notes: NONE
Well: CDV-16-611937	*TD: 11.55' bTIC	Bottom of Screen: 8.0 ft. bTIC	
Sampling Device: PP	*DTW: 6.60' bTIC	Water Column: 4.95 ft.	
Measuring Point: bTIC	Drop Pipe: NA gal.	1CV: 0.81 gal.	Packer Pressure
* Completion Depth: TD		3CV: 2.42 gal.	Before: ____ psi
[* ft. BTOC / BTIC / BGS / MSL]		Note MP height (stickup) of TOC/TIC for Alluvials 3.0 ft.	Actuation: ____ psi
			Opening: ____ psi
			After: ____ psi

DTW = (LSD - Water Level)......Water Column = (TD - DTW).....Drop Pipe = (TD/Pump intake x Drop Pipe Diameter Multiplier) 1CV = (Water Column x Well Diameter Multiplier)..... 3 CV = (1CV x 3)

TIME MST / DST	pH SU	TEMP °C	SPEC COND µs/cm	DO mg/l	Turb NTU	HACH Yes or No	ORP mV	Water Level* ft. bTIC	Discharge Rate (GPM)	NOTES
Stability:	≤ 0.2 STU variance		± 3% (>100) ± 5% (≤100)	≤ 0.3 mg/l variance	<10 or ± 10%					
1247 Pump on		water to surface								
1248	6.61	6.1	211.0	4.25	87.0	N	69.1	7.63	0.10	cloudy, yellowish odor
1251	6.23	5.9	200.8	1.33	76.9		71.3	7.90	0.06	↓
1254	6.17	5.6	197.3	2.06	54.4		66.5	7.95	0.06	↓
1257	6.20	5.6	209.7	1.87	38.2		49.7	8.26	0.06	cloudy, odor 1CV purged
1300	6.23	5.6	219.8	1.49	41.8		34.8	8.49	0.06	cloudy, odor
1303	6.27	5.7	226.6	1.21	35.9		21.5	8.69	0.06	↓
1306	6.30	5.8	229.9	1.06	26.0		14.3	8.78	0.06	↓
1309	6.33	5.9	231.6	0.87	18.2		7.4	8.87	0.06	clear, odor
1312	6.38	5.9	236.1	0.70	12.4		-2.4	8.98	0.06	↓
1315	6.42	6.0	235.8	0.66	9.6	↓	-7.3	9.05	0.06	↓
1318	pump off, 3CVs purged, Turbidity not stable, prepare to sample									
1324	pump on, Begin sampling									
1405	pump off, sampling complete									

2/16/18

Yes in HACH column = HACH Turbidimeter # NA used because NA		Final Water Level: 9.70 ft bTIC
Contact Waste: 1/2 gal.	Drum#: Municipal waste	*Purge: Formation water purged prior to sampling (excluding drop pipe water and sampling water)
*Purge Water: 2.42 gal.	Drum#'s: #0980 tank 1550 gal tank HEC square	
Total Waste Water: 2.5 gal.		

2/16/18

69

[initials] 2/16/18

ER-SOP-20032 IPC-6
Attachment 3
Compliance Checklist

Well Name: CdV-16-611937
Date: 2/16/18

Discharge calculation method	Calculated volumes (gal):	Drop pipe volume purged (gal)	Purge water volume purged (gal)	CV's Purged before sampling	Minimum Purge Met?	Comments:
Flow Meter / Manual (circled)	Drop Pipe: NA; 3 CVs: 2.42	NA	2.42	3.0	(Y) N	Turbidity not stable [initials] 2/16/18

Parameters collected at proper intervals? (HH:MM)	Stable for three consecutive readings? pH ≤0.2 STU variance	Dissolved Oxygen ≤ 0.3 mg/l variance	Specific Conductivity ± 3% (>100) ± 5% (≤100)	Turbidity <10 NTU or ± 10%,	Comments:
1309	6.33	0.87	231.6	18.2	Turbidity not stable
1312	6.38	0.70	236.1	12.4	
1315	6.42	0.66	235.8	9.6	
Calculations:	Highest: 6.42	Highest: 0.87	Median: 235.8	Median: 12.4	
	Lowest: 6.33	Lowest: 0.66	Median +__%: 242.9	Median +10%: 13.6	
	Difference: 0.09	Difference: 0.21	Median -__%: 228.7	Median -10%: 11.2	
(Y) N	(Y) N	(Y) N	(Y) N	~~Y~~ (N) [initials] 2/16/18	

SOP Requirements Met?	Comments:
(Y) N	All SOPs met

[initials] 2/16/18

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CDV-16-611937		Date: 2/16/18	Time onsite (MST): 12:30	Activity: Sampling Well	
Personnel: A. Stocker, T. VanderVis				Cable Length(ft):	Cable SN:
Telemetry: Yes \ No	Pull Transducer: Yes \ No	New Transducer Needed: Yes \ No New LT SN:		Memory % remaining:	Battery % remaining: AS 2/16/18
Connect Time:	Transducer SN:	New LT PSI Rating: AS 2/16/18	Manufacture Date:	Log Note Memory %	Log Note Battery %
Water Level (ft)		P (psi):	T [C]	Stop Test: Yes \ No	Change Desicant: Yes \ No \ NA
Last Start Date:		Data File Name: NA			
PART 2: Manual Measurements					
Measuring Point: TOC (top outer casing) (TIC (inner))		Stick-up Measured on Site ☐		Previous MP Used ☒	
Time (MST)	1236	Water Level Meter Serial No.	NA	**Notes:**	
DTW (ft bMP):	6.60'6TIC	Measurements in feet			
Time (MST)	1239	LSD ft	7359.59		
DTW (ft bMP):	6.60'6TIC	MP Height ft.	+ 3.00		
Time (MST)	AS 2/16/18	MP Elevation	= 7362.59		
DTW (ft bMP):	AS 2/16/18	DTW:	- 06.60		
Time (MST)	1236	Groundwater Elevation (GWE) Reference Level	7355.99		
TD (ft bMP):	11.55'6TIC				
		Zip Tie on Kellim's Grip:	NA		
Transducer Performance and Programming					
Part 3: Transducer Error\Drift Acceptance		**Part 4: Programming & Final Readings**			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:	AS 2/16/18		
Error tolerance of transducer:		Meas. Interval:			
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:					QA: Date and Initial:

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information					
Well Name: CdV-16-611937	Date: 2-2-2018	Time onsite (MST): 1015	Activity: PreSweep		
Personnel: T. Benham, M. Sheedo, A. Vigil & K. TOW			Cable Length(ft): 13	Cable SN: 437736	
Telemetry: Yes \ (No)	Pull Transducer: Yes \ (No)	New Transducer Needed: Yes \ (No) New LT SN: NA	Memory % remaining: NA	Battery % remaining: 94	
Connect Time: 1016	Transducer SN: 448035	New LT PSI Rating: NA	Manufacture Date: NA	Log Note Memory %: NA	Log Note Battery %: 6
Water Level (ft): 4.37' BTOC 2-2-2018	P (psi): 1.89	T (C): 6.87	Stop Test: Yes \ (No)	Change Desicant: Yes \ (No) \ NA	
Last Start Date: NA	Data File Name: NA				

PART 2: Manual Measurements				
Measuring Point: (TOC (top outer casing)) TIC (inner)	Stick-up Measured on Site	Previous MP Used: X		
Time (MST): 1016	Water Level Meter Serial No.: 34243	Notes: NONE		
DTW (ft bMP): 2-2-2018 756.52 BTOC	Measurements in feet			
Time (MST): 1019	LSD ft: 7359.59' MSL			
DTW (ft bMP): 6.52' BTOC	MP Height ft: + 3.00' BTOC			
Time (MST): 2-2-2018	MP Elevation: = 7362.59' MSL			
DTW (ft bMP):	DTW: - 6.52' BTOC			
Time (MST): 1019	Groundwater Elevation (GWE) Reference Level: 7356.07' MSL			
TD (ft bMP): 11.54' BTOC				
	Zip Tie on Kellim's Grip: NA			

Transducer Performance and Programming					
Part 3: Transducer Error\Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST)		Progamming Time		Time (MST)	Reading
WL (transducer reading) (ft)		New Test Name			
GWE from MM		Reference Level			
Difference in value		Current Depth	2-2-2018		
Error tolerance of transducer:		Meas. Interval			
[illegible]		Start Date			
[illegible]		Start Time			
15 PSI-0.03 ft 30 PSI-0.07 ft 100 PSI-0.23 ft 500 PSI-1.16 ft		Synch Clocks: Yes \ (No)			
Deleted Tests: NA				QA Date and Initial	

ATTACHMENT 1
Page 1 of 1
Groundwater Level Field Form

Groundwater Level Field Form

PART 1: Well Site Information

Well Name	Date:	Time onsite (MST):	Activity
Surgebed Monitoring well (sized)	2-10-2018	0857	V. Check

Personnel:				Cable Length(ft):	Cable SN:
T. Bonham, A. Stocker & D. Jaramillo				30	529149
Telemetry: Yes \ No	**Pull Transducer: Yes \ No**	**New Transducer Needed: Yes \ No** New LT SN:		Memory % remaining:	Battery % remaining:
		NA		NA	99
Connect Time:	**Transducer SN:**	**New LT PSI Rating:**	**Manufacture Date:**	**Log Note Memory %**	**Log Note Battery %**
0858	520402	NA	NA	NA	1
Water Level (ft)		**P (psi):**	**T (C)**	**Stop Test: Yes \ No**	**Change Desicant: Yes \ No \ NA**
0.02		0.01	10.70		
Last Start Date:		**Data File Name:**			
NA		NA			

PART 2: Manual Measurements

Measuring Point: TOC (top outer casing) TIC (inner) Stick-up Measured on Site ☐ Previous MP Used ☒

Time (MST):	0859	Water Level Meter Serial No. 34247		**Notes:** DRY to TD @ 22.82' BTIC
DTW (ft bMP):	DRY	Measurements in feet		
Time (MST):	0902	LSD ft		
DTW (ft bMP):	DRY	MP Height ft.	+0.6	
Time (MST):	2-8-2018	MP Elevation	0' =	
DTW (ft bMP):		DTW:	-	
Time (MST):	0902	Groundwater Elevation (GWE) Reference Level		
TD (ft bMP):	22.82' BTIC			
		Zip Tie on Keilm's Grip:		

Transducer Performance and Programming

Part 3: Transducer Error/Drift Acceptance		Part 4: Programming & Final Readings			
WL Reading Time (MST):		Progamming Time:		Time (MST):	Reading:
WL (transducer reading) (ft):		New Test Name:			
GWE from MM		Reference Level:			
Difference in value:		Current Depth:			
Error tolerance of transducer:		Meas. Interval	2/10/2018		
☐ Within Error Tolerance		Start Date:			
☐ Outside Error Tolerance		Start Time:			
15 PSI-0.03ft. 30 PSI-0.07 ft. 100 PSI-0.23 ft. 500 PSI-1.16 ft.		Synch Clocks: Yes \ No			
Deleted Tests:					QA Date and Initial:

78

2/13/18 Paj. Below S+N Ancho E Basin confluence

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos NATIONAL LABORATORY

Spring/Surface Water Sampling Field Data Sheet

Site name: Paj. bel. S+N Ancho E basin	**Date:** 2/13/18	**Onsite time:** 1130 MST	
Objective: Sample baseflow per SOPs tapplicable docs. on pg 3 of logbook		**Weather:** Sunny, 50s	
Sampling crew: W. Sanchez, M. Shendo, A. Stanfield			
Two-minute safety drill: Hiking on uneven surfaces, wildlife			2/13/18
Meters calibrated at (location) SMO	**by** (whom) T. Vander V.3	**at** (time) ~~56~~ 0730	
YSI Meter number: 50	**Turbidimeter serial number:** NA		
Sample Retrieval	**Date:** 2/13/18	**Time:** 1144	**Method:** PP
Sample Event ID: 116609	**Sample ID Numbers:** CAPA-18-13, -14, -15		

FIELD PARAMETERS

pH (su): 7.86	Sp. Cond. (µS/cm): 142.5	Turbidity (NTU): 7.7
Temperature (°C): 5.4	DO (mg/L): 10.71	Q (gpm): 22.89 gpm

Explanation of Q method, including calculations: measured w/ 3" Modified Parshall Flume
0.14 GHT = 0.051 cfs × 448.83 = 22.89 gpm

Contact waste: 1/2 gal

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): NA			
Description of Sampling Site:	Pool	(Riffle)	Eddy	Diffuse	Other
	Written description: Small riffle @ source				
Substrate:	Bedrock	Concrete	(Cobble)	(Gravel)	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	Gray / Other (specify):
Description of flow:	(Turbulent)	Laminar	Recirculating	Stagnant	Other
	Written description: NA				

Photos and GPS

GPS point #1:	Name: NA	Coordinates: NA		Units: NA	
GPS point #2:	Name: ↓	Coordinates: ↓		Units: ↓	
Photo #1:	Description: Upstream	Facing: W	Time: 1145	Taken by: A. Stanfield	
Photo #2:	Description: Downstream	Facing: E	Time: ↓	Taken by: A. Stanfield	
Photo #3:	Description: Source	Facing: S	Time: ↓	Taken by: A. Stanfield	

Other notes: W. Sanchez conducts HE spot test; Results negative
W. Sanchez preserves all samples, M. Shendo QAs

Offsite time: 1210 **Relinquish samples at SMO**, care of M. Montoya at (time) 1535

Objectives met? Yes

2/13/18

76

Bulldog Spring

ATTACHMENT 2

SOP-5224-2

Records Use Only

Los Alamos National Laboratory

Spring/Surface Water Sampling Field Data Sheet

Site name: Bulldog Spring	**Date:** 2-21-18	**Onsite time:** 1130
Objective: sample site per applicable SOPs and doc.		**Weather:** 30°, partly cloudy
Sampling crew: T. VanderVis, A. Stanfield, A. Vigil		
Two-minute safety drill: safe hiking, icy paths		
Meters calibrated at (location) SMO	**by** (whom) T. VanderVis	**at** (time) 0730 MST
YSI Meter number: 60	**Turbidimeter serial number:** NA	
Sample Retrieval **Date:** 2-21-18	**Time:** 1147	**Method:**
Sample Event ID: 11669	**Sample ID Numbers:** CAPA-18-2, -1, -13, -10, -6	

FIELD PARAMETERS

pH (su): 7.75	Sp. Cond. (μS/cm): 296.3	Turbidity (NTU): 2.9
Temperature (°C): 6.7	DO (mg/L): 9.24	Q (gpm): 0.91 gpm

Explanation of Q method, including calculations:

Gal. bag: 15 s
875 mL
850 mL

$\frac{862.5\,mL}{\text{~~15 sec~~}\ 4} \times 4 = 3450\,mL/min \times \frac{1\,gal}{3785\,mL} =$ $\frac{3450\,mL}{1} \times \frac{1\,gal}{3785\,mL} = 0.91\,gpm$

TV 2-21-18

Note: To convert cfs to gpm, multiply cfs by 448.83

SITE DESCRIPTION (circle all that apply)

Media type:	(Spring) circled			Baseflow (persistent flow)		
Sample location:	Bank	Wading		Station Gage: at / above / below		
	Midstream natural feature		Other (specify): Small pool below source			
Description of Sampling Site:	(Pool) circled	Riffle	Eddy	Diffuse	Other	
	Written description: small flowing pool below source					
Substrate:	Bedrock	Concrete	(Cobble) circled	(Gravel) circled	(Sand) circled	(Mud) circled
Stage Conditions:	Stable: (normal) circled / low / high	Falling	Rising	Other (specify):		
Hydraulic Event:	(Routine) circled	Snowmelt	Flood	Drought	Other (specify):	
Stream Color:	Brown	(Clear) circled	Green	Blue	Gray	Other (specify):
Description of flow:	Turbulent	(Laminar) circled	Recirculating	Stagnant	Other	
	Written description: NA					

Photos and GPS

GPS point #1:	Name:	Coordinates:		Units:
GPS point #2:	Name:	Coordinates:		Units:
Photo #1:	Description: upstream	Facing: WE	Time: 1150	Taken by: A. Stanfield
Photo #2:	Description: source	Facing: S	Time: ↓	Taken by: ↓
Photo #3:	Description: downstream	Facing: S	Time:	Taken by:

TV 2-21-18

Other notes: HE spot test yeilds negative results; A. Vigil preserves samples, A. Stanfield GAS

Contact waste: 1/4 gal.

Offsite time: 1245 **Relinquish samples at SMO**, care of R. Onstott at (time) 1340

Objectives met? yes

K. Tow K. Tow K. Tow

Appendix B

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

Appendix C

Inspection Forms

N3B Los Alamos

Work Order BMP-68947

Ind Permit BMP Insp & Maint
Printed 7/23/2018 - 8:43 AM

Maintenance Details

Requested: 7/18/2018 11:34:00 AM
Target: 7/31/2018
Procedure: Storm Water Control Measures Inspection Form (EP-DIV-SOP-20012-1 IPC3)
Priority/Type: Normal / Inspection
Last PM: 10/12/2017
Project: IP Rain Event on July 17, 2018 (P-BMP-5868)

IP
RG257
V006
CDV-SMA-2

Contact:
Phone:

Reason: IP Rain Event on July 17, 2018

Special Instructions: Route 4, V006-13-0006-177-CDV2-R8.

Tasks

#	Description	Meas.	No	Yes
	Project Map Review, If Yes, submit altered Project Map.	N/A		
20	Have you changed the location of a BMP on the Project Map?		☑	☐
30	Have you ammended the Project Map in any other way?		☑	☐
	Control Measure Review. Describe recommended action in task comment line as appropriate.			
50	**Established Vegetation [V00602040013]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
60	**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.		☑	☐
70	**Earthen Berm [V00603010006]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
80	**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.		☑	☐
90	**Earthen Berm [V00603010007]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
100	**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.		☑	☐
110	**Earthen Berm [V00603010008]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
120	**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.		☑	☐
130	**Earthen Berm [V00603010009]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
140	**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.		☑	☐
150	**Earthen Berm [V00603010010]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
160	**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.		☑	☐
170	**Rip Rap [V00604060003]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
180	**Rip Rap [V00604060003]** 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.		☑	☐
190	**Rock Check Dam [V00606010002]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
200	**Rock Check Dam [V00606010002]** Is maintenance, modification, repair, or replacement recommended or conducted at inspection? If yes, identify maintenance type (repair, replacement, or		☑	☐

Bmp- 64947 2-3

		NLR		
	modification) and describe the maintenance recommendation.			
210	**Rock Cap [V00608020012]** Is BMP Operating effectively on arrival? If no, describe existing or installed backup control.		☐	☑
220	**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.		☑	☐
	SMA Controls. Describe recommended action in task line as appropriate			
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 Report

Completed: _____

Report:

WO ID: Bmp-69947 Page 3 of 3

Responded Date: 7/25/18 Time: 6:30 Completed Date: 7/25/18 Time: 6:40

Name/Z#: R. Roybal 313118

Name/Z#: J. Romero 176877

Lead Signature: Robert Roybal

"I confirm the information as recorded is true, accurate and complete."

Certification Statement of Authorization

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

Name of Delegated Official of Permittees: Steve Veenis Z#: 109949

Date: Date on file Delegated Official Signature: Signature on File

LANL PERSONNEL USE ONLY (initials and dates)

Accepted: 7/26/18 S **Tech QC** 7/26/18 **FTL:**

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

Date/Time: Winter 2018 Report Number 1

Weather: Snowing

Personnel: Steve Maze

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?		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?
None. Area observed to be in good condition

N3B Los Alamos

Signature:

Appendix D

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