

4.0 Durango, Colorado, Disposal Site

4.1 Compliance Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducted the Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) annual inspection on May 13, 2019, and the annual groundwater monitoring event in May 2018. No cause for a follow-up inspection was identified.

Monitoring of the linear depression on the toe of the northeast side slope continues; inspectors noted that there may have been some movement of rocks in the interior of the depression (rotated inward). However, no change in depth or length of the feature was observable. Monitoring of the linear depression will continue to understand its cause and address issues. No changes were observed on the top of the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs that have been addressed.

LM conducts annual groundwater sampling and analysis to monitor potential contaminant migration downgradient from the disposal cell. The most recent annual sampling event occurred in May 2019. Concentrations in the three point-of-compliance (POC) wells are below site-specific thresholds. In addition, LM monitors one background well and three best management practice (BMP) wells or noncompliance wells. BMP well 0618 is monitored more frequently in response to variable uranium concentrations that are typically above site-specific thresholds. Increased monitoring of BMP well 0618 will continue to assess any influence from the holding pond removal and transient drainage system closure.

4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 2015) in accordance with procedures established to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC) general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 4-1 lists these requirements.

Table 4-1. License Requirements for the Durango, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 4.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 4.5	(b)(4)
Maintenance	Section 3.5	Section 4.6	(b)(5)
Emergency Measures	Section 3.5	Section 4.7	(b)(5)
Environmental Monitoring	Section 3.6	Section 4.8	(b)(2)
Corrective Action	Section 3.6	Section 4.9	--

4.3 Institutional Controls

The 121-acre site, identified by the property boundary shown in Figure 4-1, is owned by the United States and was accepted under the NRC general license in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site. Institutional controls (ICs) at the site include federal ownership of the property, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gates, warning or no-trespassing signs (entrance and perimeter signs), site markers, survey and boundary monuments, and wellhead protectors.

4.4 Inspection Results

The site, 3.5 miles southwest of Durango, Colorado, was inspected on May 13, 2019. The inspection was conducted by M. Kastens and D. Atkinson of the Legacy Management Support (LMS) contractor. J. Dayvault (LM site manager); M. Cosby (Colorado Department of Public Health and Environment); and D. Miller, D. Holbrook, C. Jarchow, and A. Blackford (LMS) attended the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate the need, if any, for maintenance or additional inspection and monitoring.

4.4.1 Site Surveillance Features

Figure 4-1 shows the locations of site features in black, including site surveillance features and inspection areas. Site features that are present but not required by the LTSP to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue text, and new observations identified during the 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are described in the following subsections. Photographs to support specific observations are identified in the text and in Figure 4-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 4.11.

4.4.1.1 Site Access, Entrance Gates, and Entrance Sign

Access to the site is via La Plata County Road 212, an improved dirt road. Entrance to the site is through the locked steel entrance gate along County Road 212 and an older, original entrance gate. Both gates were locked and functional. The entrance sign is at the original entrance gate within the property boundary. The entrance sign showed outdated information and was replaced following the inspection. No other maintenance needs were identified.

4.4.1.2 Perimeter Signs

There are 82 perimeter signs, attached to steel posts set in concrete, that delineate the property boundary. Perimeter signs are inspected for legibility and position to ensure they are functioning. Two additional perimeter signs (P83 and P84), also attached to steel posts, were installed in 2014 inside the property boundary along the east perimeter of Ditch No. 1. These recent additions act as surrogates for perimeter signs P40–P43 because perimeter signs P40–P43 are on a steep, densely wooded hillside. Perimeter signs P40–P43 are not routinely inspected unless the dense vegetation recedes.

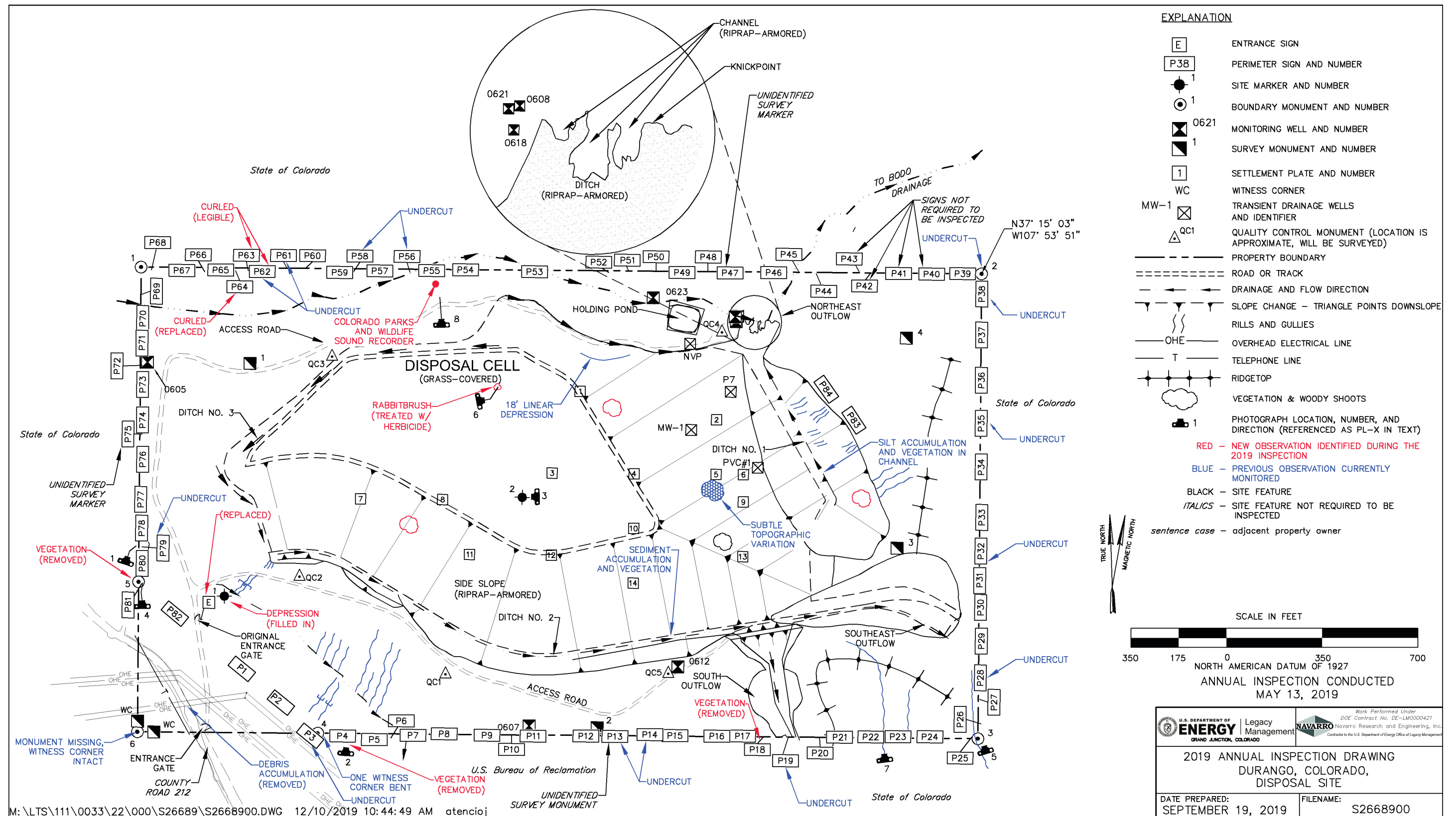


Figure 4-1. 2019 Annual Inspection Drawing for the Durango, Colorado, Disposal Site

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The concrete bases of several perimeter signs have been and continue to be undercut, but the positions of the signs remain uncompromised (PL-1). Following the 2018 inspection, perimeter sign P45 was moved approximately 25 feet (ft) to the east, a location less prone to erosion. Vegetation was encroaching on perimeter sign P4 (PL-2) and P18 and was removed in 2019 following the inspection. Perimeter sign P64 was a plastic sign and had faded and curled and was replaced in 2019 following the inspection. Perimeter signs P62 and P63 are also plastic and somewhat curled but still legible at this time. No other maintenance needs were identified.

4.4.1.3 Site Markers

The site has two site markers. Site marker SMK-1 is just inside the original entrance gate; a deep depression to the side of SMK-1 was filled in after the inspection. Site marker SMK-2 is on the top slope of the disposal cell; minor cracking and spalling along the concrete base edges was repaired in 2018 (PL-3). No other maintenance needs were identified.

4.4.1.4 Survey and Boundary Monuments

Four survey monuments and six boundary monuments (each with two witness corners) delineate the property boundary. Boundary monument BM-6 has been missing since the adjacent U.S. Bureau of Reclamation (BOR) pipeline was installed, bringing the current number of boundary monuments to five. However, both witness corners to boundary monument BM-6 were present. Replacement of boundary monument BM-6 is not warranted at this time. Boundary monument BM-5 (PL-4) and one of its witness corners was covered with vegetation, which was removed following the inspection. The north witness corner of boundary monument BM-3 was reinforced and stabilized as identified in the 2018 annual inspection (PL-5). No other maintenance needs were identified.

4.4.1.5 Monitoring Wells

The site has seven monitoring wells. All wellhead protectors observed during the inspection were undamaged and locked. No maintenance needs were identified.

4.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into six inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the top of the disposal cell, (2) the side slopes of the disposal cell, (3) the drainage ditches, (4) the holding pond, (5) the site boundary, and (6) the outlying areas. Inspectors examined specific site surveillance features within each area and looked for evidence of erosion, settling, slumping, or other modifying processes that might affect the site’s conformance with LTSP requirements.

4.4.2.1 Top of Disposal Cell

The disposal cell, completed in 1990, occupies 60 acres. It has a vegetated cover consisting primarily of perennial grasses and broadleaf plants. There was no evidence of erosion, settling, slumping, or other modifying processes on top of the disposal cell. In the past, inspectors have observed small animal burrows in several areas throughout the top; however, none were

observed in 2019. A single volunteer rabbitbrush shoot (a woody species) (PL-6) was observed growing on the disposal cell top and was treated with herbicide in 2019. No other maintenance needs were identified.

4.4.2.2 Side Slopes of Disposal Cell

The side slopes of the disposal cell are armored with rock riprap. Along the north toe of the disposal cell, rock has moved, resulting in a linear depression approximately 18 ft long that first was observed in 2015. Inspectors did not observe any significant changes to the depression. Inspectors will continue to monitor this area.

A subtle topographic variation in the surface of the northeast side slope, first observed during the 2018 annual inspection, was observed again in 2019. The variation does not pose a concern for disposal cell integrity at this time as no evidence of significant erosion was found during the 2019 inspection. Inspectors will continue to monitor the variation. No maintenance needs were identified.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed beneath the toe of the side slope on the east (Ditch No. 1), south (Ditch No. 2), and northwest and west (Ditch No. 3) sides of the disposal cell. Storm water is directed into these ditches and conveyed away from the site into natural drainages (PL-7). The ditches have sufficient depth and rock protection to carry runoff from a probable maximum precipitation event. Erosion occurs on some of the steep slopes above the ditches, depositing sediment in the riprap-armored channel. This process creates locales that favor plant establishment and enhance wildlife habitat. Sediment accumulation and associated vegetation have not adversely affected the performance of the channel.

The riprap-covered outflows of the drainage ditches were designed to self-armor. The outflows and drainage ditches below them are monitored annually. The uplands above the northeast outflow are steadily eroding over time. Erosion of the uplands does not affect the stability or effectiveness of the outflow area. No maintenance needs were identified.

4.4.2.4 Holding Pond

The holding pond and fence associated with the site's transient drainage system in the northeast corner of the site was removed in 2017. Inspectors in 2019 noted that the former holding pond area was revegetated; no evidence of erosion or damage to the newly vegetated area was observed. No maintenance needs were identified.

4.4.2.5 Site Boundary

Boundary monuments and perimeter signs delineate the site boundary (property boundary) with one exception; the site boundary marked by boundary monument BM-6 is not delineated with perimeter signs because the signs cut across the corner of the site (perimeter signs P82, P1, P2, and P3). Inspectors noted no new activities or changes to the site boundary area, with the exception of a Colorado Parks and Wildlife (CPW) sound recording device placed near the road along the north side of the disposal cell (PL-8). The device was placed onsite without the

knowledge of LM or LMS personnel. LM discussed the issue with CPW. Gullies on the southeast and southwest portion of the site remain stable and do not threaten the integrity of the disposal cell or drainage ditches. No other maintenance needs were identified.

4.4.2.6 Outlying Areas

The area beyond the site boundary for a distance of 0.25 mile was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. No such impacts were identified. CPW manages land to the north, west, and east of the site, and BOR manages land to the south. The primary land uses are wildlife habitat and recreation. Mountain bikers and other recreationists commonly use County Road 212.

4.5 Follow-Up Inspections

LM will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition or (2) LM is notified by a citizen or outside agency that conditions at the site are substantially changed. No need for a follow-up inspection was identified.

4.6 Maintenance

Inspectors documented minor maintenance needs that were addressed following the inspection, including:

- Removing vegetation from around perimeter signs P4 and P18 and boundary monument BM-5
- Replacing plastic perimeter sign P64, which had curled
- Filling in and stabilizing the soil around site marker SMK-1
- Treating woody species on the side and top slopes of the disposal cell
- Replacing the entrance sign, which showed outdated information
- Removing vegetation from around boundary monument BM-5 and one of its witness corners

4.7 Emergency Measures

Emergency measures are the actions that LM will take in response to “unusual damage or disruption” that threatens or compromises site safety, security, or integrity in compliance with Criterion 12 of 10 CFR 40 Appendix A. No need for emergency measures was identified.

4.8 Environmental Monitoring

4.8.1 Groundwater Monitoring

In accordance with the LTSP, LM conducts annual groundwater sampling and analysis to monitor disposal cell performance. Several BMP monitoring wells, such as BMP well 0618, are sampled more frequently to evaluate variable uranium concentrations. The most recent annual sampling event occurred at the site in May 2019. LM inspected the monitoring wells during the sampling event, and no maintenance needs were identified.

The LTSP establishes three POC wells at the site. The POC wells are completed in the uppermost aquifer (bedrock of the Cliff House Sandstone and the Menefee Formation) underlying the site. A background well is also completed in the uppermost aquifer.

Three additional monitoring wells are completed in the alluvium and monitored as a BMP. The LTSP describes the Cliff House/Menefee aquifer as the uppermost aquifer because of the limited area of the alluvial system saturation under natural conditions beneath the disposal cell.

Table 4-2 and Figure 4-2 show the current groundwater monitoring network at the site.

Table 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

Monitoring Well	Well Compliance Type	Hydrologic Relationship
0605	Background	Upgradient (uppermost aquifer)
0607	POC	Downgradient (uppermost aquifer)
0608	BMP	Downgradient (alluvium)
0612	POC	Downgradient (uppermost aquifer)
0618	BMP	Downgradient (alluvium)
0621	POC	Downgradient (uppermost aquifer)
0623	BMP	Upgradient (alluvium)

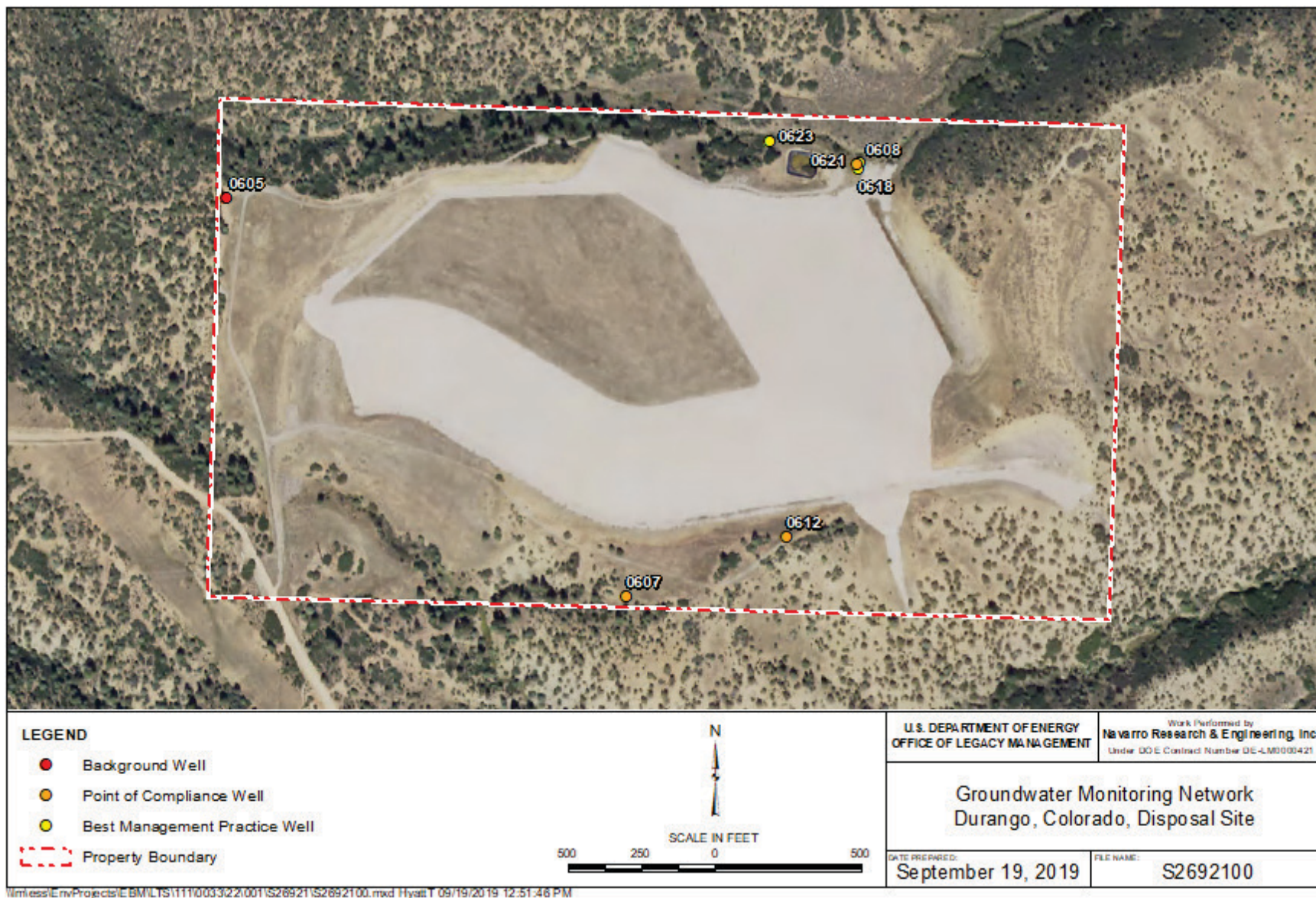


Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

Groundwater is sampled annually for three indicator parameters: molybdenum, selenium, and uranium. The site-specific standards used for the three indicator parameters are the respective maximum observed background concentrations reported in groundwater samples collected from wells completed in the bedrock aquifer, as identified in Table 2-3 of the LTSP. These site-specific standards are provided in Table 4-3. Figure 4-3 through Figure 4-5 show the time-concentration plots for the three indicator parameters, along with corresponding site-specific standards. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System website (<http://gems.lm.doe.gov/#site=DUD>).

Molybdenum, selenium, and uranium concentrations in POC wells (0607, 0612, and 0621) in the uppermost aquifer are below their respective standards.

Table 4-3. Site-Specific Groundwater Standards for the Durango, Colorado, Disposal Site Based on Background Concentrations

Constituent	Standard (mg/L)
Molybdenum	0.22
Selenium	0.042
Uranium	0.077

Abbreviation:

mg/L = milligrams per liter

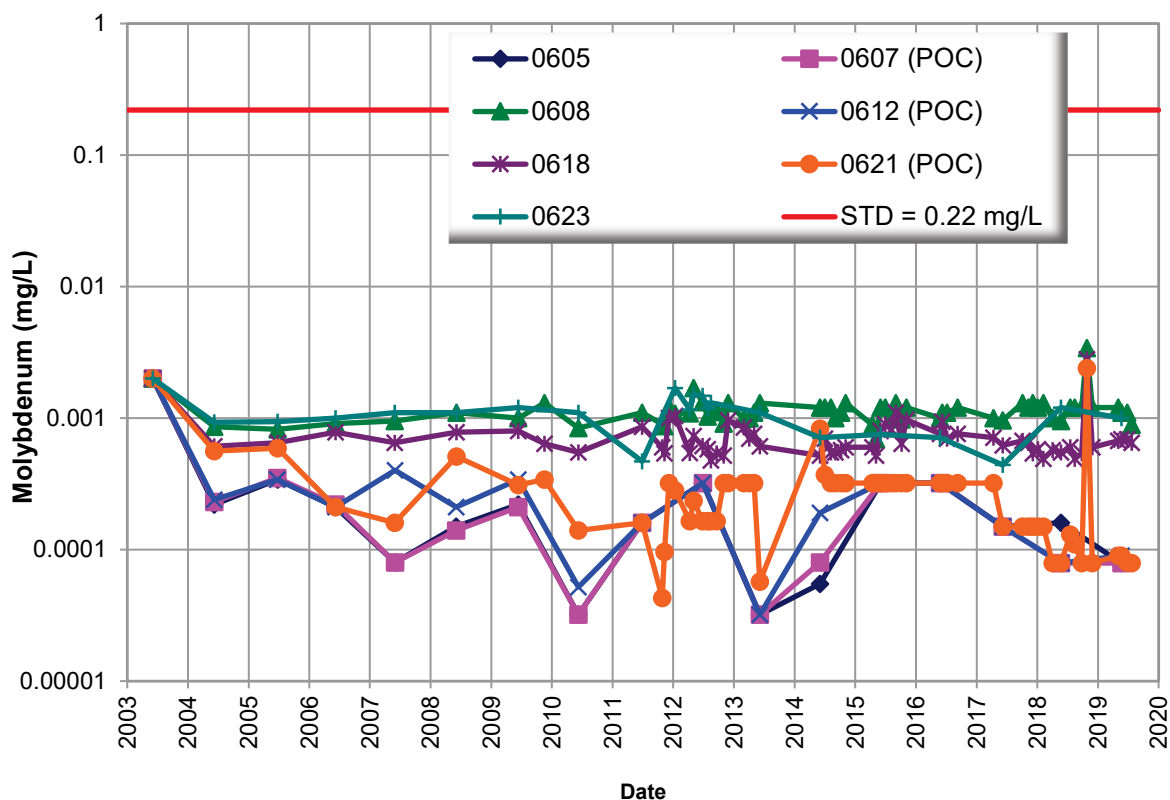


Figure 4-3. Molybdenum in Groundwater at the Durango, Colorado, Disposal Site

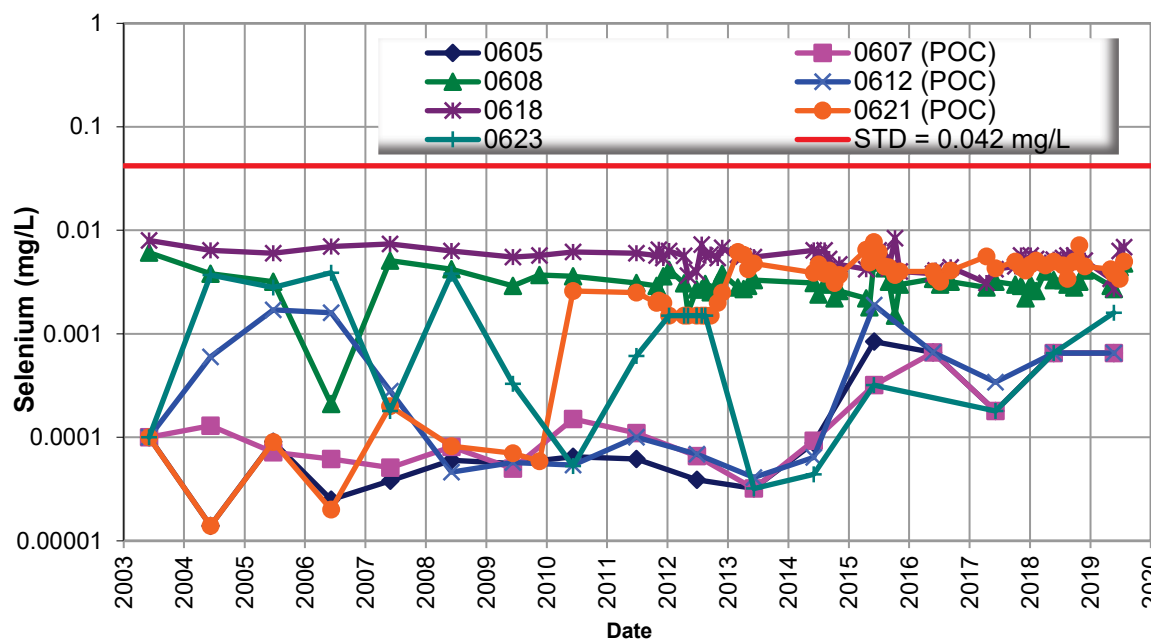


Figure 4-4. Selenium in Groundwater at the Durango, Colorado, Disposal Site

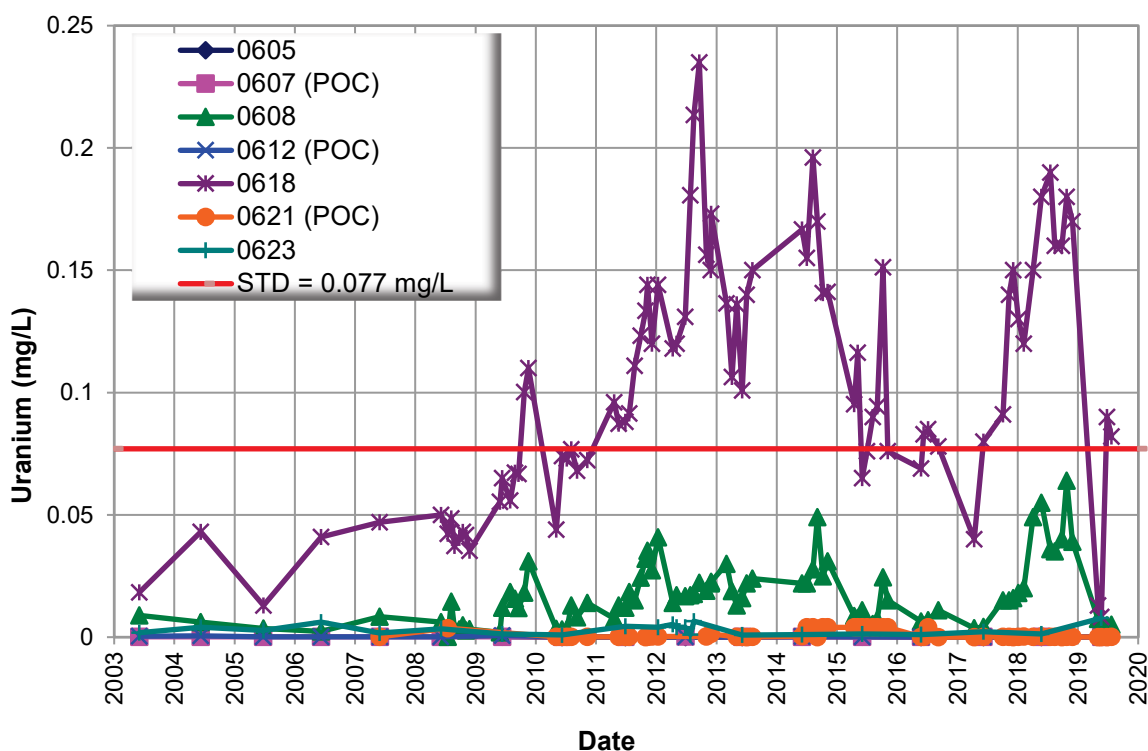


Figure 4-5. Uranium in Groundwater at the Durango, Colorado, Disposal Site

Wells completed in the alluvium are sampled as a BMP. Uranium concentrations in well 0618 have consistently been higher than concentrations in the other wells onsite. To monitor and

compare the elevated and variable uranium concentrations observed in this well, wells 0608, 0618, and 0621 are sampled monthly as weather permits. Figure 4-5 shows variable uranium concentrations between 0.04 milligrams per liter (mg/L) and 0.24 mg/L in well 0618 beginning in 2009 and continuing to the present. In 2019, uranium concentrations in well 0618 decreased from 0.18 mg/L to 0.02 mg/L—a value slightly below the minimum measured concentration—and then increased to 0.09 mg/L, which is within the range of measured historical concentrations. Investigating the cause of this variability at well 0618 continues.

4.8.2 Vegetation Monitoring

Vegetation on top of the disposal cell remains healthy. The LTSP requires deep-rooted plants on the disposal cell cover to be removed by either selective spraying or mechanical removal when their shoot height equals or exceeds 3.5 ft. Although the aboveground height of dryland alfalfa will never exceed the height criterion, it is known to be a deep-rooted plant; therefore, this species is also controlled on the disposal cell cover. Several shoots of woody species were found on the side slopes and were removed following the site inspection.

4.9 Corrective Action

In accordance with the LTSP, implementation of a corrective action program will be taken within 18 months of verification of an established exceedance of a concentration limit for one or more constituents in a POC well. No need for corrective action was identified.

4.10 References

10 CFR 40 Appendix A. U.S. Nuclear Regulatory Commission, “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content,” *Code of Federal Regulations*.

10 CFR 40.27. U.S. Nuclear Regulatory Commission, “General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites,” *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2015. *Long-Term Surveillance Plan for the Durango, Colorado, Disposal Site*, LMS/DUD/S06297, April.

4.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	20	Concrete Base of Perimeter Sign P79 (Undercut by Erosion)
PL-2	5	Vegetation Blocking Perimeter Sign P4 (Removed Following Inspection)
PL-3	270	2018 Repairs to Base of Site Marker SMK-2
PL-4	—	Vegetation Blocking Boundary Monument BM-5
PL-5	325	Boundary Monument BM-3
PL-6	80	Rabbitbrush on Disposal Cell Top
PL-7	355	Water Flowing in Natural Drainage Near Perimeter Sign P23
PL-8	—	Colorado Parks and Wildlife Sound Recorder Near Small Pull-out in Road

Note:

— = Photograph taken vertically from above.



PL-1. Concrete Base of Perimeter Sign P79 (Undercut by Erosion)



PL-2. Vegetation Blocking Perimeter Sign P4 (Removed Following Inspection)



PL-3. 2018 Repairs to Base of Site Marker SMK-2



PL-4. Vegetation Blocking Boundary Monument BM-5



PL-5. Boundary Monument BM-3



PL-6. Rabbitbrush on Disposal Cell Top



PL-7. Water Flowing in Natural Drainage Near Perimeter Sign P23



PL-8. Colorado Parks and Wildlife Sound Recorder near Small Pull-out in Road