LMS/S30146

U.S. DEPARTMENT OF ENERGY

Legacy Management

2020 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites

March 2021

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Abbreviations

ACL	alternate concentration limit
AML	Abandoned Mine Lands
BLM	U.S. Bureau of Land Management
BMP	best management practice
BOR	U.S. Bureau of Reclamation
CFR	*Code of Federal Regulations*
CPW	Colorado Parks and Wildlife
D_{50}	mean diameter
DOE	U.S. Department of Energy
EDA	energy dissipation area
EPA	U.S. Environmental Protection Agency
ft	feet
FY	fiscal year
GCAP	Groundwater Compliance Action Plan
GEMS	Geospatial Environmental Mapping System
gpm	gallons per minute
GSMT	geotechnical sampling and materials testing
IC	institutional control
ICP	interim cover protection
IRBP	interim radon barrier protection
lidar	light detection and ranging
LM	Office of Legacy Management
LMS	Legacy Management Support
LTSP	Long-Term Surveillance Plan
MCL	maximum concentration limit
mg/L	milligrams per liter
µrem/h	microrem per hour
NECA	Navajo Engineering and Construction Authority
NMED	New Mexico Environment Department
NRC	U.S. Nuclear Regulatory Commission
PL	photograph location
POC	point of compliance

RAI	request for additional information
RCT	radiation control technician
SOARS	System Operation and Analysis at Remote Sites
TCEQ	Texas Commission on Environmental Quality
UAS	Unmanned Aircraft System (UAS)
UBL	upper baseline limit
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act
USDA	U.S. Department of Agriculture

Executive Summary

This report, in fulfillment of a U.S. Nuclear Regulatory Agency license requirement, presents the results of long-term surveillance and maintenance activities conducted by the U.S. Department of Energy (DOE) Office of Legacy Management (LM) in 2020. These activities occurred at the 19 uranium mill tailings disposal sites established under Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA)[1] and verified that the UMTRCA Title I disposal sites remain in compliance with license requirements and Long-Term Surveillance Plans (LTSPs). Individual chapters for each site are available on the internet at https://energy.gov/lm/sites/lm-sites.

LM manages 18 UMTRCA Title I sites under a general license granted by NRC in accordance with Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). LM also manages the UMTRCA Title I Grand Junction, Colorado, Disposal Site, which will not be included under the general license until the open, operating portion of the disposal cell is closed. Low-level radioactive waste will be received until the disposal cell's legally mandated closure date or until it is filled to capacity, whichever comes first. In December 2020, Congress passed legislation that will extend the final disposal cell closure date from 2023 to 2031. LM's receipt of radioactive waste at the site will cease in September 2031.

Long-term surveillance and maintenance activities for these sites include inspecting and maintaining the sites; monitoring environmental media and institutional controls; conducting any necessary corrective actions; and performing stakeholder relations and administrative, recordkeeping, and other regulatory stewardship functions.

Annual site inspections and monitoring are conducted in accordance with site-specific LTSPs[2] and procedures established by DOE to comply with license requirements. Each site inspection is performed to verify the integrity of visible features at the site; to identify changes or new conditions that may affect the long-term performance of the site; and to determine the need, if any, for maintenance, follow-up inspections, or corrective action in accordance with the LTSP.

All sites require some degree of routine monitoring and maintenance, which may include groundwater and surface water monitoring, minor erosion control, vegetation control, fence and gate repairs, sign replacement, and minor trash removal. LM has begun inspecting and reporting on the conditions of the aerial survey quality control monuments in its annual compliance reports, consistent with its inspection and reporting of other site features. NRC concurred with an October 6, 2020, letter from LM that proposed to defer revising all site LTSPs to address the new aerial survey quality control monument inclusion until future revisions become necessary.

The following nonroutine activities[3] occurred in 2020:

- Several earthquakes occurred close to the Naturita and Slick Rock sites, but the earthquake magnitudes were below all reporting levels defined in the respective LTSPs. Program engineers performed peak ground acceleration calculations, but the results did not require any further action. The cause of the frequent earthquakes has been identified as a

[1] Congress directed that the Moab, Utah, Processing Site be remediated under Title I of UMTRCA. This site eventually will become the 20th Title I disposal site.
[2] The Grand Junction Disposal Site is inspected in accordance with an interim LTSP.
[3] Nonroutine activities are implemented in response to changes in site conditions, regulatory setting, or management structure following a regulatory compliance review.

Colorado River desalination project using injection wells in and around the Paradox Valley area. The project is under review by the appropriate agency and may be discontinued.

- Travel restrictions imposed in response to the novel coronavirus outbreak prevented Grand Junction-based Legacy Management Support (LMS) inspectors from traveling to the Navajo Nation to conduct annual inspections at the Shiprock, New Mexico, and Tuba City, Arizona, disposal sites. As an alternative, LMS staff enlisted the assistance of individuals from tribal organizations familiar with Shiprock and Tuba City disposal sites to conduct the inspections. The LMS contractor provided online training on the LM inspection process to the assisting parties before the inspections.

Results of the annual site inspection, maintenance, and monitoring activities are reported in the site-specific chapters that follow. Actions and issues are summarized in Table ES-1.

Table ES-1. 2020 Summary of UMTRCA Title I Site Actions and Issues

Site	Chapter	Page	Actions and Issues
Ambrosia Lake, New Mexico	1	1-2	Updated contact information on entrance sign.
		1-7	No best management practice groundwater monitoring conducted.
Burrell, Pennsylvania	2	2-5	Removed down tree.
		2-8	Installation of PVC pipe for identification of boundary monument BM-1.
		2-8	Performed minor fence repairs.
		2-10	Conducted vegetation management.
Canonsburg, Pennsylvania	3	3-5	Repaired security fence and personnel gate.
		3-11	Conducted vegetation management.
Durango, Colorado	4	4-2	Replaced entrance sign.
		4-8	Conducted groundwater monitoring.
		4-12	Conducted vegetation management.
Falls City, Texas	5	5-8	Conducted groundwater monitoring.
Grand Junction, Colorado	6	6-5	Repaired warning signs on southwest perimeter fence.
		6-5	Installed aerial survey quality control monuments.
		6-7	Conducted groundwater monitoring.
Green River, Utah	7	7-2	Unmanned aircraft system warning signs to be installed.
		7-7	Conducted groundwater monitoring.
Gunnison, Colorado	8	8-2	Replacement of perimeter signs P4–P13.
		8-5	Locks on wells 0634 and 0712 to be installed.
		8-7	No groundwater monitoring required.
Lakeview, Oregon	9	9-2	Updated contact information on entrance sign.
		9-6	Conducted riprap gradation monitoring.
		9-8	No groundwater monitoring required.
Lowman, Idaho	10	10-5	Observed wildland firefighter trail outside property boundary.
		10-6	No groundwater monitoring required.

Table ES-1. 2020 Summary of UMTRCA Title I Site Actions and Issues (continued)

Site	Chapter	Page	Actions and Issues
Maybell, Colorado	11	11-2	Performed minor fence repairs.
		11-7	No groundwater monitoring required.
		11-7	Conducted vegetation monitoring.
Mexican Hat, Utah	12	12-5	Installed unmanned aircraft system warning signs.
		12-8	No groundwater monitoring required.
		12-8	Conducted observational seep monitoring.
Naturita, Colorado	13	13-1	No groundwater monitoring required.
		13-2	Replaced entrance sign.
		13-2	Installed unmanned aircraft system warning signs.
		13-2	Performed repairs to entrance gate.
Rifle, Colorado	14	14-2	Minor fence repairs to be performed.
		14-8	Conducted disposal cell pore-water monitoring.
Salt Lake City, Utah	15	15-5	Replaced perimeter sign.
		15-6	Conducted visual riprap degradation monitoring on disposal cell.
		15-7	No groundwater monitoring required.
Shiprock, New Mexico	16	16-2	Performed minor fence repairs.
		16-2	Repaired gaps under perimeter fence.
		16-6	Treated woody vegetation on top and side slopes of disposal cell.
		16-7	Repaired degraded erosion control fabric on energy dissipation basin.
		16-8	No disposal cell performance monitoring required.
		16-8	Conducted vegetation monitoring.
Slick Rock, Colorado	17	17-5	Observed continued erosion southwest of the disposal cell apron.
		17-6	No groundwater monitoring required.
Spook, Wyoming	18	18-6	No groundwater monitoring required.
Tuba City, Arizona	19	19-6	Gaps under fence to be repaired.
		19-6	Pictorial perimeter sign to be replaced.
		19-8	Conducted evaluative groundwater monitoring.

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1.0 Ambrosia Lake, New Mexico, Disposal Site

1.1 Compliance Summary

The Ambrosia Lake, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on September 11, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up or contingency inspection.

Groundwater monitoring is not required at the site. However, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts groundwater monitoring at three wells as a best management practice at the request of the New Mexico Environment Department (NMED). The most recent groundwater sampling event occurred in November 2019, and results were reported in the 2019 site inspection report.

1.2 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 1996) 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 1-1 lists these requirements.

Table 1-1. License Requirements for the Ambrosia Lake, New Mexico, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 1.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 1.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 1.6	(b)(5)
Groundwater Monitoring	Section 5.0	Section 1.7	(b)(2)
Corrective Action	Section 9.0	Section 1.8	--

1.3 Institutional Controls

The 288-acre site, identified by the property boundary shown in Figure 1-1 is owned by the United States and was accepted under the NRC general license in 1998. 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 sign, perimeter signs, site markers, survey and boundary monuments, and wellhead protectors.

1.4 Inspection Results

Inspection of the site, 25 miles north of Grants, New Mexico, was delayed from its routine time in March because of the novel coronavirus's impacts on travel. The inspection was conducted by J. Cario, N. Keller, and D. Traub of the Legacy Management Support contractor.

B. Tsosie (LM site manager) and G. Kuntz (LM) 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.

1.4.1 Site Surveillance Features

Figure 1-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 1-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 1.10.

1.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is from a gravel road that crosses private property and leads to the site for approximately 1 mile from New Mexico Highway 509. Entrance to the site is through a locked steel gate at the intersection of the access road and Highway 509. The access road continues east past the site to private mining and grazing interests. The gate and access road are owned by Rio Algom Mining LLC. LM has been granted permanent access to the site but does not maintain the gate or the access road. The entrance sign is near the access road next to site marker SMK-1 (PL-1). The phone number on the entrance sign was updated during a subsequent site visit. No other maintenance needs were identified.

1.4.1.2 Perimeter Signs

There are 70 perimeter signs, attached to steel posts set in concrete, positioned along the unfenced property boundary (PL-2). Posts for perimeter signs P1 through P15 include additional warning signs about mining restrictions. Many of the perimeter signs were cracked and weathered but remain legible. No maintenance needs were identified.

1.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the site entrance, and site marker SMK-2 is on the top slope of the disposal cell (PL-3). No maintenance needs were identified.

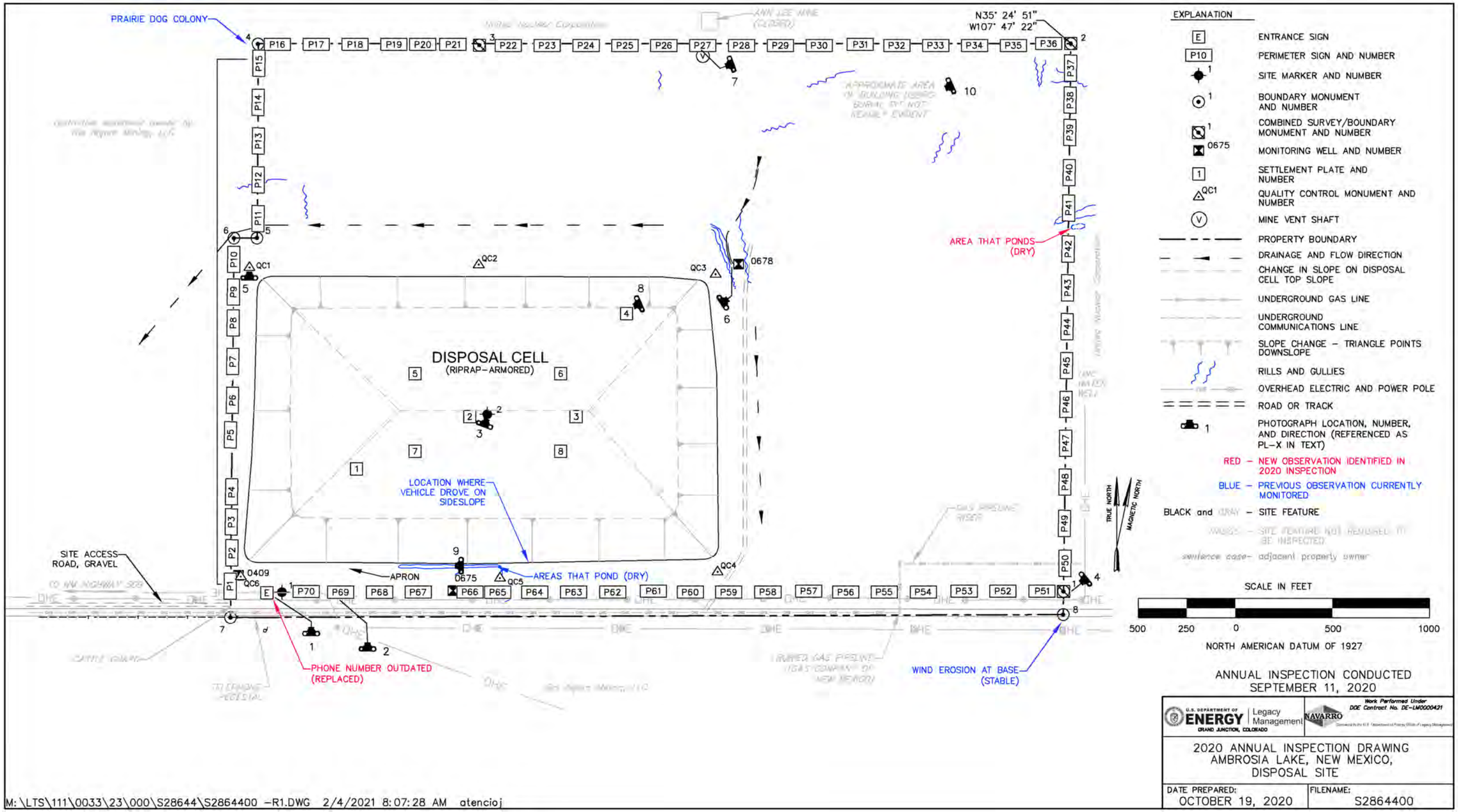

Figure 1-1. 2020 Annual Inspection Drawing for the Ambrosia Lake, New Mexico, Disposal Site

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1.4.1.4 Survey and Boundary Monuments

Three combined survey and boundary monuments and five additional boundary monuments delineate the property corners and boundary (PL-4). Steel T-posts were installed next to boundary monuments to help inspectors locate them. Erosion has occurred around the base of boundary monument BM-8, but the monument is stable. No maintenance needs were identified.

1.4.1.5 Aerial Survey Quality Control Monuments

Six aerial survey quality control (QC) monuments, installed in 2019, were inspected during the 2020 annual inspection (PL-5). No maintenance needs were identified.

1.4.1.6 Monitoring Wells

The site has three monitoring wells. A gully adjacent to well 0678 appears to be stable, and the well is not affected by the erosion (PL-6). All wellhead protectors observed during the inspection were undamaged, locked, and properly labeled. No maintenance needs were identified.

1.4.1.7 Mine Vent

A mine vent shaft associated with an abandoned underground mine is within the site boundary in the northern portion of the site (PL-7). The vent has a spot-welded cover and a casing that rises approximately 3 feet above the ground. The vent was secure at the time of the inspection. Inspectors will continue to monitor the condition of the vent to ensure that the closure remains secure. No maintenance needs were identified.

1.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the top of the disposal cell, (2) the side slopes and apron of the cell, (3) the graded and revegetated area between the disposal cell and the site perimeter, and (4) the outlying area. 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.

1.4.2.1 Top of Disposal Cell

The disposal cell, completed in 1994, occupies 91 acres and is armored with basalt riprap to control erosion and deter animal and human intrusion. The top slope showed no evidence of cracking, slumping, or erosion, and there was no indication of riprap degradation. A shallow depression around settlement plate SP-4, near the northeast corner of the disposal cell cover, was first noted during the 1997 inspection and continued to grow in depth and area in subsequent years. The depression was repaired in August 2005. Visual observations during the 2017 annual inspection indicated that very minor settlement may have occurred since the depression was repaired. The area was inspected during the 2020 annual inspection, and although the area was observed to be slightly depressed, settlement was shallow enough that neither the depth nor the extent could be definitively assessed (PL-8). Inspectors will continue to monitor this area.

Scattered annual weeds and perennial grasses and forbs are growing on the disposal cell top. In accordance with the LTSP, deep-rooted shrubs are to be removed from the disposal cell cover. No deep-rooted shrubs were noted during the inspection. No maintenance needs were identified.

1.4.2.2 Side Slopes and Apron

The basalt riprap-covered side slopes and apron showed no evidence of erosion, settling, slumping, or cracking. Standing water is occasionally observed in a portion of the south apron, but the area was dry during the inspection (PL-9). This location is the topographic low spot along the base of the disposal cell, and stormwater runoff collects in this area. No significant changes in the potential desiccation crack and small rills at the base of the disposal cell were observed. Inspectors will continue to monitor this area. No maintenance needs were identified.

1.4.2.3 Graded and Revegetated Area

In general, site vegetation appeared to be healthy. However, some areas are windswept and have little growth, particularly in an area north of the disposal cell where mill tailings had formerly been stockpiled (PL-10). Because the site is not fenced, livestock occasionally enter it. Inspectors did not observe cattle near the disposal cell, but there was evidence of recent grazing on the site. Occasional grazing will not affect the disposal cell protectiveness or long-term performance, because livestock do not walk on riprap-armored surfaces.

Onsite rills and gullies north and east of the disposal cell have been visually monitored for several years. While no new rills and gullies were observed during the 2020 annual inspection, existing rills and gullies continued to develop. These erosional features do not threaten the disposal cell's performance or integrity, because headward erosion is progressing away from the disposal cell, and there is no significant sedimentation near the disposal cell. Inspectors will continue to monitor these features to confirm that they do not impact site features. No maintenance needs were identified.

1.4.2.4 Outlying Area

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. Rills and gullies continue to be observed east of perimeter sign P41. These erosional features do not threaten the long-term integrity of the site because headward erosion is progressing away from the site. Inspectors will continue to monitor these features to ensure they do not impact site features.

1.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

1.6 Maintenance and Repairs

Inspectors noted the phone number on the entrance sign was outdated. The number was updated following the inspection. No other maintenance needs were identified.

1.7 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required at this site because (1) the groundwater is heavily contaminated from underground uranium mining and naturally occurring mineralization and (2) the uppermost aquifer is of limited use due to its low yield. Consequently, NRC concurred with the application of supplemental standards at the site and the exemption of both compliance and performance groundwater monitoring. However, LM conducts groundwater monitoring at three wells (0409, 0675, and 0678) as a best management practice at the request of NMED (Table 1-2 and Figure 1-2) (Kleinrath 2001). LM originally agreed to sample these locations once every 3 years for 30 years; however, LM sampled annually from November 2010 to November 2016 at the request of NMED. After the November 2016 sampling event, sampling was returned to a triennial schedule. The most recent sampling event occurred in November 2019.

Table 1-2. Groundwater Monitoring Network at the Ambrosia Lake, New Mexico, Disposal Site

Monitoring Well	Hydrologic Relationship
0409	Contact between alluvium and Tres Hermanos C unit, downgradient
0675	Weathered Mancos Shale, downgradient
0678	Tres Hermanos B unit, downgradient

Well 0675 is completed in weathered Mancos Shale just below its contact with the overlying alluvium, and well 0678 is completed in the Tres Hermanos B Sandstone unit of the Mancos Shale. LM installed well 0409 in May 2011 in support of a regional groundwater investigation being conducted by NMED. Well 0409, on DOE property adjacent to the southwest corner of the disposal cell, is completed in an alluvium-filled paleochannel. The bottom of the well screen is at the contact between the alluvium and the sandstone of Unit C of the Tres Hermanos member of the Mancos Shale Formation. Well 409 is dry, which suggests that groundwater is not leaving the southwest portion of the site via alluvium.

All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=AMB). The *2019 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2020) reports the most recent monitoring results. Consistent with previous sampling events, well 0409 was dry. Monitoring results for molybdenum, nitrate, selenium, sulfate, and uranium for wells 0675 and 0678 were consistent with historical monitoring results. In accordance with its agreement with NMED, LM will continue to monitor groundwater at the Ambrosia Lake site every 3 years until 2031. The next sampling event will be in November 2022.

Figure 1-2. Ambrosia Lake, New Mexico, Groundwater Best Practice Monitoring Locations

1.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

1.9 References

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.*

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1996. *Long-Term Surveillance Plan for the Ambrosia Lake, New Mexico, Disposal Site*, DOE/AL/62350-211, Rev. 1, July.

DOE (U.S. Department of Energy), 2020. *2019 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S26685, March.

Kleinrath, 2001. Art Kleinrath, program manager, Office of Legacy Management, U.S. Department of Energy, letter (about Contract No. DE-AC13-96GJ87335, "Response to New Mexico Environment Department Regarding Monitor Well Decommissioning and Ongoing Groundwater Monitoring at the Ambrosia Lake UMTRCA Title I Disposal Site") to Marcy Leavitt, branch chief, New Mexico Environment Department, Groundwater Quality Bureau, August 29.

1.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	Entrance Sign and Site Marker SMK-1
PL-2	0	Perimeter Sign P69
PL-3	20	Site Marker SMK-2
PL-4	230	Boundary Monument BM-1
PL-5	—	Quality Control Monument QC1
PL-6	55	Erosional Gully near Monitoring Well 0678
PL-7	250	Mine Vent
PL-8	245	Settlement Plate 4 and Top Slope of the Disposal Cell
PL-9	270	Base of South Side Slope of the Disposal Cell
PL-10	245	Disposal Cell and Northeast Portion of the Site

Note:
— = Photograph taken vertically from above.

PL-1. Entrance Sign and Site Marker SMK-1

PL-2. Perimeter Sign P69

PL-3. Site Marker SMK-2

PL-4. Boundary Monument BM-1

PL-5. Quality Control Monument QC1

PL-6. Erosional Gully near Monitoring Well 0678

PL-7. Mine Vent

PL-8. Settlement Plate 4 and Top Slope of the Disposal Cell

PL-9. Base of South Side Slope of the Disposal Cell

PL-10. Disposal Cell and Northeast Portion of the Site

2.0 Burrell, Pennsylvania, Disposal Site

2.1 Compliance Summary

The Burrell, Pennsylvania, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on October 21, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified minor maintenance needs but found no cause for a follow-up inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts routine groundwater monitoring every 5 years as a best management practice to aid evaluation of the disposal cell's performance. The most recent routine groundwater sampling event occurred in November 2018, and results were reported in the 2018 site inspection report. However, due to an increase in molybdenum concentration in one of the downgradient wells, LM resampled all four downgradient wells on October 19, 2020 (ahead of the required 5-year sampling frequency), to observe whether the increase persists. When finalized, these nonroutine sampling results will be reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=BUR) and in the annual compliance report for 2021.

2.2 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 2000) 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 2-1 lists these requirements.

Table 2-1. License Requirements for the Burrell, Pennsylvania, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.3 and 3.4	Section 2.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 2.5	(b)(4)
Maintenance	Section 3.6	Section 2.6	(b)(5)
Emergency Measures	Section 3.6	Section 2.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 2.8	(b)(2)

2.3 Institutional Controls

The 72-acre site, identified by the property boundary shown in Figure 2-1, is owned by the United States and was accepted under the NRC general license in 1994. DOE is the licensee and, in accordance with 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 gate and sign, security fence, perimeter signs, site marker, survey and boundary monuments, erosion control markers, quality control monuments, and wellhead protectors.

2.4 Inspection Results

The site, 1 mile east of Blairsville, Pennsylvania, was inspected on October 21, 2020. The inspection was conducted by K. Broberg and H. Swiger of the Legacy Management Support (LMS) contractor. C. Carpenter (LM site manager), D. Shearer (Pennsylvania Department of Environmental Protection), and T. Biller (site herbicide subcontractor Lawn RX) 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.

2.4.1 Site Surveillance Features

Figure 2-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 2-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 2.10.

2.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is from a road leading from Strangford Road, along a DOE right-of-way through a parcel of private property (Tract 201-E), and across DOE's leased crossing over Norfolk Southern Railroad tracks. Entrance to the site is through a locked gate in the east end of the security fence. Local residents have historically used the area along the DOE right-of-way for unpermitted dumping, hunting, target shooting, and riding all-terrain vehicles. Personnel associated with commercial interests use the road for access to the railroad tracks and several nearby natural gas wells. Because the DOE right-of-way cannot be controlled, NRC concurred that the entrance gate in the site security fence is the IC for site access rather than the gate across the access road. The entrance gate was locked and functional. The site entrance sign on the entrance gate was legible. No maintenance needs were identified.

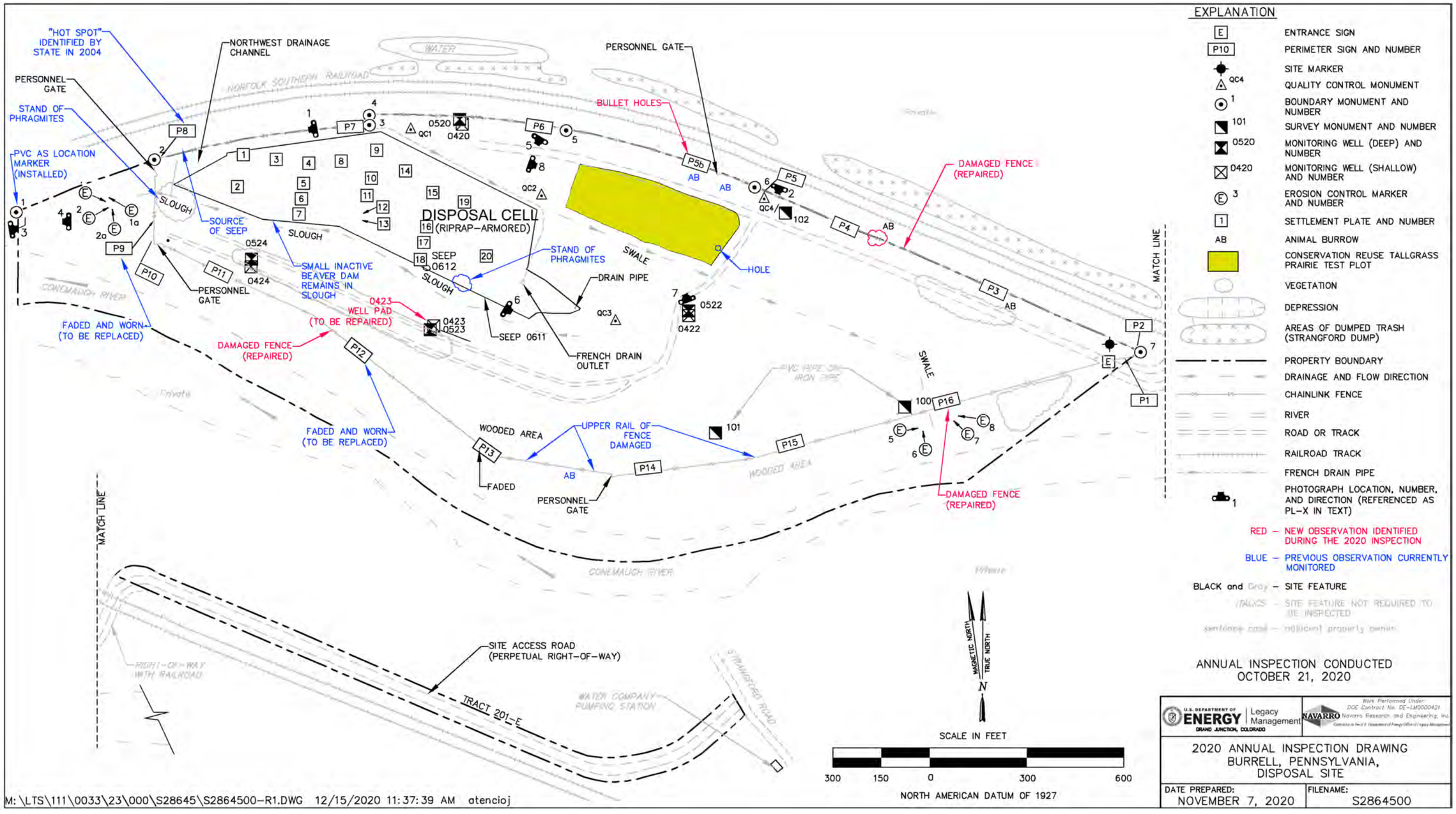

Figure 2-1. 2020 Annual Inspection Drawing for the Burrell, Pennsylvania, Disposal Site

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2.4.1.2 Security Fence and Perimeter Signs

A chainlink security fence encloses the disposal cell and drainage features (PL-1). The site herbicide subcontractor keeps the fence line clear of vegetation, which should prolong the life of the security fence. Trees felled by strong storms in 2020 damaged the fence in two places. Fence repairs were made before the 2020 site inspection.

There are 16 perimeter signs attached to the outside of the security fence. All 16 perimeter signs were present. Perimeter sign P5b on the north fence has some bullet holes but is legible.

2.4.1.3 Site Marker

The site has one granite site marker just inside the main entrance gate. The concrete pad is cracked but remains functional. No maintenance needs were identified.

2.4.1.4 Survey and Boundary Monuments

The site has three survey monuments and seven boundary monuments. Survey monument SM-102 was noted as missing in the 2017 and 2018 inspections. Quality control monument QC4 was installed in 2019 as a replacement for survey monument SM-102 (PL-2).

In past inspections, boundary monument BM-1 was difficult to locate because it was buried by dirt. LM installed a 4-foot-tall, 4-inch-diameter PVC pipe around and over boundary monument BM-1 in 2020 to aid in locating the monument (PL-3). LM also cut through a downed tree to provide access across the footpath leading back to boundary monument BM-1 (PL-4). Boundary monument BM-2 was not located during this year's inspection. A metal detector will be used during the 2021 inspection to locate it. No new maintenance needs were identified.

2.4.1.5 Aerial Survey Quality Control Monuments

Four aerial survey quality control monuments, installed in 2019, were inspected during the 2020 annual inspection. No maintenance needs were identified.

2.4.1.6 Erosion Control Markers

The site has eight erosion control markers. No maintenance needs were identified.

2.4.1.7 Monitoring Wells

The site has eight monitoring wells that were last routinely sampled and inspected in November 2018. As a best management practice, concrete well pads were installed at five monitoring wells (0420, 0520, 0422, 0522, and 0523) during the October 2018 sampling event. Monitoring well 0423 already had a concrete well pad. Saturated ground prevented the installation of concrete well pads at monitoring wells 0424 and 0524 in 2018, but these will be installed in the future. All wellhead protectors that were observed during the annual inspection were locked and undamaged. During this year's inspection the well pad at well 0423 wobbled when pressure was applied to a corner of the pad. This condition will be further evaluated and corrected the next time the sampling crew is onsite. No other new maintenance needs were identified.

2.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area adjacent to the disposal cell, (3) the site perimeter, and (4) the outlying area, including the access road that leads to the site. 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.

2.4.2.1 Disposal Cell

The disposal cell, completed in 1987, occupies 5 acres and is armored with riprap to control erosion and deter animal intrusion (PL-5). There was no evidence of erosion, settling, slumping, or any other modifying process that might affect the integrity of the disposal cell.

Control of vegetation (including woody vegetation) on the disposal cell is not required by the LTSP. A screening-level risk assessment conducted by DOE from 1996 to 1997 concluded that plant succession on the disposal cell does not present significant or credible risk to human health or the environment and, due to reduced hydraulic flux through the cover from evapotranspiration, may improve the long-term performance of the disposal cell. The LTSP was revised in 2000 to reflect these findings; at that time, NRC suggested that LM reevaluate the effects of vegetation on cover performance in 10 or 20 years (i.e., between 2010 and 2020) to confirm performance parameters and predictions. The assessment will revisit the issue of vegetation growth on the disposal cell cover to evaluate whether it remains protective of human health and the environment or interferes with the ability of inspectors to assess disposal cell cover stability. The 2017 inspection report (DOE 2018) noted that LM was planning to conduct a follow-up assessment in fiscal year 2019. LM delayed the assessment to further consult with NRC on the scope of the study. Currently, NRC and LM are working on joint research to analyze disposal cell cover performance and pedogenesis at other UMTRCA sites that could support development of the scope for a Burrell site study.

Although vegetation is allowed to grow on the disposal cell, noxious weeds and invasive plants are controlled on the disposal cell and the site through spraying and mowing. In 2008, a site Vegetation Management Plan (DOE 2008) was issued that included the control of noxious and invasive vegetation on the disposal cell cover to facilitate inspection activities. Vegetation management is effective at limiting the spread of noxious weeds. Other woody species continue to establish but are controlled. No other maintenance needs were identified.

2.4.2.2 Area Adjacent to the Disposal Cell

A French drain was installed parallel to the north slope of the disposal cell in 1998 to prevent the ponding of water next to the cell. The outlet for the French drain, on the south slope of the disposal cell, was not flowing during the inspection, and no outflow has ever been observed during inspections. Water was not ponded anywhere along the French drain, and no wetland vegetation was observed; these conditions indicate it is operating properly. Inspectors will continue to monitor the French drain area to verify that it continues to operate as designed.

A large tree fell in the slough south of the disposal cell in 2019. Given the way the tree fell and its location on a steep slope, it may not need to be removed. In 2020, inspectors observed that the downed tree is not interfering with drainage in the slough.

A small, inactive beaver dam remains in the slough south of the disposal cell. The site herbicide contractor indicated that the dam was inactive in 2020, as no evidence of recent activity was observed around the dam (e.g., animal tracks, new cuts). In its current state, it does not interfere with the flow of water enough to warrant action (PL-6). No maintenance needs were identified.

2.4.2.3 Site Perimeter

An active seep near the north security fence, about 60 feet east of perimeter sign P8 and west of the disposal cell, was not flowing during this year's inspection, but the area around the seep was moist. The seep does not pose a threat to the integrity of the disposal cell. Inspectors will continue to monitor this area. Conceivably, the seep could destabilize the nearby railroad embankment. The water for the seep along the fence line appears to be coming from the bluffs north of the railroad tracks. No other maintenance needs were identified.

2.4.2.4 Outlying Area

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 activities that could affect the long-term integrity of the site were observed.

North of the site, a dirt road parallels the railroad tracks and provides access to a long, narrow wooded area that has been used as an illegal dump. No new piles of trash were observed during the inspection. The dumping of trash is not a threat to the disposal site but indicates the overall level of activity near the disposal site and may be a predictor of vandalism. Inspectors will continue to note any dumping activity.

In 2004, a representative from the Pennsylvania Department of Environmental Protection showed inspectors a "hot spot" (an area having gamma radiation levels of 5 millirem per hour) in the rock ballast adjacent to the railroad tracks northeast of perimeter sign P8. A review of LM records confirmed that the area in question was addressed in a property completion report for the Uranium Mill Tailings Remedial Action Project. Supplemental standards have been applied to contamination beneath the tracks, because the benefit of removal does not justify the cost. LM communicated the results of a records search to the Commonwealth of Pennsylvania in late 2004. The hot spot was the subject of a follow-up discussion with Pennsylvania representatives in 2006. In October 2018, NRC personnel revisited the hot spot area and measured a gamma radiation level of 200 microrem per hour, which is considerably lower than the 2004 measurement. The area is marked on the site inspection map for future reference. The area is not on DOE property; the Commonwealth of Pennsylvania is the responsible authority.

2.5 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.

2.6 Maintenance

Minor maintenance needs identified by the inspectors during the 2019 annual inspection and completed in 2020 include the following:

- Installing 4-inch PVC pipe over boundary monument BM-1 for easier identification
- Removing a downed tree across the path leading to boundary monument BM-1

Perimeter signs P9 and P12 were identified for replacement in 2019 because they are faded. They were not replaced in 2020 but are being targeted for replacement in 2021.

Fence repairs in several places were made before the 2020 inspection. The wobbling well pad at monitoring well 0423 will be addressed the next time the sampling crew is onsite.

2.7 Emergency Measures

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

2.8 Environmental Monitoring

2.8.1 Groundwater Monitoring

In accordance with the LTSP, LM conducts routine groundwater monitoring every 5 years as a best management practice to aid evaluation of the disposal cell's performance. The most recent routine sampling event occurred in October 2018. The groundwater monitoring network consists of four sets of monitoring wells (eight monitoring wells total) and two seeps (Table 2-2 and Figure 2-2). Each set of wells consists of a shallow well completed in unconsolidated fill and alluvium (400-series wells) and a deeper well completed in the bedrock of the Casselman Formation (500-series wells). Groundwater is sampled for standard water quality indicators and four analytes: lead, molybdenum, selenium, and uranium. The maximum concentration limits (MCLs) for these four analytes in groundwater (40 CFR 192 Table 1 Subpart A) are listed in Table 2-3.

Table 2-2. Groundwater Monitoring Network for the Burrell, Pennsylvania, Disposal Site

Monitoring Well or Seep	Hydrologic Relationship
0420 and 0520	Upgradient or background monitoring well
0422 and 0522	Cross-gradient monitoring well
0423 and 0523	Downgradient monitoring well
0424 and 0524	Downgradient monitoring well
0611 and 0612	Seep

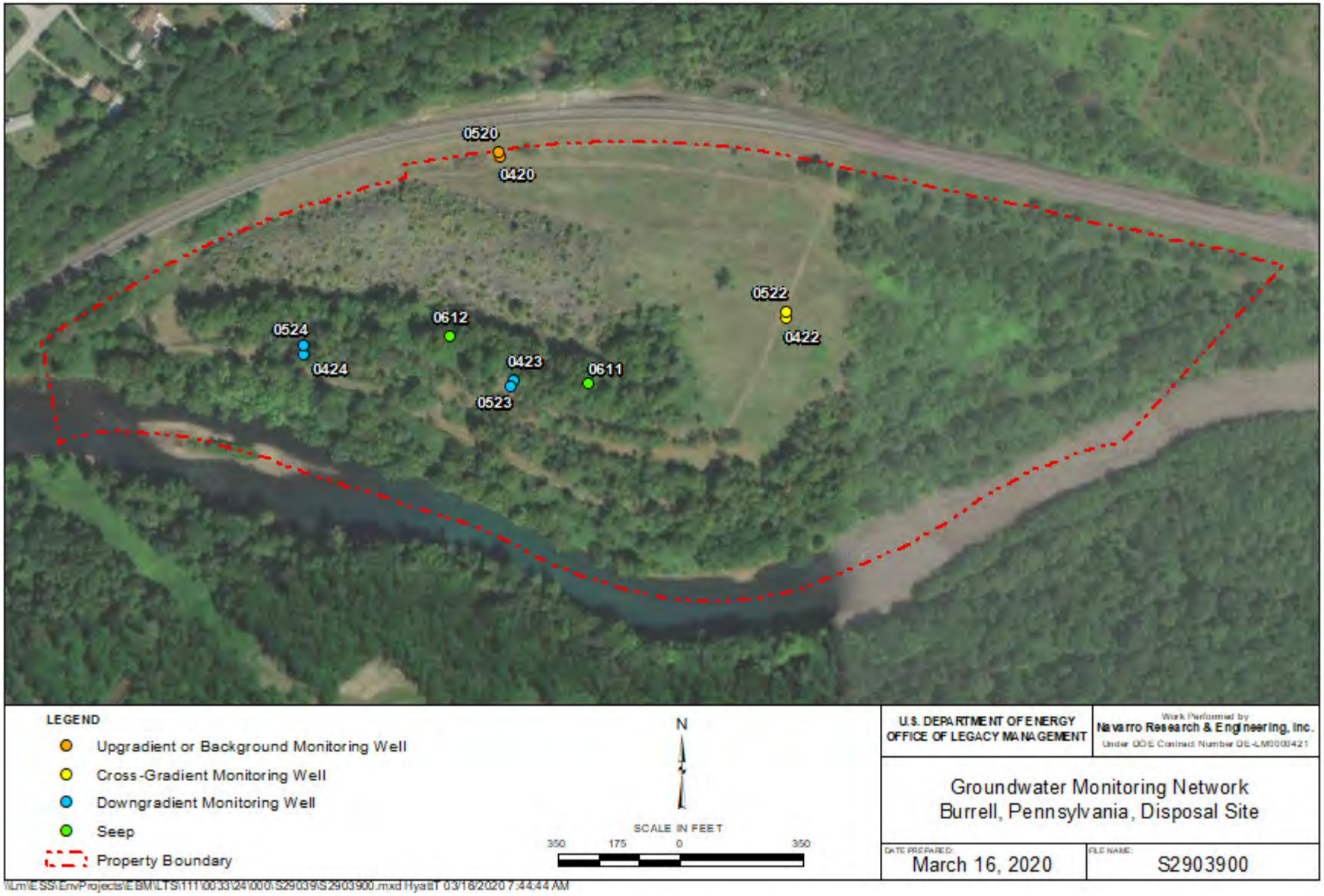

Figure 2-2. Groundwater Monitoring Network for the Burrell, Pennsylvania, Disposal Site

Table 2-3. Maximum Concentration Limits for Groundwater at the Burrell, Pennsylvania, Disposal Site

Constituent	MCL[a] (mg/L)
Lead	0.05
Molybdenum	0.1
Selenium	0.01
Uranium	0.044

Note:
[a] MCLs as listed in 40 CFR 192 Table 1 Subpart A.

Abbreviation:
mg/L = milligrams per liter

The November 2018 routine groundwater sampling results were reported in the *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2019). The results show that four analytes monitored (i.e., lead, molybdenum, selenium, and uranium) remain below MCLs found in 40 CFR 192 Table 1 Subpart A, but all four analytes increased in concentration in one or both downgradient monitoring wells. The increases for three of the target analytes (lead, selenium, and uranium) regarding their respective MCLs were considered insignificant. Should the increasing trend continue, the concentrations would not exceed the MCL for some time; this provides time for LM to investigate the cause before concentrations reach the MCL and to determine if the increase is the result of cell performance. An increase for molybdenum in one of the downgradient wells could be considered potentially significant in that it may exceed the MCL before the next routine sampling event in 2023. To be conservative, LM resampled the four downgradient wells on October 19, 2020 for molybdenum (3 years ahead of the required 5-year sampling frequency), to confirm if the increase persists. Because the sampling crew was there, LM also sampled for lead, selenium, and uranium. These nonroutine sampling results will be reported and published on the GEMS website (http://gems.lm.doe.gov/#site=BUR) and in the annual compliance report for 2021.

2.8.2 Vegetation Management

In accordance with the Vegetation Management Plan, mowing and spot herbicide application continues. Vegetation management activities include ensuring the fence line and access paths remain clear of Japanese knotweed (an invasive species), applying herbicides where needed, and regularly mowing open areas of the site. These activities have been successful in controlling Pennsylvania-listed noxious weeds onsite. Pennsylvania-listed noxious weeds purple loosestrife, poison hemlock, and multiflora rose were not observed in 2020, except for sporadic resprouts following mowing. Additional invasive species that were identified in 2019, including teasel and tree of heaven, have been addressed as well. Several other invasive plants, including Japanese knotweed and common reed, persist. A stand of common reed that was identified during previous inspections remains at the west end of the disposal cell and has spread along the southern edge of the disposal cell. This stand is very difficult to access because of standing water and its location adjacent to the perimeter fence. Wooded areas remained heavily vegetated with Japanese knotweed. Privet is an invasive shrub that was observed in several areas. Pursuant to the Vegetation Management Plan, access paths to monitoring wells and the fence line have been effectively maintained.

A conservation reuse initiative is being pursued at the site that involves the establishment of a tallgrass prairie. In 2017, a 2-acre plot in the mowed field east of the disposal cell was staked out as a test plot. In October 2018, that area was prepped and seeded. Maintenance through 2019 included mowing that helped prevent the establishment of unwanted vegetation. Following the 2019 inspection, field personnel broadcast Indiangrass to augment the 2018 seeding effort. The prairie was not mowed in 2020.

Several seeded wildflowers were observed during the 2020 inspection, and the prairie plot appears to be progressing as planned (PL-7). Prairie grasses and wildflowers are long-lived perennials that take their first couple of growing seasons to establish roots. A diverse flowering community is not expected for several years.

The prairie was surveyed during the 2020 inspection, and all but two plots had native grasses or forbs present from the seed mix (PL-8). Grasses found in the area included switchgrass and little bluestem. A wide variety of forbs were found: wild bergamot, gray-headed coneflower, purple coneflower, sawtooth sunflower, prairie dock, goldenrod species, and asters. Though the forbs were well mixed across the area, some clumps of single species are already forming. The forbs in some areas filled as much as 50% of a meter-square area, while the average 1-meter plot had about 15% coverage. Many of the late-flowering aster, sunflower, and goldenrod species still had flowers. The coneflowers and bergamot heads were dispersing seed. The native species are doing well in their second year.

In 2021, the cool-season grasses and clovers in the prairie will need to be controlled to aid in the establishment of the native grasses and forbs. It is recommended that the prairie be mowed while flowers are on the cool-season grasses and clovers and before they set seed. Mowing the last 2 weeks of May or the first week of June should prevent the cool-season grasses from seeding out and will open the canopy for the native species when they are beginning to leaf out.

2.9 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*.

40 CFR 192 Table 1 Subpart A. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2000. *Long-Term Surveillance Plan for the U.S. Department of Energy Burrell Vicinity Property, Blairsville, Pennsylvania,* GJO-2002-331-TAR, April.

DOE (U.S. Department of Energy), 2008. *Burrell, Pennsylvania, Site Vegetation Management Plan*, DOE-LM/1566-2008, January.

DOE (U.S. Department of Energy), 2018. *2017 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S17252, March.

DOE (U.S. Department of Energy), 2019. *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S22053, March.

2.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	260	Fence Line Along Northwest Side of Disposal Cell
PL-2	200	Aerial Survey Quality Control Monument QC4 and Survey Monument SM-102
PL-3	285	New Pipe Installed at Boundary Monument BM1
PL-4	270	Cleared Tree on Path to Boundary Monument BM1
PL-5	210	Northeast Side of Disposal Cell
PL-6	120	Upper Reach of Slough
PL-7	340	South View of Conservation Reuse Tallgrass Prairie Test Plot
PL-8	110	Conservation Reuse Tallgrass Prairie Test Plot

PL-1. Fence Line along Northwest Side of Disposal Cell

PL-2. Aerial Survey Quality Control Monument QC4 and Survey Monument SM-102

PL-3. New Pipe Installed at Boundary Monument BM1

PL-4. Cleared Tree on Path to Boundary Monument BM1

PL-5. Northeast Side of Disposal Cell

PL-6. Upper Reach of Slough

PL-7. South View of Conservation Reuse Tallgrass Prairie Test Plot

PL-8. Conservation Reuse Tallgrass Prairie Test Plot

3.0 Canonsburg, Pennsylvania, Disposal Site

3.1 Compliance Summary

The Canonsburg, Pennsylvania, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on October 20, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified a few minor maintenance needs.

Engineered repairs were completed to the riprap-armored embankment of Chartiers Creek north of the disposal cell in 2019. A riparian forest buffer was also planted above and along the embankment as part of that project. Disturbed areas were seeded with a pollinator-friendly native grass and wildflower mix. This riparian forest buffer corridor will work with the engineered riprap embankment to further stabilize the area against future stream flooding events and to reduce erosion upgradient of the riprap embankment. No concerns with the riprap embankment were noted during the inspection. Plantings in the riparian forest buffer experienced a 1-year survival rate of 97%. The main challenge ahead for the young plants is the local deer community.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts groundwater and surface water monitoring every 5 years to provide data to document that the site remains protective of human health, safety, and the environment. The most recent sampling event occurred in October 2018. All sampling results were below the site-specific alternate concentration limit (ACL) for uranium in groundwater and the point-of-exposure (POE) limit in surface water.

3.2 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 2013) in accordance with procedures established to comply with 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 3-1 lists these requirements.

Table 3-1. License Requirements for the Canonsburg, Pennsylvania, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 3.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 3.5	(b)(4)
Maintenance	Section 3.5	Section 3.6	(b)(5)
Environmental Monitoring	Section 3.7	Section 3.7	(b)(2)
Emergency Response	Section 3.6	Section 3.7.3	(b)(5)

3.3 Institutional Controls

The 34.2-acre site, identified by the property boundary shown in Figure 3-1, is owned by the United States and was accepted under the NRC general license in 1996. DOE is the licensee and, in accordance with 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 and sign, security fence, perimeter signs, site markers, survey and boundary monuments, erosion control markers, quality control markers, and wellhead protectors.

In addition to the area within the property boundary, separate ICs are applied to Area C and the east portion of Tract 117, both of which are southeast of Strabane Avenue. Area C (3.1 acres) was sold and transferred in 2005, and the east portion of Tract 117 (0.431 acre) was sold and transferred in 2009 to the same private owner. DOE and the Commonwealth of Pennsylvania complied with restrictions on parcel transfers stipulated in UMTRCA and in the cooperative agreement between DOE and the Commonwealth. The deeds for Area C and Tract 117 establish restrictions to limit excavation, prohibit disturbance of the streambank, maintain access for monitoring and streambank maintenance, and prevent the areas from being used for residential purposes. Use of groundwater is unrestricted. Adherence to these ICs is evaluated during the annual inspection. There was no evidence that any of the ICs were violated.

3.4 Inspection Results

The site, in Canonsburg, Pennsylvania, was inspected on October 20, 2020. The inspection was conducted by K. Broberg and H. Swiger of the Legacy Management Support contractor. C. Carpenter (LM site manager), D. Shearer (Pennsylvania Department of Environmental Protection), and T. Biller (site herbicide contractor Lawn RX) attended the inspection. The mayor of Canonsburg stopped by briefly about halfway through the inspection; other commitments that day kept him from attending the entire inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that may affect conformance with the LTSP, and evaluate the need, if any, for maintenance or additional inspection and monitoring.

3.4.1 Site Surveillance Features

Figure 3-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 3-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 3.10.

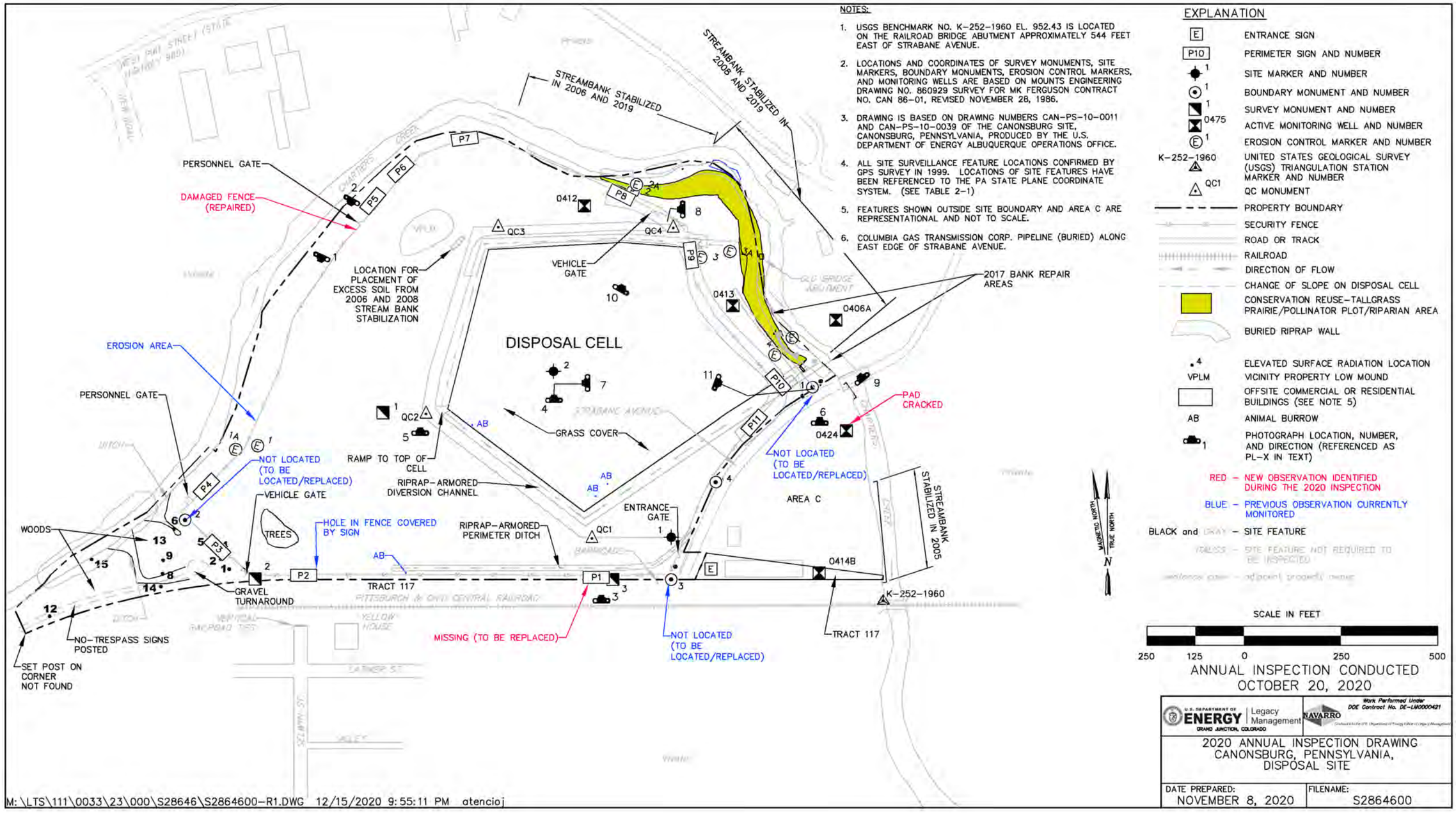

Figure 3-1. 2020 Annual Inspection Drawing for the Canonsburg, Pennsylvania, Disposal Site

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3.4.1.1 Site Access, Entrance Gates, and Entrance Sign

Main access to the site is from Strabane Avenue. There are three vehicle gates: the main entrance gate at the southeast corner of the site along Strabane Avenue, a vehicle access gate at the southwest corner of the site, and a vehicle access gate north of the disposal cell between perimeter signs P8 and P9. There are also two personnel access gates. All gates were locked and functional with the exception of the southwest personnel gate. The lock on the southwest personnel gate was in place but not fully clasped. Inspectors secured the lock on this gate. The entrance sign is posted on the main entrance gate. No maintenance needs were identified.

3.4.1.2 Security Fence and Perimeter Signs

A chainlink security fence encloses most of the site. A vegetation-free buffer zone is maintained around the entire security fence (PL-1). An area of erosion under the west security fence remains. The area appears to be stable and has not grown in several years. For added security, slats were installed in 2016 across the area beneath the fence to help fill in the gap.

The security fence was damaged in late 2019. A large tree fell on the fence and damaged both the fence and the northwest personnel gate. Repairs were made before the 2020 inspection (PL-2).

There are 11 perimeter signs attached to the security fence. All but one of the perimeter signs were accounted for and legible in 2020. The fence fabric around perimeter sign P1 was cut, and the sign was removed (PL-3). The sign will be replaced. No other maintenance needs were identified.

3.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the main entrance gate, and site marker SMK-2 is on the top slope of the disposal cell (PL-4). No maintenance needs were identified.

3.4.1.4 Survey, Boundary Monuments

The site has three survey monuments and four boundary monuments. Boundary monuments BM-1 and BM-2 (noted as missing since the 2017 inspection) were not located. Boundary monument BM-3 was not located in 2019 or in 2020. Boundary monuments BM-1 and BM-2 are scheduled to be replaced in FY 2021. Boundary monument BM-3 will also be replaced if it cannot be located by the survey crew. Vertical location markers may be installed to mark their location to make them easier to find. No other maintenance needs were identified.

3.4.1.5 Aerial Survey Quality Control Monuments

Four aerial survey quality control monuments, installed in 2019, were inspected during the 2020 annual inspection (PL-5). No maintenance needs were identified.

3.4.1.6 Erosion Control Markers

The site has four pairs of erosion control markers along the bank of Chartiers Creek. No maintenance needs were identified.

3.4.1.7 Monitoring Wells

The site has five groundwater monitoring wells that are inspected on the inside when they are sampled. Monitoring wells were last sampled and inspected in October 2018. During the 2020 inspection, the outside of the wells were inspected, and the wellhead protectors were undamaged and locked. There is a crack in the well pad of monitoring well 0424 (PL-6). The pad remains serviceable. It will be evaluated for replacement or repair during the next regularly scheduled sampling event. No other maintenance needs were identified.

3.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into five inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area adjacent to the disposal cell, (3) the diversion channels and perimeter ditches, (4) the site perimeter and security fence, and (5) 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.

3.4.2.1 Disposal Cell

The disposal cell, completed in 1985, occupies 6.8 acres and is covered in grass (PL-7). There was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell. Animals burrow on the disposal cell cover, but such burrows should not pose a risk to disposal cell integrity or public health because the buried tailings are overlain by a 36-inch-thick clay layer (radon barrier), an 18-inch-thick biointrusion rock layer, and a 12-inch-thick topsoil layer. Biointrusion down to or through the radon barrier is unlikely. Inspectors will continue to monitor the location and significance of burrows. No new significant burrows were noted on the disposal cell during the inspection. No maintenance needs were identified.

3.4.2.2 Area Adjacent to the Disposal Cell

The site consists primarily of mowed grasses within the security fence and on the disposal cell cover, with seeded fescues and crown vetch being prevalent. The spray-and-mow approach to vegetation management at the site continues to be effective. Noxious weeds within the security fence area are limited to resprouting seedlings that were observed in portions of mowed areas.

3.4.2.3 Diversion Channels and Perimeter Ditches

There was no evidence of rock deterioration or woody vegetation in the diversion channels and perimeter ditches (PL-8). Periodic physical removal and spot herbicide applications have been effective at reducing woody vegetation and will continue to be conducted as needed.

3.4.2.4 Site Perimeter

In 2007, a radiological survey was conducted on a small parcel of land southwest of the security fence to evaluate its release for industrial reuse. The survey identified isolated radium-226 contamination in the soil in excess of the established average criterion for the site. As a result, the release criteria were not satisfied for the entire parcel, and it was removed as a reuse candidate. Under current property usage, these radiological conditions do not pose a risk to personnel, and no corrective measures are required. LM controls land use through ownership. Inspectors will continue to check the area for evidence of trespassing.

During the 2017 annual inspection, an abandoned campsite was observed on the southwest corner of the site. The site and associated trash were removed in December 2017, and no-trespassing signs were posted. No evidence of recent trespassing was observed during the 2020 annual inspection.

A local plastics company has cleared some of DOE's property north of the railroad tracks and spread gravel to create a turnaround for its trucks. No-trespassing signs are now posted around this area to prevent unauthorized expansion of the turnaround. An access agreement was established in 2017 with the plastics company for continued use of the turnaround. No changes to the size of the turnaround were observed in 2020. No maintenance needs were identified.

3.4.2.5 Outlying Area

Chartiers Creek Bank: Chartiers Creek is an active, meandering waterway west, north, and east of the disposal site. Bedrock outcrops and mature trees on the streambank west of the site indicate that the bank of that creek is stable.

Between 2001 and 2008, several streambank-stabilization projects were conducted north and east of the site. The projects consisted of installing riprap armoring along the streambanks. Years of flow and heavy flow events in Chartiers Creek in late 2017 and early 2018 damaged those riprap installations. In late summer 2019, the entire length of the riprap embankment along Chartiers Creek north of the disposal cell (approximately 1200 linear feet) was repaired during low streamflow conditions. The work consisted of minor grading, replacing geotextile filter fabric, and importing and placing 2-feet-thick R6 riprap slopes (PL-9).

A conservation reuse initiative was included as part of the streambank stabilization repair project. A riparian forest buffer was planted following the riprap slope repair; it consisted of 525 new native trees and shrubs within a 1.7-acre corridor adjacent to Chartiers Creek. Disturbed areas were then seeded with a pollinator-friendly native grass and wildflower mix. This corridor will further protect the Chartiers Creek streambank and help prevent erosion above the riprap embankment. The riparian forest buffer is also recognized as a means to improve stream quality. This effort is part of the Commonwealth of Pennsylvania's goal to establish 95,000 acres of riparian forest buffer by 2025. The Pennsylvania Department of Conservation and Natural Resources was notified of the project. No concerns with the riprap embankment were noted during the inspection. Plantings in the riparian forest buffer experienced a 1-year survival rate of 97%. The general long-term health of the young plants in the riparian buffer area is tenuous due to browsing deer. A plan to better protect the plantings from deer needs to be developed. The

current use of deer tubes held up by wooden stakes is not adequate to protect the trees from browse or rub (PL-10).

Additional control of invasive vegetation on Area C between Strabane Avenue and monitoring well 0424A is recommended to enhance the health of the riparian corridor being established along Chartiers Creek north of the disposal cell. The current vegetation management approach does not address the spread of invasive vegetation from Area C to the recently planted riparian buffer area. The site vegetation management plan includes herbicide application to control invasive weeds around monitoring well 0424 (PL-11). Additional management, to include spraying and mowing in the area between the 0424 wellhead and Strabane Avenue, will be implemented to further address this invasive vegetation development.

Area C and Tract 117: Area C and Tract 117 form a triangular parcel of property east of the site bounded by Strabane Avenue, Chartiers Creek, and the Pittsburgh and Ohio Central Railroad. Area C and Tract 117 are included in the annual inspection to ensure compliance with ICs put in place to address land use and site access requirements. There was no evidence that any of the ICs in place for Area C and Tract 117 had been violated.

Strabane Avenue: The maintenance subcontractor, Lawn RX, periodically removes trash found on and adjacent to the site to maintain the site's appearance. Inspectors also pick up trash as necessary. Inspectors observed that Strabane Avenue, next to the site, was relatively clear of trash. No other maintenance needs were identified.

3.5 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 have substantially changed. No need for a follow-up inspection was identified.

3.6 Maintenance

Inspectors documented minor maintenance that was performed before the 2020 inspection. Maintenance included:

- Repairing the security fence and damaged personnel gate.

Inspectors documented minor maintenance needs that will be addressed in 2021, including:

- Locating and replacing (if necessary) boundary monuments BM-1, BM-2, and BM-3.
- Replacing perimeter sign P1.

3.7 Environmental Monitoring

3.7.1 Groundwater Monitoring

In accordance with the LTSP, LM conducts groundwater monitoring every 5 years to (1) evaluate downgradient contaminant trends in groundwater in the shallow, unconsolidated materials and in surface water; (2) demonstrate that concentrations of uranium at

point-of-compliance (POC) wells are decreasing as predicted and that the system remains in compliance with the *Ground Water Compliance Action Plan for the Canonsburg, Pennsylvania, UMTRA Project Site* (DOE 2000); and (3) ensure that remedial actions at the disposal site and Area C continue to protect human health, safety, and the environment. The most recent sampling event occurred in October 2018.

The groundwater monitoring network consists of five monitoring wells, including three POC wells and two best management practice wells (Table 3-2 and Figure 3-2). All monitoring wells are completed in the uppermost aquifer (shallow, unconsolidated materials). Groundwater is sampled and analyzed for the one constituent of concern, uranium. The ACL is 1 milligram per liter (mg/L) at the POC wells. With the exception of monitoring wells 0412 and 0413, uranium concentrations in 2018 were also below the UMTRCA maximum concentration limit (MCL) of 0.044 mg/L.

Table 3-2. Groundwater Monitoring Network for the Canonsburg, Pennsylvania, Disposal Site

Monitoring Well	Hydrologic Relationship	Groundwater Monitoring Purpose
0406A	Downgradient	Best management practice
0412	Downgradient	POC
0413	Downgradient	POC
0414B	Cross gradient	POC
0424	Downgradient	Best management practice

All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=CAN). Additionally, the *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2019) presents the comprehensive monitoring results for 2018.

3.7.2 Surface Water Monitoring

In accordance with the LTSP, LM also conducts surface water monitoring every 5 years. The most recent sampling event occurred in October 2018. Uranium concentrations in surface water sampled in 2018 were below the established ACL of 0.01 mg/L.

One surface location, 0602, is the POE for Chartiers Creek and is sampled and analyzed for uranium. In 2018, the uranium concentration from location 0602 had a concentration of 0.00096 mg/L, significantly below the MCL.

The *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2019) presents the comprehensive monitoring results for 2018.

Figure 3-2. Groundwater and Surface Water Monitoring Network for the Canonsburg, Pennsylvania, Disposal Site

3.7.3 Vegetation Management

Vegetation management activities continue to be conducted at the site in accordance with the LTSP. They include spot-treating tree of heaven (an invasive species), physical removal, spot-application of herbicides to target woody vegetation in diversion channels and perimeter ditches, and the spray-and-mow approach. These activities are mostly successful. Noxious weeds within the fenced area are limited to resprouting seedlings, which were observed in portions of mowed areas. No changes to the current vegetation management approach are recommended, other than around and in the riparian buffer area discussed earlier.

3.8 Emergency Response

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

3.9 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), 2013. *Long-Term Surveillance Plan for the U.S. Department of Energy Canonsburg Uranium Mill Tailings Disposal Site, Canonsburg, Pennsylvania,* LMS/CAN/S00404, March.

DOE (U.S. Department of Energy), 2019. *2018 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites,* LMS/S22053, March.

DOE (U.S. Department of Energy), 2000. *Ground Water Compliance Action Plan for the Canonsburg, Pennsylvania, UMTRA Project Site,* LMS/U0035901, February.

3.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	205	West Fence Line
PL-2	210	Repaired Fence Line
PL-3	0	Disposal Cell with Missing Perimeter Sign P1
PL-4	0	Site Marker SMK-2
PL-5	—	Quality Control Monument QC2
PL-6	0	Monitoring Well 0424
PL-7	270	Disposal Cell Top Slope
PL-8	270	Riprap Diversion Ditch Outlet
PL-9	320	Riprap Embankment
PL-10	30	Deer Tubes in the Riparian Forest Buffer Area
PL-11	110	Effective Invasive Weed Treatment Near Monitoring Well 0424 (not pictured)

Note:
— = Photograph taken vertically from above.

PL-1. West Fence Line

PL-2. Repaired Fence Line

PL-3. Disposal Cell with Missing Perimeter Sign P1

PL-4. Site Marker SMK-2

PL-5. Quality Control Monument QC2

PL-6. Monitoring Well 0424

PL-7. Disposal Cell Top Slope

PL-8. Riprap Diversion Ditch Outlet

PL-9. Riprap Embankment

PL-10. Deer Tubes in the Riparian Forest Buffer Area

PL-11. Effective Invasive Weed Treatment Near Monitoring Well 0424 (not pictured)

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 June 16, 2020, and the annual groundwater monitoring event in June 2020. 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 no change in depth or length of the feature. Monitoring of the linear depression will continue so that LM may understand its cause and potential impacts. 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 June 2020. 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. 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 determine if removal of the holding pond and closure of the transient drainage system will affect water quality values.

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 June 16, 2020. The inspection was conducted by M. Kastens and D. Holbrook of the Legacy Management Support (LMS) contractor. J. Dayvault (LM site manager), M. Cosby (Colorado Department of Public Health and Environment), and D. Miller (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 and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 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.

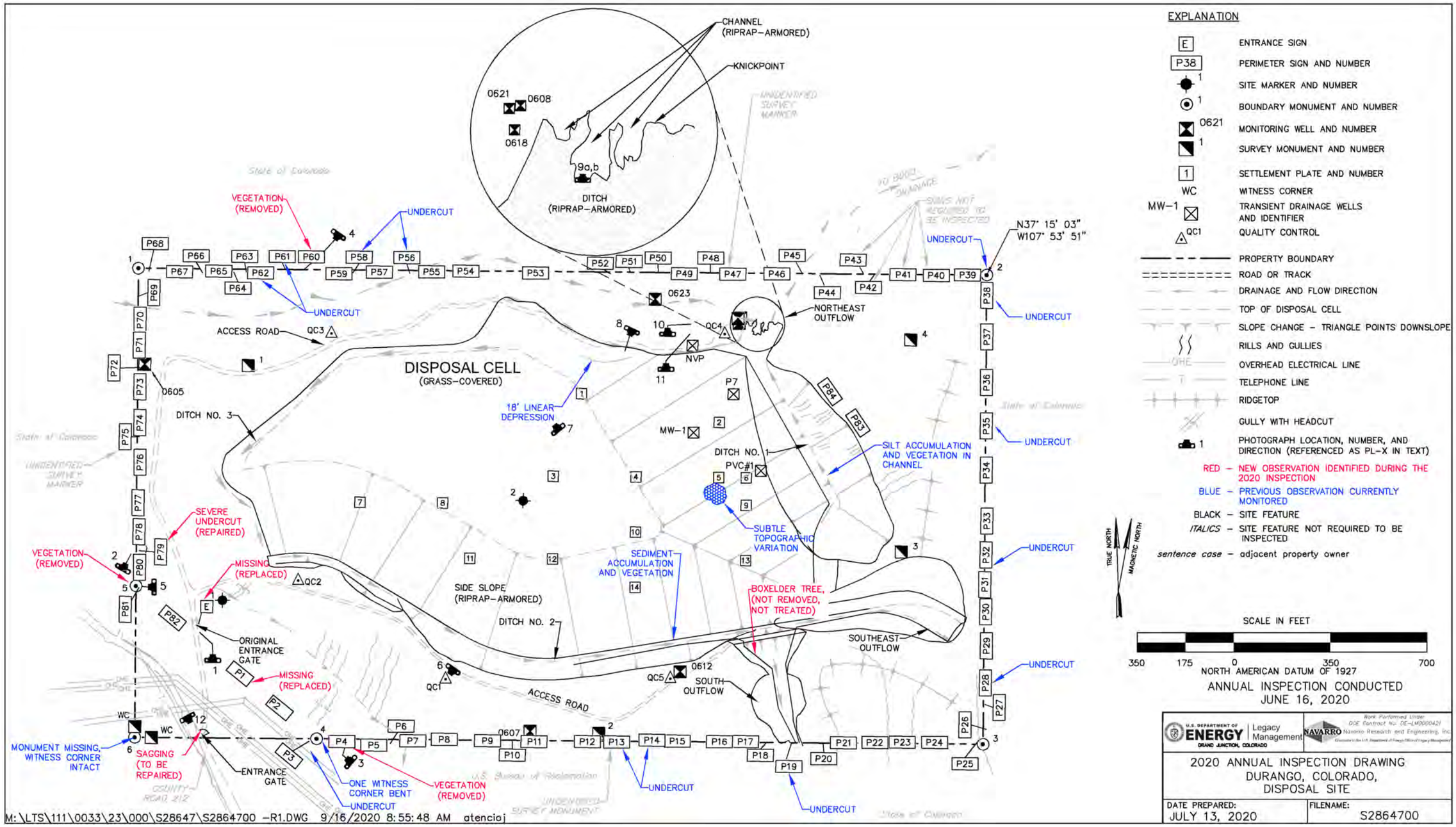
4.4.1.1 Site Access, Entrance Gates, and Entrance Sign

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, although the newer outer gate was sagging and difficult to close. This gate will be repaired before the next annual inspection.

The entrance sign is at the older entrance gate within the property boundary. Though the post for the sign was present, the sign was missing (PL-1). The sign was replaced following the inspection.

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 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.



EXPLANATION

- E — ENTRANCE SIGN
- P38 — PERIMETER SIGN AND NUMBER
- 1 — SITE MARKER AND NUMBER
- 1 — BOUNDARY MONUMENT AND NUMBER
- 0621 — MONITORING WELL AND NUMBER
- 1 — SURVEY MONUMENT AND NUMBER
- 1 — SETTLEMENT PLATE AND NUMBER
- WC — WITNESS CORNER
- MW–1 — TRANSIENT DRAINAGE WELLS AND IDENTIFIER
- QC1 — QUALITY CONTROL
- PROPERTY BOUNDARY
- ROAD OR TRACK
- DRAINAGE AND FLOW DIRECTION
- TOP OF DISPOSAL CELL
- SLOPE CHANGE – TRIANGLE POINTS DOWNSLOPE
- RILLS AND GULLIES
- OHE — OVERHEAD ELECTRICAL LINE
- T — TELEPHONE LINE
- RIDGETOP
- GULLY WITH HEADCUT
- 1 — PHOTOGRAPH LOCATION, NUMBER, AND DIRECTION (REFERENCED AS PL–X IN TEXT)

RED – NEW OBSERVATION IDENTIFIED DURING THE 2020 INSPECTION

BLUE – PREVIOUS OBSERVATION CURRENTLY MONITORED

BLACK – SITE FEATURE

ITALICS – SITE FEATURE NOT REQUIRED TO BE INSPECTED

sentence case – adjacent property owner

TRUE NORTH / MAGNETIC NORTH

SCALE IN FEET

350 175 0 350 700

NORTH AMERICAN DATUM OF 1927

ANNUAL INSPECTION CONDUCTED JUNE 16, 2020

U.S. DEPARTMENT OF ENERGY | Legacy Management — GRAND JUNCTION, COLORADO

Work Performed Under DOE Contract No. DE–LM0000421

NAVARRO Nuclear Research and Engineering, Inc.

2020 ANNUAL INSPECTION DRAWING
DURANGO, COLORADO,
DISPOSAL SITE

DATE PREPARED: JULY 13, 2020

FILENAME: S2864700

Figure 4-1. 2020 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. Inspectors noted several maintenance issues associated with the signs (1) the base of perimeter sign P79 was actively eroding and needs to be stabilized (PL-2) and (2) vegetation needs to be cleared from around perimeter signs P4 and P60 (PL-3 and PL-4, respectively) and (3) perimeter sign P1 was missing. These issues were addressed following the inspection.

4.4.1.3 Site Markers

The site has two site markers. Site marker SMK-1 is just inside the original entrance gate and was in good condition. 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. No new 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. All monuments were inspected. Boundary monument BM-6 has been missing since the adjacent U.S. Bureau of Reclamation (USBR) 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-5) and one of its witness corners was covered with vegetation, which was removed following the inspection. No other maintenance needs were identified.

4.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments installed in 2018 were inspected during the 2020 annual inspection. Inspectors noted that they are flush with the ground and will be difficult to find once vegetation matures around them (PL-6). Inspectors recommended the quality control monuments be marked with a T-post and reflector. Maintenance was completed following the inspection.

4.4.1.6 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 2020. A single volunteer rabbitbrush shoot (a woody species) (PL-7) was observed growing on the disposal cell top and was treated with herbicide later in the year. 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 feet (ft) long (PL-8) that first was observed in 2015. Inspectors did not observe 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 2020. The variation does not pose a concern for disposal cell integrity at this time, as no evidence of erosion or subsidence was found during the 2020 inspection. Inspectors will continue to monitor the variation.

Inspectors found a young tree and several rabbitbrush plants. The young tree and several deep-rooted woody species and patches of noxious weeds on the side slopes were treated with herbicide later in the year. No other maintenance needs were identified.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed at the toes of the side slopes on the east (Ditch No. 1), south (Ditch No. 2), and northwest and west (Ditch No. 3) sides of the disposal cell. Stormwater is directed into these ditches and conveyed away from the site into natural drainages. The ditches have sufficient depth and rock protection to carry stormwater 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 ditches.

The riprap-covered outflows of the drainage ditches were designed to self-armor over time. The outflows and drainage channels below them are monitored annually. A larger boxelder tree is growing along the edge of the south outflow channel but does not affect the stability or effectiveness of the channel. The uplands above the northeast outflow are steadily eroding (PL-9a and PL-9b), but this process 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 noted that the former holding pond area was

revegetating successfully and contained several species of native, pollinator-friendly wildflowers (PL-10 and PL-11). No evidence of erosion or damage to the newly vegetated area was observed. Several noxious weeds were identified in the area and treated following the inspection. No other maintenance needs were identified.

4.4.2.5 Site Boundary

Boundary monuments and perimeter signs delineate the site 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 but observed that trash was continuing to be dumped by the site entrance (PL-12). Trash was picked up after the inspection. 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 changes or new features were identified. Colorado Parks and Wildlife manages land to the north, west, and east of the site, and USBR manages land to the south. The primary land uses are wildlife habitat and recreation. Mountain bikers, hikers, 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:

- Replacing the missing entrance sign and perimeter sign P1
- Removing vegetation from around perimeter signs P4 and P60 and boundary monument BM-5
- Reinforcing the eroding base of perimeter sign P79
- Installing T-posts (with reflectors) at the five quality control survey monuments
- Treating woody species on the side and top slopes of the disposal cell
- Picking up trash in the southwest corner of the site by the entrance gate

The newer outer gate that is sagging will be repaired before the next inspection in 2021.

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 June 2020. 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 (LTSP)
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)

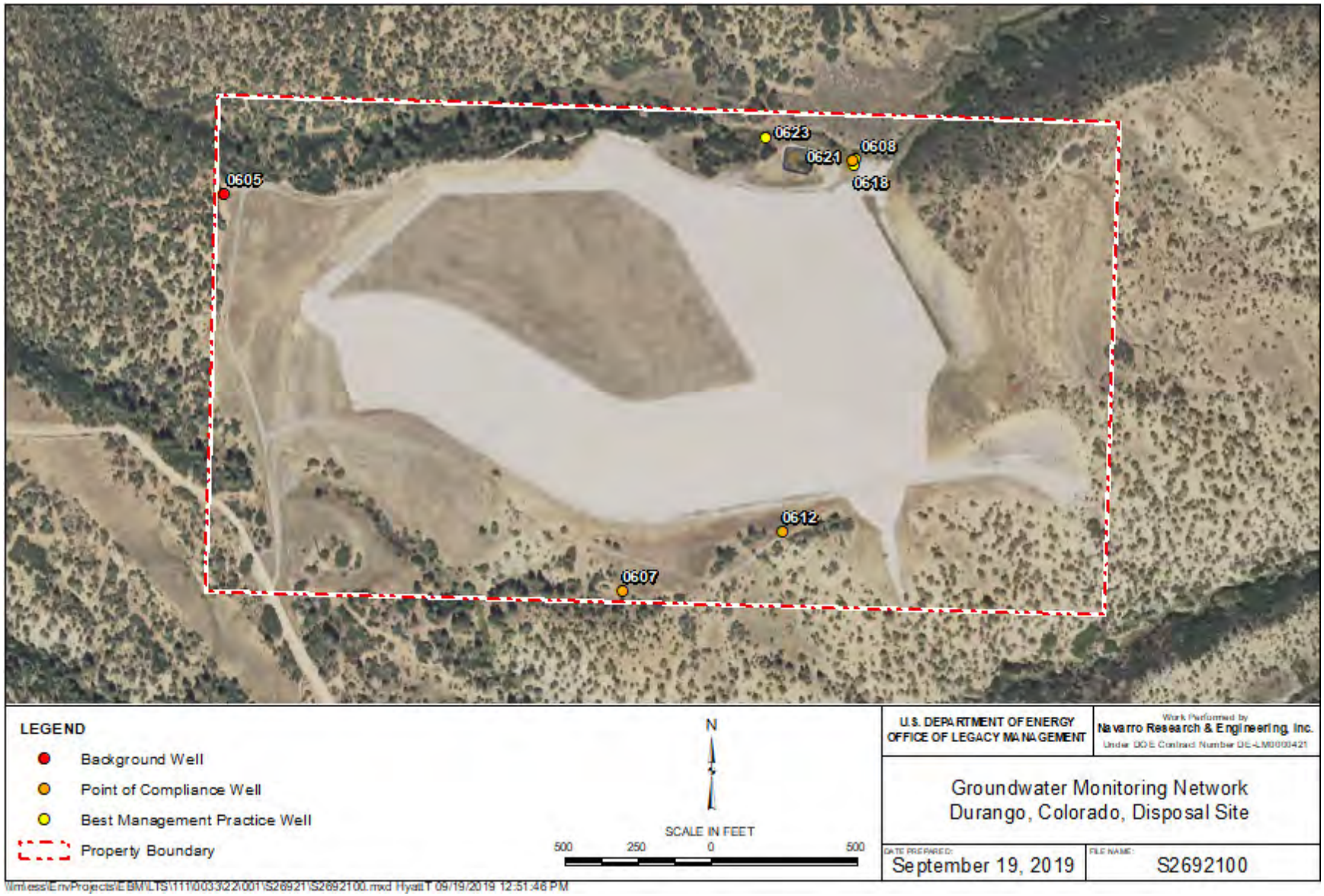

Figure 4-2. Groundwater Monitoring Network for the Durango, Colorado, Disposal Site

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 (GEMS) website (http://gems.lm.doe.gov/#site=DUD).

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

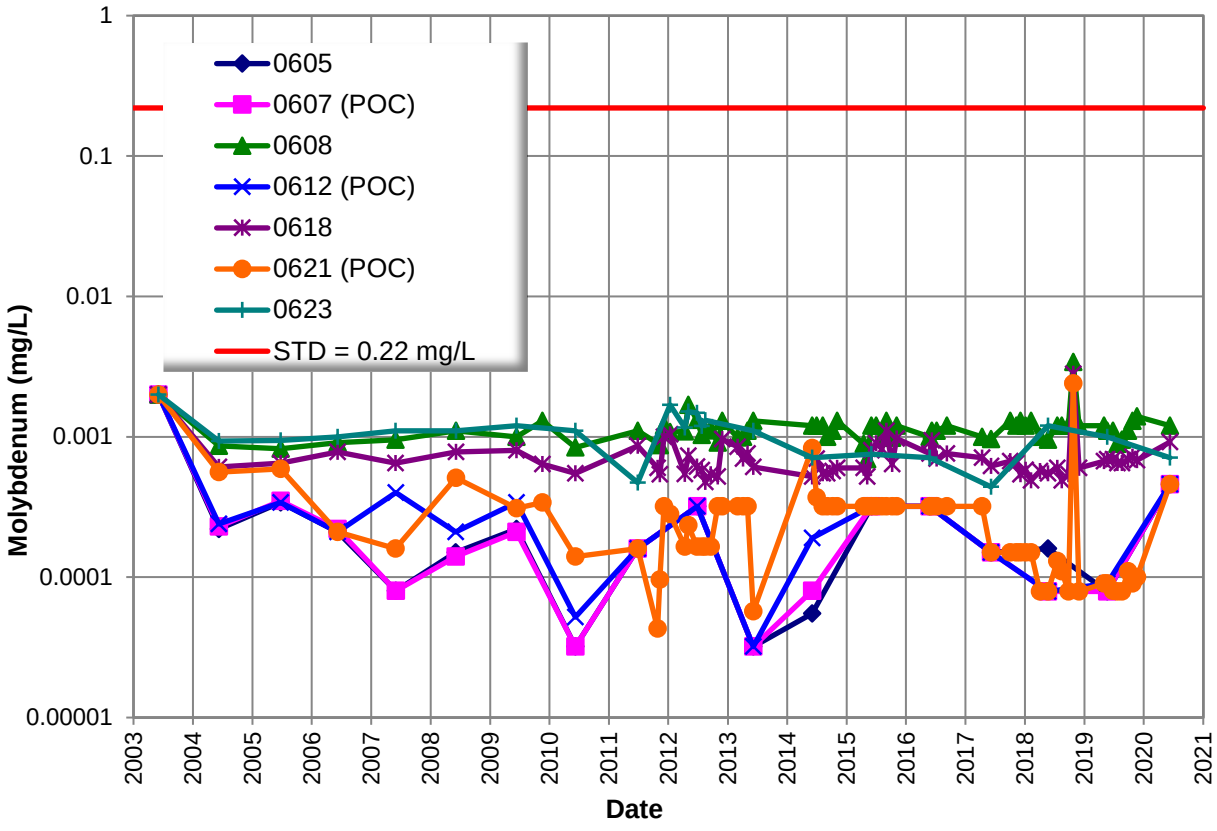

Figure 4-3. Molybdenum in Groundwater at the Durango, Colorado, Disposal Site

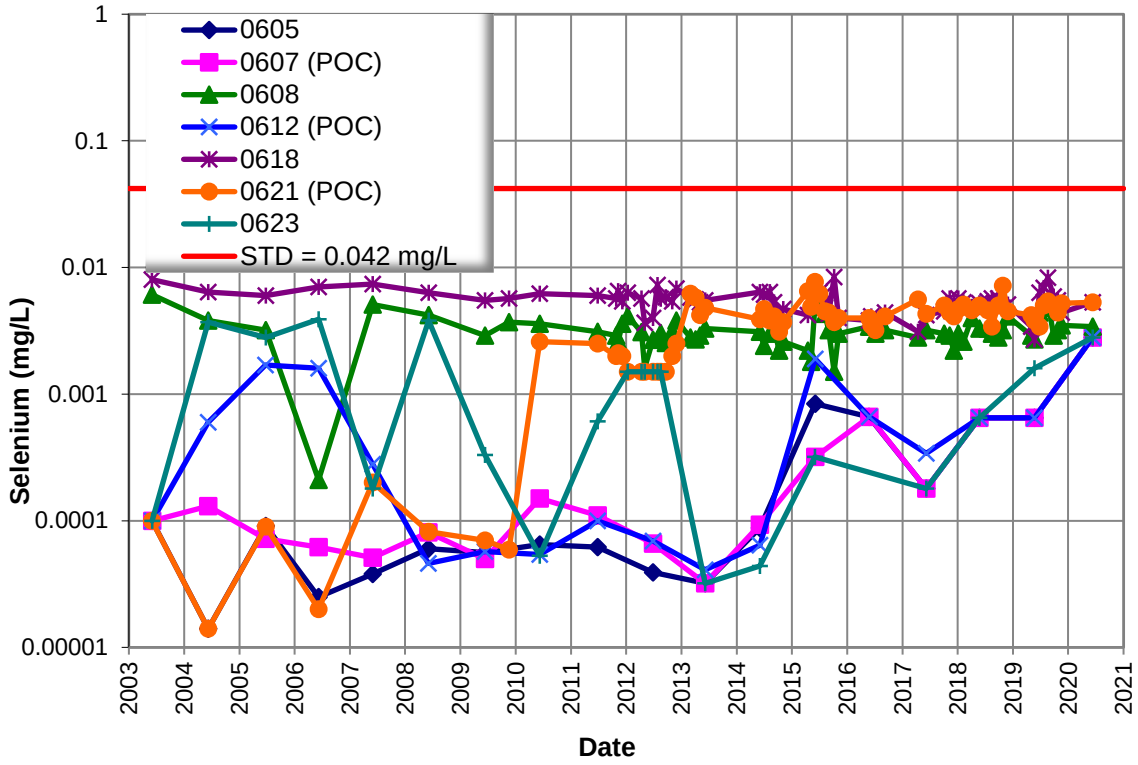

Figure 4-4. Selenium in Groundwater at the Durango, Colorado, Disposal Site

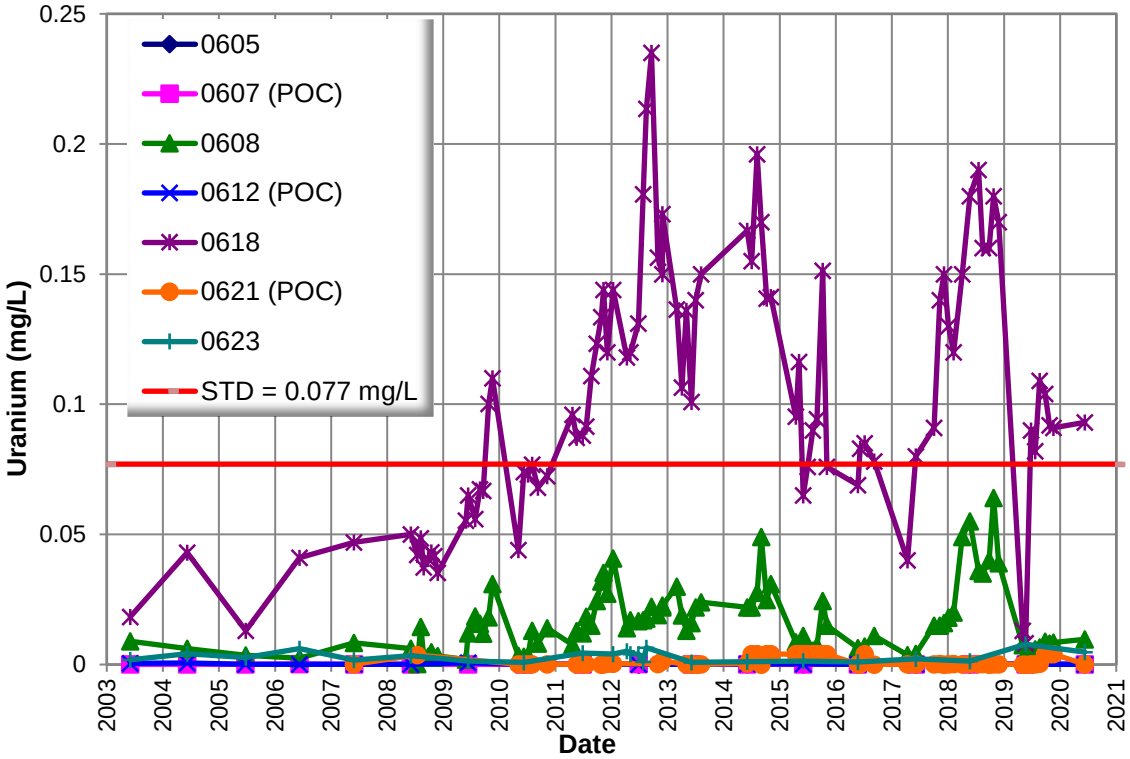

Figure 4-5. Uranium in Groundwater at the Durango, Colorado, Disposal Site

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

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 2020, uranium concentrations in well 0618 were measured to be 0.09 mg/L, which is within the range of measured historical concentrations. The cause of the variability in uranium concentration at well 0618 will be a focus of further investigation.

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 and side slopes to be eliminated by either selective spraying or mechanical removal when their shoot height equals or exceeds 3.5 ft. Several shoots of woody species were found on the cell top and side slopes and were treated with herbicide following the 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	360	Entrance Sign Missing
PL-2	30	Perimeter Sign P79 Undercut by Erosion
PL-3	310	Vegetation Surrounding Perimeter Sign P4
PL-4	215	Vegetation Around Perimeter Sign P60
PL-5	270	Boundary Monument BM-5 with Surrounding Vegetation
PL-6	215	Quality Control Monument QC1
PL-7	320	Rabbitbrush on Cell Top Slope
PL-8	205	Linear Depression in Cell Toe Slope
PL-9	360	a) Northeast Outflow in 2020 b) Northeast Outflow in 2006
PL-10	0	Firecracker Penstemon (*Penstemon eatonii*), Native Wildflower
PL-11	0	Common Yarrow (*Achillea millefolium*), Native Wildflower
PL-12	150	Trash Dumped Near Site Entrance

PL-1. Entrance Sign Missing

PL-2. Perimeter Sign P79 Undercut by Erosion

PL-3. Vegetation Surrounding Perimeter Sign P4

PL-4. Vegetation Around Perimeter Sign P60

PL-5. Boundary Monument BM-5 with Surrounding Vegetation

PL-6. Quality Control Monument QC1

PL-7. Rabbitbrush on Cell Top Slope

PL-8. Linear Depression in Cell Toe Slope

PL-9a. Northeast Outflow in 2020

PL-9b. Northeast Outflow in 2006

PL-10. Firecracker Penstemon (Penstemon eatonii), Native Wildflower

PL-11. Common Yarrow (Achillea millefolium), Native Wildflower

PL-12. Trash Dumped Near Site Entrance

5.0 Falls City, Texas, Disposal Site

5.1 Compliance Summary

The Falls City, Texas, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was visited on March 5, 2020 and September 23, 2020. No changes were observed in the disposal cell or associated drainage features, and personnel found no cause for a follow-up inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts annual groundwater monitoring as a best management practice. The most recent sampling event occurred in January 2020. The compliance strategy for groundwater protection at the site, which is designated as limited use, is no further remediation and application of supplemental standards due to widespread ambient contamination that is not due to milling and is not reasonably treatable. Therefore, no concentration limits or points of compliance (POCs) have been established. Site-related contamination in the uppermost aquifer poses no risk to human health because groundwater from this aquifer is not used for human consumption and is designated as limited use.

5.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific LM Long-Term Surveillance Plan (LTSP) (DOE 2008) 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 5-1 lists these requirements.

Table 5-1. License Requirements for the Falls City, Texas, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 5.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 5.5	(b)(4)
Maintenance	Section 3.5	Section 5.6	(b)(5)
Emergency Response	Section 3.6	Section 5.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 5.8	(b)(2)

5.3 Institutional Controls

The 231-acre site, identified by the property boundary shown in Figure 5-1, is owned by the United States and was accepted under the NRC general license in 1997. 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 structures, entrance gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

An adjacent 513-acre offsite property was sold by the State of Texas to Alamo Funding Group in 2005. The State initially acquired this land as part of the designated processing site, but this portion of the processing site was not incorporated into the final DOE-owned site. The warranty deed stipulates that the new owners agree not to use any groundwater underlying the property for commercial or industrial uses in accordance with requirements for parcel transfers stipulated in UMTRCA. No human habitation structures shall be constructed on the property, and nothing may be done to affect groundwater quality or interfere with UMTRCA groundwater remediation activities. Permission must be obtained from the Texas Commission on Environmental Quality (TCEQ) and LM before (1) constructing wells or otherwise exposing groundwater to the surface; (2) performing construction, excavation, or soil removal of any kind; or (3) selling the property. Alamo Funding Group subdivided the land and sold it to two parties in 2011 and 2012. LM confirmed that the deed restrictions remained in recorded real property documents. The two landowners will seek approval from LM and the State for any future construction.

5.4 Inspection Results

The site, 8 miles southwest of Falls City, Texas, was visited on March 5, 2020, and September 23, 2020. The first site visit was conducted by C. Boger of the Legacy Management Support contractor and T. Jasso (LM site manager). R. Thomas, M. Kawasmi, T. Gonzalez, K. Tu, and B. Wishert (TCEQ), and B. Von Till, D. Mandeville, S. Poy, and J. Saxton (NRC) attended the site visit. Much of the site was observed during that visit including the top and side slopes of the disposal cell. A second visit was conducted by the site's local grazing licensee, Roger Lyssy, on September 23, 2020. The purposes of the latter site visit 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. Due to the imposition of COVID-19 travel restrictions, LM and NRC agreed to utilize observations from both of these site visits as the basis for the 2020 annual inspection at the site. The results and photos presented here are from observations that were made during both site visits. LM will resume inspections as outlined in the LTSP for the site in 2021.

5.4.1 Site Surveillance Features

Figure 5-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue text. There are no new observations in 2020. Photographs to support specific observations are noted in the text and in Figure 5-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 5.10.

5.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is from Farm-to-Market Road 1344. The entrance gate at the east corner of the site and the vehicle gate at the north corner were locked and functional. The entrance sign is next to the main entrance gate. No maintenance needs were identified.

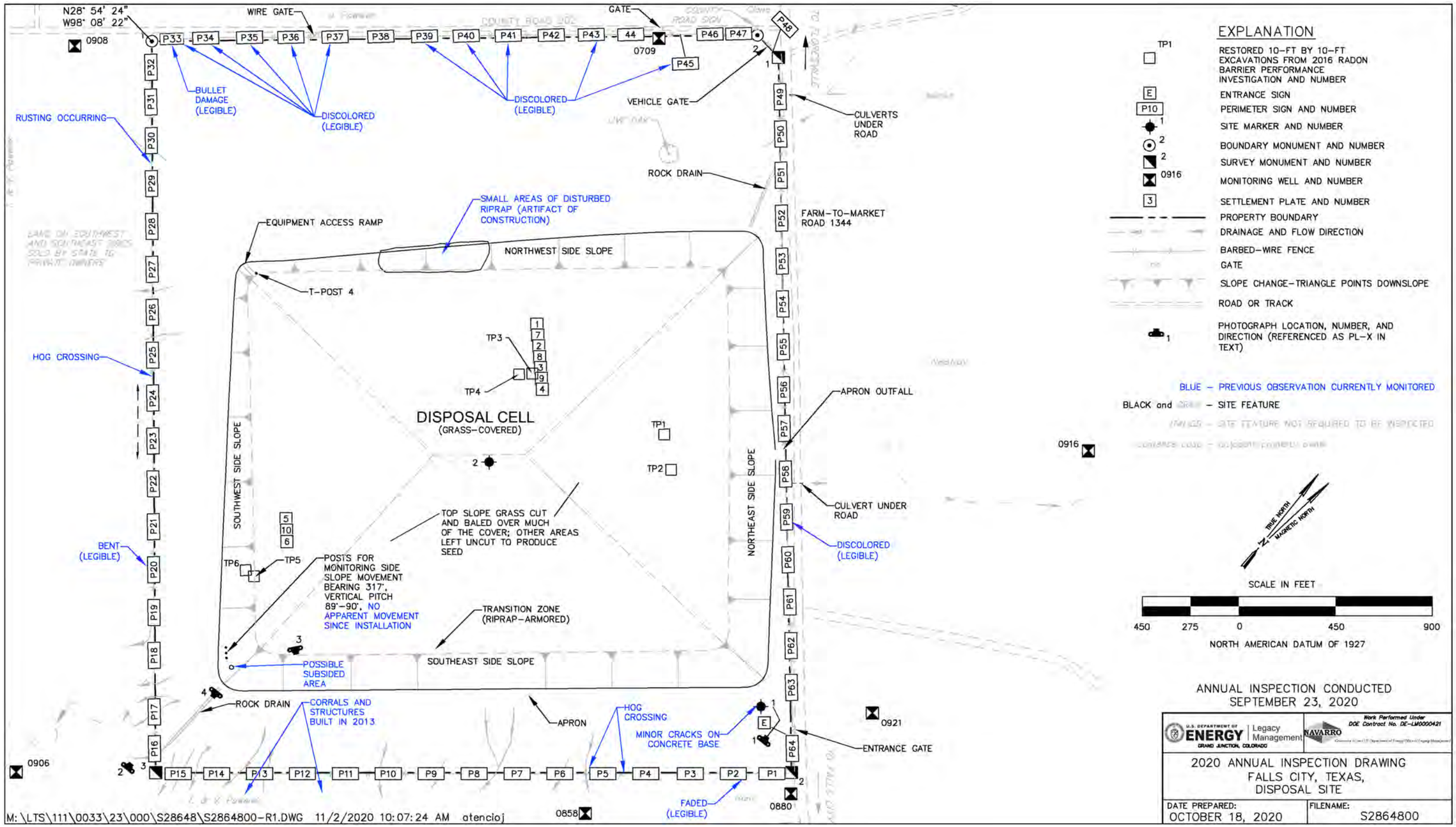

Figure 5-1. 2020 Annual Inspection Drawing for the Falls City, Texas, Disposal Site

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5.4.1.2 Perimeter Fence and Signs

A five-strand barbed-wire perimeter fence encloses the site. As noted in previous inspections, perimeter fence strands and posts are beginning to rust except along the northwest side, where the fence was replaced in 2006.

There are 64 perimeter signs attached to steel posts set in concrete positioned along the property boundary and set back 5 feet (ft). Perimeter sign P33 has bullet damage but remains legible. Additional perimeter signs are fading but remain legible. No maintenance needs were identified.

5.4.1.3 Site Markers

The site has two site markers. Site marker SMK-1 is just inside the entrance gate (PL-1). The corners of the concrete base around the marker are cracked. The cracks consistently are unchanged and repairs are not needed. Site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

5.4.1.4 Survey and Boundary Monuments

Three survey monuments and two boundary monuments delineate the corners of the property (PL-2). All monuments were located. No maintenance needs were identified.

5.4.1.5 Monitoring Wells

There is one monitoring well onsite; 11 monitoring wells are offsite. All monitoring wells were inspected during the January 2020 sampling event, and wellhead protectors were undamaged and locked. No maintenance needs were identified.

5.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the top and side slopes of the disposal cell, apron outfall, and rock drains; (2) the region between the apron at the toe of the side slopes and the site perimeter; and (3) the outlying area. 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.

5.4.2.1 Top and Side Slopes of the Disposal Cell, Apron Outfall, and Rock Drains

The disposal cell, completed in 1994, occupies 127 acres. Its vegetated cover consists primarily of well-established coastal Bermudagrass and kleingrass, with other species interspersed. The site, including the disposal cell, is managed for hay production, which ensures that turf vitality is maintained. The site maintenance subcontractor can take as many as three cuttings of hay each year from the site. The maintenance subcontractor will spot-spray woody vegetation that inspectors found distributed sporadically in the uncut grass. At the time of the September 2020 site visit, hay bales were present on the property.

There was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell. No areas of ponded water or areas of settlement were observed on top of the disposal cell during the September 2020 site visit.

The disposal cell side slopes and a transition zone where the top slope meets the side slopes are armored with riprap (PL-3). LM has monitored several small depressions on the northwest side slope of the disposal cell since 2010. These depressions do not compromise the protectiveness of the riprap side slope, and no changes have been observed since 2010. Inspectors will continue to monitor these areas.

Fractured riprap has been observed on the disposal cell side slopes since it was completed. Pieces of riprap are fractured in place, indicating that the fracturing occurred after placement. Fracturing is likely a consequence of mechanical placement or thermal expansion and contraction; the riprap condition appears stable. LM periodically takes photos of riprap at the base of T-post 4 on the west corner of the disposal cell. On the basis of a qualitative evaluation of the photos in 2018, there is no indication that the riprap is degrading, but its durability will continue to be monitored. If the number of fractured rocks appears to be increasing, LM will establish a more quantitative monitoring program.

In 2007, inspectors noted possible subsidence in the riprap at the toe of the south corner of the side slope. In 2008, three T-posts were installed in a straight line running at an orientation of 317 degrees to monitor side slope movement. Each post was installed at a vertical pitch of 90 degrees. These three posts provide reference points to assess whether the area is undergoing movement: If a post moves out of line with the other two posts or the pitch of an individual post changes, it indicates possible movement. The three posts remain in the same straight line in which they were installed and are at the same vertical pitch.

An equipment access ramp to the top of the disposal cell is at the west corner of the side slope. The ramp was installed in 2008 using clean, angular riprap of progressively smaller rock sizes to provide a free-draining and stable driving surface that does not encourage vegetation encroachment. Some displacement of smaller rock has occurred, as would be expected from use, but the ramp continues to provide a stable driving surface.

There were no issues with the vegetation management on top of the disposal cell and on side slopes. Much of the vegetation observed on the side slopes was dead or dormant grass. The grass does not affect disposal cell performance. Because deep roots of woody vegetation could penetrate the radon barrier, woody vegetation is controlled annually through cutting and applying herbicide. No additional maintenance concerns were noted on the top and side slopes of the disposal cell.

LM participated in a project sponsored by NRC to investigate the effect of soil-forming processes on the performance of the radon barrier on UMTRCA disposal cells. In April 2016, researchers excavated through the cover materials (cover soil and underlying radon barrier) at six locations to measure radon flux and document soil structure (Figure 5-1). Although significant soil structure was developing, radon flux did not exceed the U.S. Environmental Protection Agency (EPA) standard. LM will continue to monitor these locations to confirm that positive drainage is preserved and vegetation continues to thrive at the grass-covered test pits.

No water was flowing in the south rock drain during the inspection (PL-4). Willows that grow along the south drain are periodically removed by the maintenance subcontractor. No water was observed in the north rock drain. Vegetation is left uncut at the outlets of the rock drains to help dissipate the energy of stormwater runoff and to reduce soil erosion. Vegetation in the apron outfall, midway along the northeast side slope, was cut back before the 2020 inspection. No maintenance needs were identified.

5.4.2.2 Region Between the Apron at the Toe of the Side Slopes and the Site Perimeter

The area between the perimeter fence and the apron at the toe of the disposal cell side slopes is covered with well-established grass, which is primarily kleingrass with some coastal Bermudagrass. Grass is cut and baled one to three times annually, depending on precipitation. It is usually left uncut along the fence, along rock drains, and around some surveillance features such as survey monuments that cannot be accessed with conventional farming equipment.

Wild hogs dig under the perimeter fence line in some areas. Their crossings are filled in by the site maintenance contractor, as they can potentially compromise the integrity of the perimeter fence or damage haying equipment. No maintenance needs were identified.

5.4.2.3 Outlying Area

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 observed. The remainder of the adjacent former processing site is used for occasional livestock grazing. The owners have removed some of the brush to facilitate grazing.

Karnes County Road 202 runs along the northwest side of the property boundary. Public access to the road was restricted by a locked gate before 2011. The road has been open since then, but this has not led to increased vandalism or trespassing at the site.

5.5 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 observed.

5.6 Maintenance

No maintenance needs were identified.

5.7 Emergency Response

Emergency response is action LM will take in response to unusual damage or disruption that threatens or compromises site safety, security, or integrity in compliance with 10 CFR 40 Appendix A Criterion 12. No need for an emergency response was found.

5.8 Environmental Monitoring

5.8.1 Groundwater Monitoring

In accordance with the LTSP, annual groundwater monitoring is conducted as a BMP. The compliance strategy for groundwater protection at the site is no further remediation and application of supplemental standards in accordance with 40 CFR 192.21(g). The most recent sampling event occurred in January 2020.

As prescribed in the LTSP, the site groundwater monitoring program has the following purposes:

- Disposal cell performance monitoring
- Groundwater compliance monitoring to demonstrate that potential users of groundwater downgradient of the site are not exposed to contamination related to the former processing site

Two hydraulically connected groundwater units comprise the uppermost aquifer beneath the site. The shallower of the two units consists of sandstone units of the Deweesville Sandstone and Conquista Clay of the Whitsett Formation. The deeper unit is in the Dilworth Sandstone of the Whitsett Formation. The Dilworth Sandstone is underlain by the Manning Clay, a 300-foot-thick aquitard that isolates the uppermost aquifer from better-quality groundwater in deeper aquifers. Samples are collected from the Deweesville/Conquista and the Dilworth groundwater units.

Table 5-2 and Figure 5-2 describe and illustrate the groundwater monitoring network at the site, which includes the groundwater compliance monitoring wells and the disposal cell performance monitoring wells. The disposal cell performance monitoring wells are near the disposal cell and are all completed in the Deweesville and Conquista units. The groundwater compliance monitoring wells are downgradient of the site and completed in the Deweesville and Conquista units and the Dilworth unit.

Table 5-2. Groundwater Monitoring Network for the Falls City, Texas, Disposal Site

Groundwater Monitoring Purpose	Monitoring Wells
Disposal cell performance monitoring	0709, 0858, 0880, 0906, 0908, 0916, and 0921
Groundwater compliance monitoring	0862, 0886, 0891, 0924, and 0963

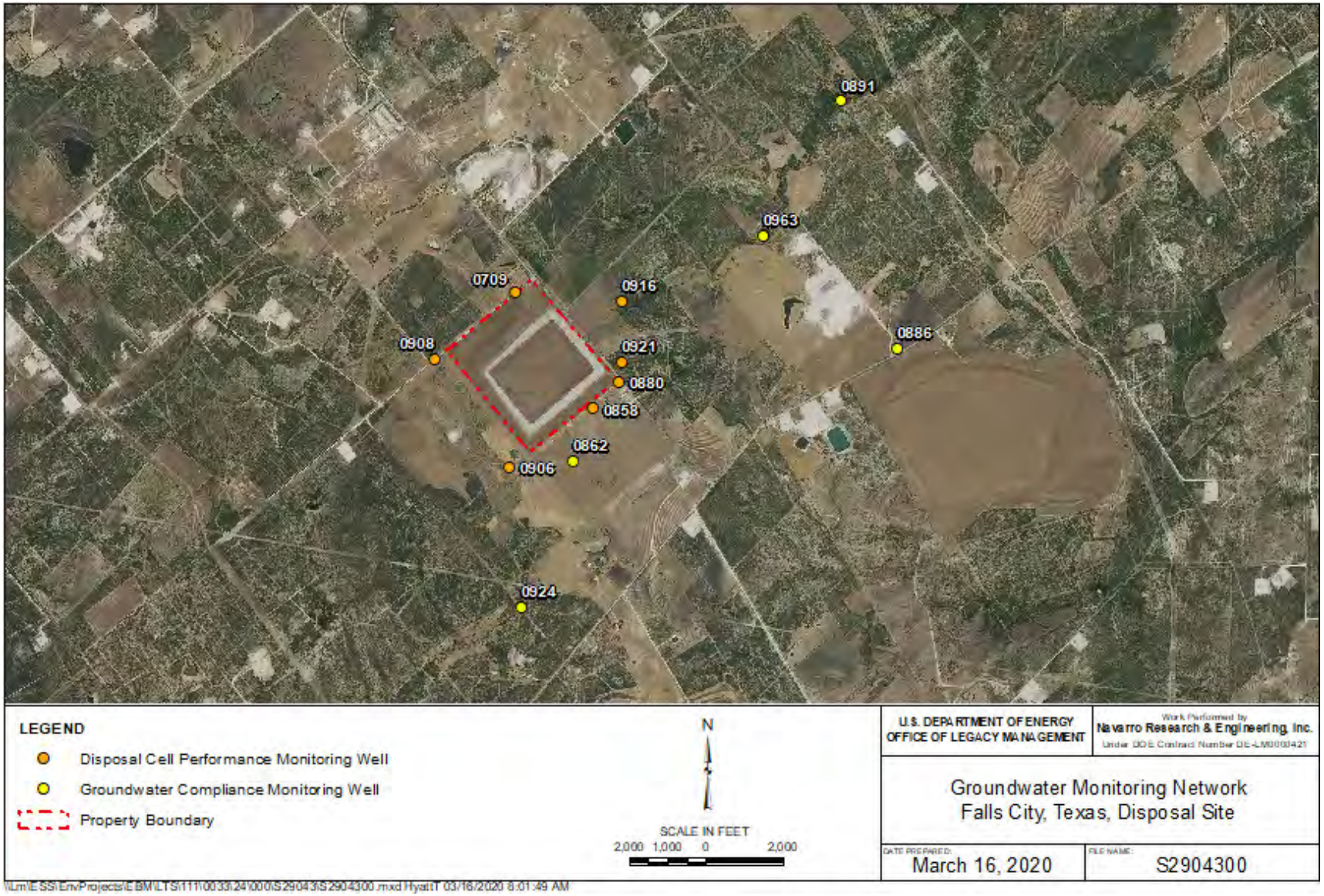

Figure 5-2. Groundwater Monitoring Well Network at the Falls City, Texas, Disposal Site

Groundwater is sampled annually for total uranium and field measurements of water level, temperature, pH, conductivity, turbidity, alkalinity, dissolved oxygen, and oxidation-reduction potential. Of particular interest are total uranium, pH, and water level. The LTSP identifies low pH levels in groundwater as an indicator of the extent and movement of the legacy groundwater plumes. Because tailings pore fluids were lower in pH than background groundwater, changes in geochemical conditions might also indicate leachate movement from the disposal cell into the uppermost aquifer. However, because pH levels and other signature contaminants in tailings pore fluids are essentially indistinguishable from processing-related contamination, it is difficult to assess whether contamination comes from the disposal cell or from legacy processing activities.

Monitoring results indicate that pH is not an indicator of contaminant concentrations at the site (DOE 2008). This is an indication that other factors, such as natural redistribution of uranium in this active ore-forming environment or buffering of low-pH groundwater, contribute to uranium distribution in the uppermost aquifer. Therefore, increasing uranium levels at a monitoring well without an attendant drop in pH might still indicate movement of processing-related contamination. Groundwater chemistry at monitoring wells near the formation subcrop can also be influenced by residence time as a response to precipitation or by changes in the oxidation state within the formation.

Because narrative supplemental standards apply to the uppermost aquifer at the site, no concentration limits or POCs have been established. Groundwater in the uppermost aquifer beneath the site meets the EPA definition of limited use (Class III) because it is not currently or potentially a source of drinking water due to widespread ambient contamination that cannot be cleaned up using methods reasonably employed by public water supply systems (40 CFR 192.11[e]).

Background groundwater quality in the uppermost aquifer varies by orders of magnitude in the area because it is in contact with naturally occurring uranium mineralization. Figure 5-3 and Figure 5-4 show the water level measurements over time at both the disposal cell performance monitoring wells and the groundwater compliance monitoring wells. Figure 5-5 through Figure 5-8 show the time-concentration plots for pH and uranium at both disposal cell performance monitoring wells and groundwater compliance monitoring wells. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (https://gems.lm.doe.gov/#site=FCT).

5.8.2 Groundwater Level Monitoring Results

Water levels in all disposal cell performance wells had significant decreasing trends since 1996 based on Mann Kendall trend analyses (Figure 5-3). Water levels in these wells appear to have stabilized since 2014. Wells 0709, 0880, and 0906 have had apparent increase in water level since 2014. Groundwater compliance wells 0862, 0886, and 0963 had significant increasing water level trends since 1996, and wells 0891 and 0924 had no statistically significant trend (Figure 5-4). Wells with increasing water level trends each had a water elevation increase of about 5 ft since 1996.

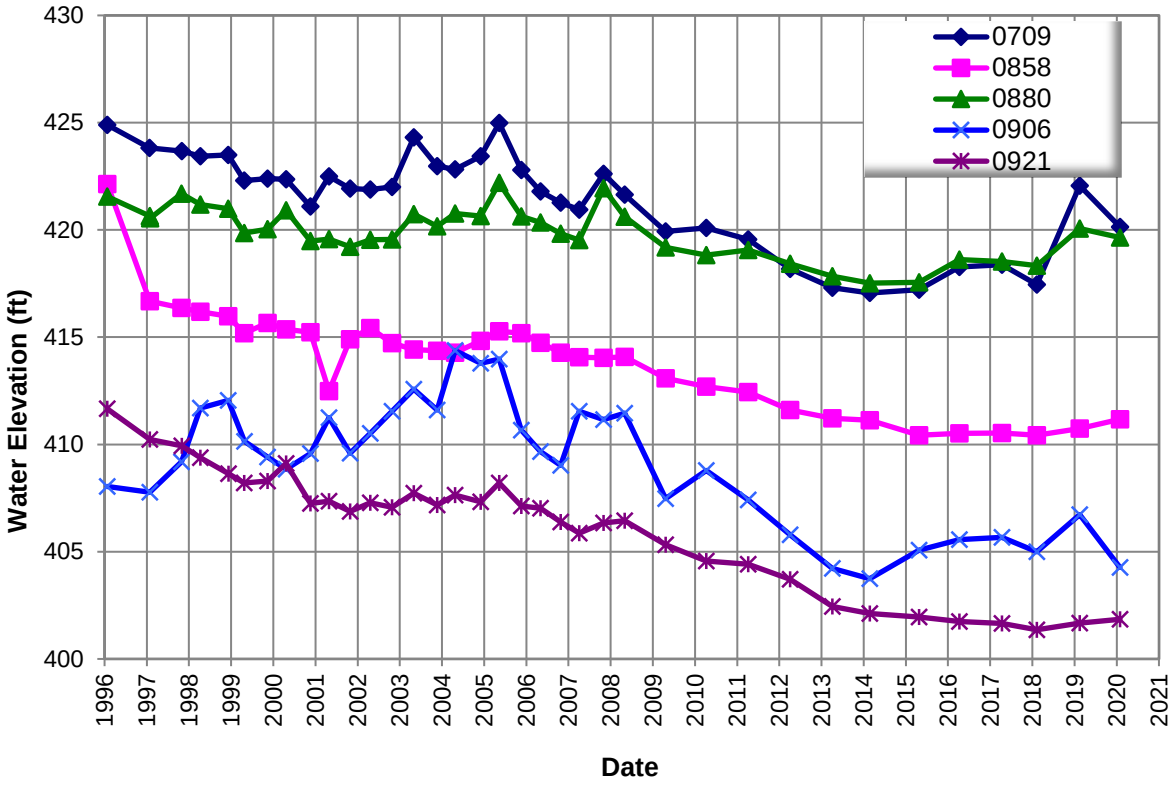

Figure 5-3. Water-Level Measurements at Disposal Cell Performance Monitoring Wells at the Falls City, Texas, Disposal Site

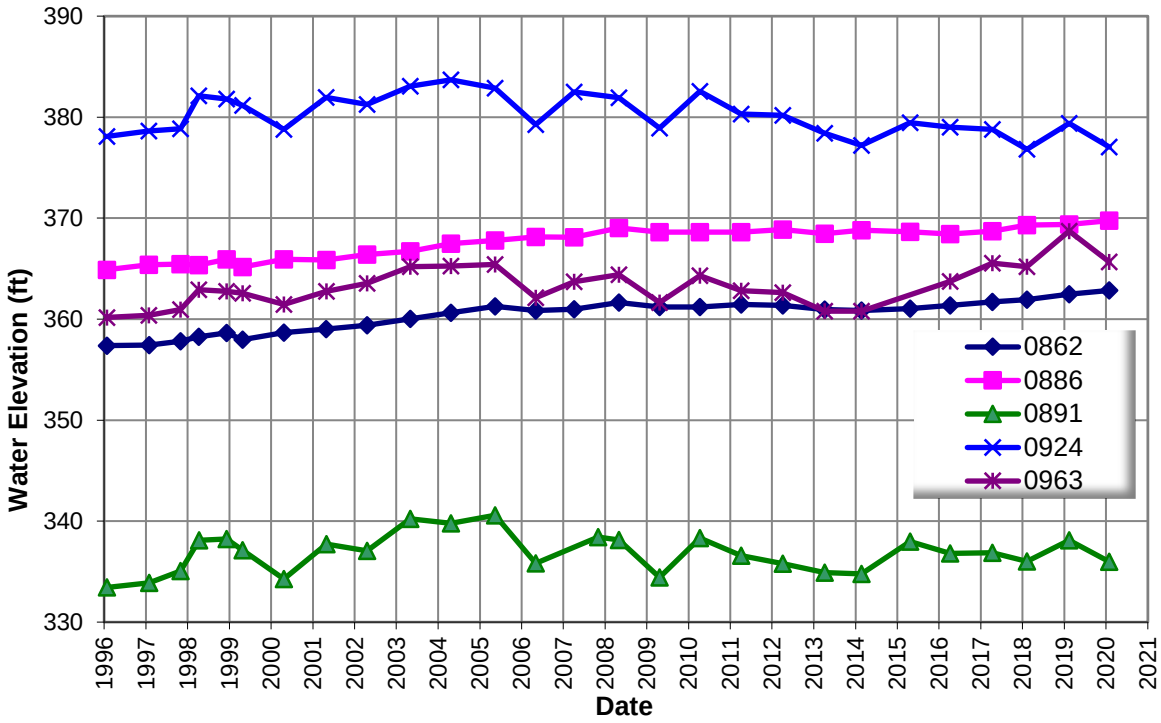

Figure 5-4. Water-Level Measurements at Groundwater Compliance Monitoring Wells at the Falls City, Texas, Disposal Site

5.8.3 Groundwater Quality Monitoring Results

pH: Wells 0858 and 0921 had significant increasing pH trends since 1996, based on Mann Kendall trend analyses, and all other disposal cell performance wells had no significant trend. At the disposal cell performance monitoring wells, pH levels have historically been greater than the pH in tailings pore fluids (pH level of 2.93). The 2020 pH levels were within the range of historical values for all disposal cell performance monitoring wells (Figure 5-5).

Statistically significant increasing trends in pH were in wells 0886, 0891 and 0924 since 1996, with no significant trends in wells 0862 and 0963 (Figure 5-6). The 2020 pH levels were within the range of historical values for all groundwater compliance monitoring wells. The pH in monitoring well 0963 historically has been lower than at the other groundwater compliance wells, with a pH of 3.8 in 2020 compared to between 6.0–7.0 in the other wells. Overall, groundwater in well 0963 had a similar pH to that of the tailings pore fluids, even compared to the wells adjacent to the disposal cell.

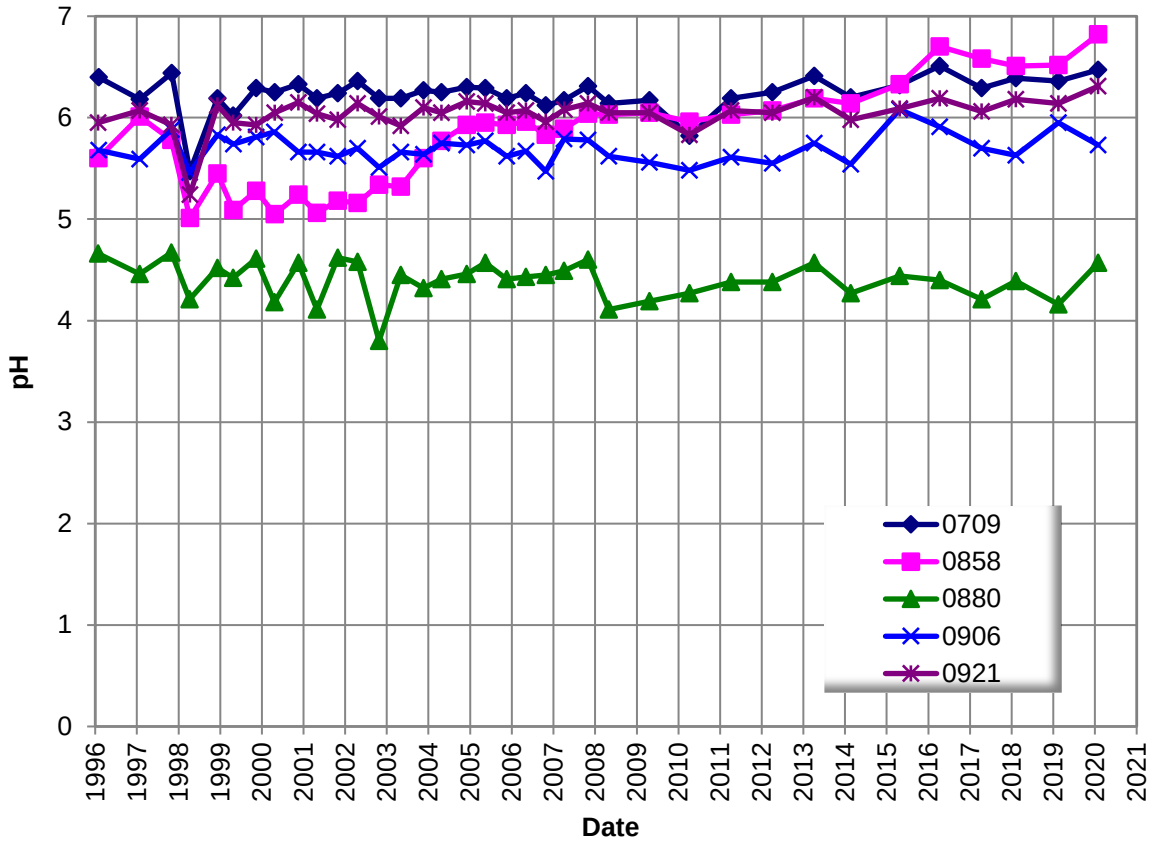

Figure 5-5. pH at Disposal Cell Performance Monitoring Wells at the Falls City, Texas, Disposal Site

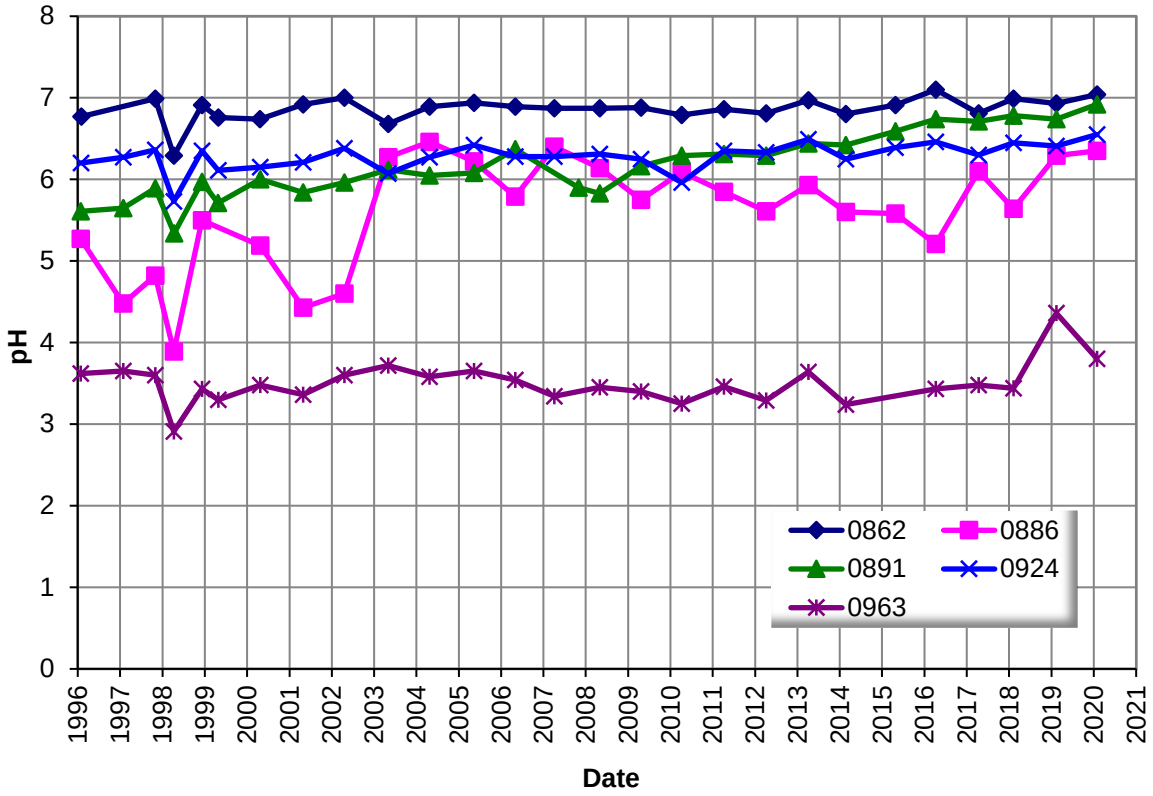

Figure 5-6. pH at Groundwater Compliance Monitoring Wells at the Falls City, Texas, Disposal Site

Uranium: The 2020 uranium concentrations for disposal cell performance monitoring wells were within the range of historical values for all groundwater compliance monitoring wells (Figure 5-7). In 2020, the uranium concentrations for monitoring wells 0709, 0906, and 0858 remained generally constant when compared with previous results. The uranium concentration in monitoring wells 0921 and 0880 decreased. Uranium concentrations in monitoring well 0880 show considerable variation, ranging from a low of 1.38 milligrams (mg/L) in 2008 to a high of 14 mg/L in 2004. The 2020 uranium concentrations for groundwater compliance monitoring wells were within the range of historical values for all groundwater compliance monitoring wells (Figure 5-8).

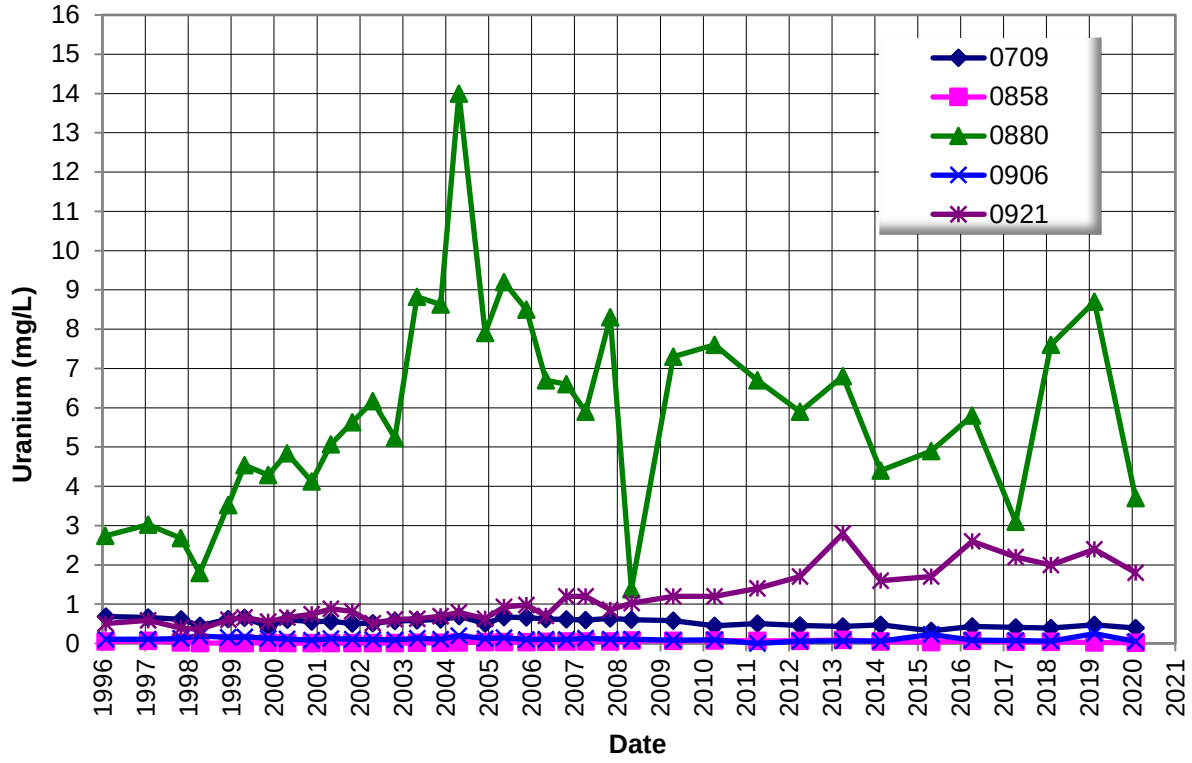

Figure 5-7. Uranium Concentrations at Disposal Cell Performance Monitoring Wells at the Falls City, Texas, Disposal Site

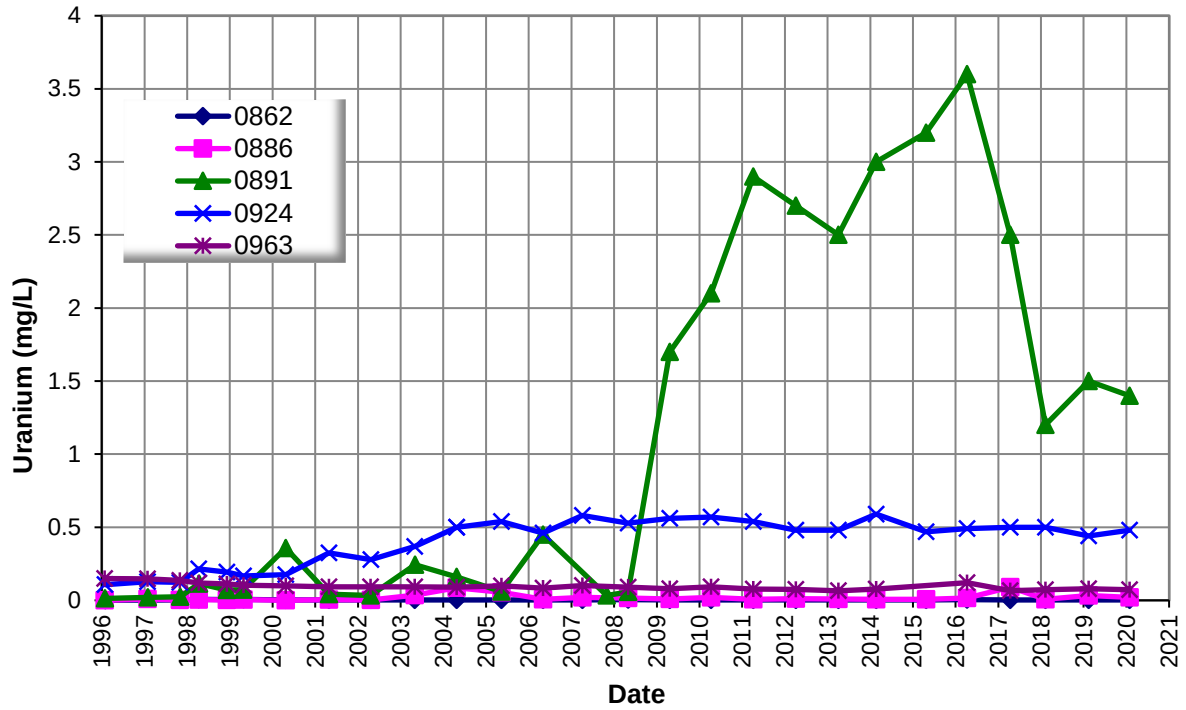

Figure 5-8. Uranium Concentrations in Groundwater Compliance Monitoring Wells at the Falls City, Texas, Disposal Site

The uranium concentration at monitoring wells 0862, 0886, and 0963 remains less than 0.2 mg/L. The uranium concentration at monitoring well 0924 has been relatively stable since 2004, fluctuating between 0.4 mg/L and 0.6 mg/L. Since 2008, the uranium concentrations measured at monitoring well 0891 have been greater than at other monitoring wells and are currently elevated when compared to the historical range for the well but not for the historical range of the aquifer (DOE 2010). The 2020 uranium result (1.4 mg/L) at monitoring well 0891 remains significantly less than the 2016 uranium result of 3.7 mg/L and less than the uranium concentration value used for groundwater in the Dilworth aquifer in the *Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Falls City, Texas* (3.04 mg/L) (DOE 1994). This suggests that a slug of groundwater with elevated uranium has flowed past this location.

5.8.4 Evaluation of Groundwater Monitoring

Uranium concentrations in disposal cell performance monitoring well 0880 have varied considerably since 1996, ranging from 1.38 mg/L in 2008 to 14 mg/L in 2004 (Figure 5-7). The uranium concentration was 3.7 mg/L in 2020. The pH at this location is less than at other disposal cell performance monitoring wells. Water levels at all the cell performance monitoring wells trended lower from 2007 until 2016, then increased in recent years (Figure 5-3). Because the uranium concentrations at some of the cell performance monitoring wells have been steady and concentrations vary at other locations, local conditions are likely influencing uranium concentrations. This is reasonable because (1) the disposal cell is located on tailings that were placed in existing open pit mines, (2) subeconomic ore remains in unmined areas, (3) the uppermost aquifer beneath the cell is oxidized and near the aquifer recharge area, and (4) uranium mineralization processes, which involve redistributing and concentrating uranium in the formation materials, are ongoing. Given the local conditions it is difficult to assess whether elevated uranium concentrations in the uppermost aquifer are a result of disposal cell performance or existing background conditions.

The high uranium concentrations in groundwater compliance well 0891 since 2008, trending downward since 2016, likely reflects the passage of a slug of groundwater with elevated uranium flowing from the direction of the former processing site. Historical data from upgradient monitoring wells that were abandoned in 2001 show a uranium anomaly moved past them (Figure 5-9) (DOE forthcoming). LM defined the groundwater flow directions in the Deweesville and the Dilworth aquifers and identified areas of low pH where tailings-derived fluids have consumed all the natural buffering capacity (DOE 2008; Figure 2-7; Figure 2-8). Monitoring well 0891 is completed in the Dilworth aquifer. Monitoring well 0963 (completed in the Deweesville Sandstone) is in a zone of low pH where groundwater in the Deweesville aquifer flows into the underlying Dilworth aquifer. Monitoring well 0966 is the next downgradient Dilworth aquifer well.

Figure 5-9 shows uranium concentration spikes in both wells (0963 and 0966) in 1992, with slowly declining uranium concentrations in 0963 over time (data for monitoring well 0966 are limited). This is likely due to an initial release of uranium and low pH tailings fluids during tailings deposition and subsequent acid leaching, with tailings removal by 1994 (DOE forthcoming). Monitoring well 0891 is the next Dilworth well directly downgradient of the low pH zone. Additionally, the elevated uranium at monitoring well 0891 is accompanied by

elevated alkalinity and chloride, which also supports the conclusion that the elevated uranium is the result of passage of a slug of groundwater containing processing-related constituents.

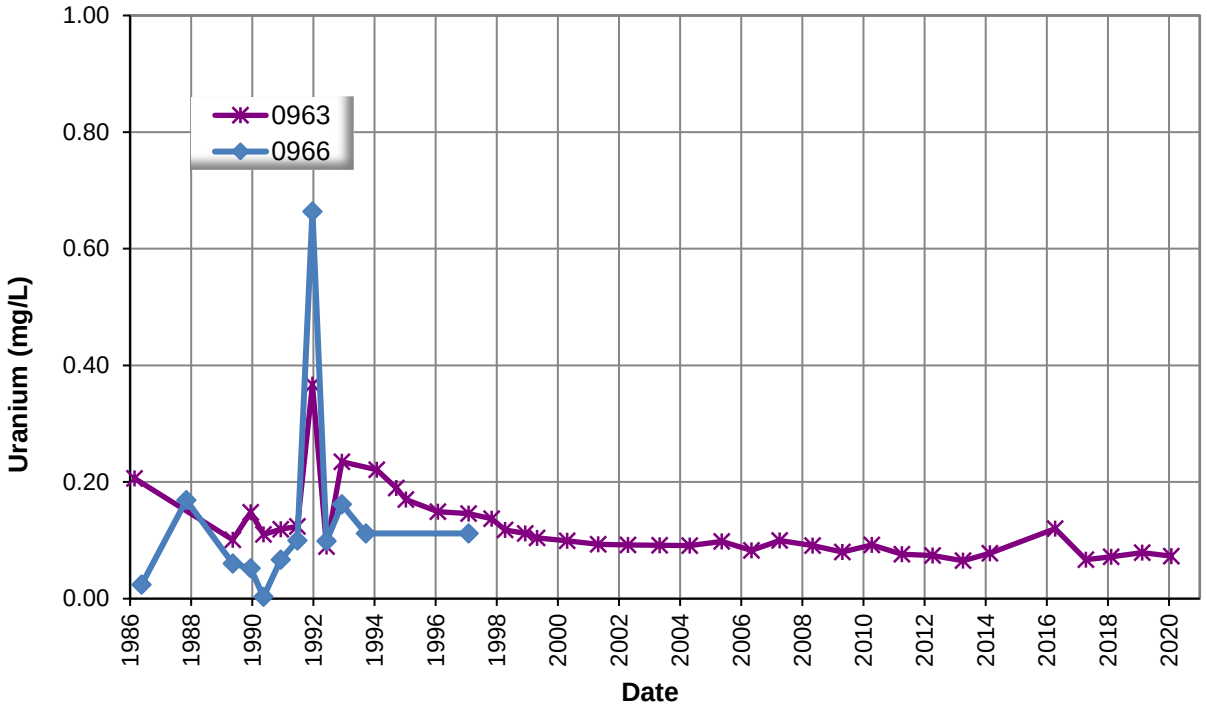

Figure 5-9. Uranium Concentrations in Monitoring Wells 0963 (in the Deweesville Aquifer) and 0966 (in the Dilworth Aquifer)

Site-related contamination in the uppermost aquifer poses no risk to human health because groundwater from this aquifer is not used for human consumption and is designated as limited use. Potable water is produced locally from the Carrizo Sandstone that lies 2000 ft beneath the surface near the site. Additionally, a 300-foot-thick aquitard isolates the uppermost aquifer from the better-quality groundwater in deeper aquifers.

LM evaluated the groundwater monitoring program at the site in 2010 as required by the LTSP (DOE 2010). Groundwater monitoring data collected from 2006 through 2010 were compared to previous data (1996 through 2005). The comparison showed that contaminant concentrations continued to fluctuate in the uppermost aquifer, but the fluctuations were within the historical range reported for the aquifer near the site. The comparison also showed no unexpected water level changes. The 2010 evaluation recommended that, after the collection of samples in 2011, groundwater monitoring activities at the site be discontinued. Recommendations made in the 2010 evaluation continue to undergo NRC review. In 2016, NRC received comments on the 2010 report from TCEQ, which concurred that monitoring could be halted at all Falls City wells except (1) monitoring well 0891 until a horizontal or decreasing trend is observed (this condition has been met, as shown in Figure 5-8) and (2) monitoring wells 0880 and 0886, which are completed in the Deweesville Sandstone and should be retained until the groundwater remedy for the downgradient Conquista site is established.

5.9 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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations.*

DOE (U.S. Department of Energy), 1994. *Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Falls City, Texas*, DOE/AL/62350-64, Rev. 1, Environmental Restoration Division, Albuquerque, New Mexico, September.

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance Plan for the U.S. Department of Energy Falls City Uranium Mill Tailings Disposal Site, Falls City, Texas,* DOE-LM/1602-2008, March.

DOE (U.S. Department of Energy), 2010. *Groundwater Monitoring Assessment, Falls City, Texas, Disposal Site*, LMS/FCT/S07069, December.

DOE (U.S. Department of Energy), forthcoming. *Groundwater Monitoring Assessment and Chronology of Groundwater Compliance Activities at the Falls City, Texas, UMTRCA Title I Disposal Site*, LMS/FCT/S25289, Office of Legacy Management, to be published.

5.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	—	Site Marker SMK-1
PL-2	—	Survey Monument SM-3
PL-3	130	South Side of Disposal Cell Side Slope
PL-4	180	Rock Drain on South Corner of Disposal Cell

Note:
— = Photograph taken from vertically above.

PL-1. Site Marker SMK-1

PL-2. Survey Monument SM-3

PL-3. South Side of Disposal Cell Side Slope

PL-4. Rock Drain on South Corner of Disposal Cell

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6.0 Grand Junction, Colorado, Disposal Site

6.1 Compliance Summary

The Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on December 9, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified minor maintenance needs that will be handled during the next routine maintenance event, but no cause for a follow-up inspection was identified.

A portion of the disposal cell remains open to receive low-level radioactive materials from various sources. The open disposal cell and its supporting structures and facilities are not included in the annual inspection. Ongoing disposal cell cover study areas, which include a cover study on top of the disposal cell and lysimeter facilities adjacent to the north and east sides of the disposal cell, are not inspected. This annual inspection includes the completed portion of the disposal cell and the remaining portions of the disposal site.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts annual groundwater monitoring at the site as a best management practice. Three monitoring wells are sampled to verify that groundwater in onsite paleochannels is not affected by potential seepage (i.e., transient drainage) from the disposal cell. Groundwater monitoring was last completed May 29, 2020. Groundwater monitoring results confirm that groundwater in the paleochannels continues to be unaffected by potential transient drainage from the disposal cell.

6.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the completed portion of the disposal cell and the remaining portion of the site are specified in the site-specific Interim Long-Term Surveillance Plan (LTSP) (DOE 1998) and in procedures LM 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 6-1 lists these requirements.

Table 6-1. Interim Requirements for the Grand Junction, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.0 and 6.2	Section 6.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 6.5	(b)(4)
Maintenance and Repairs	Sections 2.7.3 and 4.0	Section 6.6	(b)(5)
Corrective Action	Section 5.0	Section 6.7	—
Groundwater Monitoring	Section 2.6	Section 6.8	(b)(2), (b)(3)

6.3 Institutional Controls

The 360-acre site, identified by the property boundary shown in Figure 6-1, is owned by the United States. Low-level radioactive waste will be received until the disposal cell's legally mandated closure date or until it is filled to capacity, whichever comes first.

In December 2020, Congress passed legislation that will extend the final disposal cell closure date from 2023 to 2031. LM's operations to receive radioactive waste at the site will cease in September 2031. Following closure of the disposal cell, the Interim LTSP (DOE 1998) for the site will be revised and finalized; with NRC acceptance of the final LTSP, the site will come under NRC's general license. 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 gate and signs, perimeter fence and signs, boundary monuments, and wellhead protectors.

6.4 Inspection Results

The site, 18 miles southeast of Grand Junction, Colorado, was inspected on December 9, 2020. The inspection was conducted by P. Wetherstein, H. Petrie, and L. Sheader of the Legacy Management Support contractor. S. Woods from LM also attended the inspection. The purposes of the inspection were to confirm the integrity of the disposal cell and other visible site features, identify changes in conditions that might affect conformance with the Interim LTSP, and determine the need, if any, for immediate maintenance, corrective action, or additional inspection and monitoring.

6.4.1 Site Surveillance Features

Figure 6-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 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 6-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 6.10.

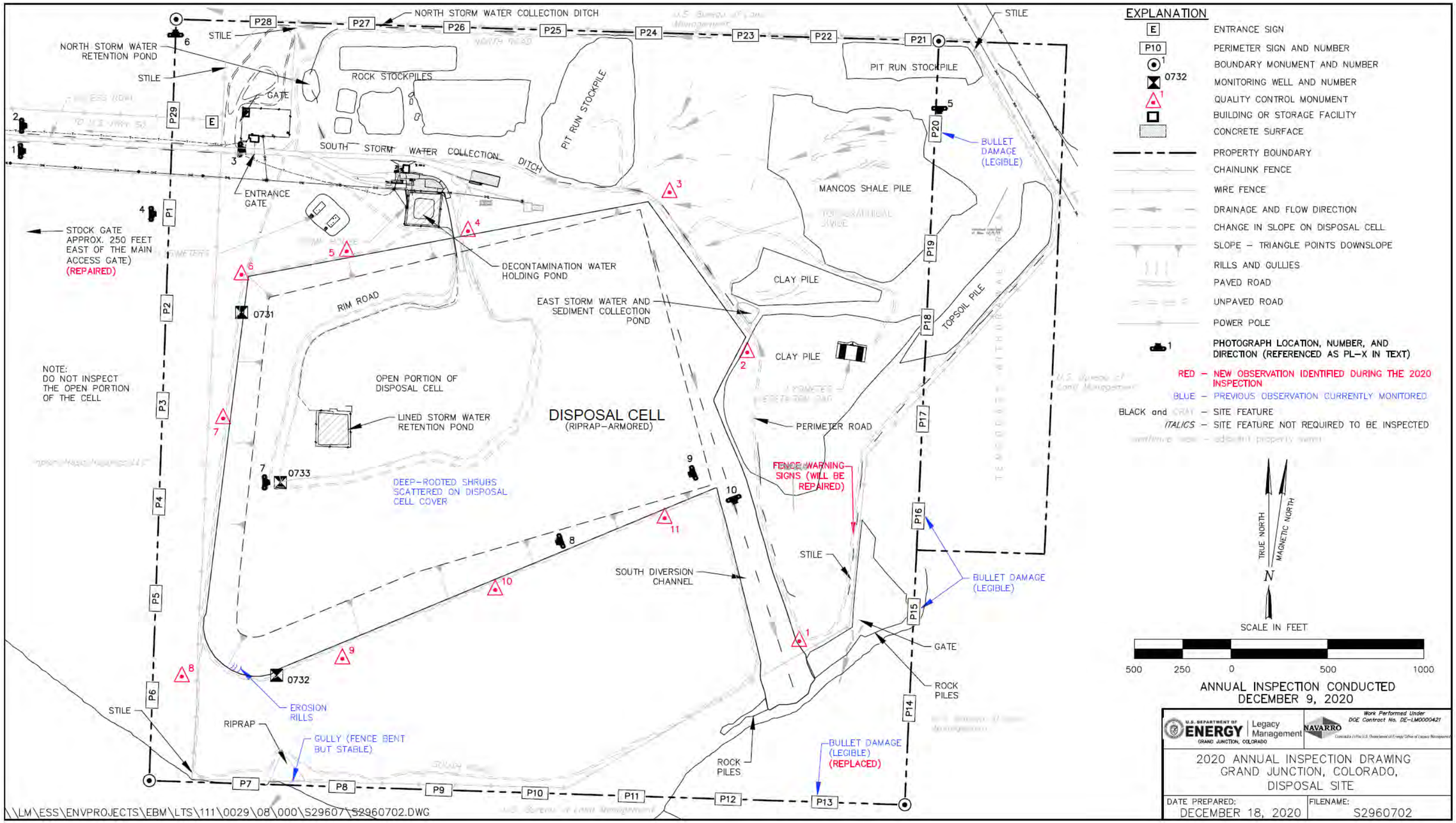

Figure 6-1. 2020 Annual Inspection Drawing for the Grand Junction, Colorado, Disposal Site

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6.4.1.1 Access Road, Entrance Gates, and Entrance Signs

Access to the site is from U.S. Highway 50 by a right-of-way grant on federal land that is administered by the U.S. Bureau of Land Management (BLM). There is a steel double-swing access gate (PL-1) along the highway right-of-way fence providing access within the BLM-administered right-of-way. The access gate (PL-2) is secured by a locking device that was locked and functional at the time of the inspection. LM is one of several parties with access to the locking device.

Although it is not required by the Interim LTSP, LM maintains the site access road and associated right-of-way. A stock gate, east of the access gate was found open and damaged. The gate was repaired following the 2020 inspection.

The site entrance gate was locked and functional, and site entrance signs on and next to the entrance gate were in good condition (PL-3). No immediate maintenance needs were identified.

6.4.1.2 Perimeter Fence and Signs

A perimeter fence encloses the disposal cell features and operations areas. It consists of a standard four-strand, barbed-wire fence in some areas and a woven wire fence topped with barbed wire in others. The perimeter fence does not match the property boundary in several areas. There are 29 perimeter signs attached to steel posts set in concrete positioned at regular intervals along the property boundary (PL-4). Perimeter sign P13, previously reported with bullet damage, was replaced. Perimeter signs P15, P16, and P20 have bullet damage but remain legible (PL-5). In addition to the perimeter signs, the perimeter fence also has warning signs ("No Trespassing" and "Controlled Area" signs). Several warning signs on the perimeter fence near the stile east of the south diversion channel are damaged and will be repaired during the next routine site maintenance event. No immediate maintenance needs were identified.

6.4.1.3 Site Markers

Granite site markers similar to those at other UMTRCA sites will not be installed until the disposal cell is closed.

6.4.1.4 Boundary Monuments

Four boundary monuments delineate the corners of the property boundary (PL-6). All were present and in good condition, and no immediate maintenance needs were identified.

6.4.1.5 Aerial Survey Quality Control Monuments

Eleven aerial survey quality control monuments installed in December 2020 were inspected during the 2020 inspection. No maintenance needs were identified.

6.4.1.6 Monitoring Wells

The groundwater monitoring network consists of three monitoring wells (0731, 0732, and 0733) (PL-7). All wellhead protectors were locked and undamaged, and no immediate maintenance needs were identified.

6.4.2 Inspection Areas

In accordance with the Interim LTSP, the site is divided into four inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the closed portion of the disposal cell, (2) diversion structures and drainage channels, (3) the area between the disposal cell and the property boundary or site perimeter fence, and (4) the outlying area. 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 integrity of the disposal cell and the site's conformance with the Interim LTSP requirements.

6.4.2.1 Closed Portion of the Disposal Cell

The closed portion of the disposal cell is armored with basalt riprap to control erosion (PL-8). The rock showed no significant weathering. There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell.

Grasses and weeds were growing on most of the disposal cell cover (PL-9). Historically, deep-rooted shrubs on top of the disposal cell have been treated with herbicide. Although treatment is not required by the Interim LTSP, LM plans to continue controlling the deep-rooted shrubs as needed.

During the 2014 annual inspection, several small erosion rills were noted in soils at the base of the disposal cell's southwestern corner. The channels were repaired and covered with gravel following the 2019 inspection. No immediate maintenance needs were identified.

6.4.2.2 Diversion Structures and Drainage Channels

The south diversion channel is a large, riprap-armored structure that intercepts run-on water from offsite and onsite, as well as stormwater runoff from the disposal cell, and conveys the water into a natural drainage that flows away from the site to the southwest (PL-10). Grasses, weeds, and shrubs grow within the diversion channel, but this vegetation is not expected to degrade the channel's performance. The discharge area of the channel is armored with large-diameter basalt riprap.

Other drainage features at the site include north and south stormwater collection ditches, the north stormwater retention pond, and the east stormwater and sediment collection pond. These small drainage features control stormwater runoff primarily from the various stockpiles of disposal cell cover materials. The stormwater collection ditches also capture stormwater run-on from offsite locations. The diversion channel, ditches, and ponds were functioning as designed, and no immediate maintenance needs were identified.

6.4.2.3 Area Between the Disposal Cell and the Site Boundary or Perimeter Fence

There are 11 discrete stockpiles of rock and soil between the disposal cell and the perimeter fence on the north and east sides of the site. Most of these materials eventually will be used to cover and close the open disposal cell. Vegetation and surface rocks generally protect the stockpiles from significant erosion.

Most of the flat areas between the disposal cell and the site (property) boundary are vegetated with native shrubs, scant perennial grasses, and annual weeds. Localized erosion previously reported along the perimeter road near the east stormwater and sediment collection pond have been repaired. Erosion rills on the west side of the perimeter road will continue to be monitored and maintenance performed as necessary. No immediate maintenance needs were identified.

6.4.2.4 Outlying Area

The area beyond the site boundary for 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 changes were identified. Most of the land surrounding the site is rangeland administered by BLM, and private property on the west side is used primarily for cattle grazing. No land use changes were evident in that area. Outside the site's eastern boundary is a 40-acre area of right-of-way that was issued by BLM to DOE for stockpiled materials. Some of the withdrawal area is included within the site perimeter fence and contains materials stockpiles. This area is not included in the Interim LTSP but is inspected as an offsite area.

6.5 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.

6.6 Maintenance and Repairs

The stock gate that was identified as damaged during the inspection was repaired following the 2020 inspection.

Inspectors identified repairs needed to the southeast perimeter fence warning signs that will be addressed during the next routine site maintenance event. No other immediate maintenance needs were identified.

6.7 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

6.8 Groundwater Monitoring

In accordance with the Interim LTSP, LM conducts annual groundwater monitoring as a best management practice. Groundwater at the site qualifies for supplemental standards because it is designated as limited use, a designation given to groundwater that is not a current or potential source of drinking water. The disposal cell is underlain by 5 to 40 feet (ft) of alluvium. Beneath the alluvium is approximately 700 ft of Mancos Shale, which overlies the uppermost aquifer at the site, the Dakota Sandstone. Groundwater in the site area occurs in thin paleochannels within lower portions of alluvium deposits and in the confined Dakota Sandstone unit. Groundwater in

the Dakota Sandstone is designated as limited use because total dissolved solids (TDS) exceed 10,000 milligrams per liter (mg/L). LM monitors groundwater from three monitoring wells adjacent to and in the disposal cell to verify that groundwater in onsite, alluvial paleochannels is not affected by seepage (i.e., transient drainage) from the disposal cell. The most recent sampling event occurred on May 29, 2020.

Monitoring wells 0731 and 0732 are screened within the alluvial paleochannels adjacent to the disposal cell and extend 5 to 7.5 ft into weathered Mancos Shale. The wells were located in two separate paleochannel systems each downgradient from the disposal cell (DOE 1998). Monitoring well 0733 is screened below the paleochannel monitoring wells in the lower tailings in the disposal cell (Table 6-2 and Figure 6-2). Disposal cell construction was initiated by excavating Mancos Shale, which resulted in the base of the disposal cell being below the weathered Mancos Shale horizon. Monitoring well 0733 is primarily used to measure water levels within the disposal cell. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=GRJ).

Table 6-2. Groundwater Monitoring Network at the Grand Junction, Colorado, Disposal Site

Monitoring Well	Hydrologic Relationship
0731	Paleochannel, downgradient, edge of disposal cell, north side
0732	Paleochannel, downgradient, edge of disposal cell, south side
0733	Disposal cell, deepest location, downgradient, center

Figure 6-2. Groundwater Monitoring Network for the Grand Junction, Colorado, Disposal Site

6.8.1 Groundwater-Level Monitoring

Static water level measurements are obtained from each monitoring well before water quality samples are collected (Figure 6-3). Water levels in disposal cell monitoring well 0733 generally increased approximately 4 ft since 1998 and has remained lower than the adjacent water levels in the two paleochannel monitoring wells. Groundwater levels in wells 0731 and 0732 remained relatively constant with the same apparent trend in variability, suggesting the two paleochannel systems are influenced by the same upgradient recharge mechanisms. The 2020 sampling occurred in late May, whereas every previous sampling since 2003 occurred in August or early September. Consequently, water level measurements in 2020 may have a seasonal influence in relation to the historical data.

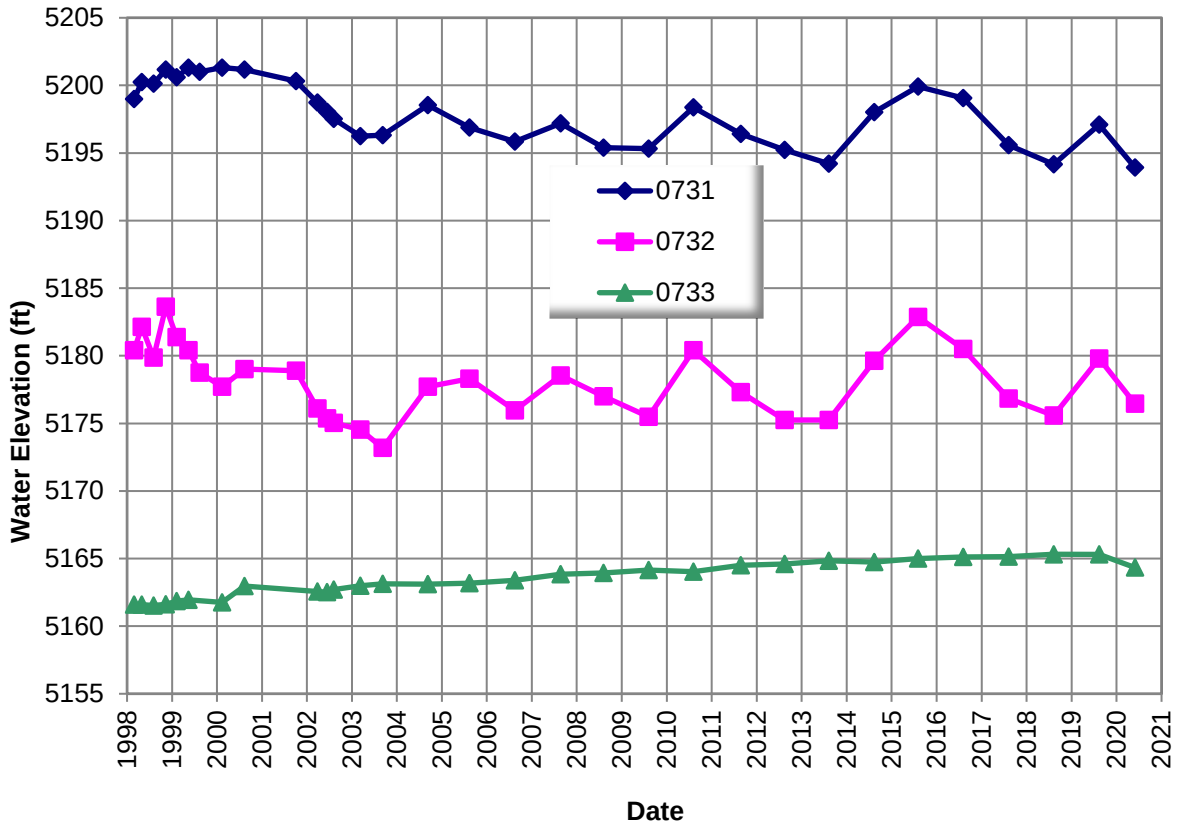


Figure 6-3. Water Level Measurements at the Grand Junction, Colorado, Disposal Site

6.8.2 Groundwater Quality Monitoring

Annual groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, polychlorinated biphenyls, selenium, sulfate, TDS, uranium, and vanadium. Key indicator analytes are molybdenum, nitrate, selenium, and uranium. The U.S. Environmental Protection Agency has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6-3) (40 CFR 192 Table 1 Subpart A). Monitoring results are compared to the MCLs for evaluation only and not for compliance purposes.

Table 6-3. Maximum Concentration Limits for Groundwater at the Grand Junction, Colorado, Disposal Site

Constituent	MCL[a] (mg/L)
Molybdenum	0.1
Nitrate (as nitrogen)	10
Selenium	0.01
Uranium	0.044

Note:
[a] MCLs as listed in 40 CFR 192 Table 1 Subpart A.

Molybdenum concentrations in all three monitoring wells have remained steady since 1998; 2020 concentrations were less than or equal to 0.003 mg/L. Time-concentration plots from 1998 through 2020 for the other key indicator analytes—nitrate (as nitrogen), selenium, and uranium—are shown in Figure 6-4 through Figure 6-6.

Nitrate (as nitrogen) concentrations in disposal cell monitoring well 0733 continued to decline from 96 mg/L in 1998 to 0.8 mg/L in 2020, significantly below the MCL of 10 mg/L (Figure 6-4). Nitrate concentrations continued to exceed the MCL of 10 mg/L in the paleochannel monitoring wells 0731 and 0732. Concentrations in monitoring wells 0731 and 0732 increased slightly in 2020, with the concentration in monitoring well 0732 remaining near the historic high value, which is just above 50 mg/L.

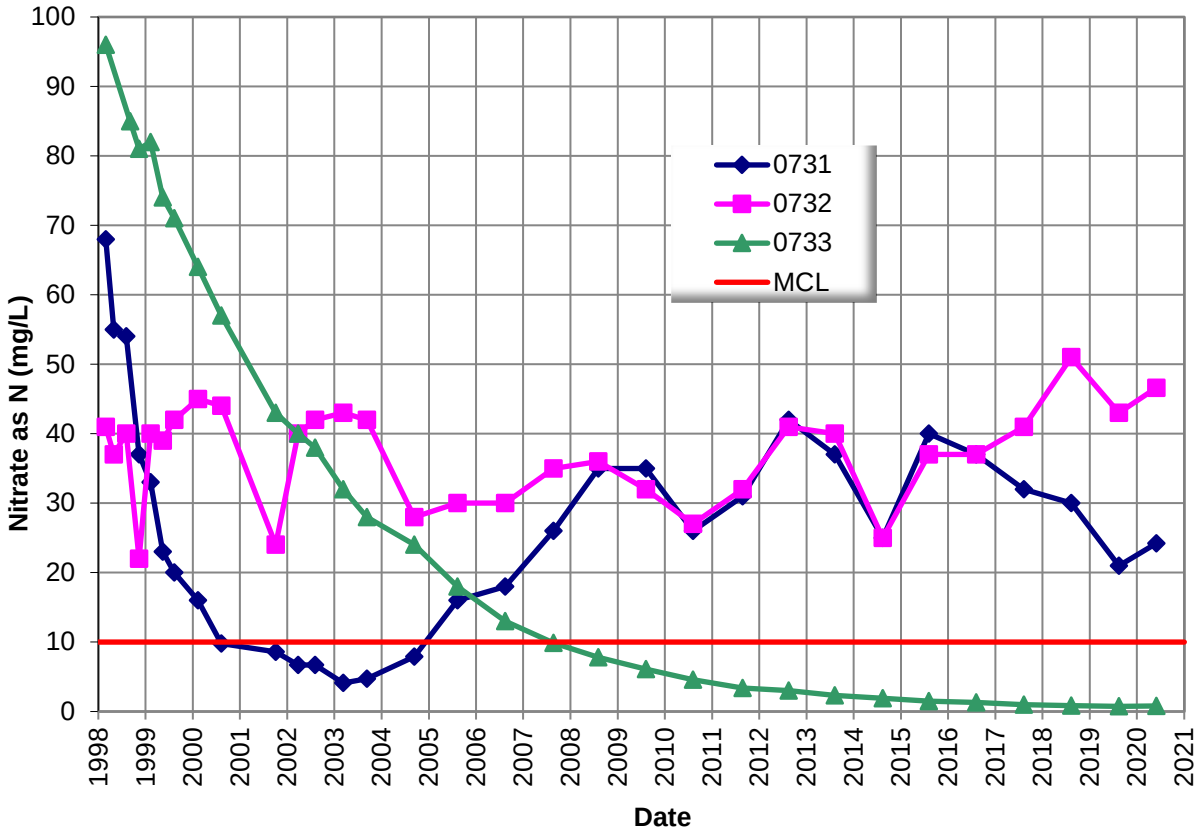


Figure 6-4. Nitrate (as Nitrogen) in Groundwater at the Grand Junction, Colorado, Disposal Site

Selenium concentrations continued to exceed the MCL of 0.01 mg/L in the paleochannel monitoring wells 0731 and 0732 (Figure 6-5). Selenium occurs naturally in the Mancos Shale deposits that underlie the disposal cell at concentrations slightly greater than the MCL of 0.01 mg/L. Paleochannel monitoring wells 0731 and 0732 are screened at the Mancos Shale unconsolidated soil contact with the alluvium. Background groundwater quality in these wells is brackish, with elevated TDS levels ranging from 870 to 7010 mg/L; this supports the theory that the shale is the source of the elevated selenium concentrations in both paleochannel monitoring wells. Disposal cell monitoring well 0733 is not screened in the weathered Mancos and selenium concentrations remain below the MCL.

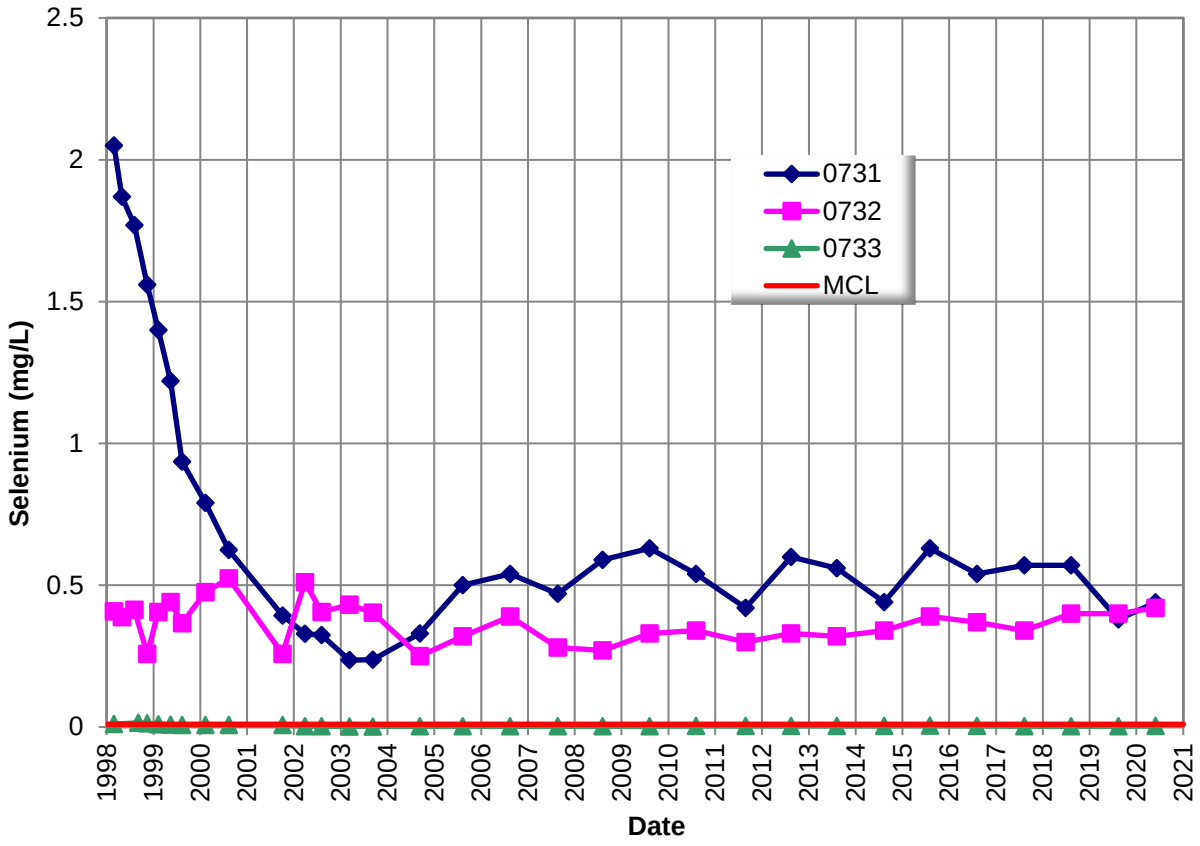
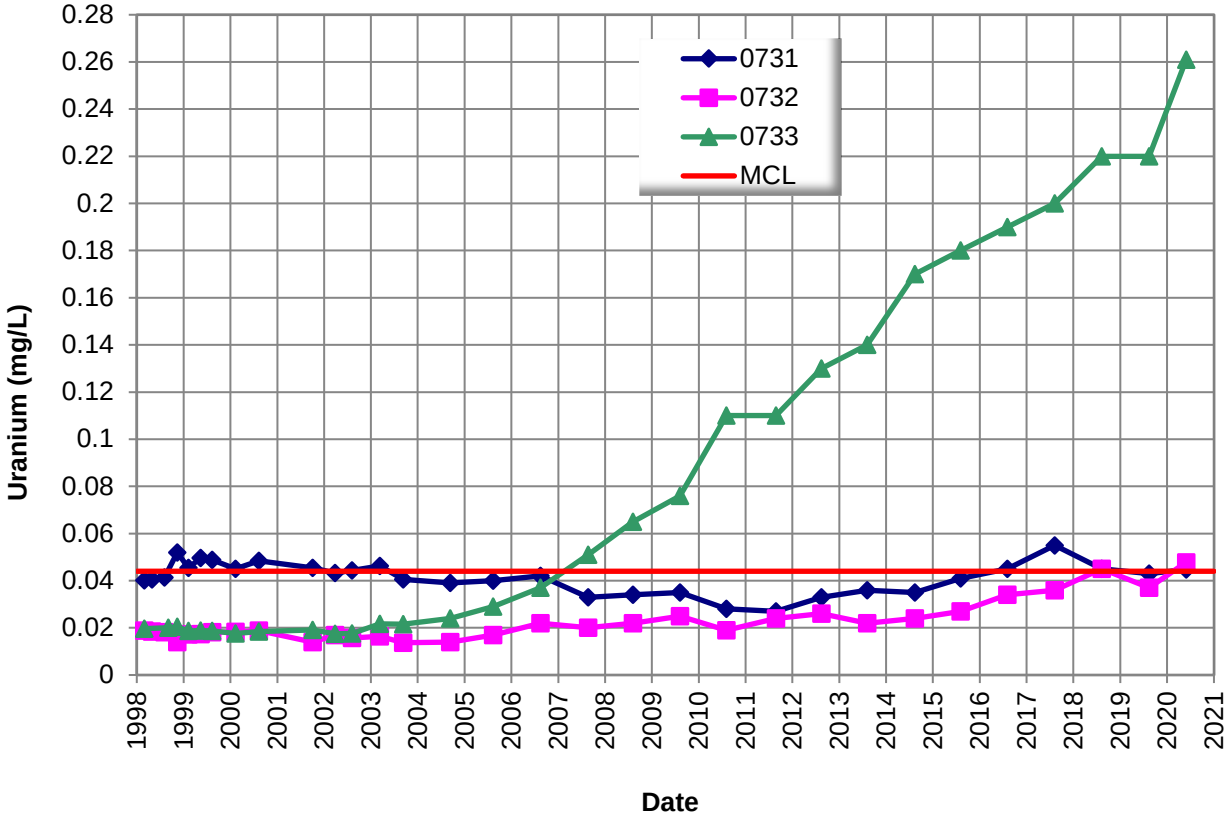


Figure 6-5. Selenium in Groundwater at the Grand Junction, Colorado, Disposal Site

Uranium concentrations in groundwater remained near the MCL of 0.044 mg/L in both paleochannel monitoring wells in 2020. Uranium concentrations in wells 0731 and 0732 have shown a gradual, apparent increasing trend since 2011 (Figure 6-6). Uranium concentrations in disposal cell monitoring well 0733 have increased from 0.02 mg/L in 2002 to 0.26 mg/L in 2020. Relatively high concentrations of uranium and other constituents are expected for a well screened in the disposal cell tailings. Constituents of concern and water levels in well 0733 are not subject to compliance goals and are monitored solely for information gathering purposes.



Note: Well 0733 is screened in the disposal cell tailings and is not subject to compliance goals.

Figure 6-6. Uranium in Groundwater at the Grand Junction, Colorado, Disposal Site

6.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

40 CFR 192 Table 1 Subpart A. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1998. *Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado*, DOE/AL/62350-243, Rev. 1, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico, April.

6.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	90	Site Access Gate
PL-2	90	Site Access Gate Signs
PL-3	95	Solar-Powered Site Entrance Gate
PL-4	90	Perimeter Sign P1
PL-5	180	Perimeter Sign P20 with Bullet Damage
PL-6	—	Boundary Monument BM-1
PL-7	90	Monitoring Well 0733
PL-8	250	South Slope of Disposal Cell
PL-9	250	South Side of Disposal Cell
PL-10	160	South Diversion Channel

Note:
— = Photograph taken vertically from above.

PL-1. Site Access Gate

PL-2. Site Access Gate Signs

PL-3. Solar-Powered Site Entrance Gate

PL-4. Perimeter Sign P1

PL-5. Perimeter Sign P20 with Bullet Damage

PL-6. Boundary Monument BM-1

PL-7. Monitoring Well 0733

PL-8. South Slope of Disposal Cell

PL-9. South Side of Disposal Cell

PL-10. South Diversion Channel

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7.0 Green River, Utah, Disposal Site

7.1 Compliance Summary

The Green River, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on May 20, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors did not identify any maintenance items or concerns that required a follow-up or contingency inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts annual groundwater monitoring to track disposal cell performance in accordance with the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1998). Groundwater monitoring was last completed in May 2020. The UMTRCA maximum concentration limits (MCLs), which the LTSP specified as the groundwater standards for the site, were exceeded at multiple point-of-compliance (POC) wells. In 2011, LM developed a draft Groundwater Compliance Action Plan (GCAP) to update the groundwater monitoring requirements (DOE 2011) as specified in the LTSP. The draft GCAP has been approved by the State of Utah but had not been accepted at the time of this report's publication by the U.S. Nuclear Regulatory Commission (NRC). LM received a request for additional information (RAI) from NRC and is addressing the commission's comments. Groundwater analytical results presented here are evaluated with respect to LTSP requirements until the GCAP is finalized.

7.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the LTSP and in accordance with procedures established to comply with the requirements of the NRC general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 7-1 lists these requirements.

Table 7-1. License Requirements for the Green River, Utah, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 7.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 7.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 7.6	(b)(5)
Groundwater Monitoring	Section 5.2	Section 7.7	(b)(2)
Corrective Action	Section 9.0	Section 7.8	--

7.3 Institutional Controls

The 25-acre site, identified by the property boundary shown in Figure 7-1, is owned by the United States and was accepted under the NRC general license in 1998. 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 gate and sign, security fence around

the disposal cell, perimeter signs, site markers, survey and boundary monuments, and wellhead protectors.

7.4 Inspection Results

The site, 1 mile southeast of Green River, Utah, was inspected on May 20, 2020. The inspection was conducted by S. Hall and P. Lemke of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager), H. Mickelson (State of Utah representative), and J. Carman and A. Farinacci of the LMS contractor 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.

7.4.1 Site Surveillance Features

Figure 7-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue, and new observations identified during the 2020 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 7-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 7.10.

7.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is either from U.S. Highway 6 and 50 heading east from the town of Green River or from U.S. Interstate 70 via Street 1600 East. The paved access road crosses property owned by the State of Utah and the U.S. Army. Access has been granted to LM through right-of-way agreements with both entities. Entrance to the site is through a locked steel gate in the paved road right-of-way fence; LM does not own the gate or the right-of-way fence. Past this gate, a dirt road leads across State land to the site. The access road divides at the security fence, with one branch entering the security fence that encloses the disposal cell and the other providing access around the outside of the security fence. The entrance sign is next to the access road where it enters the site (PL-1). No maintenance needs were identified.

7.4.1.2 Security Fence and Perimeter Signs

A chainlink security fence encloses the portion of the site that contains the disposal cell. Two vehicle gates are at the south and east corners of the security fence line, and a personnel gate is at the north corner of the security fence line. The security fence (PL-2) was intact, and the gates were locked. The minor erosion under the southeast fence line identified and repaired during the 2019 inspection remains stable.

There are 17 perimeter signs (PL-3), attached to steel posts set in concrete, positioned along the unfenced property boundary. Two new unmanned aircraft system (UAS) warning signs will be installed before the next inspection. No maintenance needs were identified.

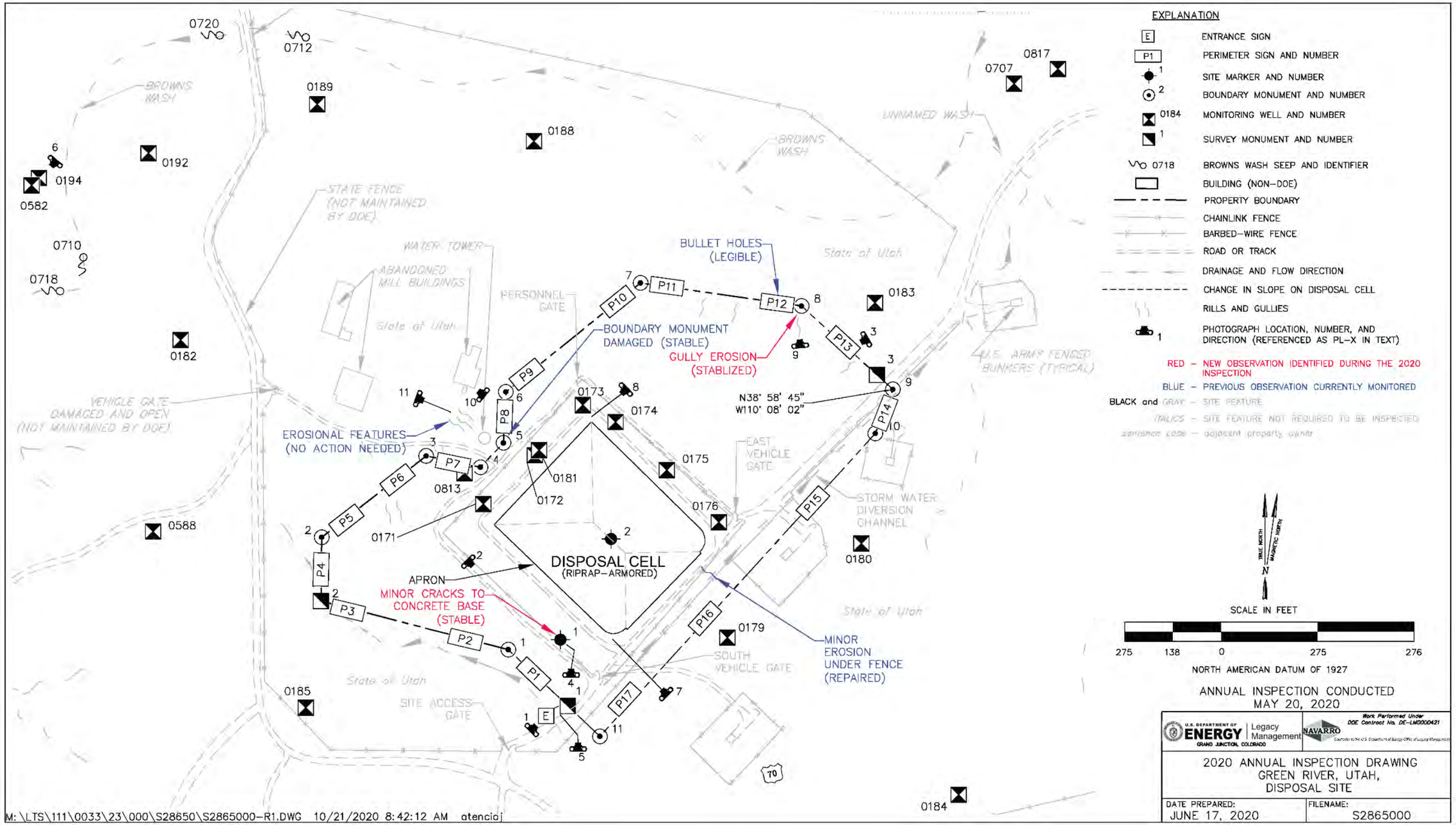

Figure 7-1. 2020 Annual Inspection Drawing for the Green River, Utah, Disposal Site

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7.4.1.3 Site Markers

The site has two granite markers. Site marker SMK-1 is inside the security fence near the southwest corner of the site (PL-4), and SMK-2 is on the crest of the disposal cell. The concrete base of SMK-1 has several minor cracks, but they do not compromise the integrity of the base, and repairs are not necessary at this time. No maintenance needs were identified.

7.4.1.4 Survey and Boundary Monuments

Eleven boundary monuments and three survey monuments (PL-5) delineate the property boundary. Boundary monument BM-5 is damaged (it is bent from being hit by a vehicle), but its condition does not require repair. No maintenance needs were identified.

7.4.1.5 Aerial Survey Quality Control Monuments

Aerial survey quality control monuments are planned to be installed in fiscal year 2021.

7.4.1.6 Monitoring Wells

There are 22 monitoring wells on or near the site. Monitoring wells were inspected during the May 2020 sampling event. All wellhead protectors observed during the inspection were undamaged and locked (PL-6). Some of the concrete monitoring well collars are cracked, but the wellhead protectors are stable and repairs are not necessary. No maintenance needs were identified.

7.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell and adjacent area inside the security fence, (2) the site perimeter between the security fence and the site boundary, and (3) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

7.4.2.1 Disposal Cell and Adjacent Area Inside the Security Fence

The disposal cell, completed in 1989, occupies 6 acres. The slopes of the disposal cell cover are armored with riprap, consisting primarily of competent basalt with a small fraction of sedimentary rocks, to control erosion (PL-7). A small percentage of the rock, including basalt and sedimentary rock, has degraded, but the riprap cover is functioning as designed. There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the disposal cell.

A boulder-filled trench, known as an apron, surrounds the disposal cell (PL-8). The apron was intact and stable, with no observed erosion along the base of the side slopes. Small erosion rills are present along portions of the outside edge of the apron. The rills form as stormwater runoff along the disposal cell perimeter road drains into the disposal cell apron. This occurrence is not a concern, because the erosion is minor and sedimentation in the apron has not adversely affected the performance of the apron (the sediment has not filled the apron or become visible in the apron). Inspectors will continue to monitor the area.

The area between the disposal cell and the security fence consists of the disposal cell perimeter dirt road, several monitoring wells, and sparsely vegetated open space. The road was passable, and there was no indication of erosion or trespassing in the open space. No maintenance needs were identified.

7.4.2.2 Perimeter Area In-Between the Security Fence and the Site Boundary

The area between the security fence and the site boundary is primarily open space but includes access roads, a stormwater diversion channel, and monitoring wells. The property boundary of the site is not fenced, and trespassing occurs on the site from several access points through State of Utah land. Unauthorized access to the site is primarily from the west through a former mill access gate that has broken off its hinges; LM is not responsible for the gate or associated fence. The site is also accessible through remote, unfenced, open-access points north and east of the site. The site will continue to be monitored for adverse public use typically indicated by trash, tire ruts, and vandalism. Inspectors did not find any indication of vandalism during this inspection.

Signs of erosion appear in multiple areas in the site perimeter. Erosional rills are present on the west side of the site but are not affecting any site surveillance features. Rills and gullies are also present along the escarpment northeast of the disposal cell in the area between boundary monument BM-7 and survey monument SM-3 (approximately 400 feet [ft] from the base of the disposal cell) (PL-9). Maximum gully depth in this area is approximately 3 ft, but the erosion appears to be stabilizing. A portion of the stormwater diversion channel along the southeast side of the site continues to erode slowly. These erosional features could eventually damage site surveillance features (i.e., perimeter signs, boundary monuments, and the security fence). The closest erosional features are approximately 300 ft from the disposal cell and do not pose a risk to the integrity of the disposal cell. Inspectors will continue to monitor this area No immediate maintenance needs were identified.

7.4.2.3 Outlying Area

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 observed. Abandoned buildings and a water tower associated with the former milling activities are northwest of the site (PL-10). The buildings are not maintained and are in disrepair, and debris tends to blow onto the site from surrounding buildings (e.g., shingles, siding, plastic). Accumulation of windblown debris is minor but will continue to be monitored and removed.

Areas of erosion noted during previous inspections include the natural drainage near the southwest side of the site and rills and gullies northwest of the water tower (PL-11). Evidence of continued erosion in these areas was apparent but does not threaten the integrity of the disposal cell or site surveillance features. Inspectors will continue to monitor these erosional features. No maintenance needs were identified.

7.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

7.6 Maintenance and Repairs

No maintenance needs were identified at the time of the inspection. Two new UAS warning signs will be installed before the next inspection.

7.7 Groundwater Monitoring

In accordance with the LTSP, annual groundwater monitoring is conducted to evaluate the performance of the disposal cell. In 2011, LM developed a draft GCAP that was approved by the State of Utah. As a best management practice, LM implemented the draft GCAP to expand the groundwater monitoring requirements (i.e., additional monitoring wells and analytes) and propose a groundwater compliance strategy. The most recent sampling event occurred in May 2020.

The LTSP establishes four POC wells at the site for postclosure groundwater monitoring. The POC wells represent the intersection of a vertical plane with the uppermost aquifer (the middle sandstone unit of the Cedar Mountain Formation) underlying the site, which is at the hydrologic downgradient limit of the disposal cell. The LTSP included monitoring well 0172, but its construction integrity was suspect, and the well was replaced with monitoring well 0181 in 2001. It has been monitored as the replacement POC well since 2001. Table 7-2 and Figure 7-2 show the current groundwater monitoring network at the site.

Table 7-2. Groundwater Monitoring Network for the Green River, Utah, Disposal Site

Groundwater Monitoring Purpose	Monitoring Wells
POC well	0171, 0173, 0181, 0813

POC wells are sampled for nitrate, sulfate, and uranium. Groundwater monitoring results are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=GRN).

Figure 7-2. Groundwater Monitoring Network at the Green River, Utah, Disposal Site

7.7.1 Water Level Monitoring

Water levels have been measured manually ever year in the POC wells since 1991. Water levels in the POC wells decreased slightly from 2017 to 2018 (Figure 7-3). Historically, the groundwater levels in these wells decreased approximately 3 ft overall from 1998 through 2004 and then increased approximately 8 ft between 2004 and 2007. Water level decreases ranged from 4 to 5 ft from 2007 through 2014. From 2014 to 2019, the water levels increased to elevations near the 2007 levels.

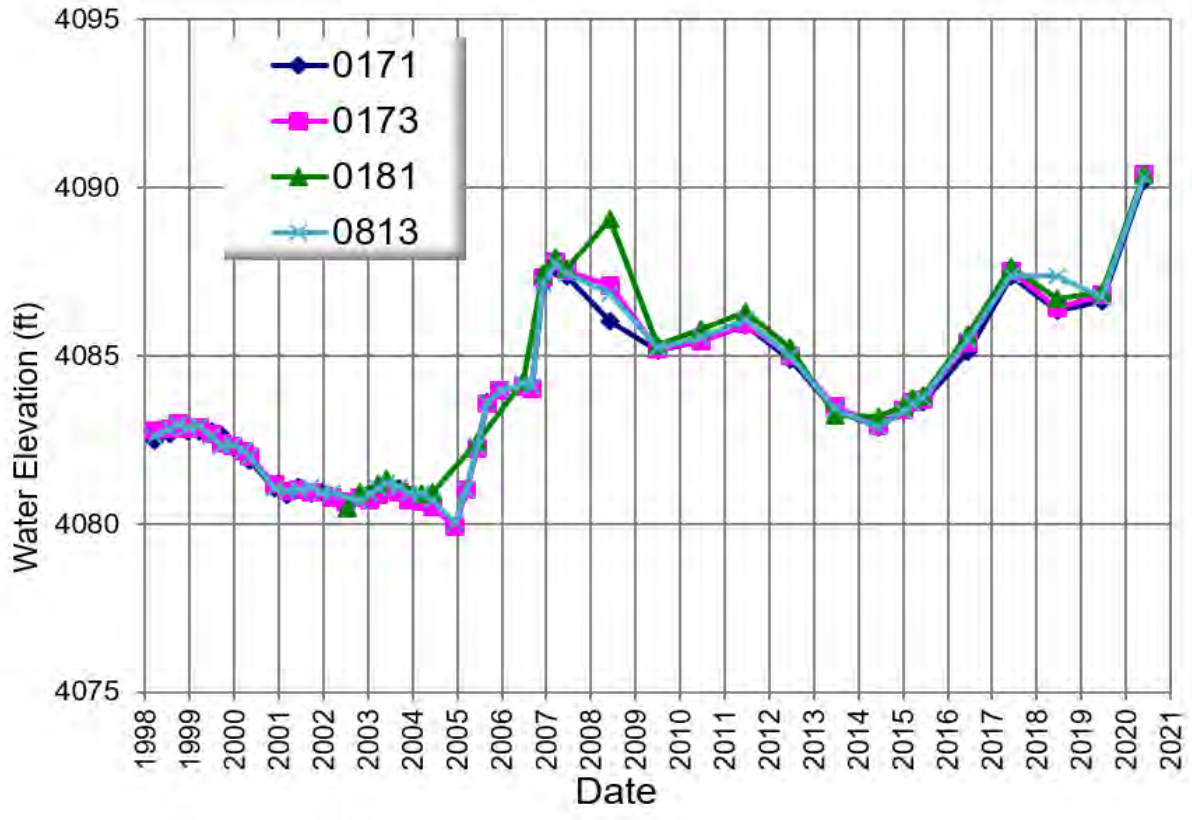


Figure 7-3. Groundwater Elevations at the Green River, Utah, Disposal Site

7.7.2 Disposal Cell Performance Monitoring

Table 7-3 presents the concentration limits for POC wells established in the LTSP. The concentration limits chosen for uranium and nitrate were the higher value from either the U.S. Environmental Protection Agency MCLs (40 CFR 192 Table 1 Subpart A) or the background concentration levels present before construction of the disposal cell (DOE 1998). The background water quality in the Cedar Mountain Formation is characterized by high total dissolved solids and concentrations of sulfate that exceed national primary and secondary drinking water regulations (DOE 1998). In accordance with the LTSP, sulfate results are compared to well-specific background concentration limits (Table 7-3). Alternate concentration limits (ACLs) are proposed as a component of the compliance strategy in the draft GCAP after it became clear that groundwater concentrations were unlikely to meet the levels specified in the

LTSP (DOE 2002). ACLs are proposed for nitrate (1000 milligrams per liter [mg/L]) and uranium (4.4 mg/L) in the draft GCAP.

Table 7-3. LTSP Concentration Limits for Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Monitoring Well	Nitrate (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0171	10[a]	3334	0.044[a]
0173	10[a]	4000	0.044[a]
0181	102	4985	0.067
0813	10[a]	4440	0.069

Note:
[a] MCL (40 CFR 192 Table 1 Subpart A).

Table 7-4 provides the analytical results at the POC wells for the May 2020 sampling event. Figure 7-4 through Figure 7-6 show the time-concentration plots for nitrate, sulfate, and uranium along with corresponding MCLs.

Table 7-4. 2020 Analytical Results for Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Monitoring Well	Nitrate[a] (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0171	43	3600	0.14
0173	92	7700	0.11
0181	47	6500	0.023
0813	0.056 U	3600	0.048

Notes:
[a] Nitrate = nitrate plus nitrite as nitrogen.
Red = equal to or exceeding LTSP-driven concentration limit.

Abbreviation:
U = not detected

Nitrate concentrations continue to exceed the MCL in POC wells 0171, 0173, and 0181. The 2020 nitrate concentrations were within the range of historical values for all POC wells (Figure 7-4).

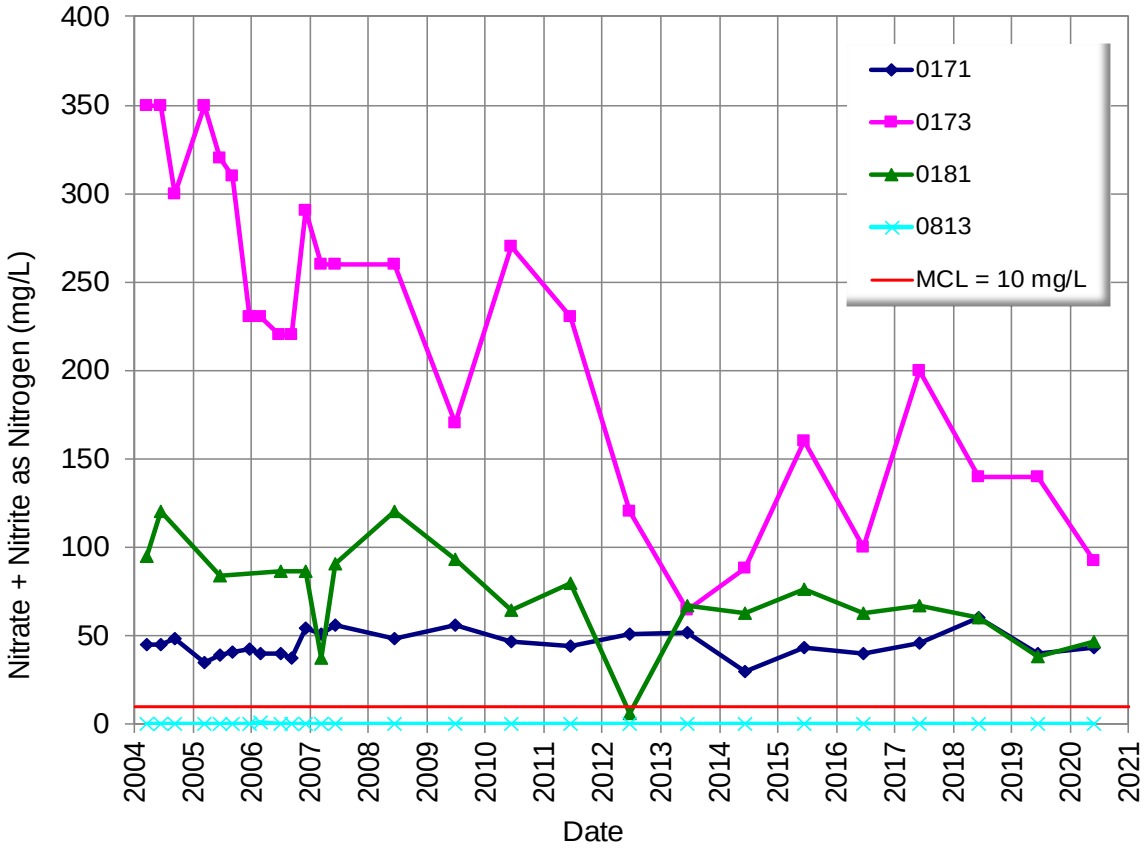


Figure 7-4. Nitrate at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Sulfate concentrations exceeded the LTSP background concentrations in all POC wells (Table 7-3) except POC well 0813. The 2020 sulfate concentrations were within the range of historical values for all POC wells (Figure 7-5).

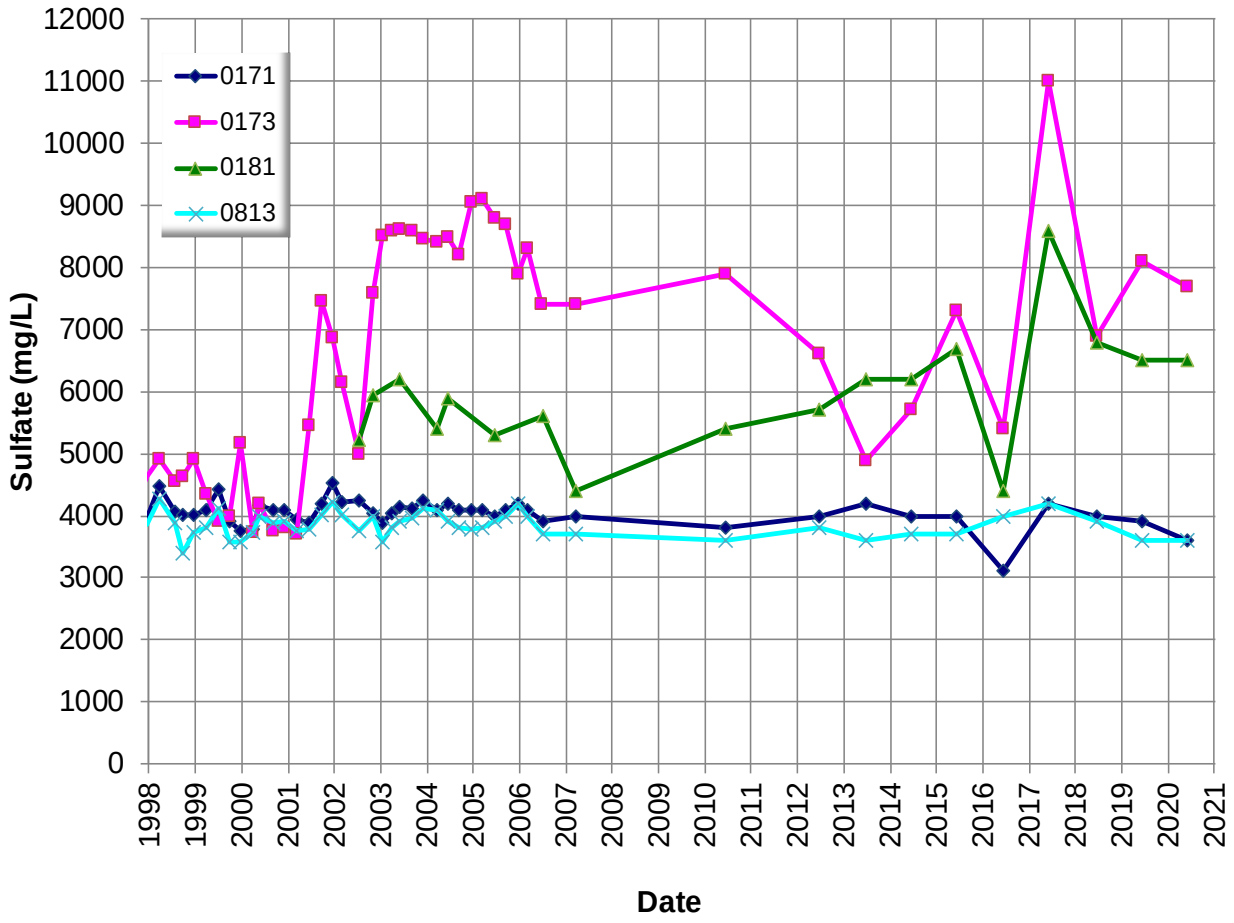


Figure 7-5. Sulfate at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

Uranium concentrations in POC well 0171 routinely exceed the UMTRCA and LTSP concentration limits, while the other POCs remain mostly below the MCL. Well 0173 exceeded 0.044 mg/L in 2018 and 2020 (Figure 7-6). Well 0181 remains below the uranium concentration limit. The uranium concentration at well 0813 exceeded the standard for the first time in the 2020 event. Uranium concentrations in POC well 0171 have varied considerably, ranging from a low of 0.0184 mg/L in 1999 to a high of 0.14 mg/L in 2016. The 2020 uranium concentrations are within the range of historical values in POC wells 0171 and 0181 and exceed the highest historical values in POC wells 0173 and 0813.

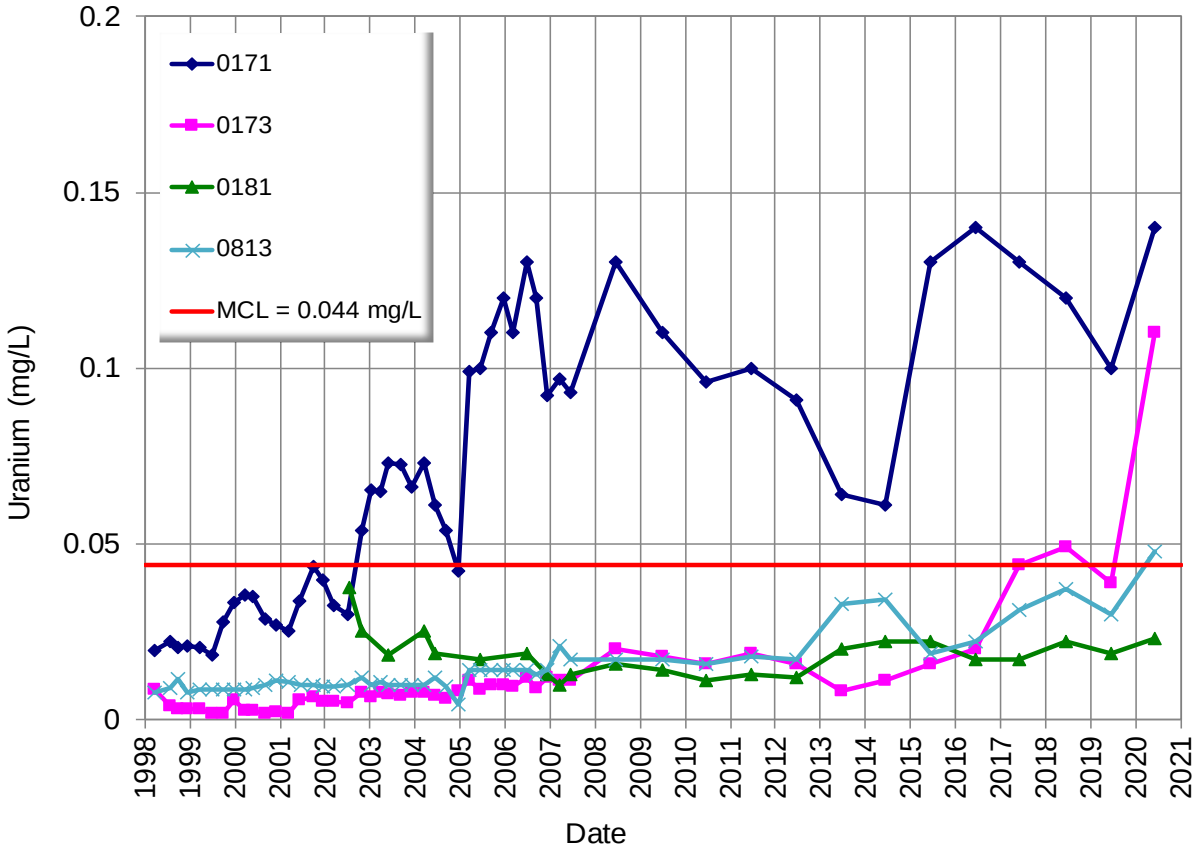


Figure 7-6. Uranium at Point-of-Compliance Wells at the Green River, Utah, Disposal Site

In summary, groundwater monitoring results were within the range of historical values at all POC wells with the exception of uranium (wells 0173 and 0813). Groundwater monitoring and disposal cell performance evaluation will continue at the site under the requirements set forth in the LTSP until the GCAP has been finalized.

7.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

7.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations.*

40 CFR 192 Table 1 Subpart A. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1998. *Long-Term Surveillance Plan for the Green River, Utah, Disposal Site*, DOE/AL/62350-89, Rev. 2, July.

DOE (U.S. Department of Energy), 2002. *Final Site Observational Work Plan for the Green River, Utah, UMTRA Project Site,* GJO-2002-356-TAC, Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2011. *Draft Groundwater Compliance Action Plan for the Green River, Utah, Disposal Site*, LMS/GRN/S07892, December.

7.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	45	Entrance Sign (Chainlink Access Gate and Disposal Cell in Background)
PL-2	135	Chainlink Security Fence
PL-3	240	Perimeter Sign P13
PL-4	—	Site Marker SMK-1
PL-5	—	Survey Monument SM-1
PL-6	220	Monitoring Wells 0194 and 0582 (with the System Operation and Analysis at Remote Sites [SOARS] Station in Background)
PL-7	315	Southwest Side Slope (and Apron) of Disposal Cell
PL-8	225	Northwest Side Slope (and Apron) of Disposal Cell
PL-9	355	Gullies Near Boundary Monument BM-8
PL-10	310	Abandoned Mill Buildings
PL-11	110	Gullies Downslope of Water Tower (Offsite)

Note:
— = Photograph taken vertically from above.

PL-1. Entrance Sign (Chainlink Access Gate and Disposal Cell in Background)

PL-2. Chainlink Security Fence

PL-3. Perimeter Sign P13

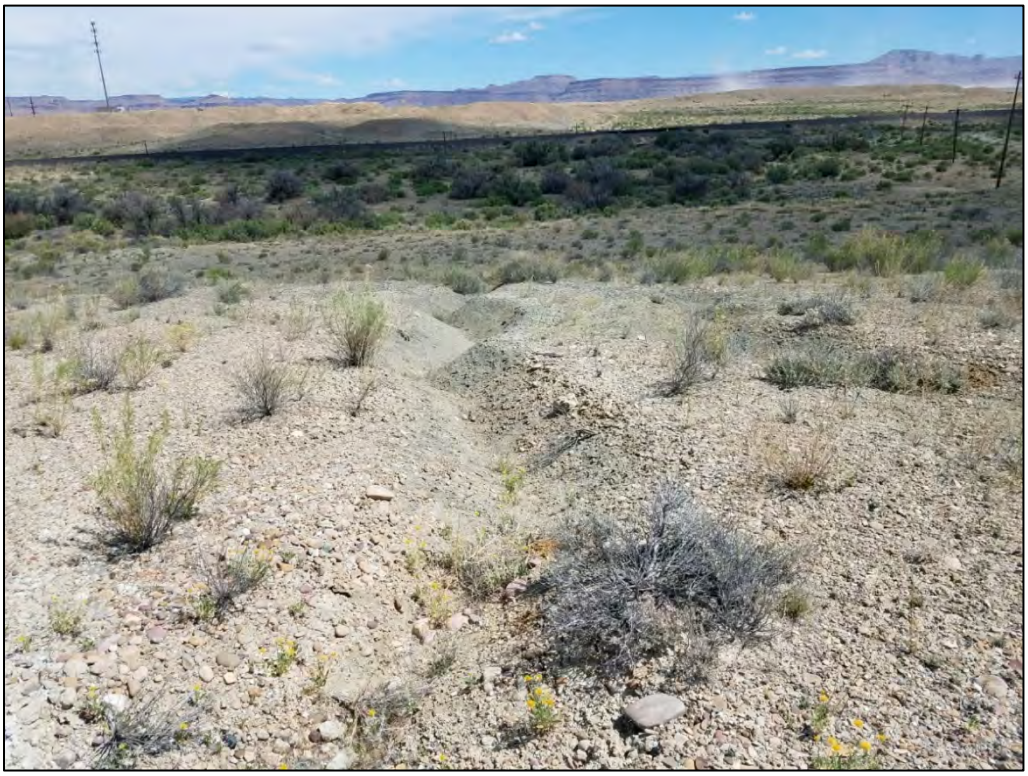
PL-4. Site Marker SMK-1

PL-5. Survey Monument SM-1

PL-6. Monitoring Wells 0194 and 0582
(with the System Operation and Analysis at Remote Sites [SOARS] Station in Background)

PL-7. Southwest Side Slope (and Apron) of Disposal Cell

PL-8. Northwest Side Slope (and Apron) of Disposal Cell



PL-9. Gullies Near Boundary Monument BM-8

PL-10. Abandoned Mill Buildings

PL-11. Gullies Downslope of Water Tower (Offsite)

8.0 Gunnison, Colorado, Disposal Site

8.1 Compliance Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducted the Gunnison, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) inspection on September 15, 2020. No cause for a follow-up inspection was identified.

No changes were observed on the disposal cell or in the associated diversion channels. Inspectors identified several minor maintenance needs and addressed most during the site inspection.

The most recent sampling event occurred in July 2016. The next scheduled monitoring event will occur in 2021. Groundwater monitoring results were below the site-specific uranium action level in all point-of-compliance (POC) wells.

8.2 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 1997) in accordance with procedures established to comply with the requirements of the U.S. Nuclear Regulatory Commission general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 8-1 lists these requirements.

Table 8-1. License Requirements for the Gunnison, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 8.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 8.5	(b)(4)
Maintenance and Repairs	Section 5.0	Section 8.6	(b)(5)
Groundwater Monitoring	Section 4.0	Section 8.7	(b)(2)
Corrective Action	Section 6.0	Section 8.8	--

8.3 Institutional Controls

The 92-acre site, identified by the property boundary shown in Figure 8-1 is owned by the United States and was accepted under the general license in 1997. 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 diversion channel, entrance gate, and sign; perimeter fence and signs; site markers, survey and boundary monuments, and wellhead protectors.

8.4 Inspection Results

The site, 6 miles southeast of Gunnison, Colorado, was inspected on September 15, 2020. The inspection was conducted by M. Kastens and D. Holbrook of the Legacy Management Support

contractor. J. Dayvault (LM site manager) and M. Cosby (Colorado Department of Public Health and Environment) 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. The results of the inspection are reported in the remainder of Section 8.4.

8.4.1 Site Surveillance Features

Figure 8-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 8-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 8.10.

8.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is from Gunnison County Road 42 onto U.S. Bureau of Land Management (BLM) Route 3068, a gravel road maintained by BLM. Entrance to the site is through a locked gate that is part of the perimeter fence. The entrance gate was locked and functional. The entrance sign (PL-1) is bolted to a perimeter fence post next to the entrance gate. The entrance sign has bullet damage but remains legible. The front entrance sign will be replaced at the time of the next scheduled site maintenance activity. No other maintenance needs were identified.

8.4.1.2 Perimeter Fence and Signs

A three-strand barbed-wire perimeter fence encloses the site; most of it is set along the property boundary. In 2019, fence flagging (PL-2 and PL-3) was added as a mechanism for protecting sage grouse and antelope that occupy the area. The perimeter fence was intact. No other maintenance needs were identified.

Two barbed-wire gates—one on the east fence line and the other on the north fence line—provide egress from the site to offsite monitoring wells; both gates were locked.

There are 45 perimeter signs bolted to the perimeter fence posts. Several perimeter signs have bullet damage but remain legible. In 2020, perimeter signs P4–P13 along the west perimeter fence were replaced. Perimeter signs P36, P37 (PL-4), P38, and P41 are constructed of plastic and are faded and curling. The plastic signs have been rescheduled for replacement with metal signs in 2021. All new signs will include the words “Gunnison Site.” Other perimeter signs that are damaged and showing wear will be replaced over the next 2 years. No other maintenance needs were identified.

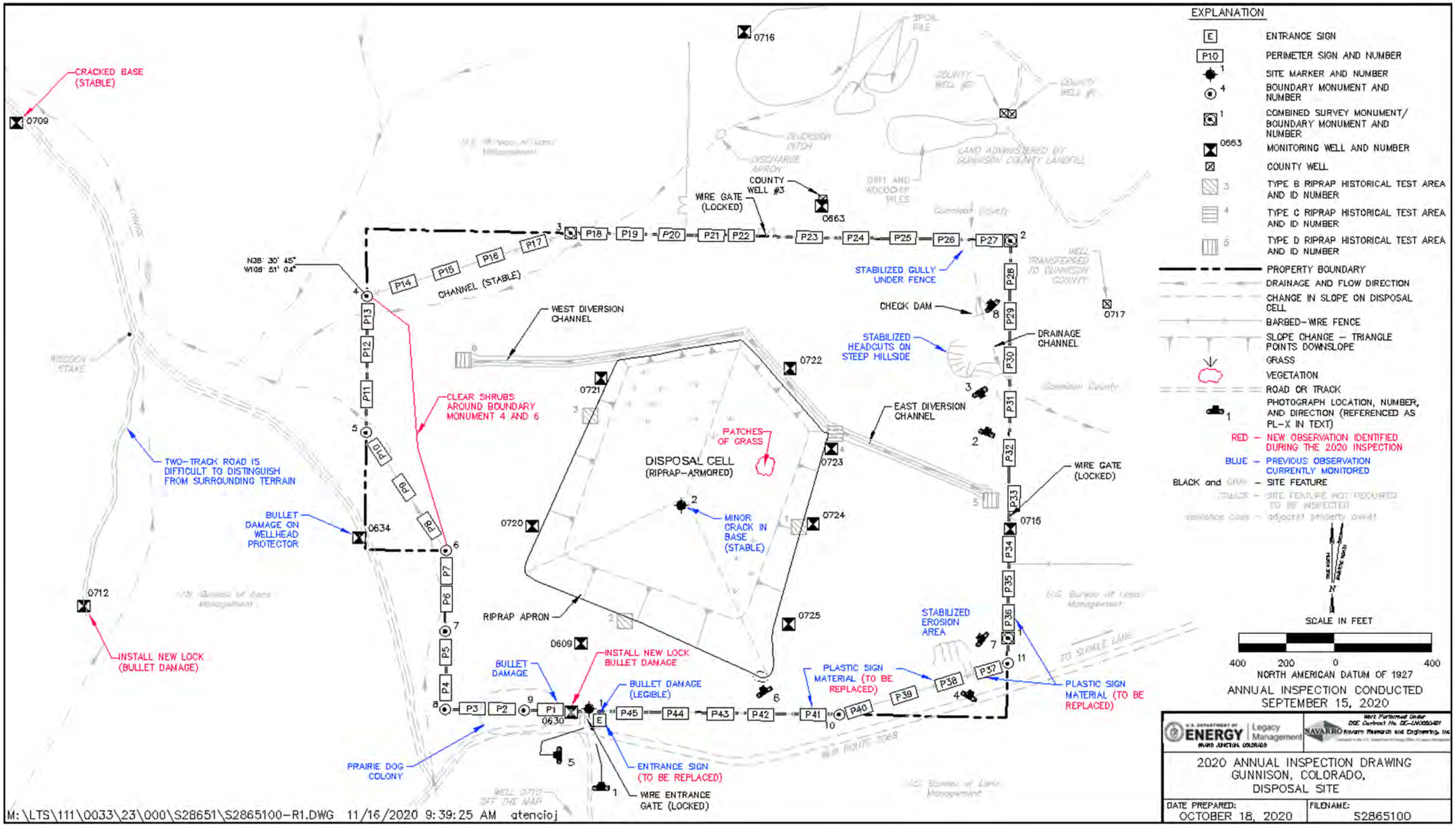


Figure 8-1. 2020 Annual Inspection Drawing for the Gunnison, Colorado, Disposal Site

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8.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. The base of site marker SMK-2 has a small, insignificant crack and remains stable. No maintenance needs were identified.

8.4.1.4 Survey and Boundary Monuments

Three combined survey and boundary monuments and eight additional boundary monuments delineate the property boundary. No maintenance needs were identified.

8.4.1.5 Monitoring Wells

The site has 16 groundwater monitoring wells. The wellhead protectors were locked and properly labeled. Bullet damage is present on the locks of monitoring wells 0630 (PL-5) and 0712 and on the wellhead protector of monitoring well 0634. Both wells are secure, though new locks will be installed on both monitoring wells. Gunnison County landfill operators have placed concrete barriers to protect monitoring well 0716, which is on landfill property, from landfill activities. The edge of an adjacent spoil pile, although close to the concrete barriers, does not impair access to monitoring well 0716. The base of monitoring well 0709 is cracked but remains stable. Inspectors will continue to monitor these features. No maintenance needs were identified.

8.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the top of the disposal cell; (2) the disposal cell side slopes, apron, and diversion channels; (3) the area between the disposal cell and the site boundary; and (4) the outlying area. 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.

8.4.2.1 Top of the Disposal Cell

The disposal cell, completed in 1995, occupies 29 acres and is armored with basalt riprap to control erosion. There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the top slope of the disposal cell. Several isolated patches of grass have established on the top slope; however, these shallow-rooted plants do not degrade the performance of the radon barrier component of the disposal cell's engineered cover. No maintenance needs were identified.

8.4.2.2 Disposal Cell Side Slopes, Apron, and Diversion Channels

Basalt riprap armors the disposal cell side slopes, an apron to collect and divert stormwater runoff from the disposal cell, and two diversion channels to protect the disposal cell from precipitation run-on. There was no evidence of settling, slumping, erosion, or any other modifying process that might affect the integrity of the disposal cell side slopes, apron, or diversion channels. Six rock-monitoring test areas were last inspected during the 2017 annual

inspection; monitoring is no longer required in accordance with the LTSP because no rock degradation had been observed.

Stormwater runoff from the disposal cell occasionally ponds in a low-lying area at the southeast corner of the disposal cell; standing water was present at the time of the inspection (PL-6). The riparian-type vegetation that has become established there indicates that the area retains moisture. Water collection in this area does not pose a problem because the disposal cell surfaces are designed to drain to the southeast, and any water that ponds there is below the elevation of tailings placed under the engineered cover. No maintenance needs were identified.

8.4.2.3 Area Between the Disposal Cell and the Site Boundary

Reclaimed and undisturbed areas comprise the area between the disposal cell and the site boundary (PL-7). In general, the vegetation in the reseeded, reclaimed areas consists of well-established grass; native plants are much less abundant and less diverse in reclaimed areas than they are in undisturbed areas. Former erosion areas continue to be stable and are naturally revegetating with native plant species. No maintenance needs were identified.

8.4.2.4 Outlying Area

In accordance with the LTSP, a drainage feature from the southeast corner of the site and along BLM Route 3068 was checked for indications of seepage from the vadose zone. The feature, which follows the borrow ditch along the road, was dry and showed no signs of seepage.

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. Gunnison County owns the land that adjoins the site boundary to the north and east and uses the land for a municipal landfill. The nearest landfill operations continue to be approximately 400 feet north of the site (PL-8). Although landfill activities do not affect the site, inspectors will continue to monitor the level of activity occurring near the site boundary and surveillance features (e.g., fences and monitoring wells). With regard to groundwater flow, the landfill operations are upgradient from the disposal cell. The proximity of the spoil pile to monitoring well 0716 (see Figure 8-1) is the only current concern for activities that could affect a site asset. Inspectors will continue to monitor this area.

8.5 Follow-Up or Contingency 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.

8.6 Maintenance and Repairs

In 2020, perimeter signs P4–P13 along the west perimeter fence were replaced.

Below is a summary of scheduled Gunnison site maintenance activities that will be completed in the future:

- Installation of new front entrance sign with current contact information
- Replacement of plastic perimeter signs P36, P37, P38, and P41
- Installation of new locks on wells 0630 and 0712
- Clearing of shrubs around boundary monuments BM-4 and BM-6

No other maintenance needs were identified.

8.7 Groundwater Monitoring

In accordance with the LTSP, LM conducts groundwater monitoring every 5 years to demonstrate that the site-specific uranium action level has not been exceeded. Groundwater was sampled and groundwater levels were measured annually from 1998 through 2001. Following the 2001 sampling event, the monitoring frequency changed to once every 5 years. The most recent sampling event occurred in July 2016. The next event is scheduled to occur in 2021.

The groundwater monitoring network consists of 16 monitoring wells. That total includes six POC wells, two monitoring wells to monitor background groundwater quality, and eight wells to monitor groundwater levels (Table 8-2 and Figure 8-2). The indicator analyte for disposal cell performance is uranium, which was selected because of its presence in tailings pore fluid, its relatively high mobility in groundwater, and its low concentration in upgradient (background) groundwater. The site-specific screening monitoring action level (action level) concentration for uranium is 0.013 milligram per liter (mg/L). The basis for this action level is the maximum observed concentration of uranium in background samples before long-term surveillance and maintenance activities began. The U.S. Environmental Protection Agency established a maximum concentration limit for uranium of 0.044 mg/L in groundwater (40 CFR 192 Subpart A Table 1).

Table 8-2. Groundwater Monitoring Network for the Gunnison, Colorado, Disposal Site

POC and Background Wells	Groundwater Level Wells
0720 (POC)	0630
0721 (POC)	0634
0722 (POC)	0663
0723 (POC)	0709
0724 (POC)	0710
0725 (POC)	0712
0609 (background)	0714
0716 (background)	0715

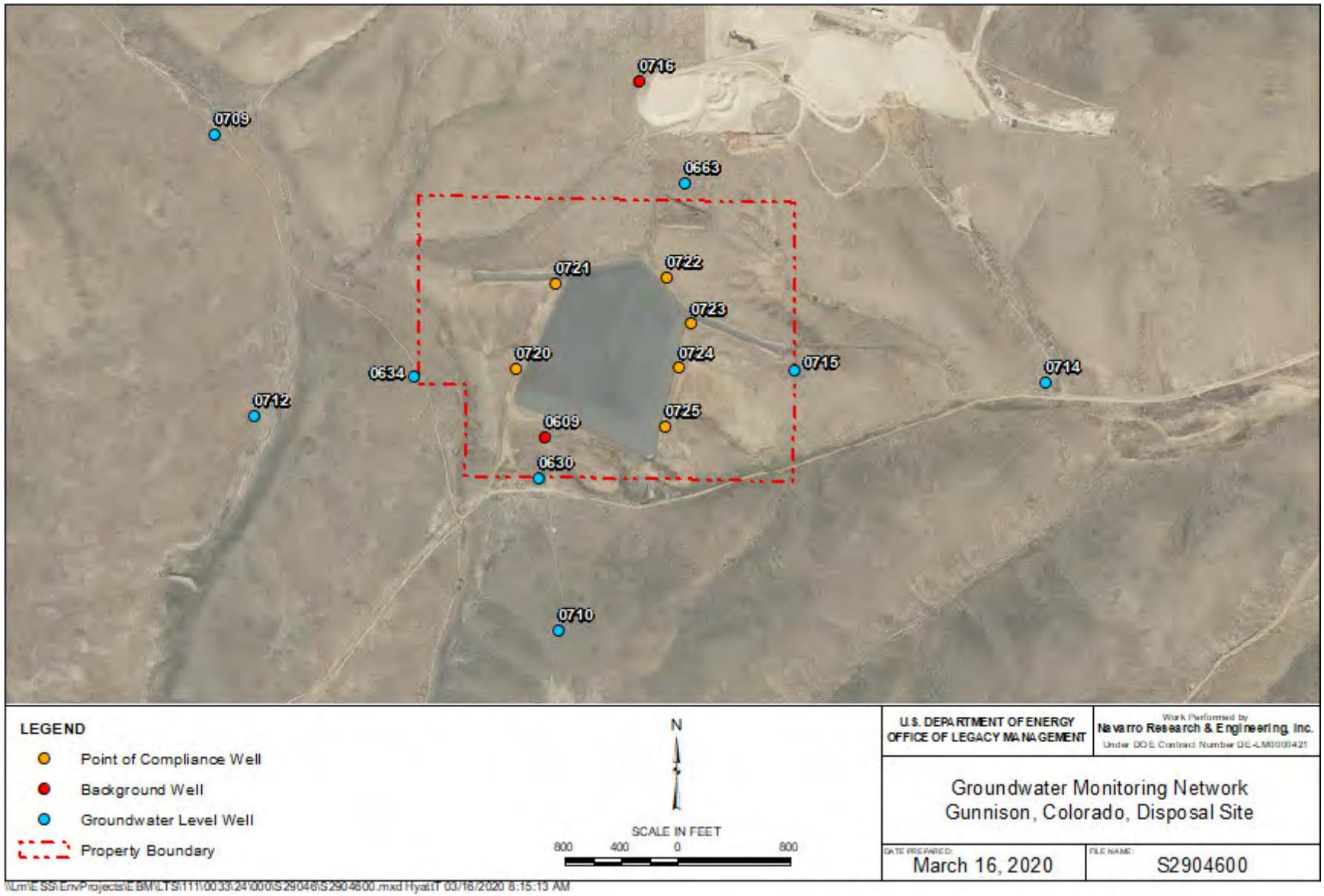


Figure 8-2. Groundwater Monitoring Network at the Gunnison, Colorado, Disposal Site

All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=GUD). The *2016 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2017) shows the most recent monitoring results. The report shows uranium concentration was below the action level (0.013 mg/L) in all POC wells and indicates continued groundwater compliance at the Gunnison disposal site.

8.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.04. No need for corrective action was identified.

8.9 References

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*.

40 CFR 192 Subpart A Table 1. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations.*

40 CFR 192.04. U.S. Environmental Protection Agency, "Corrective Action," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the Gunnison, Colorado, Disposal Site*, DOE/AL/62350-222, Rev. 2, April.

DOE (U.S. Department of Energy), 2017. *2016 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S15036, Office of Legacy Management, March.

8.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	Entrance Sign
PL-2	20	Fence Flagging on East Fence Line
PL-3	150	Fence Flagging on East Fence Line
PL-4	30	Perimeter Sign P37
PL-5	270	Well 0630
PL-6	330	Water in Cell Apron, Southeast Corner
PL-7	310	Reclaimed Area East of Cell
PL-8	320	Gunnison County Landfill Operations

PL-1. Entrance Sign

PL-2. Fence Flagging on East Fence Line

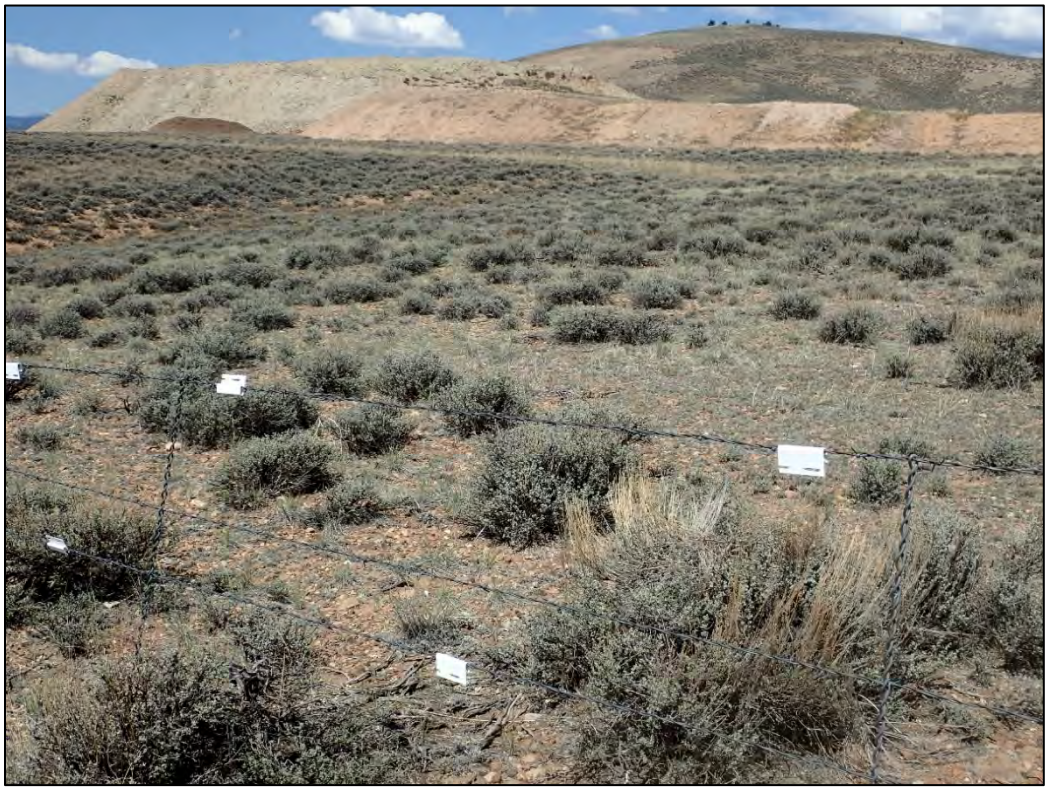
PL-3. Fence Flagging on East Fence Line

PL-4. Perimeter Sign P37

PL-5. Well 0630

PL-6. Water in Cell Apron, Southeast Corner

PL-7. Reclaimed Area East of Cell



PL-8. Gunnison County Landfill Operations

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9.0 Lakeview, Oregon, Disposal Site

9.1 Compliance Summary

The Lakeview, Oregon, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected October 13 and October 14, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified minor maintenance needs but no cause for a follow-up or contingency inspection.

Disposal cell riprap gradation monitoring has been performed annually since 1997 at random locations on the west side slope due to concerns over premature rock degradation. With the approval of the U.S. Nuclear Regulatory Commission (NRC) in 2019 to discontinue rock gradation monitoring at the site (Mandeville 2019), rock gradation monitoring was not performed in 2020. During the 2020 annual inspection, there was no evidence of settling, slumping, erosion, or any other modifying process on the disposal cell side slopes that might affect the integrity of the cell.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts groundwater monitoring every 5 years to demonstrate compliance with established groundwater quality protection standards. The most recent sampling event occurred in June 2019. Groundwater monitoring results were below the U.S. Environmental Protection Agency (EPA) designated maximum concentration limits (MCLs) in all monitoring wells.

9.2 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 1994) in accordance with procedures established to comply with the requirements of the NRC general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 9-1 lists these requirements.

Table 9-1. License Requirements for the Lakeview, Oregon, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 9.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 9.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 9.6	(b)(5)
Groundwater Monitoring	Section 5.3	Section 9.7	(b)(2)
Corrective Action	Section 9.0	Section 9.8	—

9.3 Institutional Controls

The 40-acre site, identified by the property boundary shown in Figure 9-1, is owned by the United States and was accepted under the NRC general license in 1995. 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 gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

9.4 Inspection Results

The site, approximately 7 miles northwest of Lakeview, Oregon, was inspected on October 13 and October 14, 2020. The inspection was conducted by D. Traub and D. Atkinson of the Legacy Management Support contractor. J. Nguyen (LM site manager) and T. Sicilia (Oregon Department of Energy) participated in 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.

9.4.1 Site Surveillance Features

Figure 9-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs that support specific observations are identified in the text and in Figure 9-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 9.10.

9.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is from a gravel road that heads west from Lake County Road 2-16B. DOE was granted a perpetual easement on the approximately 1.2-mile access road between the county road and the property boundary. A lockable gate across the access road on the adjacent privately owned land limits access to the site. The entrance gate to the site is in the southeast corner of the perimeter fence. The entrance gate was locked and undamaged. The entrance sign is attached to a steel post set in concrete along the access road and was undamaged (PL-1). The entrance sign was updated with new contact information during the inspection. A pedestrian gate in the northwest corner of the site was locked and undamaged. No maintenance needs were identified.

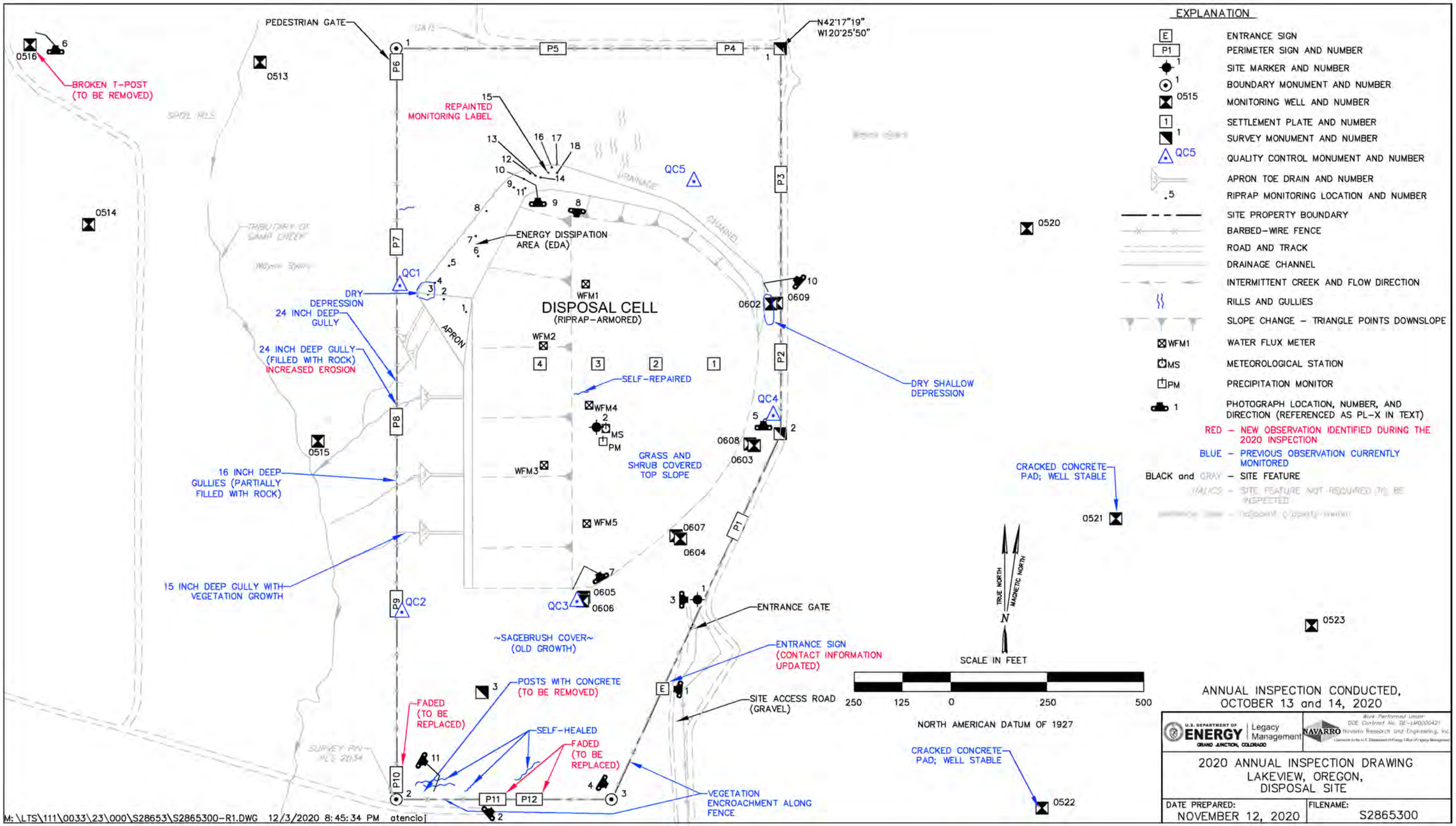

Figure 9-1. 2020 Annual Inspection Drawing for the Lakeview, Oregon, Disposal Site

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9.4.1.2 Perimeter Fence and Signs

A four-strand barbed-wire perimeter fence (five strand along much of the western boundary) encloses the site. Repairs to the perimeter fence identified in the 2018 annual inspection were made in June 2019. During the 2020 annual inspection, inspectors confirmed the necessary repairs were made. Some vegetation is growing near, and entangled in, the perimeter fence line, but the fence appeared stable and remains functional.

There are 12 perimeter signs, attached to steel posts set in concrete, positioned along the property boundary. Perimeter signs P10, P11 (PL-2), and P12 were faded and will be replaced during next year's inspection. No other maintenance needs were identified.

9.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 (PL-3) is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

9.4.1.4 Survey and Boundary Monuments

Three survey monuments and three boundary monuments (PL-4) delineate the property boundary. No maintenance needs were identified.

9.4.1.5 Aerial Survey Quality Control Monuments

In August 2019, five aerial survey quality control monuments (PL-5) were installed at the site in preparation for a baseline aerial survey of the disposal cell. These quality control monuments were inspected in 2020. No maintenance needs were identified.

9.4.1.6 Monitoring Wells

The site has 12 downgradient groundwater monitoring wells with four wells offsite to the east. Four upgradient wells are offsite to the west. A few of the concrete bases were cracked, but the wellhead protectors remain stable. Well 0608 was found unlocked and was secured during the inspection. The remainder of the wellhead protectors were locked and undamaged. The T-post adjacent to well 0516 was broken (PL-6) and will be removed during the next maintenance event. No additional maintenance needs were identified.

9.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas 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, adjacent drainage channel, and aprons; and (3) the site perimeter and outlying area. The 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.

9.4.2.1 Top of Disposal Cell

The disposal cell, completed in 1988, occupies 16 acres. At the time of disposal cell construction, the entire top slope of the disposal cell was covered in 12 inches of Type B-size riprap. In 1989, at the request of the State of Oregon, 4 inches of soil was added over the riprap to allow a vegetative cover to be established and help minimize the visual impact of the disposal cell. The design for the top of the disposal cell has created conditions that favor the growth of deep-rooted plants. The growth of shrubs on the disposal cell top slope is favored by movement of precipitation through the topsoil, riprap, and bedding layers; the compacted soil (radon barrier) inhibits root growth from reaching the tailings. Grasses and forbs growing on the top slope have gradually increased over the years, but some areas remain sparsely vegetated, consistent with surrounding offsite areas. Riprap was observed through the soil on the top slope in several small areas during the inspection. These areas are sporadic across the top slope and are likely caused by the soil infilling the riprap-void spaces. No structural or disposal cell performance concerns are associated with the riprap becoming visible on the top slope.

The incipient development of checkerboard soil erosion patterns was observed in some of the more sparsely vegetated areas on the top slope (consistent with similar areas offsite). A previously identified shallow rill on the top slope could not be found and was assumed to be self-repaired from natural weather processes. No additional changes were noted during the inspection. No structural or disposal cell performance concerns are associated with this condition because the riprap rock cover is continuous beneath the top slope soil cover, slope crests, and side slopes. Inspectors will continue to monitor this condition.

The contact boundary between the disposal cell top and side slopes was inspected and generally appears stable and uniform (PL-7 and PL-8). No erosion was observed during the inspection at the crest of the west side slope and the disposal cell top slope, which appears to be stable. Inspectors will continue to monitor the transition zone between the disposal cell top slope and the west side slope for erosion development. There was no evidence of settling, slumping, erosion, or any other modifying process on the top of the disposal cell that might affect the integrity of the disposal cell.

LM is participating in an NRC-sponsored project to investigate the effect of soil-forming processes on the performance of the radon barrier on UMTRCA disposal cells. In October 2017, researchers excavated through the cover materials (soil, riprap, bedding material, and underlying radon barrier) at six locations on the disposal cell (five on the top slope and one on the west side slope) to support the study. Areas restored and reseeded in 2017 as part of the study were observed to have vegetation growth. Inspectors will monitor the restored locations to confirm that no settlement is occurring, positive drainage is preserved, and vegetation reestablishes. No maintenance needs were identified.

9.4.2.2 Disposal Cell Side Slopes and Adjacent Drainage Channel, Apron, and Toe Drains

Deterioration of the basalt riprap that armors the disposal cell side slopes is a result of physical and chemical weathering processes. Deterioration monitoring at the site consists of rock gradation monitoring on the west side slope and photographic monitoring in the energy dissipation area (EDA) in accordance with the LTSP. Addendums to the LTSP commit LM to annually assess the D_{50} value of the riprap on the west side slope through gradation monitoring to ensure the riprap remains large enough to protect the disposal cell from erosion during a major

precipitation event, as designed. The thickness of the riprap on the west side slope was doubled during construction due to concerns over the quality of the rock.

In 2015, LM proposed to replace the annual gradation monitoring with more rigorous and focused inspection of all rills that may form along the interface between the vegetated soil and rock top slope and the rock-covered west side slope (Dayvault 2015). Focusing on these areas will enable LM to more proactively assess and mitigate vulnerability of potential failure points along the side slope. In 2019, NRC concurred with the discontinuation of rock gradation monitoring (Mandeville 2019); therefore, it was not performed in 2020. DOE is updating the LTSP to reflect this change. No rills or erosional features were observed along the interface between the vegetated soil and rock top slope during the inspection (PL-7 and PL-8).

Minor rock degradation has been observed in the EDA since monitoring began at the original 10 photograph locations established in 1997 and at the 8 additional locations established in 2000. Annual photographic monitoring of the 18 locations for long-term rock monitoring was conducted during the 2020 inspection (PL-9). In 2018, it was observed that some of the numbered rocks had faded labels, and they were repainted in 2019. Location 15 was repainted during the 2020 inspection since it was missed in 2019. No significant degradation of the EDA rock has been observed since monitoring began.

In the past, water has been observed in the large depression in the EDA at the lower end of the drainage channel. Water is a potential concern, because inundation may accelerate deterioration of the large riprap by the freeze-thaw process, although the rock used in the EDA is apparently not as susceptible to this process as other rock types present on the disposal cell. Dry conditions were observed in the EDA depression during the inspection.

Small amounts of vegetation (primarily grass) have encroached on the riprap on the side slopes (PL-7), on the upper (eastern) portion of the stormwater drainage channel (i.e., diversion channel) (PL-10), and on the west side slope's apron. The relatively sparse plant growth in these features will not affect their performance (i.e., channels were designed to control stormwater runoff from affecting encapsulated materials within the disposal cell). There are a few small shrubs in the upper (eastern) portion of the drainage channel, but they will not obstruct water flow. Should flow obstruction become a concern in the future, maintenance will be performed. There is an area of dense, tall grass near Toe Drains 1 and 3, which suggests that conditions are periodically wetter in this area because stormwater runoff is channeled there by control features. No ponded water was observed during the inspection. Increased erosion was observed near the fence line near Toe Drain 3. There was no evidence of settling, slumping, erosion, or any other modifying process on the disposal cell side slopes that might affect the integrity of the disposal cell. No other maintenance needs were identified.

9.4.2.3 Site Perimeter and Outlying Area

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. This includes the seeded grass area extending from the disposal cell to the site boundary and the site perimeter fence. No such impacts were observed.

Gullies that formed in seeded areas extending west of Toe Drains 1 through 5 were filled with rock in 2000. Although the rock has generally arrested the headcutting that was advancing

eastward from the adjacent private property onto DOE property, some minor headcutting is still evident. Several small gullies have been observed on the private property directly west of the site in the heavily grazed areas downslope of the perimeter fence line. Several rills and shallow gullies were also observed onsite on the slope north of the disposal cell where grass reestablishment has been limited, in a drainage area on the site north of perimeter sign P7, and in the southwest corner of the site. These gullies and rills were identified during previous annual inspections but appear to be self-repaired, as no significant changes were observed in 2020. The gullies do not pose a threat to disposal cell integrity, and inspectors will continue to monitor these areas. In previous years inspectors also observed a pile of cut telephone poles and signposts with concrete bases in the southwest corner of the site. The cut telephone poles were removed in June 2019; however, the fence posts with cement bases were too heavy to remove by hand (PL-11). This remaining debris does not affect site integrity; however, it will be removed in the future. No other maintenance needs were identified.

9.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

9.6 Maintenance and Repairs

During the inspection, two maintenance items identified during the 2019 inspection were completed:

- Repainting the rock monitoring label at location number 15
- Updating contact information on the entrance sign

Inspectors documented minor maintenance to be addressed during the next inspection:

- Removing the broken T-post at well 0516
- Replacing faded perimeter signs P10, P11, P12

Inspectors documented minor maintenance to be addressed in the future:

- Removing the signposts with concrete bases from the southwest corner of the site

No other maintenance needs were identified.

9.7 Groundwater Monitoring

In accordance with the LTSP, LM conducts groundwater monitoring every 5 years to demonstrate compliance with established groundwater quality protections standards. The most recent sampling event occurred on June 13, 2019, and the next event will occur in 2024.

The groundwater monitoring network consists of nine monitoring wells, including eight downgradient point-of-compliance (POC) wells and one upgradient background monitoring well (Table 9-2 and Figure 9-2). Four of the nine monitoring wells were observed to be dry on June 13, 2019, and could not be sampled. Seven additional LM-owned monitoring wells (wells 0513, 0514, 0516, 0520, 0521, 0522, and 0523) are on private property adjacent to the site but are no longer required to be sampled as identified in the LTSP (Figure 9-1). The hazardous constituents monitored in site groundwater are arsenic, cadmium, and uranium. EPA established MCLs for these analytes in groundwater in 40 CFR 192 Table 1 Subpart A (Table 9-3).

Table 9-2. Groundwater Monitoring Network for the Lakeview, Oregon, Disposal Site

Groundwater Monitoring Purpose	Monitoring Wells
Paired POC wells	0602/0609
Paired POC wells	0603/0608
Paired POC wells	0604/0607
Paired POC wells	0605/0606
Upgradient	0515

Table 9-3. Maximum Concentration Limits for Groundwater at the Lakeview, Oregon, Disposal Site

Constituent	MCL[a] (mg/L)
Arsenic	0.05
Cadmium	0.01
Uranium	0.044

Note:
[a] MCL (40 CFR 192 Table 1 Subpart A)

Abbreviation:
mg/L = milligrams per liter

Concentrations of these constituents continued to remain significantly below their respective MCLs in 2019. Arsenic concentrations were similar to the prior 2014 results, all cadmium concentration results were below the laboratory detection limit of 0.000083 milligrams per liter, and uranium concentrations remained stable or have slightly increased (DOE 2020).

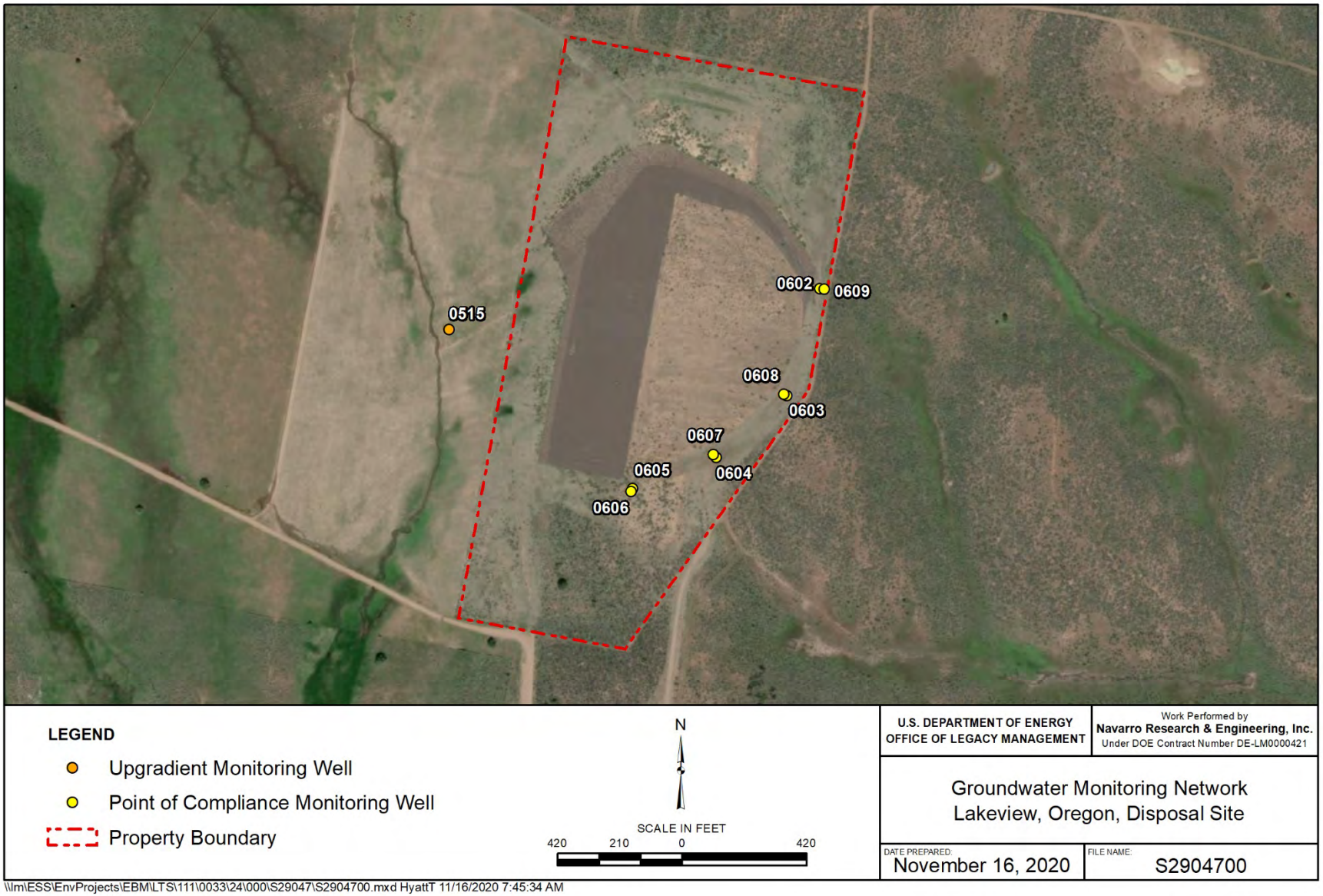

Figure 9-2. Groundwater Monitoring Network, Lakeview, Oregon, Disposal Site

All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=LKD). The *2019 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites* (DOE 2020) shows the most recent monitoring results. All monitoring results were within the range of historical monitoring results, with the exception of the uranium concentration at monitoring well 0606, which showed a slight increase but remains below the MCL. Based on the monitoring results to date, there is no indication of any degradation of groundwater quality near the site. The next disposal cell groundwater monitoring is scheduled for 2024.

9.8 Corrective Action

In accordance with the LTSP, corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

9.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

40 CFR 192 Table 1 Subpart A. U.S. Environmental Protection Agency, "Maximum Concentration of Constituents for Groundwater Protection," *Code of Federal Regulations*.

Dayvault, 2015. Jalena Dayvault, UMTRCA site manager, U.S. Department of Energy Office of Legacy Management, letter (about Lakeview, Oregon, Uranium Mill Tailings Radiation Control Act [UMTRCA] Title I Disposal Site's west side slope rock degradation assessment) to U.S. Nuclear Regulatory Commission, March 2.

DOE (U.S. Department of Energy), 1994. *Long-Term Surveillance Plan for the Collins Ranch Disposal Site, Lakeview, Oregon*, DOE/AL/62350-19F, Rev. 3, August.

DOE (U.S. Department of Energy), 2020. *2019 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites*, LMS/S26685, March.

Mandeville, 2019. Doug Mandeville, project manager, U.S. Nuclear Regulatory Commission, letter (about Lakeview Rock Degradation Monitoring Program) to Jason Nguyen, UMTRCA site manager, U.S. Department of Energy Office of Legacy Management, October 11.

9.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	275	Entrance Sign with Updated Contact Information
PL-2	50	Faded Perimeter Sign P11
PL-3	90	Site Marker SMK-1
PL-4	120	Boundary Monument 3 and Southeast Fence Corner
PL-5	45	Aerial Survey Quality Control Monument QC4
PL-6	225	Broken T-Post near Monitoring Well 0516
PL-7	330	Contact Boundary West Side Slope and South Top Corner with Encroaching Vegetation
PL-8	185	Contact Boundary West Side Slope and North Top Corner
PL-9a	—	Riprap Monitoring Location Number 10 in Energy Dissipation Area–2020
PL-9b	—	Riprap Monitoring Location Number 10 in Energy Dissipation Area–2004 Photo for Comparison
PL-10	310	Drainage Channel with Encroaching Vegetation
PL-11	120	Old Fence Posts with Concrete Bases

Note:
— = Photograph taken vertically from above.

PL-1. Entrance Sign with Updated Contact Information

PL-2. Faded Perimeter Sign P11

PL-3. Site Marker SMK-1

PL-4. Boundary Monument 3 and Southeast Fence Corner

PL-5. Aerial Survey Quality Control Monument QC4

PL-6. Broken T-Post near Monitoring Well 0516

PL-7. Contact Boundary West Side Slope and South Top Corner with Encroaching Vegetation

PL-8. Contact Boundary West Side Slope and North Top Corner

PL-9a. Riprap Monitoring Location Number 10 in Energy Dissipation Area–2020

PL-9b. Riprap Monitoring Location Number 10 in Energy Dissipation Area–2004 Photo for Comparison

PL-10. Drainage Channel with Encroaching Vegetation

PL-11. Old Fence Posts with Concrete Bases

10.0 Lowman, Idaho, Disposal Site

10.1 Compliance Summary

The Lowman, Idaho, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on July 23, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified no maintenance needs and found no cause for a follow-up inspection. Groundwater monitoring is not required and was discontinued in 2004.

10.2 Compliance Requirements

Requirements for long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 2005) 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 10-1 lists these requirements.

Table 10-1. License Requirements for the Lowman, Idaho, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.3	Section 10.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 10.5	(b)(4)
Site Maintenance	Section 3.5	Section 10.6	(b)(5)
Emergency Response	Section 3.6	Section 10.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 10.8	(b)(2)

10.3 Institutional Controls

The 18-acre site, identified by the property boundary shown in Figure 10-1, is owned by the United States and was accepted under the NRC general license in 1994. The U.S. Department of Energy (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 gate and sign, perimeter signs, site markers, and survey and boundary monuments.

10.4 Inspection Results

The site, 0.5 mile east of Lowman, Idaho, was inspected on July 23, 2020. The inspection was conducted by B. Mays of the Legacy Management Support (LMS) contractor. T. Jasso, the Office of Legacy Management (LM) site manager, and P. Rekow, a vegetation control subcontractor, 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.

10.4.1 Site Surveillance Features

Figure 10-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font, and new observations identified during the 2020 annual inspection are shown in red. Inspection results are described in the following subsections. Photographs to support specific observations are identified in the text and in Figure 10-1 by photograph location (PL) numbers. The photographs and photo log are presented in Section 10.10.

10.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is at the end of a gravel road about 650 feet (ft) north of Idaho Highway 21. Entrance to the site is through a locked steel gate on the site access road about 150 ft from the highway. The site is not fenced, but the topography and forest vegetation prevent vehicle access around the entrance gate and along the property boundary. The entrance gate was locked and functional, the access road was passable, and the entrance sign was present and legible. No maintenance needs were identified.

10.4.1.2 Perimeter Signs

There are 18 perimeter signs, attached to steel posts set in concrete, positioned along the unfenced property boundary (PL-1). Several perimeter signs (P2, P3, P4, P13, and P15) have bullet damage but remain legible. Perimeter sign P3 is rotated about 90 degrees from its original position, but it continues to be legible and noticeable. Perimeter sign P7 is slightly bent from tree fall but remains legible. No maintenance needs were identified.

10.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the southwest property boundary, and site marker SMK-2 (PL-2) is on the top slope of the disposal cell. Lichen is growing on the surface of both site markers, but it is easily removable by hand and does not detract from the legibility of the markers. No maintenance needs were identified.

10.4.1.4 Survey and Boundary Monuments

Three combined survey and boundary monuments and four boundary monuments delineate the property boundary. Steel T-posts are installed next to the survey and boundary monuments to help inspectors find the monuments. Several years ago, the U.S. Department of Agriculture (USDA) surveyed USDA lands managed by the U.S. Forest Service (USFS) and placed its own boundary monuments along the shared DOE-USDA border. Inspectors noted that the USDA survey monuments were about 5 to 15 ft outside DOE survey monuments. No maintenance needs were identified.

10.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments were installed in October 2020 following the annual inspection.

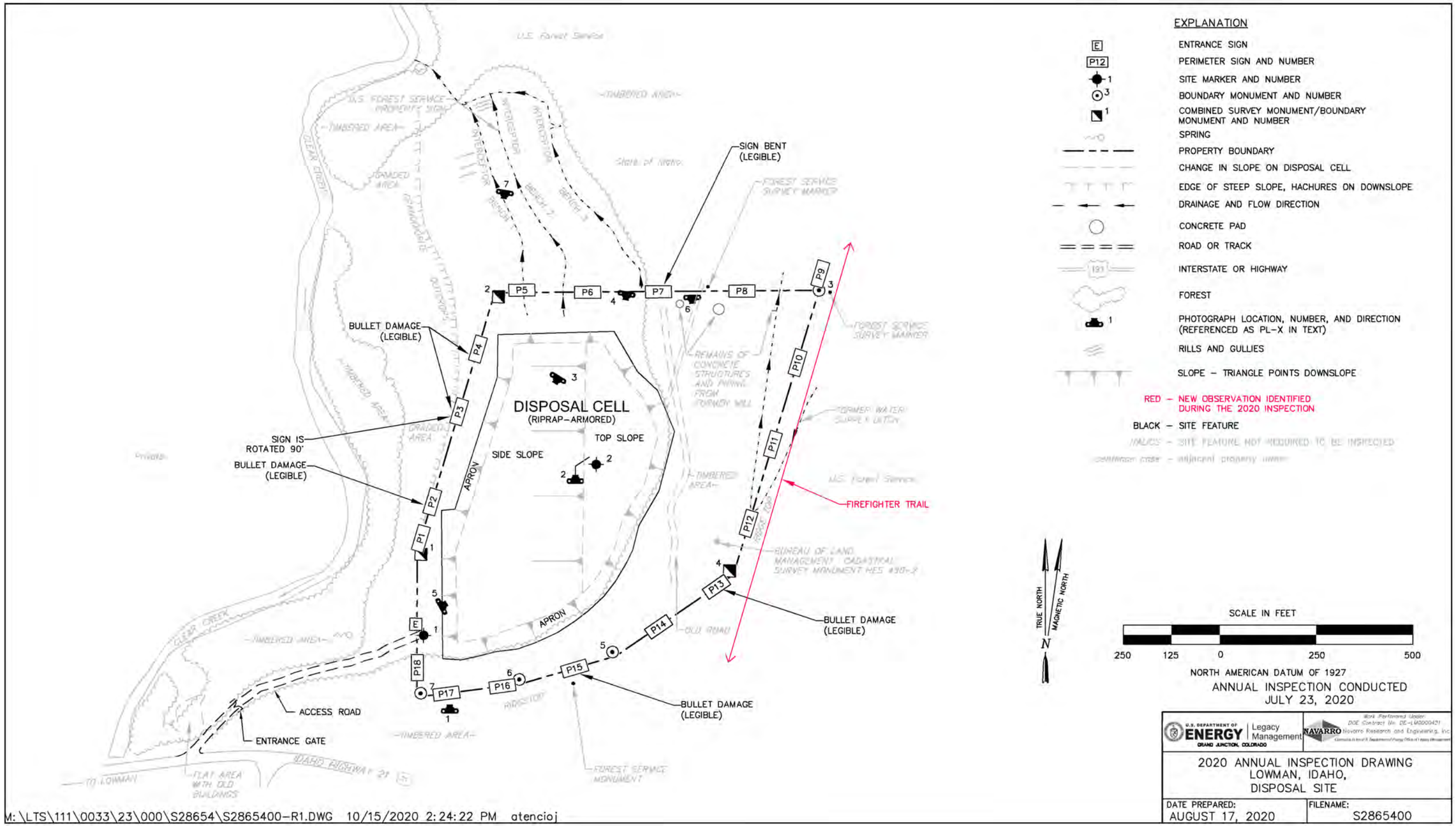

Figure 10-1. 2020 Annual Inspection Drawing for the Lowman, Idaho, Disposal Site

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10.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the top and side slope of the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area. Inspectors examined the 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.

10.4.2.1 Top and Side Slope of the Disposal Cell

The disposal cell, completed in 1991, occupies 8.29 acres. The disposal cell top and side slopes are armored with basalt riprap to control erosion (PL-3). An apron of larger riprap surrounds the disposal cell on all sides (PL-4). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell.

Natural vegetation continues to encroach on the top and side slopes of the disposal cell. Although the LTSP states that control of vegetation growth on the cell is not needed, LM concluded that controlling the growth of conifers—primarily ponderosa pine—would be a best management practice. Unlike the shrubs and other vegetation growing on the disposal cell, mature conifers could potentially become uprooted during windstorms and damage the surface of the disposal cell. Numerous ponderosa pine trees were observed on the disposal cell top and side slopes and were cut down and left in place in September 2018. Other plants growing on the disposal cell were not removed, as they do not present a physical threat to the integrity of the disposal cell (PL-5). No maintenance needs were identified.

10.4.2.2 Area Between the Disposal Cell and the Site Boundary

The steep slopes east and south of the disposal cell are stable and vegetated with well-established ponderosa pines, shrubs, and grasses. Several features from the historical mining operations remain on the steep hillside east of the disposal cell, including a water-supply ditch and the remains of a water piping system (PL-6). The slopes north and west of the disposal cell were highly disturbed during site remediation, but they are now stable and vegetated. No maintenance needs were identified.

10.4.2.3 Outlying Area

The area within 0.25 mile of the site boundary was inspected for evidence of construction, development, logging, or changes in land use that might affect the site. No changes were observed in the area across Clear Creek to the west, where there are several cabins and campsites. USFS, an office of USDA, manages the areas east and south of the site, and those areas remain visually unchanged from previous inspections. The area along Highway 21 east of the site does not show evidence of new development. The inspectors observed a wildland firefighter trail outside the site boundary along the ridgeline east of the site. The trail does not affect the integrity of the site or pose a need for follow-up inspection.

The reclaimed area north of the disposal cell and outside the site boundary is a steep area owned by the State of Idaho. LM installed three interceptor benches across the steep slope in this area in

1998 to intercept stormwater runoff and route it offsite into Clear Creek. Over the years, minor erosion has breached the benches in several locations, and LM has conducted repairs on numerous occasions, most recently in October 2016. The three interceptor benches (PL-7) and a collection ditch are inspected annually to ensure that erosion in this area does not affect overall site stability. In 2020, inspection of the 2016 repairs showed they remain intact, and LM will continue to inspect as the vegetation continues to establish.

10.5 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 have substantially changed. No need for a follow-up inspection was identified.

10.6 Maintenance

No maintenance needs were identified.

10.7 Emergency Response

Emergency response is action LM will take in response to unusual damage or disruption that threatens or compromises site safety, security, or integrity in compliance with 10 CFR 40 Appendix A. No need for an emergency response was identified.

10.8 Environmental Monitoring

In accordance with the LTSP, groundwater monitoring is not required and was discontinued in 2004. Groundwater monitoring is not required because (1) the disposal cell is performing as designed, and (2) the groundwater monitoring program demonstrated that the site is in compliance with groundwater protection standards and that no site-related contamination exists in groundwater near the site. All monitoring wells at the site were decommissioned in 2006.

10.9 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), 2005. *Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site*, DOE-LM/GJ771-2005, Rev. 2, January.

10.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	Perimeter Sign P17
PL-2	—	Site Marker SMK-2
PL-3	210	Disposal Cell Cover
PL-4	190	Disposal Cell Apron
PL-5	60	Vegetation on Disposal Cell Cover
PL-6	180	Concrete Structure and Water Piping Remains
PL-7	190	Interceptor Bench 1

Note:
— = Photograph taken vertically from above.

PL-1. Perimeter Sign P17

PL-2. Site Marker SMK-2

PL-3. Disposal Cell Cover

PL-4. Disposal Cell Apron

PL-5. Vegetation on Disposal Cell Cover

PL-6. Concrete Structure and Water Piping Remains

PL-7. Interceptor Bench 1

11.0 Maybell, Colorado, Disposal Site

11.1 Compliance Summary

The Maybell, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on September 3, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection. Groundwater monitoring is not required.

11.2 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 2008) 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 11-1 lists these requirements.

Table 11-1. License Requirements for the Maybell, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.3 and 3.4	Section 11.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 11.5	(b)(4)
Maintenance	Section 3.6	Section 11.6	(b)(5)
Emergency Measures	Section 3.6	Section 11.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 11.8	(b)(2)

11.3 Institutional Controls

The 251-acre site, identified by the property boundary shown in Figure 11-1, is owned by the United States and was accepted under the NRC general license in 1999. The U.S. Department of Energy (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 gate and sign, perimeter fence and perimeter (warning) signs, site markers, and survey and boundary monuments.

11.4 Inspection Results

The site, 25 miles west of Craig, Colorado, was inspected on September 3, 2020. The inspection was conducted by J. Cario and B. Mays of the Legacy Management Support contractor. J. Nguyen (Office of Legacy Management [LM] site manager) and J. Doebele (Colorado Department of Public Health and Environment) 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.

11.4.1 Site Surveillance Features

Figure 11-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 11-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 11.10.

11.4.1.1 Access Road, Entrance Gate, and Entrance Sign

Access to the site is from the gravel-surfaced Moffat County Road 53, which runs north from U.S. Highway 40 approximately 8 miles east of Maybell, Colorado. County Road 53 ends at an unlocked gate near the northeast corner of the site (approximately 3 miles from the highway). The road continues west as a dirt two-track road directly north of the site. From the end of County Road 53 to the site entrance gate (and beyond, to the UMTRCA Title II Maybell West, Colorado, Disposal Site), LM is responsible for road maintenance under a U.S. Bureau of Land Management right-of-way permit. Entrance to the site is through two locked, metal stock gates in the perimeter fence. One is the entrance gate, which is adjacent to the site marker and entrance sign (PL-1). The second gate is between perimeter signs P3 and P4 in the northwest corner of the property. Both gates were locked and functional. The entrance sign is near the entrance gate and is mounted on a T-post in the perimeter fence. The entrance sign has bullet damage but remains legible. No maintenance needs were identified.

11.4.1.2 Perimeter Fence and Signs

To facilitate land management by LM, a four-strand barbed-wire perimeter fence encloses the disposal cell, drainage structures, and much of the site. The site is in wintering grounds frequented by big-game animals (primarily pronghorn, deer, and elk) and is also surrounded by open range used to graze cattle. As a result, minor damage to the perimeter fence periodically occurs. Perimeter fence strands were broken in two locations (PL-2) near perimeter sign P1, and a loose T-post was observed along the perimeter fence near perimeter sign P7. Damage to the perimeter fence was repaired on September 21, 2020.

There are 26 perimeter signs. On the north, west, and south sides of the site, perimeter signs are attached to T-posts in the perimeter fence. On the east side of the site, perimeter signs are attached to steel posts set in concrete and are inside the property boundary approximately midway between the disposal cell and the perimeter fence (PL-3). Several of the perimeter signs along the dirt road north and west of the site (P5, P6, P8, P11, and P26) have bullet damage but remain legible. Perimeter sign P25 was observed to be damaged (PL-4) and was replaced on September 21, 2020. No other maintenance needs were identified.

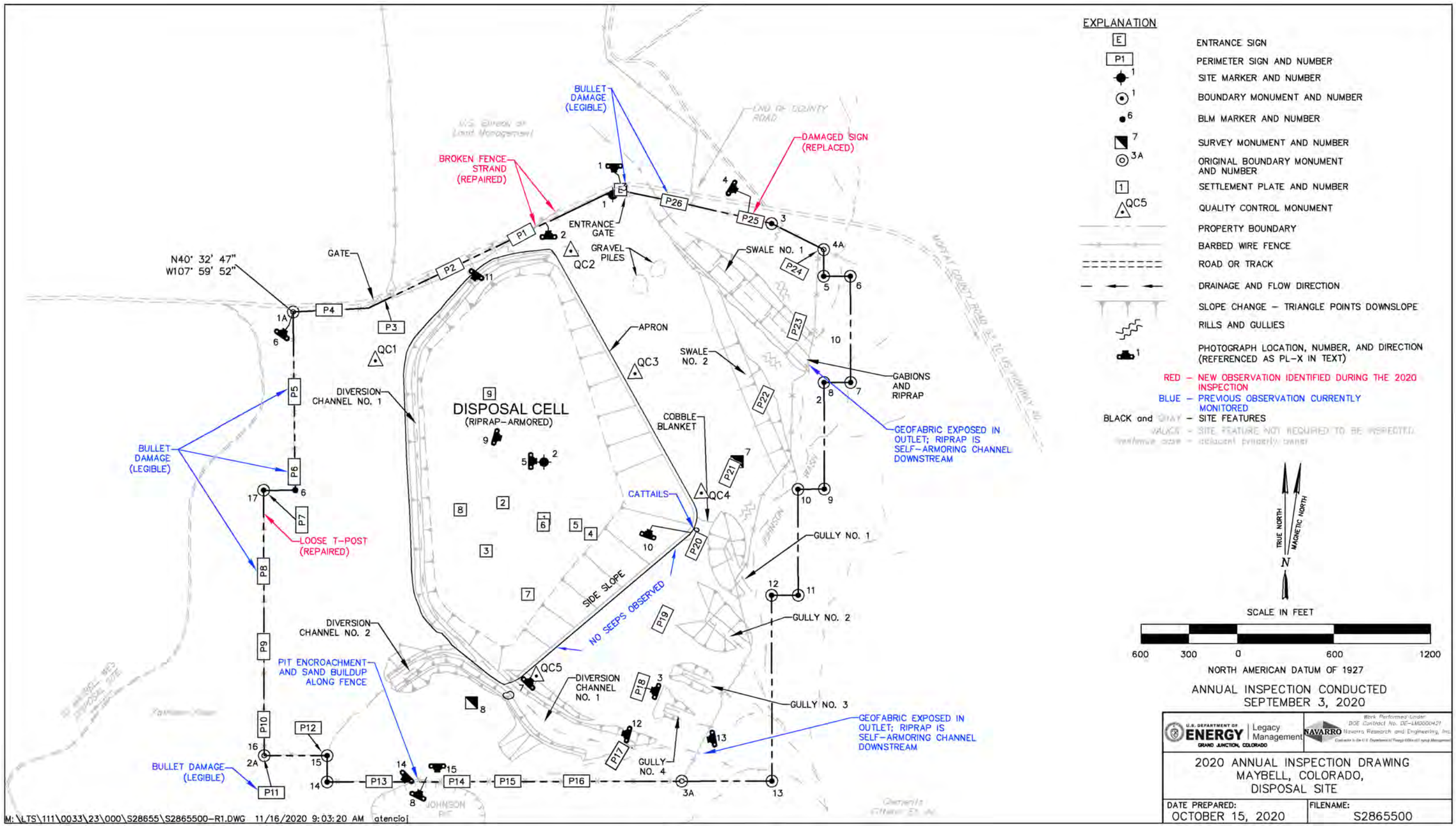

Figure 11-1. 2020 Annual Inspection Drawing for the Maybell, Colorado, Disposal Site

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11.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell (PL-5). No maintenance needs were identified.

11.4.1.4 Survey and Boundary Monuments

The site has two survey monuments. Survey monument SM-7 is on the bench above Johnson Wash just north of perimeter sign P21, and survey monument SM-8 is south of the disposal cell on the bench above Diversion Channel No. 2. The two survey monuments were not inspected during the inspection but were confirmed to be present and intact during a previous site visit. Seventeen boundary monuments delineate the property boundary (PL-6). No maintenance needs were identified.

11.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments, installed in 2018, were inspected during the 2020 inspection (PL-7). No maintenance needs were identified.

11.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) other areas inside the site boundary, and (3) the outlying area. Inspectors examined the 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.

11.4.2.1 Disposal Cell

The disposal cell, completed in 1998, occupies 66 acres. The disposal cell is armored with riprap to control erosion and deter animal and human intrusion (PL-8). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. Scattered shallow-rooted plants continue to establish on the disposal cell top and side slopes (PL-9); these plants do not affect the integrity of the cell. Deep-rooted plants and noxious weeds are controlled as required by the LTSP.

In accordance with the LTSP, inspectors looked for seeps on the east and southeast side slopes of the disposal cell, because slimes were encapsulated in this portion of the cell. No seeps were observed at the toe of the disposal cell in these areas. Cattails continue to grow at the toe of the east corner of the disposal cell, indicating the presence of moisture (PL-10). Stormwater runoff from the disposal cell discharges at this location, and standing water has been observed in this area during past inspections; no standing water was noted during the 2020 inspection. A 2003 laboratory analysis of evaporite minerals from this location confirmed that no constituents attributable to the disposal cell contents were present. No other maintenance needs were identified.

11.4.2.2 Other Areas Inside the Site Boundary

The surface conditions at the site are a combination of rock-armored drainage and diversion channels, along with contouring of soil surfaces to achieve the necessary surface water drainage control to protect the disposal cell from erosion. The rock-armored diversion channels, swales, and gullies are performing as designed (PL-11 and PL-12). Erosion directly downgradient of the outlets of Diversion Channel No. 1 and Swale No. 1 that has exposed the underlying geofabric had not changed significantly (PL-13). Riprap placed within the outlets continues to provide protection against headcutting. Minor rills adjacent to Swale No. 1 and Gully No. 1 continue to stabilize due to natural armoring and increased vegetation growth. Minor erosion on the northern portion of the site directly downslope of the perimeter fence (between perimeter signs P1 and P2) continues to stabilize. Minor erosion perpendicular to the perimeter fence near boundary monument BM-3 was observed. These occurrences of erosion do not threaten the disposal cell, and there was no evidence of sediment moving offsite into Johnson Wash. No maintenance needs were identified.

11.4.2.3 Outlying Area

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 observed.

Directly south of the site is a former open-pit uranium mine known as the Johnson Pit (PL-14). Over time, slumping of the pit wall resulted in the pit encroaching several feet onto property now owned by DOE. This encroachment presents no threat to the integrity of the disposal cell and occurred before reclamation and transfer of the site to DOE for long-term surveillance and maintenance. This encroachment is visually monitored annually; it is periodically documented with photographs to assess whether there is any further slumping of the pit wall and to verify the integrity and functionality of the perimeter fence. There was no evidence of any additional encroachment of the pit onto the site at the time of the inspection. However, windblown sand continues to accumulate along the northern crest of the pit wall along the perimeter fence line (PL-15). The perimeter fence remains functional, but continued accumulation of sand will require vertically extending the fence or removing the sand. Inspectors will continue to monitor this area. No immediate maintenance needs were identified.

11.5 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.

11.6 Maintenance

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

- Spraying noxious weeds and deep-rooted plants on the disposal cell
- Replacing perimeter sign P25
- Repairing loose T-post south of perimeter sign P7 along the western perimeter fence
- Repairing broken fence strands east of perimeter sign P1 along the northern perimeter fence

No other immediate maintenance needs were identified.

11.7 Emergency Measures

In compliance with the LTSP, 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. No need for emergency measures was identified.

11.8 Environmental Monitoring

11.8.1 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required. Supplemental standards have been applied to site groundwater because it is designated as limited use, a designation given to groundwater that is not a current or potential source of drinking water. Groundwater in the uppermost aquifer is designated as limited use because it contains widespread ambient contamination that cannot be cleaned up by treatment methods reasonably employed in public water systems (40 CFR 192.11[e]). There are no current or future uses of the uppermost aquifer in the area. Water level monitoring did not detect disposal-cell-related impacts to the groundwater system, such as transient drainage downgradient of the cell, and NRC concurred that stipulated groundwater level monitoring requirements had been satisfied (Janosko 2005). Therefore, no further groundwater monitoring was required.

11.8.2 Vegetation Monitoring

In accordance with the LTSP, annual visual inspections are conducted to verify the continued health of the onsite vegetation and to ensure that undesirable plant species (deep-rooted plants on the disposal cell cover and noxious weeds) do not proliferate on the site. Minor occurrences of noxious weeds and deep-rooted plants were noted on the disposal cell during the inspection. Annual noxious weed treatment will continue. Following reclamation, the disturbed soil surfaces on the site were revegetated with a mix of native and adaptive grasses to provide soil stability. These revegetated areas appeared to be healthy, with similar diversity and density as the surrounding non-disturbed areas.

11.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance Plan for the Maybell, Colorado (UMTRCA Title I) Disposal Site, Moffat County, Colorado*, DOE-LM/1605-2008, Revision 4, April.

Janosko, G.S., 2005. Gary S. Janosko, chief of Fuel Cycle Facilities Branch, U.S. Nuclear Regulatory Commission, letter (about decommissioning of monitor wells at the Maybell, Colorado, Uranium Mill Tailings Radiation Control Act [UMTRCA] Title I Disposal Site) to Michael Tucker, site manager, U.S. Department of Energy, January 5.

11.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	180	Entrance Sign
PL-2	0	Broken Fence Strands Along Northern Perimeter Fence
PL-3	290	Perimeter Sign P18
PL-4	120	Damaged Perimeter Sign P25
PL-5	90	Site Marker SMK-2
PL-6	35	Original Boundary Monument BM-1A
PL-7	45	Quality Control Monument QC5
PL-8	25	Disposal Cell
PL-9	105	Vegetation on Top Slope of Disposal Cell
PL-10	20	Cattails Adjacent to Disposal Cell Toe Slope and Apron
PL-11	215	Diversion Channel No. 1 and North Side Slope of Disposal Cell
PL-12	285	Diversion Channel No. 1
PL-13	260	Perimeter Fence near Outlet to Diversion Channel No.1
PL-14	225	Sand Accumulation Around Perimeter Fence with Johnson Pit in Background
PL-15	180	Sand Accumulation Around Perimeter Fence near Johnson Pit

PL-1. Entrance Sign

PL-2. Broken Fence Strands Along Northern Perimeter Fence

PL-3. Perimeter Sign P18

PL-4. Damaged Perimeter Sign P25

PL-5. Site Marker SMK-2

PL-6. Original Boundary Monument BM-1A

PL-7. Quality Control Monument QC5

PL-8. Disposal Cell

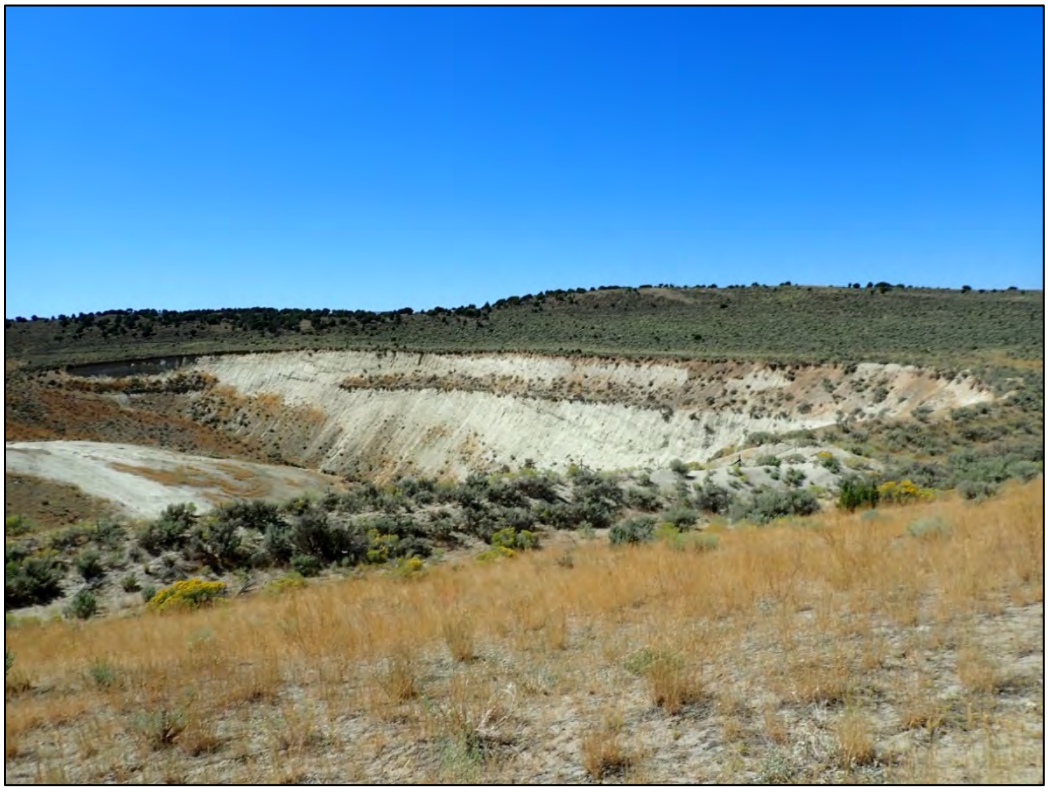
PL-9. Vegetation on Top Slope of Disposal Cell

PL-10. Cattails Adjacent to Disposal Cell Toe Slope and Apron

PL-11. Diversion Channel No. 1 and North Side Slope of Disposal Cell

PL-12. Diversion Channel No. 1

PL-13. Perimeter Fence near Outlet to Diversion Channel No.1



PL-14. Sand Accumulation Around Perimeter Fence with Johnson Pit in Background

PL-15. Sand Accumulation Around Perimeter Fence near Johnson Pit

12.0 Mexican Hat, Utah, Disposal Site

12.1 Compliance Summary

The Mexican Hat, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on September 15, 2020.

In response to the depressions identified in 2016, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) continued investigations and performed geotechnical sampling and materials testing (GSMT) on the disposal cell side slope cover components in April 2019 (DOE 2019a). Data obtained through the GSMT are being used to identify causes for the cover degradation features that have been observed at the site. Additionally, interim radon barrier protection was implemented at GSMT sampling areas that exhibited radon barrier degradation. During this work, a series of test pits and one test strip were excavated to observe cover conditions and obtain samples. Backfilling and reconstruction of the excavated area included the addition of a moisture-conditioned, bentonite-amended granular material where radon barrier material had been eroded. During this work, systematic screening for gamma radiation was performed, and no elevated readings were observed.

The Interim Cover Protection (ICP) project was conducted in 2019. It was a temporary measure to replace and restore to the original design specifications the cover system components in the area of observed cover degradation associated with the lower portions of the northeast side slope until a long-term solution can be assessed. During this work, systematic screening for gamma radiation was performed, and no elevated readings were observed.

No evidence of a breach through the radon barrier has been identified, and the site remains protective of human health and the environment. Efforts to evaluate the cause or causes of the erosional features are in progress.

LM conducted annual observational monitoring consisting of photographic documentation and observational description of seven designated seeps during the annual inspection. Seep 0248 (PL-16) exhibited typical conditions and was dripping, upgradient (background) Seep 0261 (PL-19) was flowing, and the remaining seeps were dry. Ephemeral drainages along the perimeter of the site were dry. Groundwater monitoring is not required.

12.2 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 2007) 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 12-1 lists these requirements.

Table 12-1. License Requirements for the Mexican Hat, Utah, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.3 and 3.4	Section 12.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 12.5	(b)(4)
Maintenance	Section 3.6	Section 12.6	(b)(5)
Emergency Measures	Section 3.6	Section 12.7	(b)(5)
Environmental Monitoring	Section 3.7	Section 12.8	(b)(2)

12.3 Institutional Controls

The 119-acre disposal site, identified by the property boundary shown in Figure 12-1 is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized DOE to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation to perform remedial actions at the former uranium processing sites. DOE and the Navajo Nation executed a Custodial Access Agreement that provides perpetual access to DOE for custody and long-term care at the site.

The site was accepted under the NRC general license in 1997. 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 custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, fence, perimeter signs, site markers, and survey and boundary monuments.

12.4 Inspection Results

The site, 1.5 miles south of the town of Mexican Hat, Utah, and 0.5-mile northeast of the Navajo community of Halchita, was inspected on September 15, 2020. The inspection was conducted by D. Atkinson, K. Lott, and J. Manée of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager) 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.

12.4.1 Site Surveillance Features

Figure 12-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 12-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 12.10.

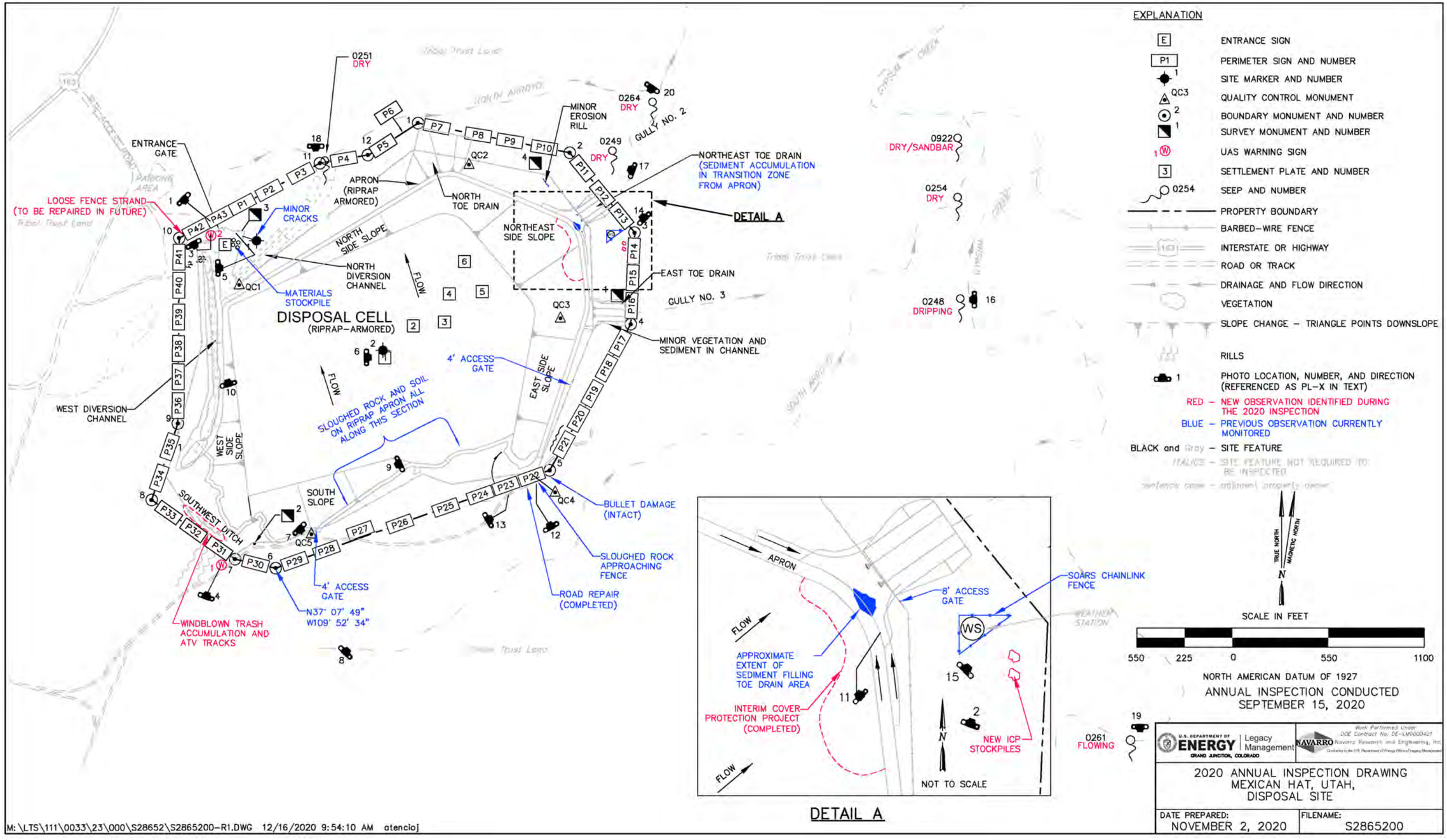


Figure 12-1. 2020 Annual Inspection Drawing for the Mexican Hat, Utah, Disposal Site

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12.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is from a short, unmarked dirt road off U.S. Highway 163 that ends at a graded parking area. Minor erosion continues to occur along the dirt access road, but the site remains accessible. Entrance to the site is through a locked steel entrance gate at the northwest corner of the site. The entrance gate was locked and functional. The entrance sign is affixed to a steel post immediately behind the entrance gate (PL-1). No maintenance needs were identified.

12.4.1.2 Fence and Perimeter Signs

A barbed-wire fence encloses the disposal cell. Periodically, the fence is damaged by livestock, erosion, or vandalism and requires repair. One loose fence strand was identified on the northwest corner of the site, by perimeter sign P42. Two 4-foot access gates and one 8-foot access gate were permanently installed in 2018 in the perimeter barbed-wire fence to support disposal cell cover evaluations and maintenance activities performed in prior years.

A perimeter chainlink fence was installed in 2019 around the existing System Operation and Analysis at Remote Sites (SOARS) weather monitoring station (PL-2). Approximately 260 linear feet of 6-foot-tall chainlink fence and a lockable double swing gate were installed on existing dirt and rock surfaces around the SOARS station.

There are 43 pairs of perimeter signs, designated P1 through P43 (each pair consisting of an upper sign indicating property ownership and barring trespassing and a lower sign identifying the site as a radioactive materials disposal site), positioned along the property boundary. Each paired perimeter sign is attached to a single steel post set in concrete. Perimeter signs are typically outside the fence that encloses the disposal cell, but some are affixed directly to the fence or immediately inside the fence. All bullet-riddled perimeter signs (perimeter signs P19, P20, P21, P23, P24, P26, and P27) and signs that were bent (presumably from animal contact), faded, or cracked (perimeter signs P14, P15, P19, P21, P27, P33, P34, P37, and P42) were replaced in 2019 and were in excellent condition during the 2020 inspection.

Two new unmanned aircraft system (UAS) warning signs were installed during the 2020 inspection. One sign was installed by the entrance gate at the northwest corner of the site (PL-3), and one sign was installed on the southwest corner of the site between perimeter sign P31 and boundary monument BM-5 (PL-4). No immediate maintenance needs were identified.

12.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the fence near the entrance gate (PL-5); its concrete base has several minor cracks, but they do not compromise the integrity of the base, and repairs are not necessary at this time. Site marker SMK-2 is on the top slope of the disposal cell (PL-6). No immediate maintenance needs were identified.

12.4.1.4 Survey and Boundary Monuments

During construction of the disposal cell, four survey monuments were installed for survey control. Twelve boundary monuments delineate the property boundary. Bullet damage remains at boundary monument BM-5, but repairs are not necessary at this time, as the boundary monument remains legible and intact. No immediate maintenance needs were identified.

12.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control monuments, installed in 2018, were inspected during the 2020 annual inspection (PL-7). No maintenance needs were identified.

12.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the toe drains and diversion channels, (3) the balance of the site and the site perimeter, and (4) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

12.4.2.1 Disposal Cell

The disposal cell, completed in 1994, occupies 68 acres. The disposal cell is armored with riprap to control erosion. No erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell were evident on the top slope of the disposal cell (PL-8).

Depressions in the riprap cover along the toe and lower portions of the northeast side slope of the disposal cell were identified during the 2016 annual inspection and a follow-up inspection on April 8, 2016 (DOE 2017). Additional site visits to further characterize the depression features have been completed every year since 2016 and are detailed in the *Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report, Mexican Hat, Utah* (DOE 2019b), also known as the Depressions Evaluation Report. The ICP project was conducted in 2019 as a temporary measure to replace and restore to the original design specifications the cover system components in the area of observed cover degradation associated with the lower portions of the northeast side slope until a long-term solution can be assessed.

There was no noticeable increase of sloughed red rock and soil along the south apron of the disposal cell (PL-9). Because the apron is adjacent to the base of a steep, rocky cliff, it is expected that sediment and rock from the cliff will continue to fall onto the apron. The accumulated material is not currently affecting the function of the apron, and this area will continue to be monitored.

12.4.2.2 Toe Drains and Diversion Channels

Upgradient offsite areas continue to erode, resulting in the transport of sediment onto the site and into the west diversion channel. Sediment accumulation has promoted the growth of vegetation, including perennial grasses and annual weeds, in the west diversion channel (PL-10). However, sediment accumulation and associated vegetation growth have not adversely affected the performance of the west diversion channel.

Sediment accumulation has also been observed along the transition zone from the apron to the northeast toe drain. The origin of this material is currently being evaluated and analyzed, but it may be a combination of windblown material and previously observed radon barrier erosion associated with the depression features. Visual observations during the inspection did not

identify any apparent increases in the sediment accumulation in this area compared to previous visual observations; however, increased vegetation growth was apparent in this drainage apron, at the toe of the northeast side slope (PL-11). Increased vegetation growth was most likely a result of the water used during the ICP project while moisture conditioning and compacting cover components. Inspectors will continue to monitor this area on the northeast side slope. Conversely, no sediment accumulation has been observed below the north side slope where one depression and radon barrier erosion have been identified. No immediate maintenance needs were identified.

12.4.2.3 Balance of the Site and Site Perimeter

Minor erosion continues in upgradient areas along the southwest portions of the site. This is an expected natural process, as the exposed geology at the site is brittle and subject to weathering. Inspectors will continue to monitor erosion in these areas, but erosion is not a concern unless it damages the fence or affects the performance of site drainage and diversion features such as the west diversion channel.

Sloughed rock from an overhanging shelf continues to be observed along the southern perimeter of the site (PL-12). Although no visual changes were evident, and this material currently appears to be stable, this rock is approaching the barbed-wire fence between perimeter signs P22 and P23 and will likely need to be removed or secured in the future to protect the fence from damage or a potential breach.

Scattered trash (broken glass, bottles, cans, cardboard, and paper containers) continues to accumulate in areas of the site that are accessible to vehicles (e.g., outside the perimeter of the barbed-wire fence). The most noticeable accumulation of trash is in the southwest ditch, inside the barbed-wire fence; however, this trash is likely transported onto the site by wind. Trespassing occurs just inside the site boundary (outside the fence), as evidenced by vehicle and all-terrain vehicle tracks in the same areas where trash accumulations are present.

As part of the ICP project, front-end road repairs were performed along the dirt access road to allow for safe transportation of haul trucks and delivery trucks. Road repairs included grading the entire access road. Two areas damaged from rain events were corrected by installing geocell with standard U.S. Department of Transportation-specific rock type to stabilize these areas, which will also allow for proper drainage from rain events. These repaired areas were examined during the inspection and appeared to be performing as designed (PL-13).

Material storage and equipment storage areas utilized during the ICP project were revegetated and had straw wattles installed to provide stormwater run-on and runoff protection (PL-14). These areas were also inspected, and new vegetation growth was observed in these areas. The straw wattles were still in place and performing as designed.

The old bedding material removed during the ICP project and new excess bedding material were stockpiled near the SOARS perimeter chainlink fence (PL-15), and straw wattles were also installed around this material for stormwater runoff protection. The old bedding material was systematically screened for gamma radiation during the ICP project, and no elevated readings were observed. This area was evaluated during the inspection and is performing as designed. No immediate maintenance needs were identified with any of these site features.

12.4.2.4 Outlying Area

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.

12.5 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 have substantially changed. No follow-up inspections, evaluations, or work is needed based on the inspection results.

12.6 Maintenance

No immediate maintenance needs were identified during the 2020 annual site inspection. The loose fence strand near P42 will be repaired sometime in the future. During the inspection, two new UAS warning signs were installed.

12.7 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 10 CFR 40 Appendix A Criterion 12. The depression features identified in 2016 along the disposal cell's northeast side slope do not meet the criteria for implementing an emergency action; therefore, no need for emergency measures was identified.

12.8 Environmental Monitoring

12.8.1 Groundwater Monitoring

In accordance with the 2007 LTSP, groundwater monitoring is not required because the uppermost aquifer is hydrogeologically isolated from contamination in the overlying formation.

12.8.2 Seep Monitoring

In accordance with Section 3.7.2 of the LTSP, LM conducts observational monitoring of seven designated seeps during annual inspections as specified in an approved monitoring plan (DOE 2019c). Observational monitoring consists of visual observations and photographic documentation of the seven seep locations specified in the LTSP. The observed seep locations, shown in Figure 12-2, are primarily the result of the infiltration of precipitation into the surrounding formation or perched water that leaked from the former processing site tailings pond. Most seeps have exhibited dry conditions over the past 11 years of observational monitoring.

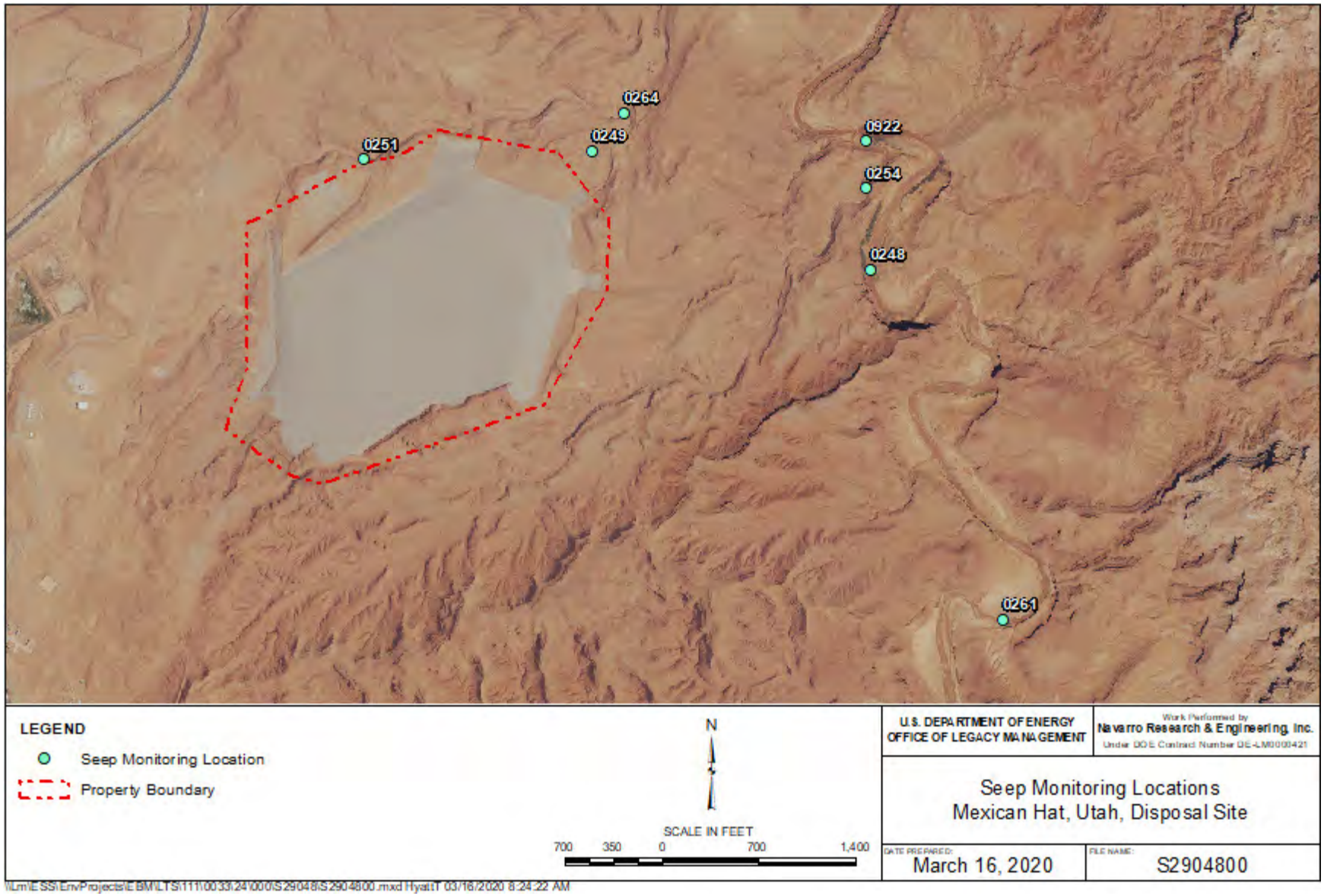

Figure 12-2. Seep Monitoring Locations at the Mexican Hat, Utah, Disposal Site

The LTSP required annual visual monitoring of the seven designated seep locations through 2016, at which time an evaluation was to be conducted and a decision made about whether to continue or discontinue visual seep monitoring. This report has been finalized, and visual monitoring continues to be performed during the annual site inspection as described in the *Seep Monitoring Evaluation Report, Mexican Hat, Utah, UMTRCA Title I Disposal Site* (DOE 2019c).

Since 2010, groundwater discharge from seeps had only been observed at cross-gradient Seep 0248, which typically exhibits dripping conditions. During the inspection, Seep 0248 (PL-16) was observed dripping; since the seep was only dripping and did not exhibit steady flow, an estimated flow rate was not evaluated. Additionally, upgradient (background) Seep 0261 (PL-19) was observed to be flowing during the inspection. Seep 0261 is approximately 0.50 mile upstream of Seep 0248 in Gypsum Creek.

The remaining seeps on the annual monitoring plan exhibited dry conditions during the inspection. Table 12-2 documents the conditions of each monitored seep that was observed during the inspection and includes the respective drainage in which each seep occurs and, if applicable, a reference to photographic documentation.

Table 12-2. Observations of Seeps near the Mexican Hat, Utah, Disposal Site

Seep Location Number	Drainage	Location Relative to Disposal Cell	Photograph Location Number	Observed Seep Conditions
0248	Gypsum Creek	Cross gradient	PL-16	Seep was dripping at a much slower rate compared to previous visual observations (no flow rate measured).
0249	Gully No. 2	Downgradient	PL-17	Dry conditions (no evaporites present); seep area is covered with gray limestone that presumably is extra riprap apron material from disposal cell construction. Warning sign not posted at this location since this seep has never been documented to be discharging water.
0251	North Arroyo	Downgradient	PL-18	Dry conditions (no evaporites present).
0254	South Arroyo	Downgradient	N/A	Dry conditions (no evaporites present). Warning sign not posted at this location due to seasonal flash flood conditions in the ephemeral drainage.
0261	Gypsum Creek	Upgradient (background)	PL-19	Flowing conditions. This seep discharges directly into Gypsum Creek, which was dry outside of the immediate seep discharge area. Warning sign not posted at this location since this seep is a background location.
0264	North Arroyo	Downgradient	PL-20	Dry conditions (no evaporites present in immediate area). Ephemeral wash near seep location was dry with no evidence of evaporites in the areas observed during the inspection.
0922	Gypsum Creek	Downgradient	N/A	Dry conditions (no evaporites present in immediate area). Seep is along the south side of Gypsum Creek, and the seep location is still covered entirely by a sandbar that has formed along this section of Gypsum Creek.

Abbreviation:
N/A = not applicable

12.8.3 Vegetation Monitoring

In accordance with the LTSP, vegetation conditions are observed during annual inspections to ensure that undesirable plant species, including deep-rooted plants on the disposal cell cover and noxious weeds, do not proliferate at the site. Except for deep-rooted vegetation, natural plant community succession is expected and will not adversely impact the performance of the disposal cell. Vegetation growth in the west diversion channel will continue to be monitored during annual inspections to ensure that it does not negatively affect the performance of this surface water diversion structure (PL-10). No maintenance needs were identified.

12.9 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), 2006. *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site,* DOE-LM/GJ1139-2006, March.

DOE (U.S. Department of Energy), 2007. *Long-Term Surveillance Plan for the Mexican Hat, Utah (UMTRCA Title I), Disposal Site, San Juan County, Utah,* DOE-LM/1530-2007, Rev. 3, October.

DOE (U.S. Department of Energy), 2017. *2016 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites,* LMS/S15036, Office of Legacy Management, March.

DOE (U.S. Department of Energy), 2019a. *Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site*, LMS/HAT/S20483, Rev. 1, Office of Legacy Management, January.

DOE (U.S. Department of Energy), 2019b. *Mexican Hat UMTRCA Disposal Cell Side Slope Cover Depressions Evaluation Report, Mexican Hat, Utah*, LMS/HAT/S14765, Office of Legacy Management, January.

DOE (U.S. Department of Energy), 2019c. *Seep Monitoring Evaluation Report, Mexican Hat, Utah, UMTRCA Title I Disposal Site*, LMS/HAT/S15190, Office of Legacy Management, December.

12.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	135	Entrance Gate
PL-2	20	ICP Stockpiles with System Operation and Analysis at Remote Sites (SOARS) Weather Monitoring Station in Background
PL-3	150	UAS Warning Sign
PL-4	20	UAS Warning Sign
PL-5	90	Site Marker SMK-1
PL-6	90	Site Marker SMK-2
PL-7	135	Aerial Survey Quality Control Monument QC5
PL-8	45	Top of Cell – Looking Northeast
PL-9	245	Sloughed Rock Area on South Apron
PL-10	345	West Diversion Channel
PL-11	315	Northeast Toe Drain
PL-12	330	Sloughed Rock Approaching Fence
PL-13	60	Road Repair Area
PL-14	315	ICP Storage Area
PL-15	45	ICP Stockpiles
PL-16	270	Seep 0248
PL-17	290	Seep 0249
PL-18	180	Seep 0251
PL-19	180	Seep 0261
PL-20	215	Seep 0264

PL-1. Entrance Gate

PL-2. ICP Stockpiles with System Operation and Analysis at Remote Sites (SOARS) Weather Monitoring Station in Background

PL-3. UAS Warning Sign

PL-4. UAS Warning Sign

PL-5. Site Marker SMK-1

PL-6. Site Marker SMK-2

PL-7. Aerial Survey Quality Control Monument QC5

PL-8. Top of Cell – Looking Northeast

PL-9. Sloughed Rock Area on South Apron

PL-10. West Diversion Channel

PL-11. Northeast Toe Drain

PL-12. Sloughed Rock Approaching Fence

PL-13. Road Repair Area

PL-14. ICP Storage Area

PL-15. ICP Stockpiles

PL-16. Seep 0248

PL-17. Seep 0249

PL-18. Seep 0251

PL-19. Seep 0261

PL-20. Seep 0264

13.0 Naturita, Colorado, Disposal Site

13.1 Compliance Summary

The Naturita, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on June 10, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection.

Groundwater monitoring is not required and was discontinued in 2014. The site-specific U.S. Department of Energy (DOE) Long-Term Surveillance Plan (LTSP) was revised in 2019 to exclude the groundwater monitoring requirement (DOE 2019).

13.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the LTSP 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 13-1 lists these requirements.

Table 13-1. License Requirements for the Naturita, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.2, 3.3	Section 13.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 13.5	(b)(4)
Site Maintenance	Section 3.5.1	Section 13.6	(b)(5)
Environmental Monitoring	Section 3.6	Section 13.7	(b)(2)
Emergency Measures	Section 3.5.2	Section 13.8	--

13.3 Institutional Controls

The 26.65-acre site, identified by the property boundary shown in Figure 13-1, is owned by the United States and was accepted under the NRC general license in 1999. 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 gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

13.4 Inspection Results

The site, 13 miles northwest of Naturita, Colorado, was inspected on June 10, 2020. The inspection was conducted by C. Wentz, D. Atkinson, and K. Meadows of the Legacy Management Support (LMS) contractor. A. Denny, the Office of Legacy Management (LM) site manager, and J. Carman of LMS attended the inspection. Due to the novel coronavirus and resulting travel restrictions in place at that time, the representative from the Colorado

Department of Public Health and Environment was not in attendance. 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.

13.4.1 Site Surveillance Features

Figure 13-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red font. 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 13-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 13.10.

13.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is from Colorado Highway 141 to Montrose County Road EE22, which borders the northeast side of the site. Entrance to the site is through a locked steel gate directly off County Road EE22. One hinge on the entrance gate was damaged, but the gate was locked and functional (PL-1). The hinge was repaired after the inspection. The entrance sign, next to the entrance gate, was missing at the time of the inspection but replaced following the inspection. No other maintenance needs were identified.

13.4.1.2 Perimeter Fence and Signs

A barbed-wire perimeter fence encloses the site. Inspectors identified two loose fence strands near perimeter signs P13 and P18. These were repaired following the inspection.

There are 25 perimeter signs positioned along the perimeter fence attached to steel posts set in concrete and set back 5 feet. Perimeter sign P5 was missing and was replaced following the inspection. Inspectors continue to monitor the erosion around the concrete base of P22. No other maintenance needs were identified.

Two new unmanned aircraft system (UAS) warning signs were installed following the 2020 inspection. One sign was installed at the entrance area (PL-2), and the other was installed on the southeast corner of the site between perimeter sign P7 and boundary monument BM-17.

13.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 (PL-3) is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

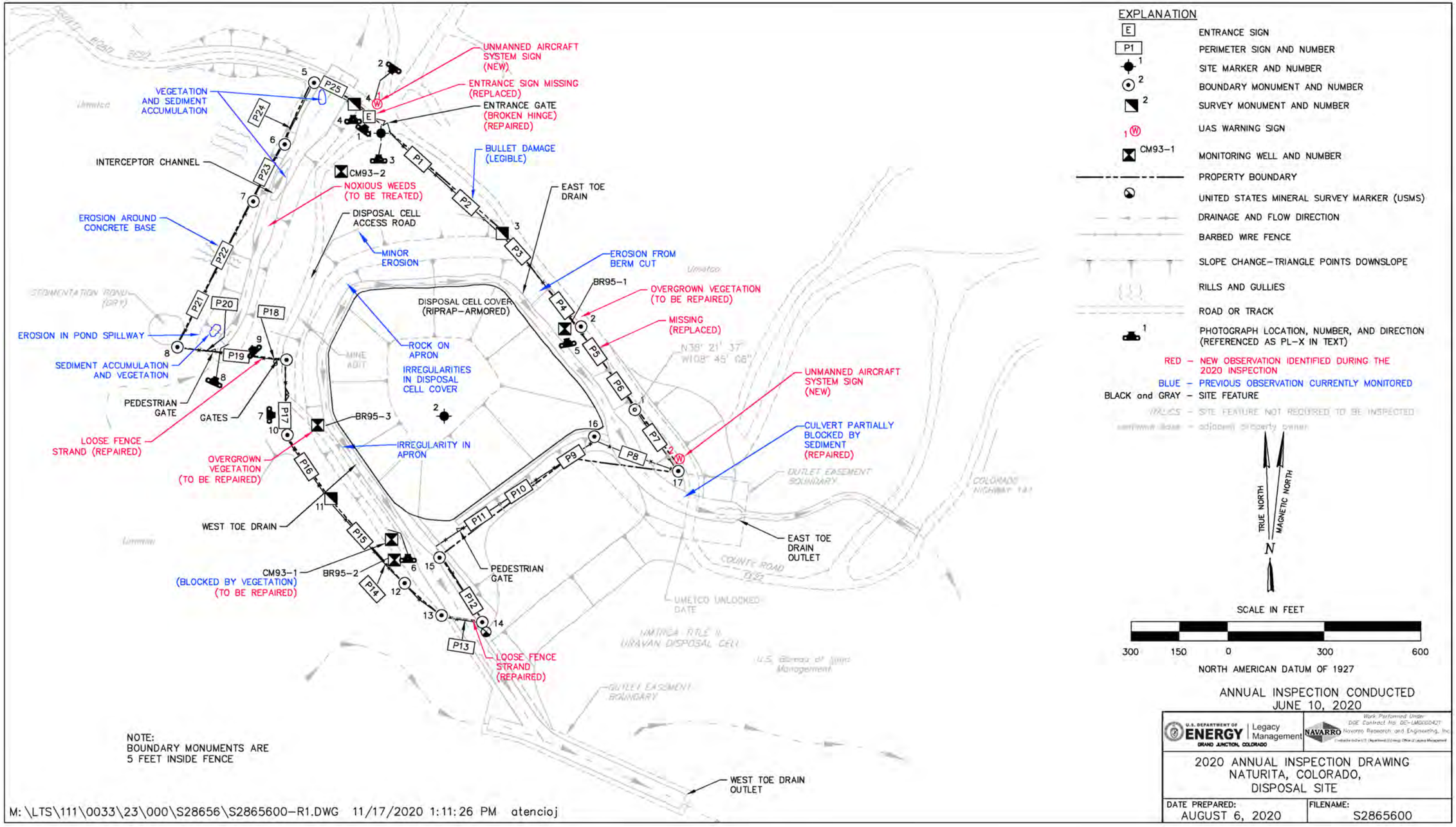

Figure 13-1. 2020 Annual Inspection Drawing for the Naturita, Colorado, Disposal Site

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13.4.1.4 Survey and Boundary Monuments

Three survey monuments and 14 boundary monuments delineate the property boundary. Boundary monuments BM-1 through BM-17 mark the property corners. Survey monuments SM-3, SM-4, and SM-11 represent boundary monuments BM-3, BM-4, and BM-11, respectively (PL-4). No maintenance needs were identified.

13.4.1.5 Aerial Survey Quality Control Monuments

Aerial survey quality control monuments are scheduled to be installed before the next inspection in 2021.

13.4.1.6 Monitoring Wells

The site has five groundwater monitoring wells. The wellhead protectors were undamaged and locked. Monitoring wells CM93-1, BR95-3, and BR95-1 all were completely surrounded by woody vegetation (PL-5 and PL-6). Sampling of the wells is not required, and the vegetation will be addressed upon well abandonment, planned for fiscal year 2021. No immediate maintenance needs were identified.

13.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the remainder of the site, and (3) the outlying area. 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.

13.4.2.1 Disposal Cell

The disposal cell, completed in 1998, occupies 10 acres (PL-7). The disposal cell is armored with riprap to control erosion. The riprap is rounded, with larger diameter rock on the side slopes than on the top slope. There was no evidence of settling, slumping, erosion, rock degradation, or other modifying processes that might affect the integrity of the disposal cell.

Irregularities in the riprap on the top slope of the disposal cell continue to be observed. The irregularities consist of slightly darker rock that are not lower than surrounding areas and have not changed over time. Another irregularity in the apron area on the west side of the disposal cell appears to be old vehicle tracks. The irregularity does not present a hazard to the disposal cell or surrounding area. Inspectors will continue to monitor these areas. As first identified in the 2019 inspection, a large boulder rests on the northeast side of the disposal cell apron, a presumed result of erosion from the steep cliff above the disposal cell. Inspectors will continue to monitor for potential impacts. No other maintenance needs were identified.

13.4.2.2 Remainder of the Site

Two riprap-armored toe drains (the west and east toe drains) collect water from the disposal cell side slopes and divert it to the southeast. The west toe drain outlet is south of the site in an

easement. Soft bedrock is being eroded near the west toe drain outlet, but that erosion does not threaten the performance of the toe drain, and repairs are not necessary. The east toe drain outlet is southeast of the site in an easement. Water is conveyed to the east toe drain outlet through the east toe drain and five culverts under County Road EE22. Vegetation continues to grow in the accumulating sediment just outside the culverts, potentially blocking stormwater flow through the culverts. The vegetation growth was addressed before the 2020 inspection. Erosion has exposed resistant bedrock near the east toe drain outlet but does not threaten the performance of the toe drain, and repairs are not necessary. Some sediment has accumulated in the upper end of the east and west toe drains, allowing scattered vegetation to grow, but this has not adversely affected the performance of the toe drains.

A riprap-armored interceptor channel, upgradient and northwest of the disposal cell, diverts stormwater and snowmelt runoff to the northeast under County Road EE22. Some sediment has eroded from the offsite area upslope from the channel and is being deposited in the channel. Sediment accumulation and associated vegetation have not adversely affected the performance of the interceptor channel (PL-8). Herbicide treatment of rabbitbrush plants is ongoing.

The area south of monitoring well CM93-2 upgradient of the disposal cell is showing signs of erosion, as identified during the 2019 inspection. When inspected this year, the erosion did not seem to have increased significantly and does not present a hazard to the disposal cell or to any site features. Inspectors will continue to monitor this area for ongoing erosion.

The disposal cell access road along the northwest side of the site descends through shale and sandstone units of the Salt Wash Member of the Morrison Formation. The road provides access to the disposal cell and monitoring wells on the west side of the site. No other maintenance needs were identified.

Erosion in the steep cliff below the previous berm cut alongside County Road EE22 does not pose a current threat to the integrity of the disposal cell or site features. Inspectors will continue to monitor this area. No other maintenance needs were identified.

13.4.2.3 Outlying Area

The surrounding 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. The area has been highly disturbed by mining, quarrying, reclamation, and road building.

Headcutting erosion identified during the 2019 inspection within the spillway channel below the sedimentation pond on the outlying area northwest of the site (PL-9) continues to show signs of erosion within the channel. Sedimentation from this area appears to be deposited in the interceptor channel but does not pose a problem at this time. Inspectors will continue to monitor this area for ongoing erosion and resulting impacts, if any.

13.5 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.

13.6 Maintenance and Repair

The sediment partially blocking the culverts on the south side of the cell, identified in the 2019 inspection, was removed before the 2020 inspection.

Inspectors documented minor maintenance needs that were completed following the 2020 inspection, including:

- Replacement of the entrance sign.
- Replacement of perimeter sign P5.
- Repair hinge on entrance gate.
- Repair of loose fence strands near perimeter signs P13 and P18.
- Installation of UAS warning signs at the entrance gate and between perimeter sign P7 and boundary monument BM-17.

Rabbitbrush growing in the interceptor channel will be treated before the next inspection.

13.7 Environmental Monitoring

In accordance with the LTSP, LM conducts vegetation monitoring. A plant specialist or other qualified person will periodically conduct vegetation monitoring.

If volunteer plant growth or sedimentation occurs to the point that the function of engineered structures might be degraded, DOE will evaluate the potential impact and select appropriate responses (DOE 2019). A rabbitbrush plant (a deep-rooted woody species) growing in the deposited sediment in the interceptor channel was identified and will be treated before the next inspection. No other maintenance needs were identified.

13.8 Emergency Measures

Emergency measures are actions DOE will take in response to "unusual damage or disruption" that threatens or compromises site safety, security, or integrity (10 CFR 40 Appendix A Criterion 12). No need for emergency measures was identified.

13.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2019. *Long-Term Surveillance Plan for the Naturita, Colorado Disposal site*, LMS/NAD/S13227, December.

13.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	35	Site Entrance Gate with Detached Hinge
PL-2	215	New Entrance Sign with Unmanned Aircraft System Sign
PL-3	0	Site Marker SMK-1
PL-4	—	Survey Monument SM-4
PL-5	350	Overgrown Vegetation Around Well BR95-1
PL-6	0	Overgrown Vegetation Around Well CM93-1
PL-7	90	Perimeter Sign P17; Disposal Cell in Background
PL-8	25	Sediment Accumulation and Vegetation in Interceptor Channel
PL-9	315	Spillway Above Interceptor Channel

Note:
— = Photograph taken vertically from above.

PL-1. Site Entrance Gate with Detached Hinge

PL-2. New Entrance Sign with Unmanned Aircraft System Sign

PL-3. Site Marker SMK-1

PL-4. Survey Monument SM-4

PL-5. Overgrown Vegetation Around Well BR95-1

PL-6. Overgrown Vegetation Around Well CM93-1

PL-7. Perimeter Sign P17; Disposal Cell in Background

PL-8. Sediment Accumulation and Vegetation in Interceptor Channel

PL-9. Spillway Above Interceptor Channel

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14.0 Rifle, Colorado, Disposal Site

14.1 Compliance Summary

The Rifle, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on August 25, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection.

The disposal cell dewatering system is activated when the interior water elevation reaches 6016 feet (ft); this is called the pump trigger level. This level has been exceeded when (1) solar-powered pumps are nonoperational (at night and when sunlight is insufficient); (2) temperatures are below freezing; and (3) maintenance is being performed. However, pore-water levels in standpipes SP-2 and SP-3 have remained below the geotextile liner at 6020 ft, preventing water from overtopping the disposal cell liner. Groundwater quality monitoring is not required.

14.2 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 1997) 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 14-1 lists these requirements.

Table 14-1. License Requirements for the Rifle, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 14.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 14.5	(b)(4)
Maintenance and Repairs	Section 4.0	Section 14.6	(b)(5)
Groundwater Monitoring	Section 2.6	Section 14.7	(b)(2)
Disposal Cell Pore-Water Level Monitoring	Appendix	Section 14.8	—
Corrective Action	Section 5.0	Section 14.9	—

14.3 Institutional Controls

The 205-acre site, identified by the property boundary shown in Figure 14-1, is owned by the United States and was accepted under the NRC general license in 1998. The U.S. Department of Energy (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 and sign, stock fence, perimeter signs, site markers, survey and boundary monuments, standpipes, and evaporation pond.

14.4 Inspection Results

The site, 6 miles north of Rifle, Colorado, was inspected on August 25, 2020. The inspection was conducted by D. Holbrook, M. Kastens, and B. Mays of the Legacy Management Support contractor. T. Jasso, the Office of Legacy Management (LM) site manager, and M. Cosby, of Colorado Department of Public Health and Environment, 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.

14.4.1 Site Surveillance Features

Figure 14-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are identified in the following subsections. Photographs to support specific observations are identified in the text and in Figure 14-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 14.11.

14.4.1.1 Access Road, Entrance Gates, and Entrance Sign

Access to the site is from an improved gravel road northeast of Colorado Highway 13. A perpetual right-of-way across U.S. Bureau of Land Management (BLM) property provides access to the site. Entrance to the site is through two locked gates on the access road: an outer reinforced metal gate about 1700 ft south of the site and an inner metal gate at the stock fence. Tumbleweed accumulation was observed at the entrance gate and was removed following the inspection (PL-1). The entrance sign, which is next to the inner gate, had minor cracks but remained legible. No other maintenance needs were identified.

14.4.1.2 Stock Fence and Perimeter Signs

A four-strand barbed-wire stock fence at the south end of the site extends to the edge of steep-sided arroyos that bound the site on the east and west. In previous years, livestock associated with an adjacent BLM grazing allotment would go around the fence to graze onsite vegetation. Results from the 2020 inspection showed evidence of continued livestock grazing. Onsite grazing is discussed further in Section 14.4.2.3. The strands of the barbed-wire fence were intact but needed repair in several places (PL-2). Two barbed-wire personnel gates are at the southeast corner of the site. The northern gate, which provides access to DOE property, was locked with a chain and padlock. The southern gate is left open to allow livestock on the adjacent BLM allotment to pass through the fence.

There are 27 perimeter signs positioned along the perimeter. Perimeter signs P0 through P11 are attached to the stock fence, and signs P12 through P26 are attached to steel posts set in concrete and set back 5 ft from the boundary. Inspectors noted that perimeter signs P15 and P19 had bullet damage, but they remain legible and do not need to be replaced at this time. Perimeter sign P18 had minor cracks and peeling but remains legible. No other maintenance needs were identified.

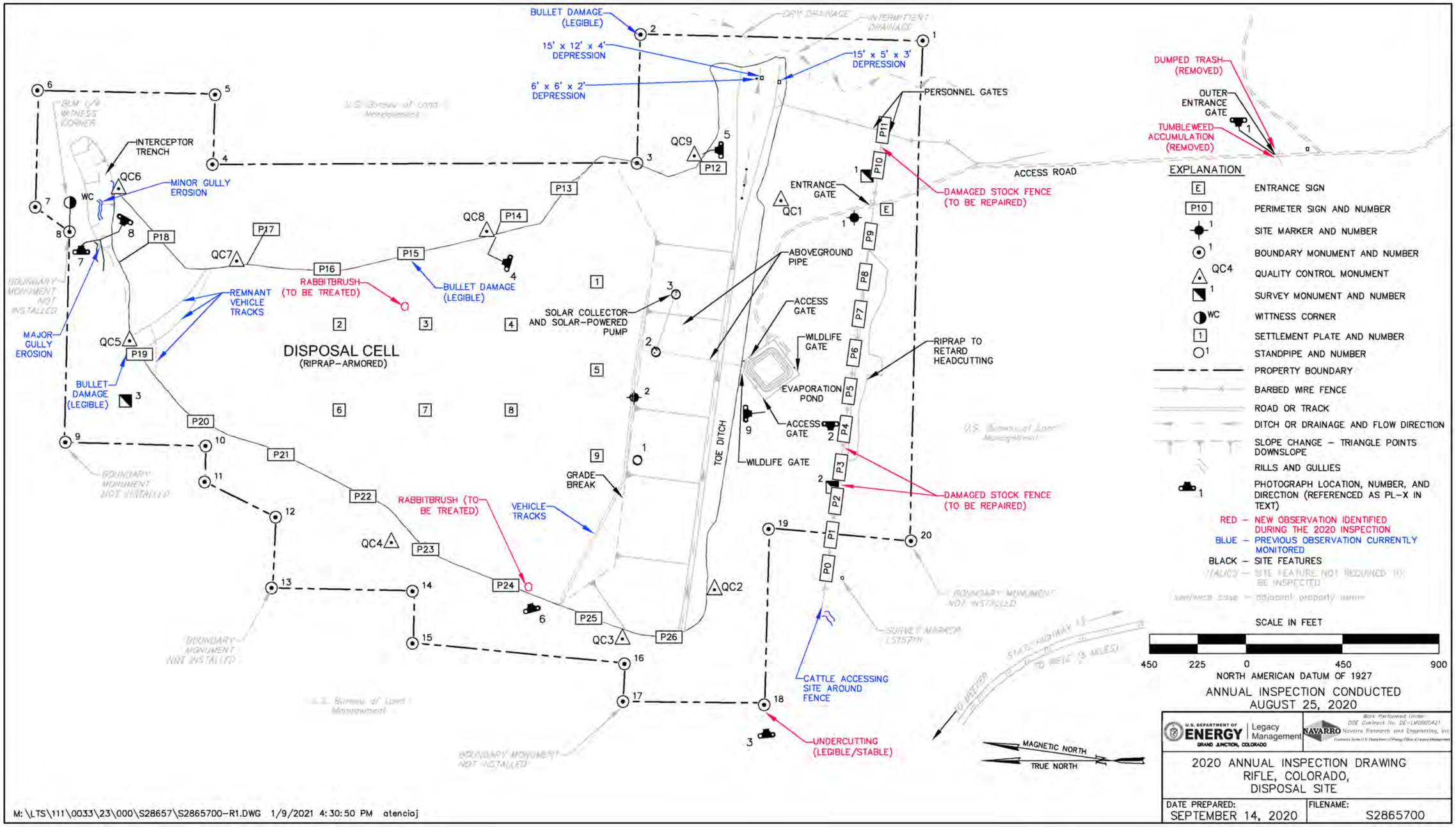

Figure 14-1. 2020 Annual Inspection Drawing for the Rifle, Colorado, Disposal Site

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14.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the inner entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

14.4.1.4 Survey and Boundary Monuments

Three survey monuments and 15 boundary monuments delineate the property boundary. The boundary monuments are set at the corners of the irregular site boundary. Although the site boundary has 20 corners, only 15 are marked by boundary monuments because 5 of the corners are on extremely steep terrain that is not safely accessible. Consequently, boundary monuments BM-8, BM-9, BM-13, BM-17, and BM-20 were never installed. Several of the existing boundary monuments are difficult to locate because they are installed in steep, hard-to-access areas. Inspectors located all boundary monuments with a GPS unit. Boundary monument BM-2 has several bullet holes but remains intact. Boundary monument BM-18 has undercutting at the ground surface but remains legible and stable (PL-3). No maintenance needs were identified.

14.4.1.5 Aerial Survey Quality Control Monuments

Nine aerial survey quality control monuments installed in 2019 were inspected during the 2020 annual inspection. Inspectors noted sediment accumulation on quality control monument QC8 and vegetation growth around quality control monument QC9, obstructing their visibility (PL-4 and PL-5). T-posts will be installed to help locate the quality control monuments. No other maintenance needs were identified.

14.4.1.6 Standpipes

Three standpipes (SP-1–SP-3) on the south side slope of the disposal cell are used to monitor pore-water levels in the disposal cell. At the time of the inspection, disposal cell pore water was being pumped from standpipes SP-2 and SP-3 (also known as monitoring wells 02 and 03, respectively) into the evaporation pond. Redevelopment of standpipe SP-2 is scheduled for fiscal year (FY) 2021.

14.4.1.7 Evaporation Pond

A lined evaporation pond was constructed adjacent to the disposal cell in 2001 to receive water pumped from standpipes SP-2 and SP-3. It contained water at the time of the inspection. Evaluation of the pond liner's integrity is scheduled for fall 2020. The chainlink security fence around the pond was intact and effectively prevents livestock from entering the area. The vehicular access gates on the north and west corners of the fence were closed and locked at the time of the inspection.

A meteorological station alongside the pond was functioning normally. No other maintenance needs were identified.

14.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) onsite reclaimed areas, and (4) the outlying area. Inspectors examined specific site surveillance features within each area and looked for evidence of settlement, erosion, or other modifying processes that might affect the site's conformance with LTSP requirements.

14.4.2.1 Disposal Cell and Interceptor Trench

The disposal cell, completed in 1996, occupies 71 acres and is armored with riprap consisting of river cobbles and boulders to control erosion and deter animal and human intrusion. There was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell. As in the past several inspections, inspectors noticed minor rock degradation on the disposal cell top slope, primarily in the form of cracking and spalling. Rock degradation does not present a concern at this time.

Remnant vehicle tracks, which formed on the cover during well decommissioning activities in 2002, remain evident in the north portion of the disposal cell. Additional vehicle tracks continue to be visible in the south portion of the disposal cell; these were made during installation of solar panels and pumps at standpipes SP-2 and SP-3.

In the early 2000s, inspectors became concerned that the steep slopes of the disposal cell cover, particularly in the north portion, could lead to slope instability. In response, LM conducted annual three-dimensional surveys of the rock cover between 2006 and 2011. The surveys confirmed that the rock cover was stable.

Two deep-rooted, woody rubber rabbitbrush plants were found on the cell top (PL-6). The plants will be treated with herbicide before the 2021 inspection. Small, isolated patches of other grasses and annual weeds also were present on the disposal cell cover and side slope, but they do not present a concern.

A vegetated interceptor trench was constructed at the top of the disposal cell to protect the disposal cell from stormwater and snowmelt runoff. The trench appeared to be functioning as designed, although minor gully erosion has been occurring in the lower portion of the trench. The gully did not appear to be increasing in depth or width (PL-7); the deepest downcut was approximately 18 inches deep and 24 inches wide. In the outfall area below the trench (down the steep-sided natural slope), stormwater runoff has formed a major gully to the north of the armoring riprap placed in this area in the early 2000s. The gully did not appear to be increasing in depth or width (PL-8). The outfall area will continue to be monitored to assess if additional riprap will need to be placed on the slope to prevent upstream gully migration. No maintenance needs were identified.

14.4.2.2 Toe Ditch and Toe Ditch Outlet

A toe ditch runs along the downslope (south) edge of the disposal cell and is armored with the same rock that protects the disposal cell. The toe ditch diverts stormwater runoff from the disposal cell offsite to the east. The ditch was stable and functioning as designed.

Minor erosion, anticipated in the design, remains evident in the channel at the toe ditch outlet. Rock previously placed in the outlet to stabilize the erosion has dropped into and armored the eroded areas. Inspectors found two depressions in the rock during the 2017 annual inspection (one about 15 × 12 ft in area and 4 ft deep and one about 6 × 6 ft in area and 2 ft deep) and another depression during the 2018 annual inspection (about 15 × 5 ft in area and 3 ft deep). These depressions were formed after the underlying soil eroded away. They are not a concern at this time but will continue to be monitored. No maintenance needs were identified.

14.4.2.3 Onsite Reclaimed Areas

Disturbed areas around the edges and south of the disposal cell were reseeded in 1996 and, overall, have been successfully reclaimed. Before 2012, there was little evidence of cattle or sheep grazing within the site boundaries. Since 2012, however, heavy grazing by cattle has been observed regularly. Because the site was deemed unsuitable for livestock grazing, LM contacted BLM in 2018 to address this issue while inspectors noticed continued evidence of significant grazing on the site in 2020 (PL-9). LM has met with BLM and the grazing lessee and will continue monitoring and discussing BLM practices.

Three arroyos are present in the reclaimed area south of the disposal cell and outside the stock fence. A rock apron was placed between the stock fence and the headcuts in these arroyos to prevent headward migration toward the disposal cell. As erosion has migrated into the rock apron, the rock has naturally armored the arroyos and effectively stabilized them from further erosion. Inspectors will continue to monitor this area. No maintenance needs were identified.

14.4.2.4 Outlying Area

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. The primary land uses in the area are grazing, hunting, recreation, and wildlife habitat. Historically, trash has been dumped along the access road between Highway 13 and the outer entrance gate, and BLM has periodically removed it. During the 2020 inspection, a new pile of trash was observed near the outer entrance gate and was removed. No other changes to the outlying area were observed.

14.5 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.

14.6 Maintenance and Repairs

Inspectors documented the following maintenance and repair needs in 2020; these will be addressed before the 2021 annual inspection:

- Repair damaged stock fence
- Install T-posts next to quality control monuments
- Treat the two rabbitbrush plants on top of the disposal cell with herbicide

14.7 Groundwater Monitoring

Groundwater quality monitoring is not required by the LTSP (DOE 1997). Transient drainage from the disposal cell enters the Wasatch Formation, a 3800-foot-thick sequence of shales, siltstones, and fine-grained sandstones (DOE 1997). The Wasatch separates the disposal cell from the uppermost useable aquifer (the Mesaverde Group). Groundwater in the Wasatch Formation is classified as limited use due to naturally occurring concentrations of total dissolved solids that exceed 10,000 milligrams per liter (DOE 1997). Additionally, this unit produces very little water and is not considered to be an aquifer. Ambient levels of barium, cadmium, chromium, lead, molybdenum, selenium, and combined radium-226 and radium-228 exceed maximum concentration limits. The Wasatch Formation does not represent a useable source of water, and no exposure pathways to site-related groundwater exist at the site. Further groundwater monitoring is not required (DOE 1997). All monitoring wells at the site were decommissioned in 2002.

14.8 Disposal Cell Pore-Water Level Monitoring

In accordance with the LTSP, LM monitors pore-water levels in the disposal cell at standpipes SP-2 and SP-3, installed at the downgradient end of the disposal cell on the south side slope (Figure 14-1). This monitoring is performed to ensure that pore water in the disposal cell does not rise above a high-density polyethylene (HDPE) liner that was installed in the toe of the disposal cell at an elevation of 6020 ft during original construction. The bottom of standpipe SP-1 is at an elevation of 6021.4 ft; as such, it continues to be dry and does not require continuous monitoring.

A contingency plan for control of pore-water levels at the toe of the disposal cell was appended to the LTSP. The plan required installation of a dewatering system and evaporation pond when the water level reached an elevation of 6014 ft and initiation of dewatering at an elevation of 6016 ft. The 6014 ft action level was reached in 2001, and the 6016 ft action level was reached in 2003. As required by the contingency plan, the evaporation pond was constructed in 2001. Daytime pumping under solar power from standpipes SP-2 and SP-3 to the evaporation pond began in 2003 and continued until September 2006, when it was concluded that standpipe SP-2 could not sustain prolonged pumping due to consistent lack of sufficient recharge. Although pumping at standpipe SP-2 was discontinued at that time, the datalogger remained, and water-level monitoring continued at this standpipe. Pumping at standpipe SP-2 was restarted in June 2018, with the objective of more effectively dewatering the disposal cell toe. Water pumped from the standpipes is discharged through an aboveground polyethylene pipe to the evaporation pond.

Pore-water levels in standpipes SP-2 and SP-3 have shown a rising trend since 2011 but remained below the 6016 ft pump trigger level until 2016 for standpipe SP-3 and 2017 for standpipe SP-2 (Figure 14-2). While the 6016 ft pump trigger level has been exceeded, pore-water levels in both standpipes SP-2 and SP-3 have been maintained by pumping to remain below the top of the HDPE liner elevation of 6020 ft. In compliance with requirements of the LTSP, pumping will continue until water levels in the standpipes stabilize at an elevation of 6014 ft or lower. Table 14-2 lists total dewatering volumes.

Table 14-2. Total Dewatering Volumes at the Rifle, Colorado, Disposal Site

Reporting Years	Annual Dewatering Volumes (gals)	Annual Dewatering (gals per day)	Cumulative Dewatering Volumes (gals)
2008	143,110	392.08	143,110
2009	389,618	1067.45	532,728
2010	215,569	590.60	748,297
2011	61,434	168.31	809,731
2012	155,189	425.18	964,920
2013	106,267	291.14	1,071,187
2014	138,574	379.65	1,209,761
2015	30,948	84.79	1,240,709
2016	168,555	461.79	1,409,263
2017	87,741	240.39	1,497,005
2018	160,191	438.88	1,657,196
2019	247,537	678.18	1,904,733
2020	177,712	486.88	2,082,445

Abbreviation:
gals = gallons

Pore-water levels in standpipe SP-2 did not reach the pump trigger level until 2018. Real-time disposal cell water elevations collected in 2018 (using pressure transducers and dataloggers) continued to indicate that daily maximum or static pore-water levels in standpipes SP-2 and SP-3 exceed the 6016 ft pump trigger level (Figure 14-2). In 2019, LM modified the seasonal pumping regimen to pump year-round while a long-term solution is evaluated and implemented.

In Figure 14-2, data fluctuations for standpipe SP-2 observed from 2018 to 2020 are the result of seasonal variability and partial overnight recharge due to well inefficiencies. Water levels for standpipe SP-2 generally remain below the 6016 ft trigger level in the summers where longer days and greater solar exposure allows for more frequent pumping, which prevents substantive overnight recharge. Downhole video in both standpipes revealed fouling in the screened interval. Redevelopment of standpipe SP-2 to remove mineral scale and biofouling was conducted in fall 2020. The dewatering system will be upgraded and optimized in spring 2021 to allow for additional pumping during periods of low solar exposure. LM is currently investigating the cause of the rising pore-water elevation trends and other potential sources of recharge and will keep NRC informed of mitigation actions as they are developed.

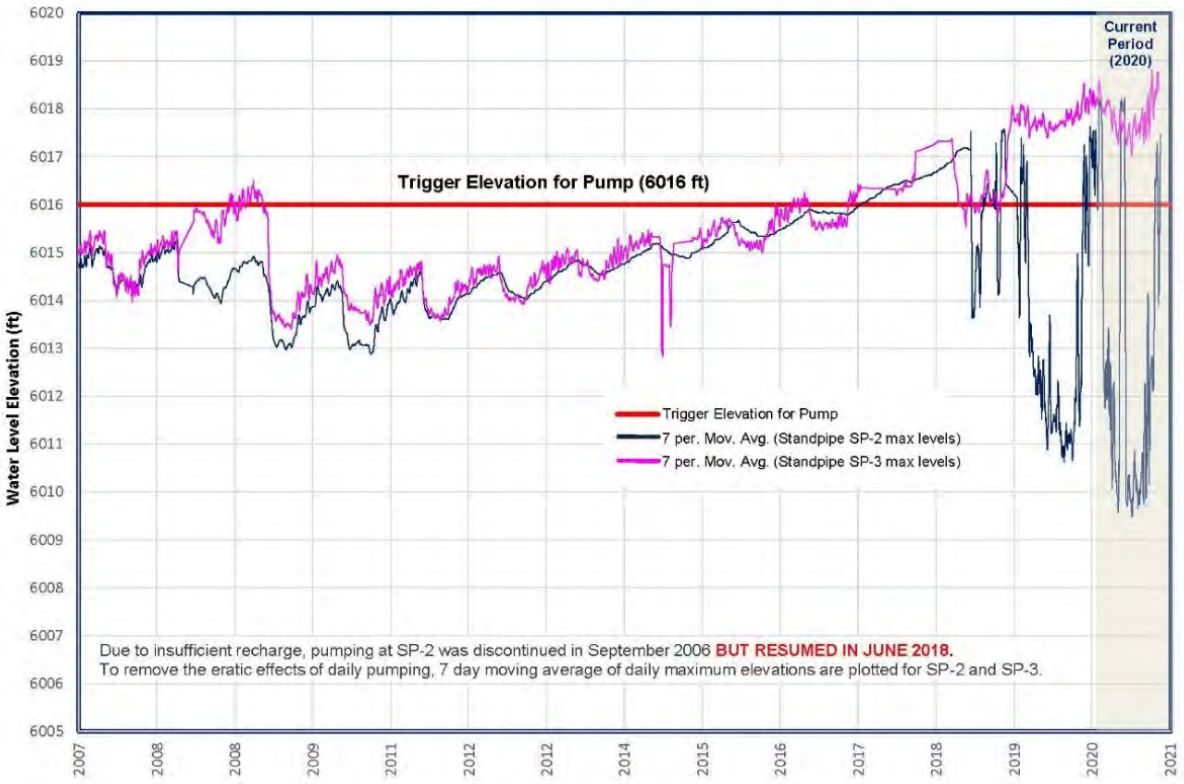


Figure 14-2. Disposal Cell Pore-Water Levels in Standpipes SP-2 and SP-3 at the Rifle, Colorado, Disposal Site

14.9 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

14.10 References

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*.

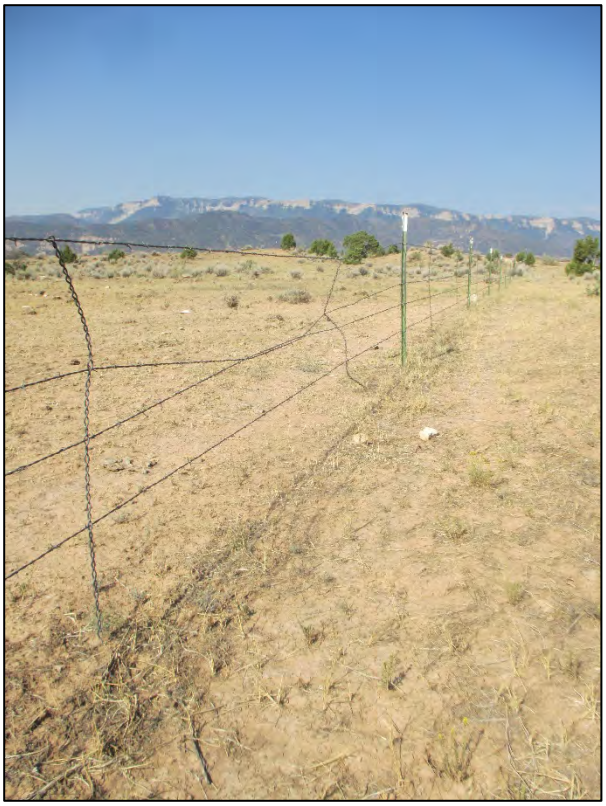
40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the Estes Gulch Disposal Site near Rifle, Colorado*, DOE/AL/62350-235 Rev. 1, November.

14.11 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	260	Tumbleweed Accumulation Near Outer Gate
PL-2	270	Fence Damage
PL-3	85	Boundary Monument BM-18 with Undercutting
PL-4	15	Quality Control Monument QC8 Covered with Sediment
PL-5	0	Quality Control Monument QC9 Obscured by Vegetation
PL-6	75	Deep-Rooted Woody Plant—Rabbitbrush—on Cell Cover
PL-7	90	(a) Minor Gully Erosion at Interceptor Trench in 2020 (b) Minor Gully Erosion at Interceptor Trench in 2016
PL-8	300	(a) Major Gully Erosion in Interceptor Trench Outfall in 2020 (b) Major Gully Erosion in Interceptor Trench Outfall in 2016
PL-9	180	Heavily Grazed Vegetation

PL-1. Tumbleweed Accumulation Near Outer Gate



PL-2. Fence Damage

PL-3. Boundary Monument BM-18 with Undercutting

PL-4. Quality Control Monument QC8 Covered with Sediment

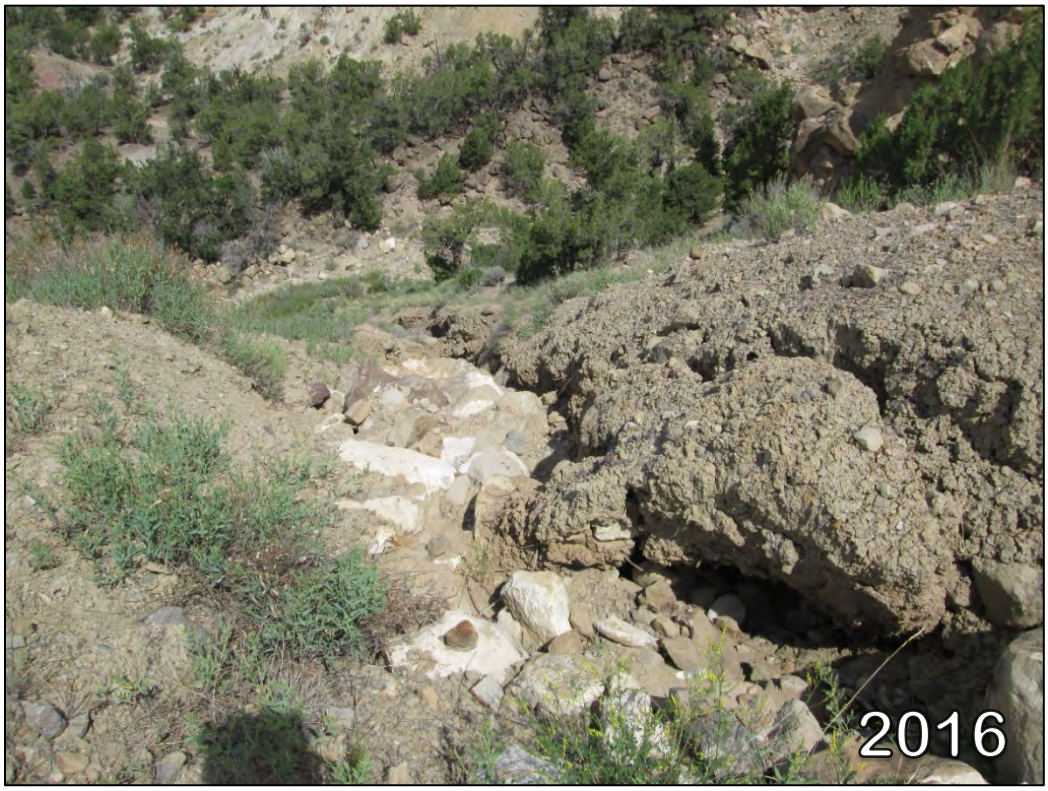
PL-5. Quality Control Monument QC9 Obscured by Vegetation

PL-6. Deep-Rooted Woody Plant—Rabbitbrush—on Cell Cover

PL-7a. Minor Gully Erosion at Interceptor Trench in 2020

PL-7b. Minor Gully Erosion at Interceptor Trench in 2016

PL-8a. Major Gully Erosion in Interceptor Trench Outfall in 2020



PL-8b. Major Gully Erosion in Interceptor Trench Outfall in 2016

PL-9. Heavily Grazed Vegetation

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15.0 Salt Lake City, Utah, Disposal Site

15.1 Compliance Summary

The Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on July 14, 2020. No changes were observed on the disposal cell or in associated drainage features. Observations of rock-quality monitoring plots indicated no significant change from the previous year. Inspectors identified one routine maintenance need but found no cause for a follow-up inspection. Maintenance needs that could be addressed during the inspection were completed by inspectors. Groundwater monitoring is not required.

15.2 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 1997) 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 15-1 lists these requirements.

Table 15-1. License Requirements for the Salt Lake City, Utah, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 3.0	Section 15.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 15.5	(b)(4)
Maintenance and Repairs	Section 5.0	Section 15.6	(b)(5)
Groundwater Monitoring	Section 4.0	Section 15.7	(b)(2)
Corrective Action	Section 6.0	Section 15.8	--

15.3 Institutional Controls

The 100-acre site, identified by the property boundary shown in Figure 15-1, is owned by the United States and was accepted under the NRC general license in 1997. The U.S. Department of Energy 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 and sign, fences, perimeter (warning) signs, site markers, and boundary monuments.

15.4 Inspection Results

The site, 81 miles west of Salt Lake City, Utah, was inspected on July 14, 2020. The inspection was conducted by J. Lobato and D. Atkinson of the Legacy Management Support contractor. H. Mickelson, C. Bishop, L. Kellum, and J. Olson (Utah Department of Environmental Quality) attended the inspection. S. Gurr, of EnergySolutions (the private operator of a radioactive waste disposal facility that surrounds the site), escorted the inspection group, and S. Stanley (EnergySolutions) provided support as a radiation control technician (RCT). 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.

15.4.1 Site Surveillance Features

Figure 15-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 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 15-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 15.10.

15.4.1.1 Site Access, Entrance Gates, and Entrance Sign

The site is completely surrounded by the EnergySolutions facility. A perpetual right-of-way easement ensures that the Office of Legacy Management (LM) and its representatives have continued access across the EnergySolutions property to the site. LM also provides EnergySolutions access to the site to perform periodic maintenance activities, as needed, through a signed access agreement. In accordance with the agreement, EnergySolutions is required to provide a minimum 48-hour notice to LM before accessing or conducting maintenance activities at the site.

All personnel entering the EnergySolutions facility must sign in at the security building. Because of the surrounding radioactive waste disposal facility, posted radiological control areas must be crossed to access the site. Therefore, EnergySolutions requires that inspectors and other site visitors receive a radiological hazard awareness briefing, sign the EnergySolutions Radiological Work Permit, wear a dosimeter, and be escorted to and from the site. Hard hats, safety glasses, high-visibility vests, and steel-toed boots are also required on the EnergySolutions property. Following the inspection and before exiting the radiological control area, personnel and equipment are scanned for radiological contamination using a personal contamination monitor.

A route across the EnergySolutions property provides access to the southwest corner of the site. Six locked gates around the site limit access to the site and disposal cell. Two gates (Gates 61 and 64) are in the southwest corner of the property, and one gate (Gate 87) is in the northwest corner of the property; these property boundary gates are maintained by EnergySolutions. The remaining three gates (Gate 65 in the northwest corner and Gates 60 and 62 in the southwest corner) are along the interior chainlink security fence that surrounds the disposal cell; these interior gates are maintained by LM. Gates 60, 61, and 64 are considered site entrance gates. Gates were locked and functional. The entrance sign is on Gate 61. No maintenance needs were identified.

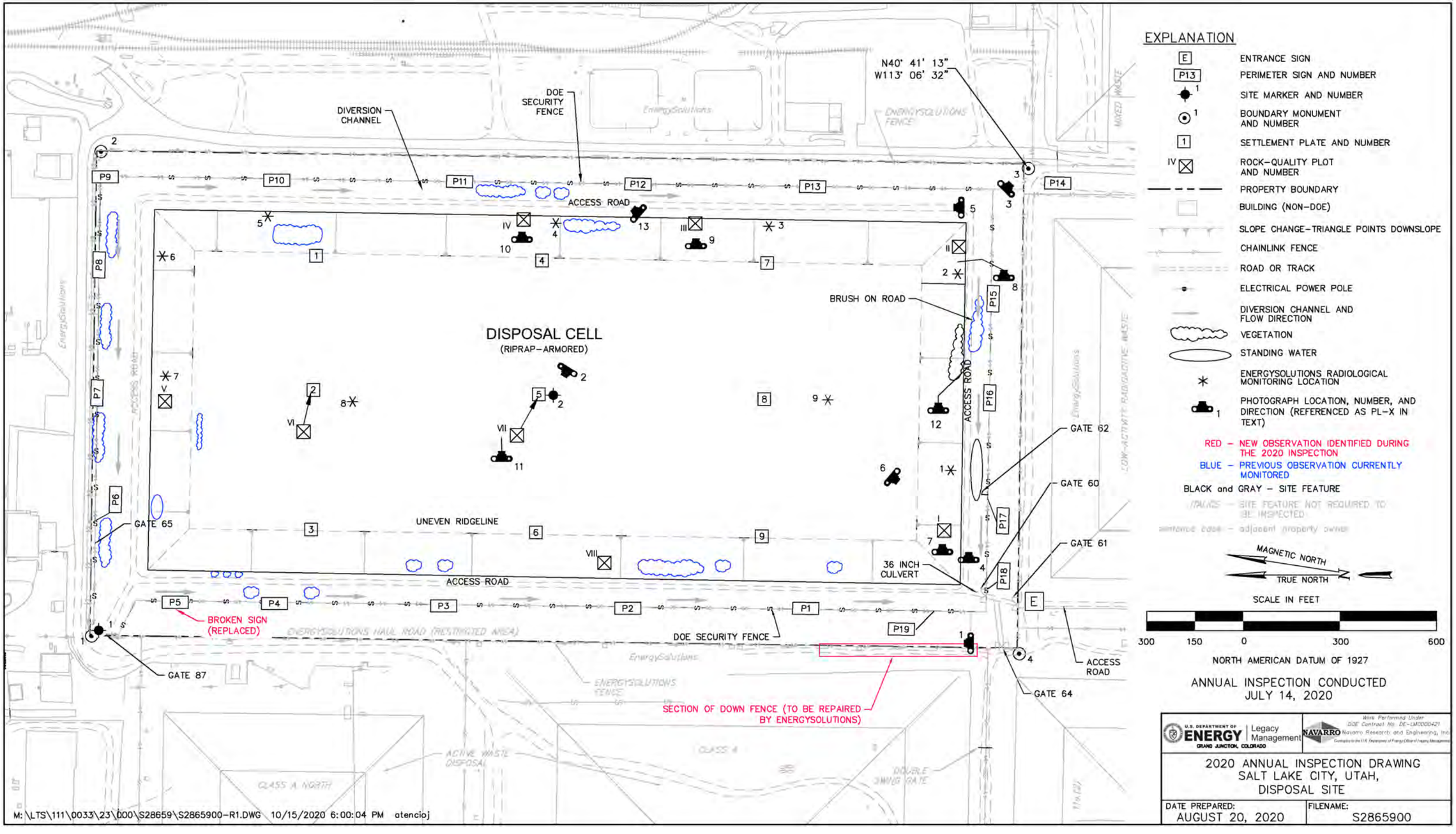

Figure 15-1. 2020 Annual Inspection Drawing for the Salt Lake City, Utah, Disposal Site

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15.4.1.2 Fences and Perimeter Signs

The site has two chainlink fences: the exterior EnergySolutions perimeter fence along the property boundary and the interior LM security fence that encloses the disposal cell and surface water diversion channels. There are 19 perimeter signs attached to the LM security fence. Perimeter sign P5 was observed to be damaged and broken and was replaced during the 2020 annual inspection. A section of the outer chainlink fence just north of Gate 64 was blown down (PL-1). EnergySolutions will repair the down section of fence in before the next inspection.

15.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside Gate 87 in the northwest corner of the site. Site marker SMK-2 is on the top slope of the disposal cell (PL-2). No maintenance needs were identified.

15.4.1.4 Boundary Monuments

Four boundary monuments delineate the corners of the property boundary (boundary monuments BM-1 to BM-4). Protective casings that EnergySolutions installed over each boundary monument continue to protect the boundary monuments from damage by surrounding earthmoving activities (PL-3). No maintenance needs were identified.

15.4.1.5 Aerial Survey Quality Control Monuments

Aerial survey quality control monuments are scheduled to be installed before the next inspection in 2021.

15.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area between the disposal cell and the site perimeter, and (3) the outlying area. 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.

15.4.2.1 Disposal Cell

The disposal cell, completed in 1988, occupies 54 acres (PL-4). The disposal cell is armored with riprap to control erosion (PL-5 and PL-6). There were noticeable vehicle tracks on the east side slope of the disposal cell, but there was no evidence of erosion, settling, slumping, or other modifying processes that might affect the integrity of the disposal cell. No maintenance needs were identified.

One of several types of rock used for the disposal cell erosion-protection riprap layer has exhibited minor degradation since the disposal cell was constructed. As a result, eight rock-quality monitoring plots, each measuring 1 square meter (indicated by Roman numerals I–VIII in Figure 15-1), were established in 2010 to monitor for continued rock degradation.

The rock type exhibiting degradation constitutes approximately 1%–10% of the riprap material; degradation of this less competent rock is thought to result from freeze-thaw weathering. Rock-quality monitoring plots are visually monitored and documented annually with photographs. Approximately 1%–10% of the rock in the plots exhibited signs of weathering during the 2020 annual inspection (PL-7 through PL-11), with no significant changes from the 2019 annual inspection. Comparisons to the initial 2010 rock-quality plot photographs indicate very little (if any) additional rock degradation since monitoring began. The minimal rock degradation observed to date has not reduced the effectiveness of the riprap cover. Rock-quality monitoring plots will continue to be visually monitored and documented annually with photographs to ensure that the riprap continues to protect the integrity of the disposal cell.

Nine settlement plates are on the top slope of the disposal cell; several outer casings associated with the settlement plates were visually inspected. Surveying of the settlement plates is not required unless settlement appears to be occurring. Every year, EnergySolutions performs light detection and ranging (lidar) surveys of the area, including this disposal cell; these lidar survey results are available on request.

Although areas of the disposal cell have continued to have minor perennial grass growth, no deep-rooted plants were growing on the disposal cell. Standing water from stormwater runoff was observed in the apron at the base of the south side slope of the disposal cell toe drainage; no adverse impacts to the disposal cell were noted or expected as a result of this water. No maintenance needs were identified.

15.4.2.2 Area Between Disposal Cell and Site Perimeter

Inspectors examined the area between the toe of the disposal cell and the EnergySolutions security fence on the property boundary. No evidence of erosion was observed. Vegetation continues to encroach along the access road (PL-12), but the road remains functional, and no maintenance is required.

The surface water diversion channels were functioning as designed. Although minor areas of ponded water were observed, vegetation growth in these diversion channels is not impeding stormwater runoff.

Radiological surveys are performed every 2 years on the site by EnergySolutions personnel to confirm the absence of spillover or windblown radioactive contamination from surrounding radioactive waste disposal operations. Survey measurements include taking dose rate measurements at random locations across the site and collecting wipe samples that are analyzed for gross alpha and beta radiation contamination.

Dose rate measurements and wipe samples were collected at various locations around the base of the disposal cell, including on the disposal cell top slope, during the 2019 annual inspection. Nine wipe samples were collected by the EnergySolutions RCT at the specific radiological monitoring locations depicted in Figure 15-1. The RCT also collected dose rate measurements at random locations throughout the duration of the inspection using a handheld meter capable of detecting radiation doses greater than 20 microrem per hour.

Results from radiological surveys conducted at the site to date have been below applicable exposure limits established in LM's *Radiological Control Manual* (LMS/POL/S04322). Therefore, both spillover and windblown radiological contamination from the surrounding

radioactive waste disposal operation are not evident. All results from the 2019 wipe samples collected by EnergySolutions were below the minimum detectable activities (i.e., nondetect) for removable alpha and beta radiation contamination. The next radiological survey will occur during the 2021 annual site inspection.

EnergySolutions conducts periodic walkthroughs of the site to remove any windblown debris, and the company reported no debris on the site in 2020. No maintenance needs were identified.

15.4.2.3 Outlying Area

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 observed.

A variety of features and ongoing waste disposal activities that are managed by EnergySolutions surround the site (PL-13). The most obvious waste disposal activities are occurring directly west of the site where a Class A (i.e., low-level radioactive waste) disposal cell is being capped. On the northeast and east sides of the site, incoming wastes are unloaded from railcars and transferred to haul trucks; decontamination facilities are also present. Directly to the south is a completed low-level radioactive waste disposal cell, to the southwest is a waste disposal cell containing Atomic Energy Act Section 11e.(2) byproduct material, and to the southeast is an operating mixed-waste treatment and disposal facility. Administration, security, and maintenance buildings lie directly north-northwest of the site. A shredding facility, rotary dump, and railroad spur delivery loop are northwest of the site. These adjacent operations and facilities are not affecting the site.

15.5 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 have substantially changed. No need for a follow-up inspection was identified.

15.6 Maintenance and Repairs

Inspectors replaced the broken perimeter sign P5 following the 2020 inspection.

One minor maintenance item will be completed by EnergySolutions by the next inspection in 2021:

- Repair section of down fence just north of Gate 64

No other maintenance needs were identified.

15.7 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required. Supplemental standards have been applied as site standards because (1) the uppermost aquifer is classified as limited use due to naturally occurring concentrations of total dissolved solids that exceed 10,000 milligrams per liter, and (2) the site is not contributing to the contamination of any current or potentially

useful aquifer. EnergySolutions owns and maintains several groundwater monitoring wells throughout its licensed radioactive waste facility.

15.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

15.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations.*

DOE (U.S. Department of Energy), 1997. *Long-Term Surveillance Plan for the South Clive Disposal Site, Clive, Utah*, DOE/AL/62350-228, Rev. 2, September.

Radiological Control Manual, LMS/POL/S04322, continually updated, prepared by Navarro Research and Engineering, Inc., for the U.S. Department of Energy Office of Legacy Management.

15.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	EnergySolutions Fence Down
PL-2	300	Site Marker SMK-2
PL-3	135	Protective Casing on Boundary Monument BM-3
PL-4	90	Disposal Cell, South Side Toe Drainage
PL-5	0	Disposal Cell, East Side Toe Drainage
PL-6	220	Disposal Cell, West Side Apron
PL-7	—	(a) Rock Quality Plot No. I—2020 (b) Rock Quality Plot No. I—2010 Photo for Comparison
PL-8	—	(a) Rock Quality Plot No. II—2020 (b) Rock Quality Plot No. II—2010 Photo for Comparison
PL-9	—	(a) Rock Quality Plot No. III—2020 (b) Rock Quality Plot No. III—2010 Photo for Comparison
PL-10	—	(a) Rock Quality Plot No. IV—2020 (b) Rock Quality Plot No. IV—2010 Photo for Comparison
PL-11	—	(a) Rock Quality Plot No. VII—2020 (b) Rock Quality Plot No. VII—2010 Photo for Comparison
PL-12	90	Vegetation on Cell Perimeter Road
PL-13	40	EnergySolutions Facility

Note:
— = Photograph taken vertically from above.

PL-1. EnergySolutions Fence Down

PL-2. Site Marker SMK-2

PL-3. Protective Casing on Boundary Monument BM-3

PL-4. Disposal Cell, South Side Toe Drainage

PL-5. Disposal Cell, East Side Toe Drainage

PL-6. Disposal Cell, West Side Apron

PL-7. (a) Rock Quality Plot No. I—2020

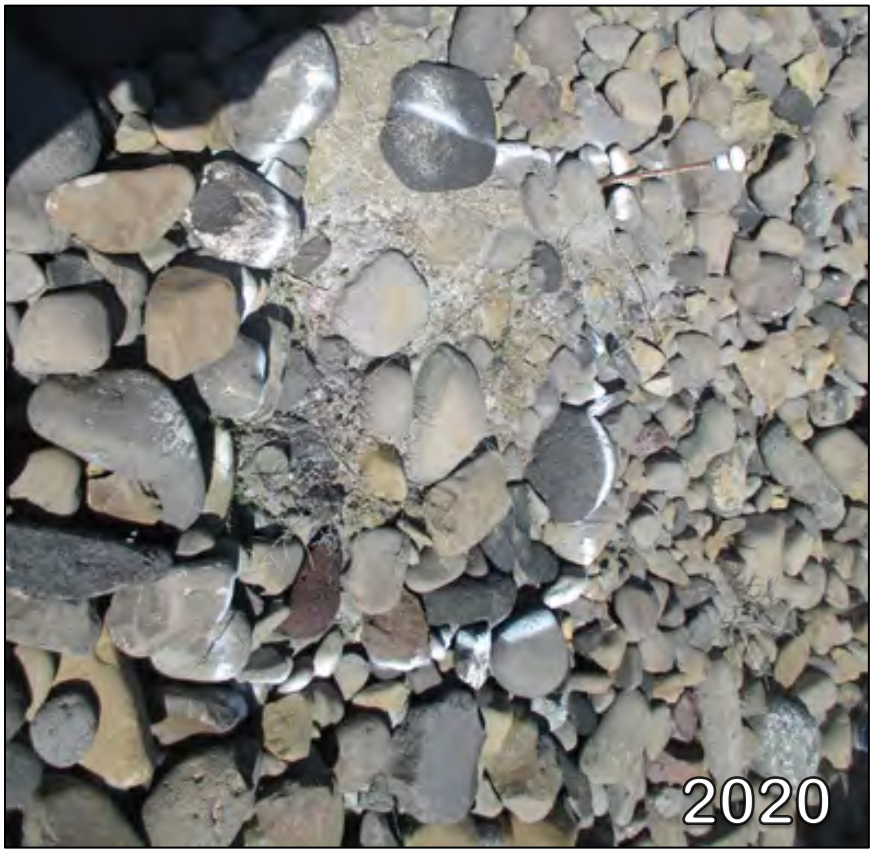
PL-7. (b) Rock Quality Plot No. I—2010 Photo for Comparison

PL-8. (a) Rock Quality Plot No. II—2020

PL-8. (b) Rock Quality Plot No. II—2010 Photo for Comparison

PL-9. (a) Rock Quality Plot No. III—2020

PL-9. (b) Rock Quality Plot No. III—2010 Photo for Comparison



PL-10. (a) Rock Quality Plot No. IV—2020

PL-10. (b) Rock Quality Plot No. IV—2010 Photo for Comparison

PL-11. (a) Rock Quality Plot No. VII—2020

PL-11. (b) Rock Quality Plot No. VII—2010 Photo for Comparison

PL-12. Vegetation on Cell Perimeter Road

PL-13. EnergySolutions Facility

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16.0 Shiprock, New Mexico, Disposal Site

16.1 Compliance Summary

The Shiprock, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on October 13, 2020. No changes were observed on the disposal cell or in the associated diversion channels. Inspectors identified several minor maintenance needs but found no cause for a follow-up inspection. Groundwater monitoring to evaluate disposal cell performance is not required.

16.2 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 1994) and 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 16-1 lists these requirements.

Table 16-1. License Requirements for the Shiprock, New Mexico, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 16.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 16.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 16.6	(b)(5)
Environmental Monitoring	Sections 5.0 and 6.4	Section 16.7	(b)(2)
Corrective Action	Section 9.0	Section 16.8	–

16.3 Institutional Controls

The 105-acre site, identified by the property boundary shown in Figure 16-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized the U.S. Department of Energy (DOE) to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation and required it to be in place before bringing the site under the NRC general license. DOE and the Navajo Nation executed a Custodial Access Agreement that conveys to the federal government title to the residual radioactive materials stabilized at the repository site and ensures that DOE has perpetual access to the site.

The site 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 custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gates and signs, perimeter fence and signs, site markers, survey and boundary monuments, and erosion control markers.

16.4 Inspection Results

The site, 1 mile south of Shiprock, New Mexico, was inspected on October 13, 2020. An action plan for the inspection was developed to allow for modified stakeholder-assisted execution, thus avoiding the need for Grand Junction-based Legacy Management Support (LMS) staff to travel to the Navajo Nation while travel restrictions were put in place as a response to the novel coronavirus.

The inspection was conducted by L. Scott and G. Jay of the LMS contractor. J. Tallbull and S. Salt (Navajo Nation Abandoned Mine Lands [AML] Program) attended the inspection. The purposes of the inspection were to confirm the integrity of the 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.

16.4.1 Site Surveillance Features

Figure 16-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 16-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 16.10.

16.4.1.1 Access Roads, Entrance Gates, and Entrance Signs

Access to the site is from a gravel road off U.S. Highway 491. Three gates allow access to the site through the perimeter fence: the east gate (the current main entrance gate near the terrace escarpment), the north gate (an auxiliary access gate), and the west gate (the former main entrance gate). Access to the main entrance gate is through a gravel pit. The three gates were locked and functional. Pairs of entrance signs—one pictorial and one textual—are present near each gate. One pair is present at the east and north gates, and two pairs are present at the west gate. No maintenance needs were identified.

16.4.1.2 Perimeter Fence and Signs

A chainlink perimeter fence encloses the disposal cell and drainage features. Gaps under the perimeter fence observed in 2019 near signs P3 and P15 were repaired before the 2020 inspection. The fence near perimeter sign P15 that was identified as damaged in 2019 was repaired before the 2020 inspection and was observed to be in good condition in 2020.

Dirt accumulation that was previously observed in the channel and along the fence on the southern side of the site was removed before the 2020 inspection. Inspectors will continue to monitor these areas. Regular maintenance to keep the perimeter fence lines free of trash, tumbleweeds, or other debris will continue. No other maintenance is needed at this time.

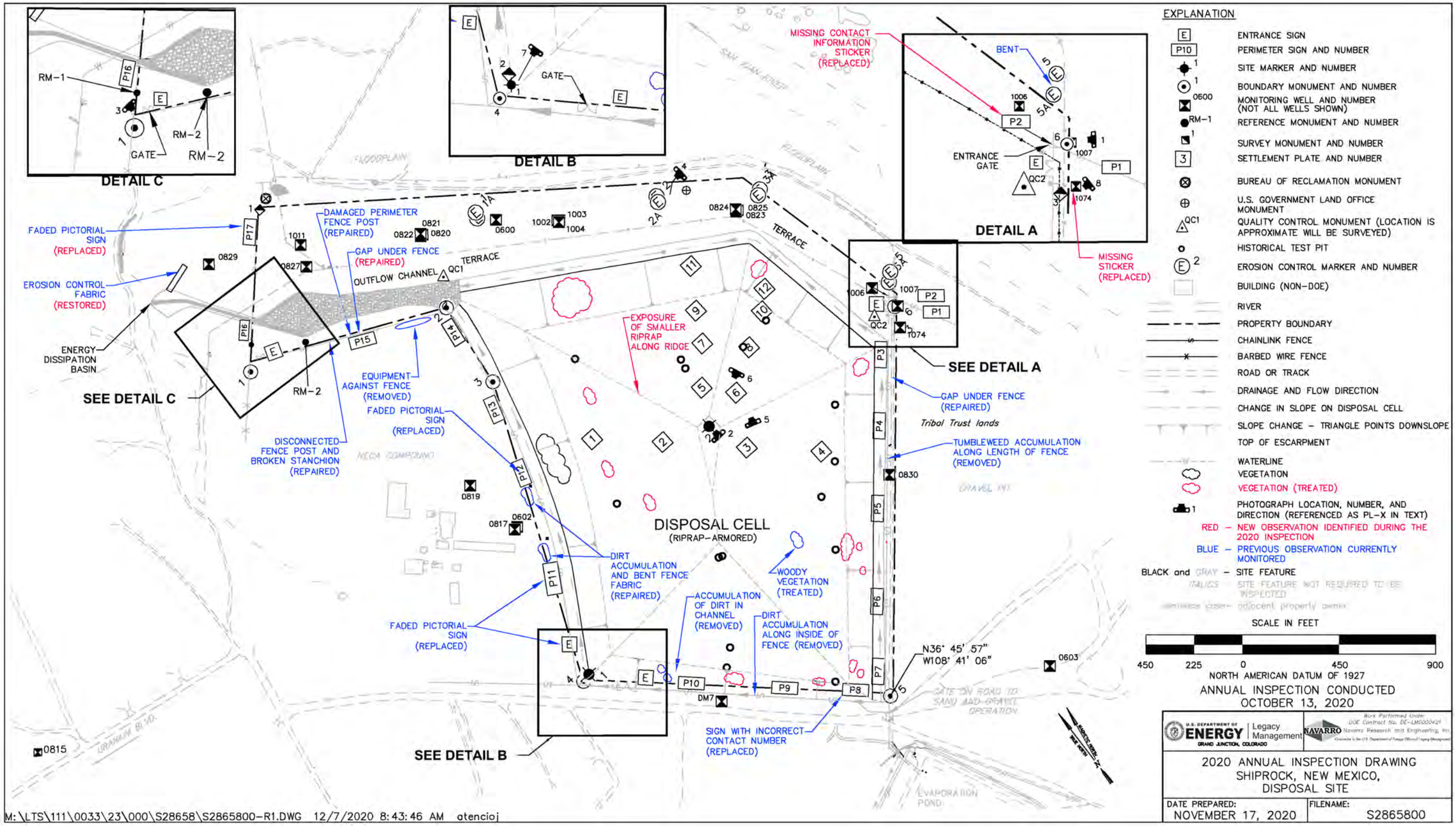

Figure 16-1. 2020 Annual Inspection Drawing for the Shiprock, New Mexico, Disposal Site

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There are 17 pairs of perimeter signs, designated P1 through P17 (each pair consisting of one pictorial and one textual sign), positioned along the perimeter fence.[1] The pictorial signs near the southwestern entrance sign and perimeter signs P11, P12, and P17, replaced in 2019, were observed to be in good condition during the 2020 inspection. Perimeter sign P2 was observed to have a faded contact information sticker, which was replaced following the inspection (PL-1). No other maintenance needs were identified.

16.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the west gate; minor cracks in its concrete base were resealed in 2018. Site marker SMK-2 (PL-2) is on the top slope of the disposal cell. No maintenance needs were identified.

16.4.1.4 Survey and Boundary Monuments

Three survey monuments and six boundary monuments delineate the property boundary. Two additional boundary monuments are offsite; monitoring of these monuments was discontinued in 1999 and 2003. Steel T-posts were installed next to all boundary monuments to help inspectors locate the monuments. The site map was updated with the more recent coordinates for boundary monument BM-6, as resurveyed in 2018. Boundary monument BM-1 (PL-3) was identified within the Navajo Engineering and Construction Authority yard and the location was added to the site map following the inspection. The GPS coordinates were resurveyed in 2019 following the inspection. The concrete at survey monument SM-1 is cracked, but the crack does not threaten the integrity of the marker. All boundary monuments were observed to be clear of vegetation and were visible during the 2020 inspection. No maintenance needs were identified.

16.4.1.5 Aerial Survey Quality Control Monuments

Two aerial survey quality control monuments, installed earlier in 2020, were inspected during the 2020 annual inspection. No maintenance needs were identified.

16.4.1.6 Erosion Control Markers

The site has four pairs of erosion control markers along the edge of the terrace escarpment (1/1A, 2/2A, 3/3A, and 5/5A) (PL-4). Erosion control markers 4 and 4A are not inspected; they were installed on the terrace east of the site in the gravel pit. Erosion control marker 5A, near the east entrance gate, was previously bent by a vehicle, but it is functional and does not require repair. No maintenance needs were identified.

16.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, diversion channels at the base of the disposal cell, and the outflow channel; (2) the terrace area north and northeast of the

[1] Plate 1 of the LTSP shows six sets of perimeter signs on fence fabric along the terrace escarpment. These were never installed because a fence was never installed in this area. As the escarpment itself prohibits access to the site, a fence was not needed.

disposal cell; and (3) the outlying area, which includes the fenced evaporation pond south of the disposal cell and the gravel pit southeast of the disposal cell. 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.

16.4.2.1 Disposal Cell, Diversion Channels, and Outflow Channel

The disposal cell, completed in 1986, occupies 77 acres and is armored in riprap to control erosion and deter animal and human intrusion (PL-5). There was no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. Piezocones associated with a research project installed on the disposal cell cover in the past are no longer in use. Some of the filled piezocone pits have subsided slightly or were never completely backfilled, which resulted in shallow conical depressions in the cover. As reported in previous site inspection reports, the surface of the disposal cell contains numerous ruts associated with past vehicle traffic. An area where smaller riprap has been exposed was identified along the northern ridge of the disposal cell. This area will be monitored for further changes that might indicate erosion or degradation of the cover. The condition of other depressions and vehicle ruts is monitored annually and has not changed significantly since the 2014 inspection.

Windblown sediment has accumulated in the rock cover in several places. In accordance with the LTSP, woody, deep-rooted shrubs are controlled. Numerous woody shrubs found on the top and side slopes of the disposal cell (PL-6) were treated in 2020 before the inspection.

Diversion channels around the base of the disposal cell contained scattered vegetation, including several woody shrubs. The channel along the southwestern side of the disposal cell has accumulated sediment, and a significant amount of vegetation has grown (PL-7). It is possible that the sediment was generated from the maintenance of the road adjacent to the perimeter fence and has settled in the bottom of the channel. These shrubs do not adversely affect the performance of the diversion channel at this time and are not a concern, but they will continue to be monitored. Nonwoody plants were growing within the outflow channel, and woody vegetation was growing on the banks of the channel. No other maintenance needs were identified.

16.4.2.2 Terrace Area

The terrace area is north and northeast of the disposal cell along the top of a steep escarpment. Other than annual weeds, little vegetation grows on the terrace. The edge of the escarpment varies between 175 and 345 feet from the base of the disposal cell and is prone to slumping. No new significant erosion was evident during the inspection in 2020. The LTSP states that the base of the terrace escarpment should be inspected for signs of seepage, and seeps were identified during early site inspections. However, this is no longer part of annual inspection, procedures as the seeps are now monitored as part of the groundwater compliance program for the site. Monitoring well 1074 was observed to be missing a No. 4 ID sticker, and the No. 1 ID sticker was damaged (PL-8). These stickers were replaced following the 2020 inspection. No maintenance needs were identified.

16.4.2.3 Outlying Area

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 observed. A former gravel pit that is no longer actively extracting aggregate is immediately southeast of the disposal cell. Inspectors identified no significant changes in land use associated with the gravel pit or with other outlying areas near the disposal cell during the 2020 inspection.

In 2002, the Office of Legacy Management (LM) constructed an 11-acre lined evaporation pond near the disposal cell as part of the groundwater compliance strategy. The pond, surrounded by a chainlink security fence, is maintained under the groundwater compliance strategy. Both the security fence and pond were intact and functional at the time of the inspection. The degraded portion of the erosion control fabric on the south-facing bank of the energy dissipation basin identified during the 2018 inspection has been repaired and is functioning as intended.

Fences and warning signs posted in Bob Lee Wash are maintained under the groundwater compliance strategy and were not examined during the 2020 annual inspection. No other maintenance needs were identified.

16.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

16.6 Maintenance and Repairs

Minor maintenance needs completed before the 2020 inspection, include the following:

- Repairing the gaps under the fence at perimeter signs P3 and P15
- Repair of fence near perimeter sign P15
- Removal of dirt accumulation in the channel and along the southern fence line
- Treatment of woody vegetation on top and slide slopes of the cell

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

- Replacing the missing stickers on monitoring well 1074
- Replacing a faded sticker containing contact information on perimeter sign P2

Ongoing maintenance conducted at the site included removal of trash and debris (including tumbleweeds) along the perimeter fence.

16.7 Environmental Monitoring

16.7.1 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring to evaluate disposal cell performance is not required. However, groundwater monitoring is conducted in accordance with a groundwater compliance strategy. The monitoring wells associated with the groundwater compliance strategy (i.e., along the terrace and at offsite locations) are not included in the annual inspection process. All wells encountered during the inspection were locked, and no maintenance needs were observed.

16.7.2 Vegetation Monitoring

In a 1999 letter to the Navajo AML Reclamation/Uranium Mill Tailings Remedial Action Department (Bergman-Tabbert 1999), LM committed to spraying annual weeds on the disposal cell top slope. During the inspection, annual weeds were observed growing on less than 1% of the top slope. After discussion among LM, Navajo AML, and LMS ecologists, LM recommended that it cease treatment of nonnoxious weeds on the cell and allow natural plant succession to progress. LM wrote a new letter to Navajo AML outlining its proposed vegetation management plan (Kautsky 2019). Under the plan, LM would continue to treat weeds listed as noxious by the State of New Mexico and Navajo Nation (primarily *Halogeton glomeratus*) in accordance with applicable laws and would treat deep-rooted woody species in accordance with the LTSP. Vegetation will continue to be monitored to inform future management decisions.

16.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

16.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

Bergman-Tabbert, 1999. D. Bergman-Tabbert, site manager, U.S. Department of Energy Office of Legacy Management, letter (Shiprock Uranium Mill Tailings Remedial Action Site) to Madeline Roanhorse, director Navajo Nation UMTRA Program Division of Natural Resources, May 13.

DOE (U.S. Department of Energy), 1994. *Long-Term Surveillance Plan for the Shiprock Disposal Site, Shiprock, New Mexico*, DOE/AL/62350-60F, Rev. 1, September.

Kautsky, M., 2019. Mark Kautsky, Title I manager, U.S. Department of Energy Office of Legacy Management, letter (Updated Agreement for Vegetation Control on the Shiprock Disposal Cell) to Madeline Roanhorse, director Navajo Nation UMTRA Program Division of Natural Resources, October 10.

16.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	270	Pictorial Sign and Perimeter Sign P2 with Faded Information
PL-2	—	Site Marker SMK-2
PL-3	180	Boundary Monument BM-1
PL-4	270	Erosion Control Marker E-2
PL-5	20	Disposal Cell Top Slope
PL-6	250	Disposal Cell Top Slope with Growing Vegetation
PL-7	260	Sediment Accumulation near Southwest Fence Line
PL-8	230	Missing ID Stickers on Monitoring Well 1074

Note:
— = Photograph taken vertically from above.

PL-1. Pictorial Sign and Perimeter Sign P2 with Faded Information

PL-2. Site Marker SMK-2

PL-3. Boundary Monument BM-1

PL-4. Erosion Control Marker E-2

PL-5. Disposal Cell Top Slope

PL-6. Disposal Cell Top Slope with Growing Vegetation

PL-7. Sediment Accumulation Near Southwest Fence Line

PL-8. Missing ID Stickers on Monitoring Well 1074

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17.0 Slick Rock, Colorado, Disposal Site

17.1 Compliance Summary

The Slick Rock, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on May 20, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several routine maintenance needs but found no cause for a follow-up or contingency inspection. Groundwater monitoring is not required.

17.2 Compliance Requirements

Requirements for long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (LTSP) (DOE 1998) 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 17-1 lists these requirements.

Table 17-1. License Requirements for the Slick Rock, Colorado, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Sections 3.0 and 6.2	Section 17.4	(b)(3)
Follow-Up Inspections	Section 3.4	Section 17.5	(b)(4)
Maintenance and Repairs	Section 4.0	Section 17.6	(b)(5)
Groundwater Monitoring	Section 2.5	Section 17.7	(b)(2)
Corrective Action	Section 5.0	Section 17.8	--

17.3 Institutional Controls

The 62-acre site, defined by the property boundary shown in Figure 17-1, is owned by the United States and was accepted under the NRC general license in 1998. The U.S. Department of Energy (DOE) is the licensee and, in accordance with 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 gate and sign, perimeter fence and signs, site markers, and survey and boundary monuments.

17.4 Inspection Results

The site, 5 miles northeast of Slick Rock, Colorado, was inspected on May 20, 2020. The inspection was conducted by D. Marshall, D. Miller, and K. Meadows of the Legacy Management Support contractor. 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.

17.4.1 Site Surveillance Features

Figure 17-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required 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 2020 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 17-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 17.10.

17.4.1.1 Entrance Gate and Sign

Access to the site is from San Miguel County Road T11. Entrance to the site is through a chained and locked gate. The wire entrance gate was locked and is worn but remains functional. The entrance sign is next to the gate (PL-1). No maintenance needs were identified.

17.4.1.2 Perimeter Fence and Signs

A four-strand barbed-wire perimeter fence encloses the disposal cell, drainage structures, and much of the site. The top and bottom strands are smooth wire to allow wildlife to pass over and under, and the middle two strands are barbed wire. A T-post along the northeast perimeter fence identified in the 2019 inspection was repaired.

There are 32 perimeter signs, attached to steel posts set in concrete, positioned along the property boundary; they are set back 5 feet (ft) and cut in at the southwest corner. Some cracking of the printed overlay is beginning to appear on several signs, and several signs still display bullet damage, but all remain legible. The concrete bases on perimeter signs P14 and P15 are slightly undercut by erosion but remain stable. No other maintenance needs were identified.

17.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate, and site marker SMK-2 is on top of the disposal cell (PL-2). Erosion near site marker SMK-1 is being monitored and will be repaired if it threatens the integrity of the marker. No immediate maintenance needs were identified.

17.4.1.4 Survey and Boundary Monuments

The site has three survey monuments. Survey monument SM-2 was set in a low area and is frequently covered by several inches of soil. A T-post and rocks have been placed next to the monument to assist in locating this feature. Six boundary monuments delineate the corners of the site boundary (PL-3). Boundary monument BM-5 is difficult to locate. A T-post was installed for ease of location after the inspection. No other maintenance needs were identified.

17.4.1.5 Aerial Survey Quality Control Monuments

Aerial survey quality control monuments are planned to be installed before the next inspection.

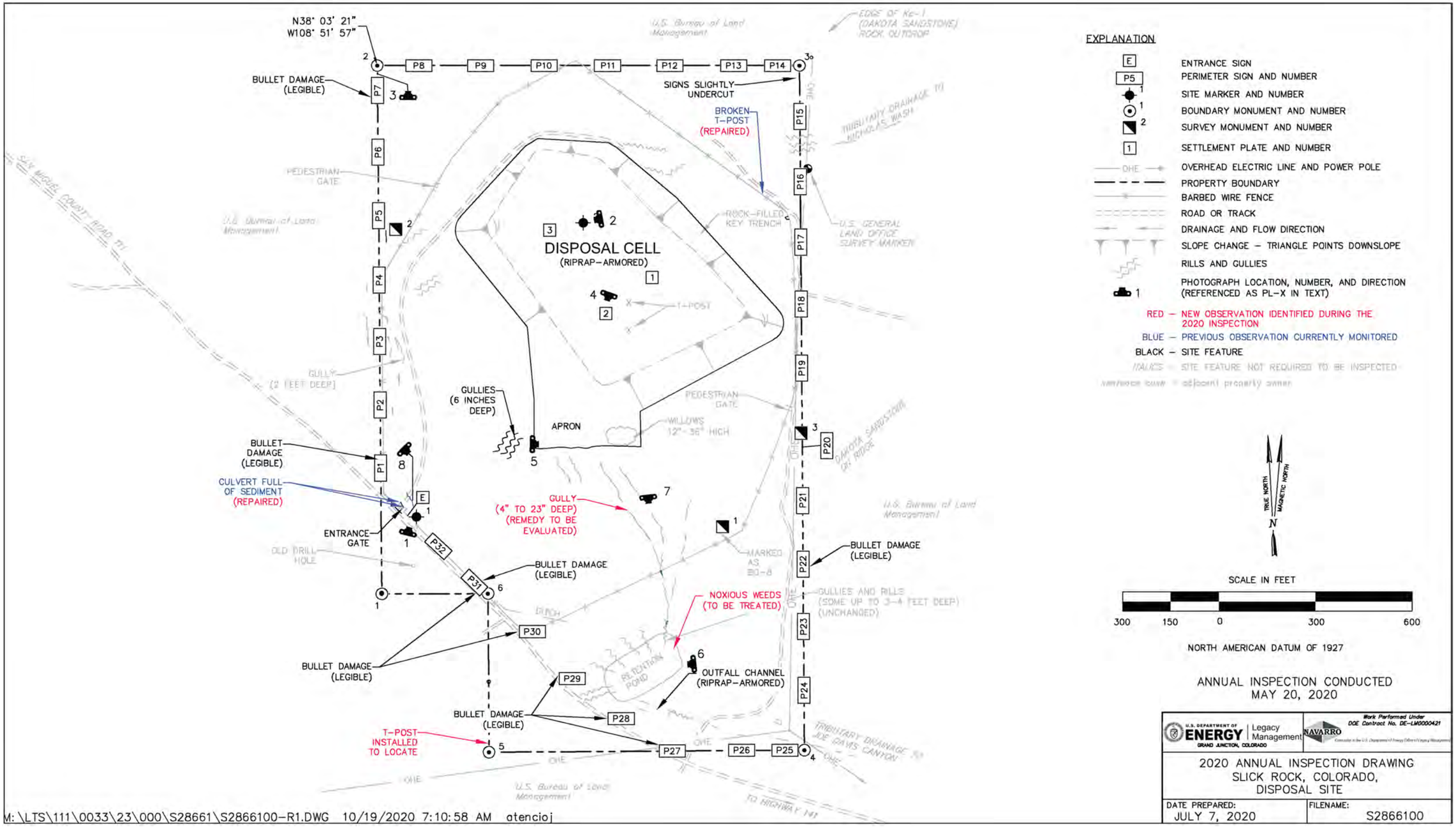

Figure 17-1. 2020 Annual Inspection Drawing for the Slick Rock, Colorado, Disposal Site

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17.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, including side slopes, key trench, and apron; (2) the area between the disposal cell and the site boundary; and (3) the outlying area. 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.

17.4.2.1 Disposal Cell, Key Trench, and Apron

The disposal cell, completed in 1996, occupies 12.9 acres and is armored with riprap, consisting of rounded, cobble-sized river rock to control erosion and deter animal and human intrusion (PL-4). The inspection found no evidence of erosion, settling, slumping, rock degradation, or other modifying processes that might affect the integrity of the disposal cell. No other maintenance needs were identified.

At the toe of the disposal cell side slopes is a key trench that encloses the disposal cell. The key trench, designed to convey stormwater runoff away from the disposal cell, is as much as 5 ft deep and 20 ft wide and filled with rock. Stormwater runoff from the key trench discharges to an apron at the south (downslope) corner of the disposal cell. The apron extends 50 to 200 ft beyond the key trench. The key trench and apron are covered with rounded cobble- and pebble-sized river rock. Willow brush (a deep-rooted species) is growing on a portion of the apron but is not considered to be detrimental to the integrity of the disposal cell (PL-5). No other maintenance needs were identified.

17.4.2.2 Area Between the Disposal Cell and the Site Boundary

The area around the disposal cell includes the retention pond. Surface drainage from the disposal cell flows south from the apron into the retention pond, which is constructed in a channel tributary to Joe Davis Canyon. An outflow channel below the pond is lined with rounded riprap for a short distance. The pond was dry at the time of inspection (PL-6).

The site was originally graded for sheet flow from the apron to the retention pond. Rills have been developing since 1998 on the northwest side of the retention pond and now are 3 ft deep or deeper adjacent to the pond and shallower farther upslope. Most of the rills are stabilizing. One gully identified in an earlier inspection appears to have deepened (PL-7). Stabilization options will be evaluated before the next inspection. No other maintenance needs were identified.

Erosion rills and gullies are present in several other areas of the site but do not affect the disposal cell or any site features. Vegetation in the reclaimed areas was healthy. Noxious weeds are controlled to comply with State of Colorado and San Miguel County requirements. Noxious weeds were identified growing on the east side of the retention pond area and will be treated before the next inspection.

The two occluded culverts identified in the 2019 inspection were cleaned out following the inspection (PL-8). No other maintenance needs were identified.

17.4.2.3 Outlying Area

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 observed. The natural, undisturbed areas outside the site support grass and scattered pinyon and juniper trees. Steep hillsides north and northeast of the site slope eastward into Nicholas Wash. The primary land use is grazing. The areas north and northeast of the site also are routinely used for firewood cutting and recreation, such as hunting and off-road use by all-terrain vehicles.

17.5 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) a citizen or outside agency notifies LM that conditions at the site are substantially changed. No need for a follow-up inspection was identified.

17.6 Maintenance and Repairs

The installation of a T-post at boundary monument BM-5 for ease of location was completed following the inspection.

Inspectors documented minor maintenance needs that will be completed before the next inspection. They include:

- Treatment of noxious weeds growing near the retention pond.
- Evaluation of stabilization options to address the growing erosional gully between the disposal cell apron and retention pond.

17.7 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring at this site is not required. Groundwater at the site qualifies for supplemental standards because it is designated as limited use, a designation given to groundwater that is not a current or potential source of drinking water. Groundwater in the uppermost aquifer is designated as limited use because of low yield. The aquifer does not yield enough water to be used for beneficial purposes; with no complete exposure pathways at the site, monitoring is not required. All monitoring wells were abandoned in 2001, and the standpipes in the disposal cell were abandoned in 2002.

17.8 Corrective Action

In accordance with the LTSP, corrective action is taken to correct conditions that threaten the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

17.9 References

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*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 1998. *Long-Term Surveillance Plan for the Burro Canyon Disposal Cell, Slick Rock, Colorado*, DOE/AL/62350-236, Rev. 0, Ver. 4, May.

17.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	15	Entrance Sign
PL-2	260	Site Marker SMK-2
PL-3	—	Boundary Monument BM-2
PL-4	200	Settlement Plate on Disposal Cell
PL-5	90	Willows on Disposal Cell Toe
PL-6	265	Retention Pond
PL-7	175	Erosional Gully
PL-8	135	Cleaned-Out Culvert

Note:
— = Photograph taken vertically from above.

PL-1. Entrance Sign

PL-2. Site Marker SMK-2

PL-3. Boundary Monument BM-2

PL-4. Settlement Plate on Disposal Cell

PL-5. Willows on Disposal Cell Toe

PL-6. Retention Pond

PL-7. Deep Erosional Gully

PL-8. Cleaned-Out Culvert

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18.0 Spook, Wyoming, Disposal Site

18.1 Compliance Summary

The Spook, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on July 14, 2020. No changes were observed on the land surface of the disposal cell. Inspectors identified no maintenance needs and found no cause for a follow-up or contingency inspection. Groundwater monitoring is not required.

18.2 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 1993) 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 18-1 lists these requirements.

Table 18-1. License Requirements for the Spook, Wyoming, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 18.4	(b)(3)
Follow-Up or Contingency Inspections	Section 7.0	Section 18.5	(b)(4)
Maintenance	Section 8.0	Section 18.6	(b)(5)
Groundwater Monitoring	Section 5.0	Section 18.7	(b)(2)
Corrective Action	Section 9.0	Section 18.8	--

18.3 Institutional Controls

The 14-acre site, identified by the property boundary shown in Figure 18-1, is owned by the United States and was accepted under the NRC general license in 1993. The U.S. Department of Energy (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, entrance sign, perimeter signs, site markers, and survey and boundary monuments.

18.4 Inspection Results

The site, 48 miles northeast of Casper, Wyoming, was inspected on July 14, 2020. The inspection was conducted by D. Traub and B. Mays of the Legacy Management Support contractor. T. Jasso, the Office of Legacy Management (LM) site manager, 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.

18.4.1 Site Surveillance Features

Figure 18-1 shows the locations of site features in black and gray font, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue text. There were no new observations in 2020. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 18-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 18.10.

18.4.1.1 Access Road and Entrance Sign

Access to the site is from Wyoming Highway 95 from Glenrock or Wyoming Highway 93 from Douglas to Converse County Road 31 and onto Hornbuckle Ranch Road. Site access is maintained through perpetual easements across the Hornbuckle ranch. The road to the site is graded and hard packed and is maintained by the ranch. The entrance sign is mounted on a steel post set in concrete (PL-1). No maintenance needs were identified.

18.4.1.2 Perimeter Signs

There are 10 perimeter signs, attached to steel posts set in concrete, positioned around the site outside the unfenced property boundary (PL-2). No maintenance needs were identified.

18.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is at the south side of the disposal cell (PL-3). Its concrete base is damaged due to spalling but is stable; there were no apparent changes from the previous year. Site marker SMK-2 is at the north side of the disposal cell. No maintenance needs were identified.

18.4.1.4 Survey and Boundary Monuments

The site has three survey monuments and eight boundary monuments. Boundary monument BM-6 is bent but stable (PL-4). The boundary monuments and a survey monument, as well as the perimeter signs, are outside the property boundary. The owner of the surrounding property (Hornbuckle ranch) is aware they are on his property but is not concerned. Therefore, the survey and boundary monuments and perimeter signs will remain at their current locations.

18.4.1.5 Aerial Survey Quality Control Monuments

Four aerial survey quality control monuments were installed in 2019 following the site inspection (PL-5). The quality control monument locations are shown in Figure 18-1. No maintenance needs were identified.

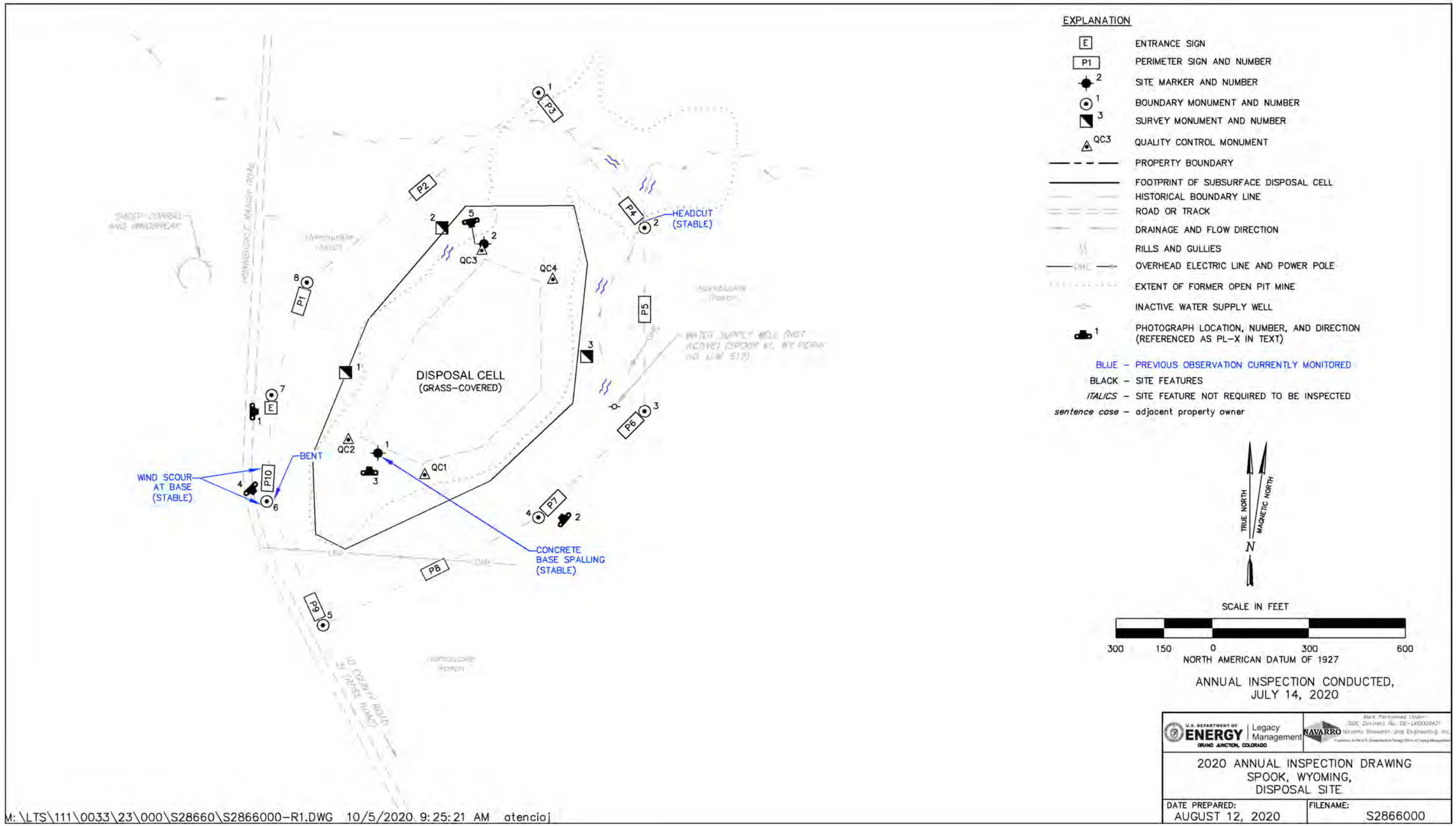

Figure 18-1. 2020 Annual Inspection Drawing for the Spook, Wyoming, Disposal Site

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18.4.2 Inspection Areas

The site is divided into three inspection areas to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the site perimeter, and (3) the outlying area. Inspectors examined specific site surveillance features within each area, observed the condition of site vegetation, and looked for evidence of erosion, settling, slumping, or other modifying processes that might affect the site's conformance with LTSP requirements.

18.4.2.1 Disposal Cell

The site is unique among Title I sites in that tailings were placed in the bottom of an open pit mine and covered with 40–60 feet of clean fill and topsoil. Therefore, many of the observations and concerns routinely associated with above-grade disposal cells—such as the quality of the riprap and the stability of side slopes—do not apply to this site. The ground surface over the 5-acre disposal cell, completed in 1989, showed no evidence of settling. Vegetation on the ground surface, consisting of grasses and forbs, was healthy and indistinguishable from that growing on the remainder of the site and on the surrounding ranch land. No maintenance needs were identified.

18.4.2.2 Site Perimeter

There is no perimeter fence at the site. The area between the disposal cell and the site perimeter showed no evidence of settling or active erosion. No maintenance needs were identified.

18.4.2.3 Outlying Area

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 observed. Several minor rills and gullies are near the site, and they appeared to be stable. The erosion is not harming the function of the disposal cell cover or other site features, and it is not a concern at this time. Inspectors will continue to monitor this area.

The access road has frequent truck traffic to service and maintain oil wells in the area. Even though oil field activity has greatly increased near the site, inspectors found no evidence of trespassing or vandalism on the site.

18.5 Follow-Up or Contingency Inspections

LM will conduct follow-up or contingency 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 or contingency inspection was identified.

18.6 Maintenance

No maintenance needs were identified.

18.7 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required due to the application of supplemental standards. Groundwater at the site qualifies for supplemental standards because it is designated as limited use, a designation given to groundwater that is not a current or potential source of drinking water. Groundwater in the uppermost aquifer is designated as limited use because it contains contamination from widespread, naturally occurring uranium mineralization and is of limited yield. Therefore, monitoring of the groundwater is not required.

18.8 Corrective Action

In accordance with the LTSP, corrective action is taken to correct conditions that threaten the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

18.9 References

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.*

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations.*

DOE (U.S. Department of Energy), 1993. *Final Long-Term Surveillance Plan for the Spook, Wyoming, Disposal Site*, UMTRA-DOE/AL-350215.0000, January.

18.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	90	Site Entrance Sign
PL-2	310	Perimeter Sign P7
PL-3	0	Site Marker SMK-1
PL-4	135	Boundary Monument BM-6
PL-5	170	Quality Control Monument QC3

PL-1. Site Entrance Sign

PL-2. Perimeter Sign P7

PL-3. Site Marker SMK-1

PL-4. Boundary Monument BM-6

PL-5. Quality Control Monument QC3

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19.0 Tuba City, Arizona, Disposal Site

19.1 Compliance Summary

The Tuba City, Arizona, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site (site) was inspected on October 15, 2020. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified maintenance needs but found no cause for a follow-up inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts semiannual groundwater monitoring to compare current conditions to baseline postconstruction groundwater quality at the site. Evaluative groundwater monitoring is performed in lieu of normal point-of-compliance (POC) monitoring, as preexisting milling-related groundwater contamination may mask contamination leaching from the disposal cell. Analytical results from the February 2020 evaluative monitoring event indicate that groundwater quality downgradient from the former mill site is still degraded. Concentrations of regulated contaminants (i.e., molybdenum, nitrate, selenium, and uranium) in the downgradient plume are elevated in comparison with unimpacted (upgradient) groundwater quality. The second 2020 semiannual sampling event would have been performed in August, but was cancelled due to travel restrictions imposed in response to the novel coronavirus pandemic.

Active groundwater remediation is ongoing. Remediation includes operation of extraction wells and conveyance of the extracted (contaminated) groundwater to the onsite evaporation pond. Extraction wells located in areas and depths of greatest contamination are operated to maximize source mass removal. However, annual extraction volume is constrained to 5 million gallons due to evaporation pond capacity. For the past 3 years, the remediation system was operated in "high-intensity, short-duration" campaigns of 4 months, beginning in July and ending in October. The progress of groundwater remediation is evaluated and reported annually, separately from this compliance evaluation.

19.2 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 1996) in accordance with procedures established to comply with 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 19-1 lists these requirements.

Table 19-1. License Requirements for the Tuba City, Arizona, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 19.4	(b)(3)
Follow-Up Inspections	Section 7.0	Section 19.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 19.6	(b)(5)
Environmental Monitoring	Section 5.2	Section 19.7	(b)(2)
Corrective Action	Section 9.0	Section 19.8	—

19.3 Institutional Controls

The 145-acre disposal site, identified by the property boundary shown in Figure 19-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized DOE to enter into a Cooperative Agreement (DE-FC04-85AL26731) (DOE 1984) with the Navajo Nation to perform remedial actions at the former uranium processing sites. DOE and the Navajo Nation executed a Custodial Access Agreement that conveys to the federal government title to the residual radioactive materials stabilized at the disposal site and ensures that DOE has perpetual access to the site.

The site 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 custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

19.4 Inspection Results

The site, 5 miles northeast of Tuba City, Arizona, was inspected on October 15, 2020. An action plan for the inspection was developed to allow for modified stakeholder-assisted execution, thus avoiding the need for Grand Junction-based Legacy Management Support (LMS) staff to travel to the Navajo Nation while coronavirus-related travel restrictions were in effect. The inspection was conducted by L. Scott, an LMS Tuba City disposal site operations staff member who lives on the Navajo Nation. Due to the coronavirus pandemic and associated travel restrictions, LMS and LM staff living in locations off the Navajo Nation did not travel to the site to perform the annual inspection. Instead, LMS staff enlisted the assistance of individuals from tribal organizations who are familiar with the Tuba City disposal site. Online training on the inspection process was provided to the assisting parties by LMS prior to the inspections. Tribal individuals who assisted with the inspection were S. Salt (Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action [Navajo AML/UMTRA]), J. Tallbull (Navajo AML/UMTRA), and L. Leslie (Hopi Tribe's Office of Mining and Mineral Resources). 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.

19.4.1 Site Surveillance Features

Figure 19-1 shows the locations of site features, including site surveillance features and inspection areas, in black and gray font. Site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue, and new observations identified during the 2020 annual inspection are shown in red font. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 19-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 19.10.

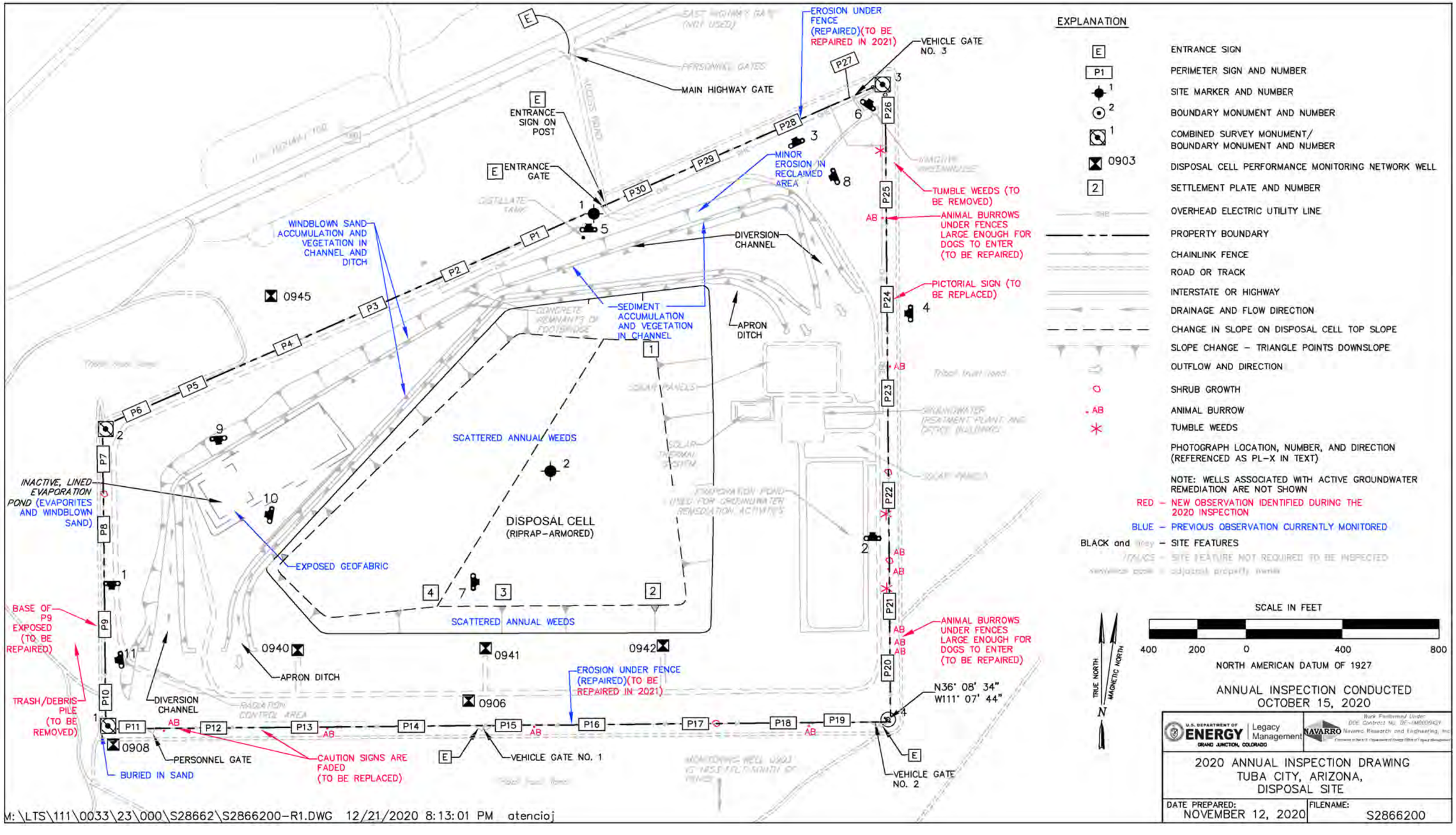

Figure 19-1. 2020 Annual Inspection Drawing for the Tuba City, Arizona, Disposal Site

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Many structures and features at the site are associated with the former groundwater treatment system. Beginning in 2002, contaminated groundwater was extracted and treated through ion exchange and distillation processes, then returned to the aquifer through an infiltration trench, upgradient of the disposal cell. Operation of the groundwater treatment plant (GWTP) was suspended in September 2014 due to hydrologic constraints on extraction and GWTP maintenance challenges. The structures associated with the GWTP remain onsite and include a control building; a shop and laboratory building; an ion exchange building, external tanks, and distillation skid; a solar water-heating system; two photovoltaic panel arrays for utility power generation; evaporation ponds; a network of extraction, injection, and monitoring wells; and a treated water infiltration trench.

An Interim Treatment Plan was prepared in 2015, after the GWTP operation was suspended. Active remediation continued in the form of extraction and conveyance of contaminated groundwater to the onsite evaporation pond. Under interim treatment, extraction of contaminant mass is to be optimized through operation of the extraction wells located in the areas of highest contaminant concentrations. The contaminant plume is to be monitored and additional mitigative actions are to be defined and implemented if monitoring reveals unacceptable migration of the plume.

From 2015 through 2017, the "extract-and-evaporate" system was operated year-round with the flow rate being adjusted to maintain a constant water level in the pond (i.e., higher extraction flow rate in hot, windy, dry weather conditions, and lower flow rate in cold, calm, humid conditions). The average annualized evaporation rate ranged from 7 to 10 gallons per minute (gpm), constraining annual groundwater extraction volume in a range of 3.7 million to 5.3 million gallons.

In 2018, 2019, and 2020, short-duration, high-intensity extraction campaigns were planned and executed. The operational objectives were to extract a volume of contaminated groundwater equivalent to the pond's annual evaporative capacity and to maintain the maximum source mass removal under the constraint of interim operation. As many as 11 extraction wells were operated at a cumulative flow rate of 40 to 50 gpm from July through October. In addition to the operational objectives, groundwater drawdown and recovery data were collected during and after the extraction campaign to refine the hydrologic site characterization and to define the effective capture zone of the most productive extraction wells.

The purpose of groundwater treatment is to remove contamination that resulted from past uranium-ore processing at the site. Groundwater remediation activities are not addressed in the LTSP because they are not related to the long-term disposal and stabilization of contaminated materials under the cell cover. Therefore, the features associated with groundwater treatment are not included in the annual inspection and are only addressed in this report as they relate to site integrity or safety concerns.

19.4.1.1 Access Road, Entrance Gates, and Entrance Signs

Access to the site is from U.S. Highway 160. Perpetual access to the site is granted by the Custodial Access Agreement. A gate in a chainlink fence on the highway right-of-way ("main highway gate" in Figure 19-1) allows access to the site via a gravel road. The entrance gate is in the inner chainlink perimeter fence between perimeter signs P1 and P30. Both gates were open at the time of the inspection because of ongoing site activities. Vehicle gates are also present in the

northeast corner of the site to allow access to Diné College's (inactive) greenhouse and along the southern fence line to facilitate access for offsite activities.

Entrance signs are posted on the main highway gate, on a post near the entrance gate (in the inner chainlink perimeter fence), and on two vehicle gates (No. 1 and No. 2). Vehicle Gate No. 3, in the northeast corner of the site, purposefully does not have a sign. No maintenance needs were identified.

19.4.1.2 Perimeter Fence and Signs

A chainlink perimeter fence encloses the site. Windblown sand continues to accumulate along the western perimeter fence and road (PL-1) and in a few areas along the western end of the north perimeter fence. The sand accumulation is not of concern at this time. Inspectors found numerous animal burrows (PL-2) and areas of erosion beneath the fence (PL-3). Gaps beneath the fence on the east side need to be repaired, and accumulated tumbleweeds need to be cleared from the fence near perimeter sign P25.

Thirty pairs of perimeter signs, designated P1 through P30, are attached to steel posts set in concrete directly inside and along the perimeter fence. One of the sign pairs is textual, and the other is pictorial. All were legible and stable, with the exception of the P24 pictorial sign, which is becoming faded (PL-4), and the P9 signpost, which is being undercut at its base from wind erosion. Two faded signs warning of high voltage need to be replaced near perimeter sign P12. Erosion under the fence near P16 and P28 was repaired last year, but there is new erosion that needs to be repaired. No other maintenance needs were identified.

19.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 (PL-5) is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

19.4.1.4 Survey and Boundary Monuments

One boundary monument and three combined survey and boundary monuments delineate the corners of the site. Combined survey and boundary monuments SM/BM-1 and SM/BM-3 tend to get covered with windblown sand and are marked with steel T-posts. Only survey and boundary monument SM/BM-3 was found in this condition during the inspection. SM/BM-3 was cleared and exposed for visual detection during the inspection (PL-6). All four survey and boundary monuments were located and in good condition. No other maintenance needs were identified.

19.4.1.5 Monitoring Wells

Seven monitoring wells (0903, 0906, 0908, 0940, 0941, 0942, and 0945) constitute the disposal cell performance monitoring network. Monitoring wells 0906, 0908, 0940, 0941, and 0942 are inside or immediately outside the perimeter fence. Inspectors checked the wellhead protectors (with the exception of distal downgradient well 0903, which is offsite), and all were found to be undamaged and locked. Monitoring wells are also inspected during semiannual groundwater sampling events; their condition and maintenance needs, if any, are reported. No maintenance needs were identified.

19.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area. 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.

19.4.2.1 Disposal Cell

The disposal cell, completed in 1989, occupies 50 acres. The disposal cell is armored with riprap to control erosion and deter animal and human intrusion (PL-7). There was no evidence of erosion, settling, slumping, or other modifying processes on the disposal cell.

In accordance with the LTSP, deep-rooted vegetation is controlled to prevent potential penetration of the radon barrier. Periodic spot-application of herbicide has been effective in controlling deep-rooted vegetation growth on the disposal cell cover. No deep-rooted shrubs were observed on the cell top or side slopes during the inspection. Scattered patches of annual weeds grow on the disposal cell top and side slopes, but these shallow-rooted plants are not a concern. Windblown sand and dirt continue to accumulate on the rock-covered surfaces, providing a favorable environment for plant growth. No maintenance needs were identified.

19.4.2.2 Area Between the Disposal Cell and the Site Boundary

The disposal cell is protected from stormwater runoff by a disposal cell apron ditch and a diversion channel, both armored with riprap and located along the north and northwest sides of the disposal cell. Windblown sand and vegetation accumulate in the apron ditch and the diversion channel (PL-8) along the north and northwest sides of the disposal cell. This sand deposition and associated vegetation establishment have not adversely affected the performance of these structures. No evidence of recent or past water flows was observed in the apron ditch or the diversion channel.

The north slope above the diversion channel, consisting of noncohesive sandy soil, is subject to erosion from stormwater runoff. Erosion repair conducted in this area in 2013 reduced the rate of erosion and subsequent soil deposition in the channel. Some erosion and deposition continue, however, and erosion control repairs are performed as needed. No repairs are necessary at this time.

Two of the three evaporation ponds near the northwest side of the disposal cell were removed in 2007. The area was reclaimed and seeded with a native seed mix in 2007 and again in 2013. Because the area is often scoured by wind, perennial vegetation is establishing extremely slowly (PL-9), and most of the plants are early successional annual species.

The remaining evaporation pond, filled minimally with windblown sand and evaporites, is retained as a backup for the main evaporation pond on the east side of the site. The steel cable and caution signs surrounding the pond were in good condition. The high-density polyethylene liner was in good condition. Lastly, the plastic geofabric that stabilizes the south-facing slope of the pond is still exposed (PL-10). No repairs of the geofabric are needed at this time, as it

remains mostly buried and continues to stabilize the slope. Inspectors will continue to monitor this area. No other maintenance needs were identified.

19.4.2.3 Outlying Area

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. A small pile of trash and debris was observed offsite on the west side near perimeter sign P9 (PL-11) and will be removed. No other issues were identified.

19.5 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.

19.6 Maintenance and Repairs

Inspectors observed and reported maintenance and repair tasks that will be completed following the lifting of the Navajo Nation's novel coronavirus travel ban. Maintenance will include:

- Repair of gaps beneath the fence created by animals and soil erosion.
- Replacement of the P24 pictorial perimeter sign.
- Repair of P9 perimeter signpost's exposed base, which was undercut by erosion.
- Replacement of two caution signs near perimeter sign P12 warning of high voltage.
- Removal of tumbleweeds from the chainlink fence near perimeter sign P25.
- Removal of small trash and debris pile near perimeter sign P9.

No other maintenance needs were identified.

19.7 Environmental Monitoring

In accordance with the LTSP, semiannual groundwater monitoring is conducted to compare current conditions to baseline postconstruction groundwater quality at the site. Groundwater quality beneath and downgradient of the disposal cell has been degraded by contamination from former uranium-processing activities. This preexisting milling-related contamination might mask contamination leaching from the disposal cell and limits the effectiveness of normal POC groundwater monitoring as a reliable indicator of disposal cell performance (40 CFR 192 Subpart A). In lieu of POC monitoring, groundwater monitoring is performed in accordance with Section 5.2.2 of the LTSP and is defined as evaluative monitoring. Evaluative monitoring is performed to "(1) evaluate trends in ground water quality, (2) monitor the downgradient extent of contamination in ground water, (3) analyze the impacts of transient drainage and surface runoff, and (4) assess the effects of ground water restoration measures associated with containing the contamination related to uranium processing activities." (DOE 1996). Evaluative groundwater monitoring was conducted once in February 2020. The second semiannual sampling event, which is normally performed in August, was cancelled due to novel coronavirus travel restrictions. The

progress of groundwater remediation is evaluated and reported annually, separately from this compliance evaluation.

Seven wells (Figure 19-2 and Table 19-2) identified in the LTSP are monitored for four hazardous constituents: molybdenum, nitrate, selenium, and uranium (DOE 1996). As a baseline for cell performance evaluation, provisional upper baseline limits (UBLs) for the four hazardous constituents were calculated in accordance with *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities–Interim Final Guidance* (EPA 1989) and documented in the LTSP (Table 19-3). UBLs were described in the LTSP as provisional because "baseline conditions were established for locations other than the disposal cell monitor wells." Establishing baseline conditions at wells 906 and 908 was intended for determination of "transient excursions from baseline conditions, potential chemical gradients between baseline and disposal cell locations, and stabilization of postclosure disposal cell hydrology" (DOE 1996). UBLs are concentrations that, with 95% confidence, would be exceeded less than 5% of the time during long-term monitoring if groundwater conditions near the monitoring well did not change. Because the four hazardous constituents are present in tailings material, are relatively mobile in groundwater, and are found in low concentrations in background groundwater quality, exceedance of UBLs in more than 5% of sampling events over the long term could indicate that the disposal cell is not performing to design standards. However, the LTSP also notes that elevated concentrations could result from transient drainage of tailings fluid into the subsurface (directly beneath the cell) or from rainfall infiltrating through contamination in the unsaturated zone in the area of the mill ponds (not covered by the disposal cell). Elevated concentrations attributed to transient drainage or infiltration would not be indicative of substandard performance for the cell.

Figure 19-2. Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Table 19-2. LTSP Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Monitoring Well	Hydrologic Relationship	Monitoring Frequency
0903	Downgradient (offsite)	Annually
0906	Downgradient	Semiannually
0908	Downgradient	Semiannually
0940[a]	Downgradient	Semiannually
0941	Downgradient	Semiannually
0942[b]	Downgradient	Semiannually
0945	Upgradient (background)	Annually

Notes:
[a] Between August 2004 and February 2010, samples from well 0940 could not be obtained because of an insufficient volume of water. This accounts for the data gaps in Figure 19-3 through Figure 19-6.
[b] Well 0942 was converted from a monitoring well to an extraction well in 2015.

Table 19-3. Provisional Upper Baseline Limits for Groundwater at the Tuba City, Arizona, Disposal Site

Constituent	Provisional UBL (mg/L)[a]	MCL (mg/L)[b]
Molybdenum	0.14	0.10
Nitrate (as nitrogen)	311	10
Selenium	0.05	0.01
Uranium	1.17	0.044

Notes:
[a] As documented in the 1996 LTSP.
[b] MCLs as listed in 40 CFR 192 Subpart A.

Abbreviations:
MCL = maximum concentration limit
mg/L = milligrams per liter

Active groundwater remediation was anticipated when the LTSP was prepared in 1996, and it was expected that deviations from anticipated disposal cell performance could be detected even with groundwater remediation ongoing. However, the LTSP also noted that (1) POC sampling and analysis protocol to monitor cell performance could not be established until groundwater restoration was complete and (2) the LTSP would be revised at that time.

As noted in the definition of UBLs above, the UBL value should not be exceeded more than 5% of the time as long as conditions near the monitoring well do not change. Due to implementation of active remediation (2000–2014) and interim treatment (2015 to present), the conditions near the LTSP cell performance wells have constantly been affected, and exceedance of UBLs cannot be attributed to disposal cell performance. Recent operation of the interim treatment system, potentially affecting concentrations of target analytes in the LTSP-specified evaluative monitoring wells, is described in the following paragraphs.

Throughout the period of interim treatment (2015 to present) active remediation has been performed by pumping contaminated groundwater directly to the onsite evaporation pond (DOE 2015). The volume of contaminated groundwater that can be extracted is limited to the

pond's evaporation rate, at approximately 5 million gallons annually. From 2015 through 2017 groundwater extraction was operated year-round and the extraction flow rate was adjusted seasonally, operating at a relatively high rate in warm weather and at a lower rate in cold weather. In these years, three extraction wells were typically operated at flow rates ranging from 5 gallons per minute (gpm) to 30 gpm, dependent on seasonal changes in evaporation. The wells were used because of their consistent productivity and for maximum contaminant mass removal.

In 2018, 2019, and 2020, extraction pumping was conducted in high-intensity/short-duration campaigns, with the objective of evaluating the effects on plume capture and maximum groundwater drawdown achievable under the interim treatment regime. In 2018, the high-intensity/short-duration pumping campaign used 11 extraction wells operating at a cumulative flow rate of 44 gpm for 76 days. In 2019, the pumping campaign used nine extraction wells at a cumulative pumping rate of 33 gpm for 99 days. The 2020 pumping campaign was similar to 2018 in the number of wells operated, cumulative flow rate, and duration. Groundwater levels were constantly measured in a surrounding network of monitoring wells. Results and evaluation of the recent pumping campaigns will be reported in a groundwater performance report.

Figure 19-3 through Figure 19-6 show time-concentration plots for the four target analytes, along with corresponding UBLs and MCLs. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (http://gems.lm.doe.gov/#site=TUB). MCLs are presented as information only. The LTSP requirement related to disposal cell performance is for evaluative monitoring over time, in comparison with UBLs.

Since 2004, molybdenum concentrations have been below both the 0.10 milligram per liter (mg/L) MCL and the 0.14 mg/L UBL in all LTSP evaluative wells except well 0906 in August 2019 (Figure 19-3). Molybdenum concentrations in the westernmost downgradient well 0908 and in distal downgradient well 0903 (approximately 1250 feet south of the site perimeter) continue to be comparable to concentrations in background well 0945. Well 0906 exceeded the UBL for molybdenum in August 2019 for the first time since 1999. The UBL exceedance in well 0906 was measured during the 2019 pumping campaign. In February 2020, when there was no pumping, the molybdenum concentration in well 0906 decreased below the MCL.

Nitrate concentrations have historically exceeded the 10 mg/L MCL in all LTSP evaluative wells, except background well 0945 (Figure 19-4). Exceedances of the 311 mg/L UBL were observed at compliance wells 0906 (350 mg/L) and 0940 (610 mg/L) in February 2020. Nitrate concentrations in well 0908 dropped below the UBL in February 2020 after exceeding it for the first time in August 2019. Nitrate concentrations in distal downgradient well 0903 have regularly exceeded the MCL since 2004 but remained below the UBL in 2020.

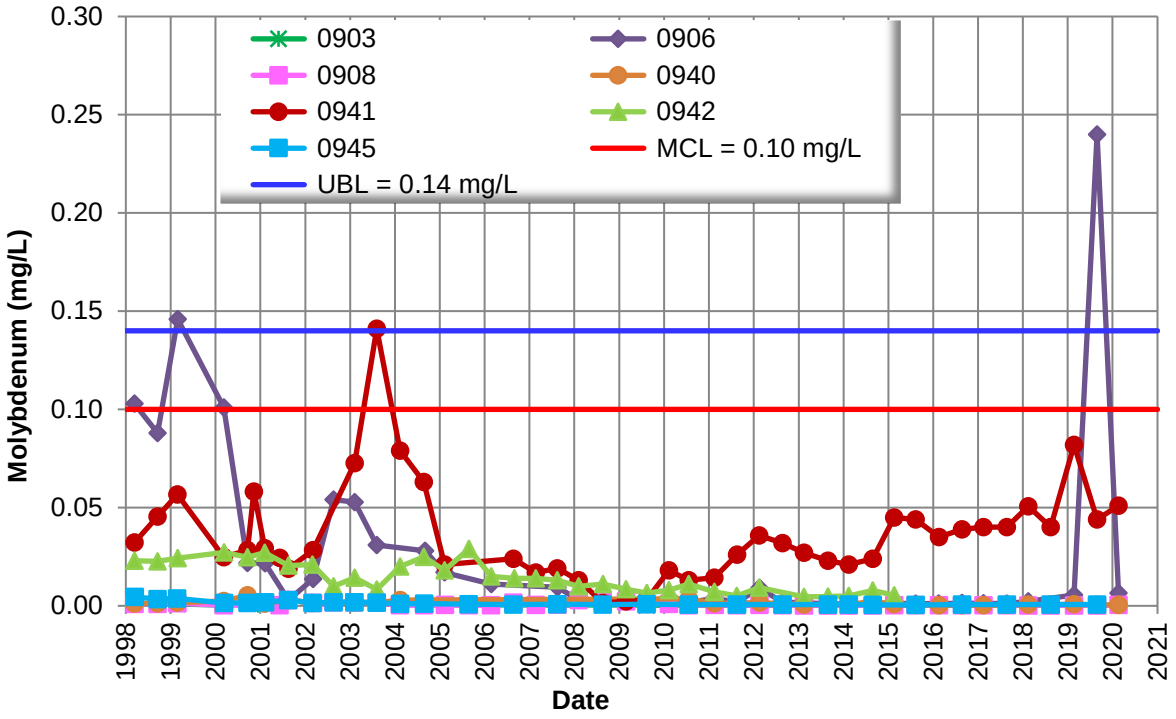

Figure 19-3. Molybdenum in Groundwater at the Tuba City, Arizona, Disposal Site

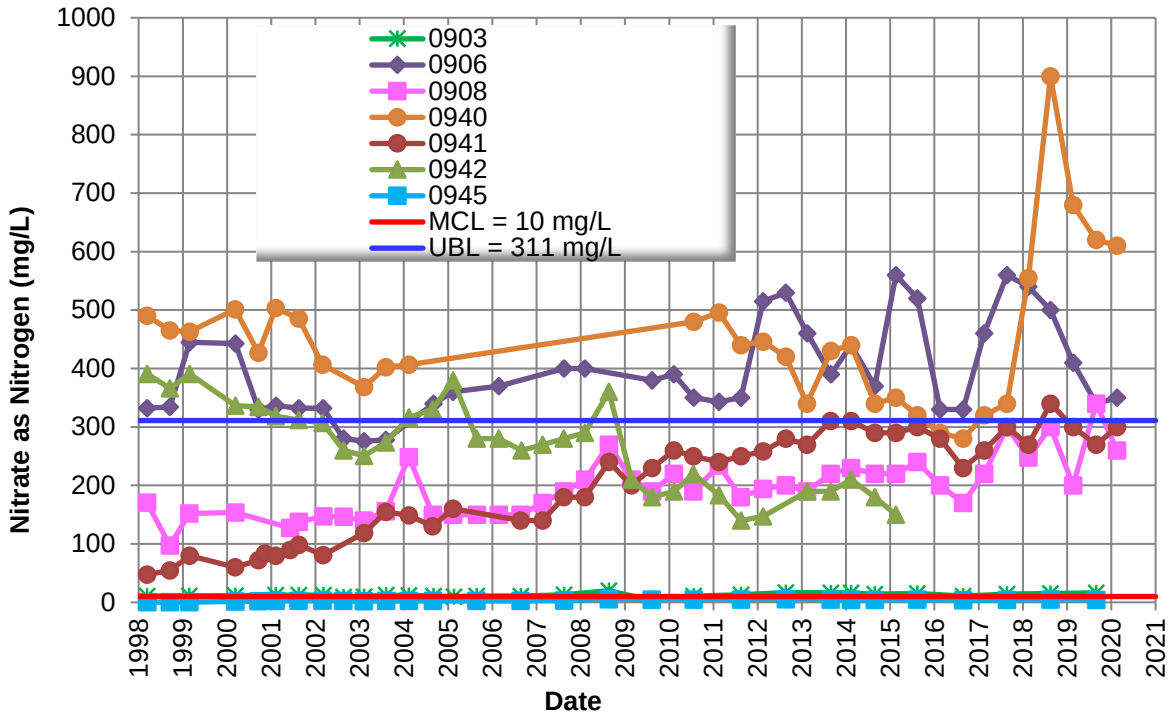

Figure 19-4. Nitrate in Groundwater at the Tuba City, Arizona, Disposal Site

Selenium concentrations have historically exceeded the 0.01 mg/L MCL in all LTSP evaluative wells except background well 0945 and distal well 0903 (Figure 19-5). Concentrations in well 0908 exceeded the UBL for selenium in 1997 and have since remained at or slightly above the 0.01 mg/L MCL since August 2018. Selenium concentrations in well 0942 exceeded the UBL in February 2015, and that well has not been sampled since. Concentrations continued to exceed the 0.05 mg/L UBL in wells 0906, 0940, and 0941, all of which are immediately downgradient of the disposal cell. Selenium concentrations increased in well 0906 to 0.16 mg/L during the high-intensity pumping campaign in August 2019, the highest level since 1997. Selenium concentrations increased in well 0941 from 0.018 mg/L in 1998 to 0.08 mg/L in 2020. Selenium concentrations in distal downgradient well 0903 have consistently been below both the UBL and the MCL and, since late 2004, below levels measured in background well 0945.

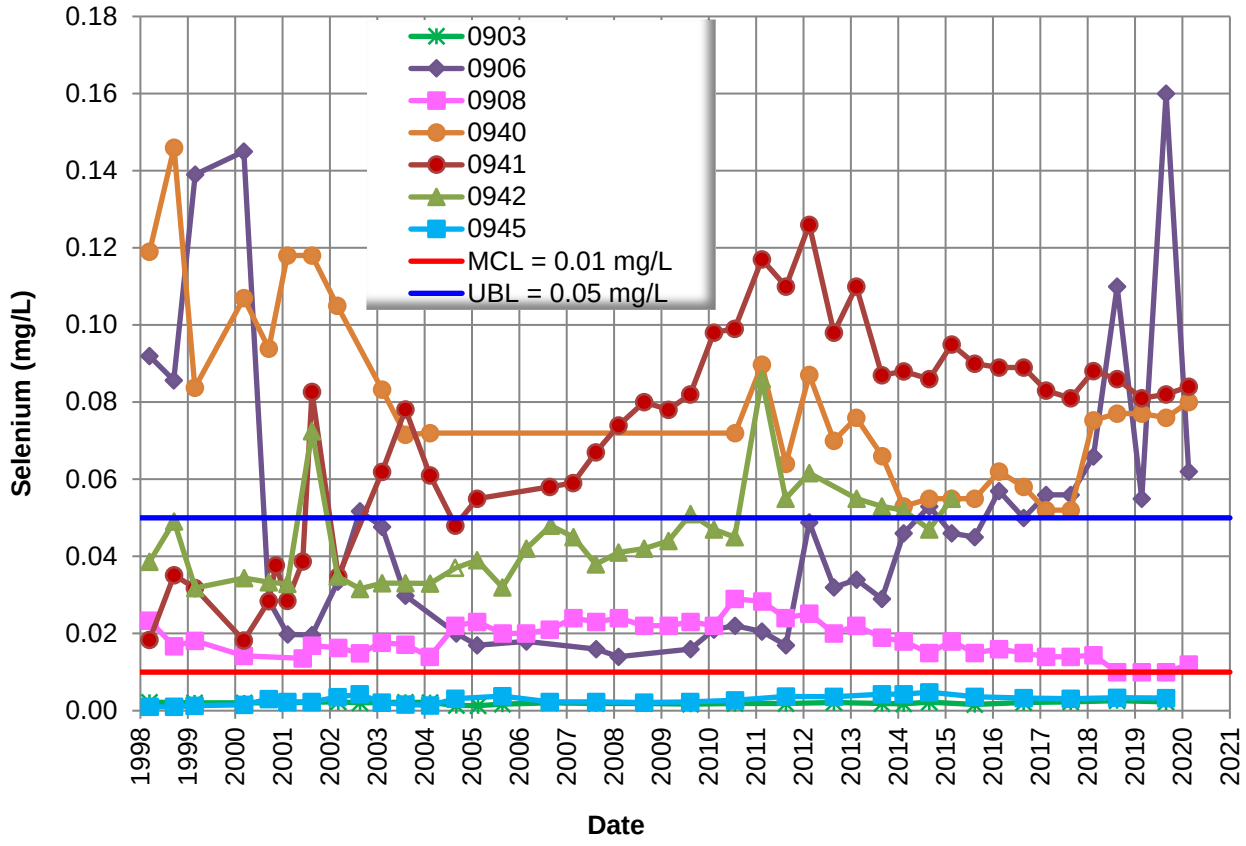

Figure 19-5. Selenium in Groundwater at the Tuba City, Arizona, Disposal Site

Uranium concentrations have historically exceeded the 0.044 mg/L MCL in all compliance wells except for distal downgradient well 0903 and background well 0945, both of which have always been below the MCL (Figure 19-6).

Uranium concentrations in central downgradient well 0941 have gradually increased since 2005 from 0.05 mg/L to 0.27 mg/L. Concentrations in well 0906 have more recently increased from 0.36 mg/L in February 2017 to 1.4 mg/L in February 2020. The February 2020 concentration is above the UBL of 1.17 UBL and is the first recorded UBL exceedance of uranium at the site.

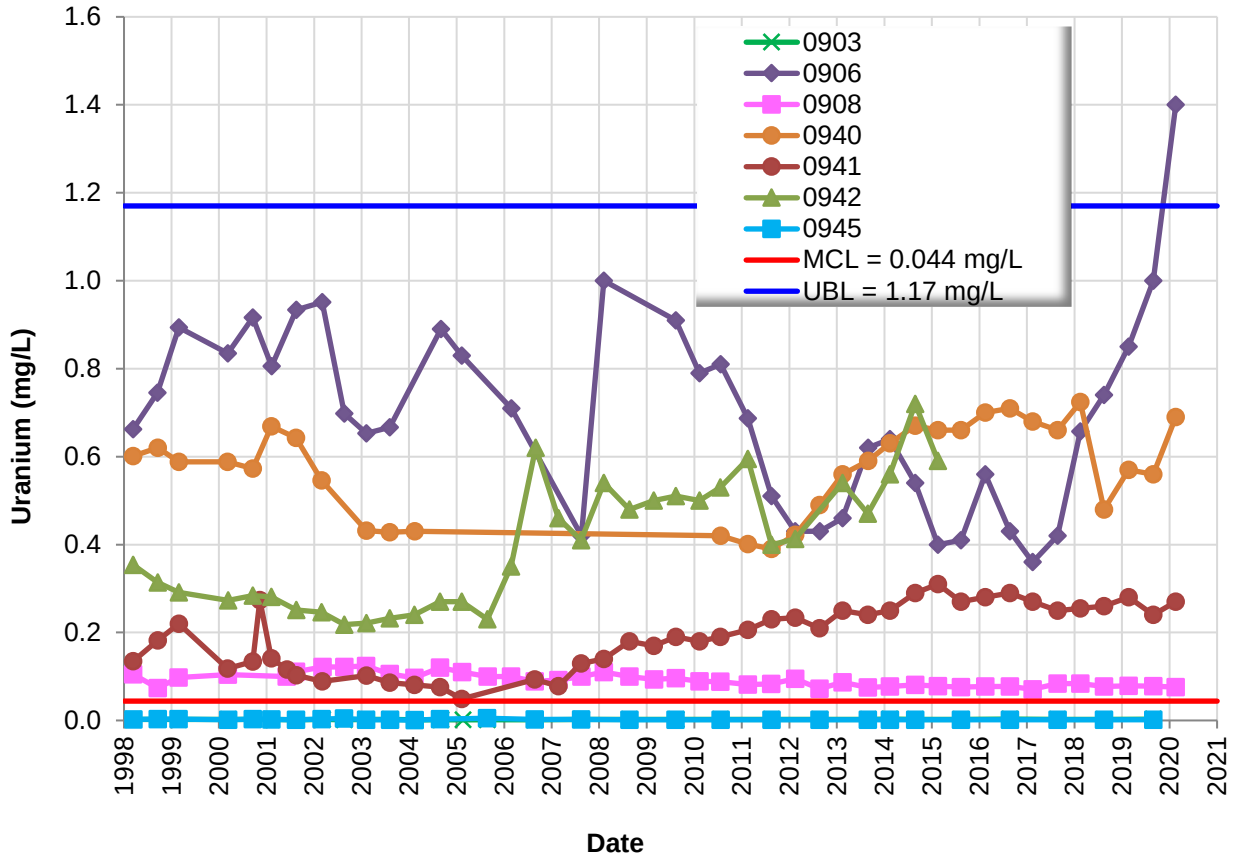

Figure 19-6. Uranium in Groundwater at the Tuba City, Arizona, Disposal Site

Sample results from the 2020 evaluative monitoring indicate that groundwater quality immediately downgradient of the former mill site (in wells 0906, 0908, 0940, 0941, and 0942) is still degraded relative to concentrations of molybdenum, nitrate, selenium, and uranium in background well 0945. Concentrations of all four analytes in distal downgradient well 0903 are comparable with those measured in background well 0945 and below corresponding UBLs, although nitrate concentrations continue to be slightly above the MCL. Analysis of water quality trending and progress of the groundwater remedy are reported in the site-specific annual groundwater report for the Tuba City site. No concerns about disposal cell performance are identified in the evaluative monitoring results.

19.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.

19.9 References

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*.
40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

40 CFR 192 Subpart A. U.S. Environmental Protection Agency, "Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites," *Code of Federal Regulations.*

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19.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	180	Sand Accumulation and Treated Woody Vegetation Along West Fence
PL-2	0	Animal Burrow
PL-3	335	Erosion Under Fence
PL-4	279	Faded Pictorial Perimeter Sign P24
PL-5	—	Site Marker SMK-1
PL-6	45	Survey/Boundary Monument SM/BM-3 with Sand Accumulation
PL-7	90	Disposal Cell Top and Side Slope
PL-8	250	Diversion Channel
PL-9	175	Inactive, Lined Evaporation Pond
PL-10	280	Exposed Geofabric on South Side of Inactive, Lined Evaporation Pond
PL-11	265	Offsite Trash and Debris Pile

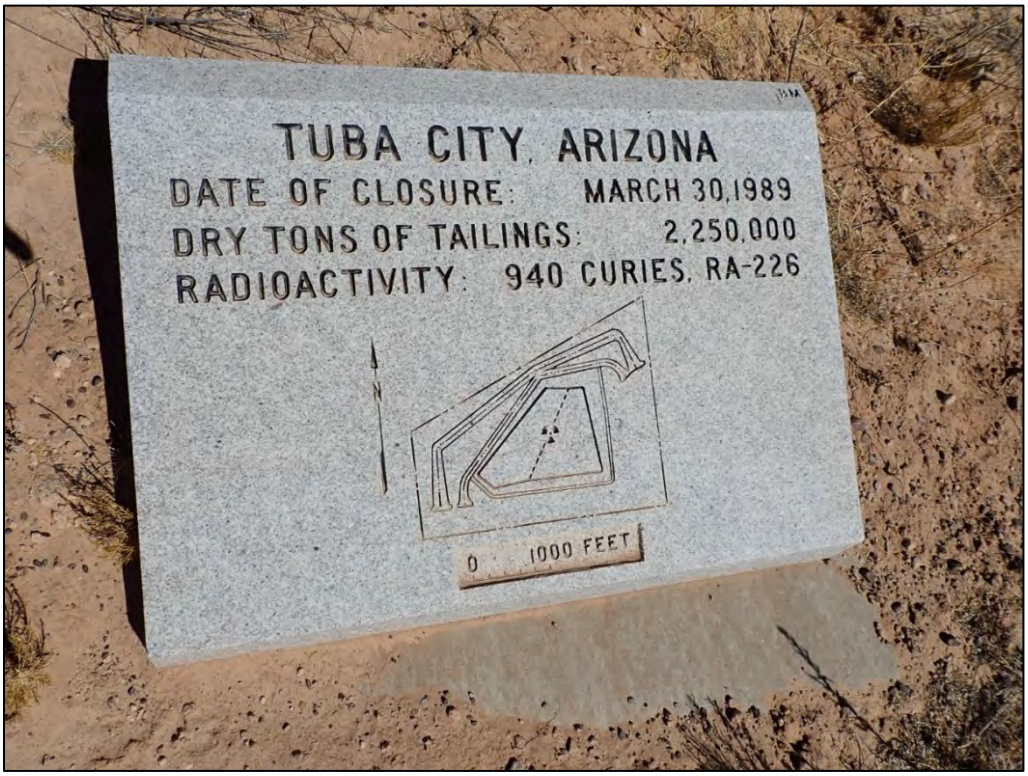
Note:
— = Photograph taken vertically from above.

PL-1. Sand Accumulation and Treated Woody Vegetation Along West Fence

PL-2. Animal Burrow

PL-3. Erosion Under Fence

PL-4. Faded Pictorial Perimeter Sign P24



PL-5. Site Marker SMK-1

PL-6. Survey/Boundary Monument SM/BM-3 with Sand Accumulation

PL-7. Disposal Cell Top and Side Slope

PL-8. Diversion Channel

PL-9. Inactive, Lined Evaporation Pond

PL-10. Exposed Geofabric on South Side of Inactive, Lined Evaporation Pond

PL-11. Offsite Trash and Debris Pile