

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 April 30, 2019. Depressions in the riprap cover identified during the 2016 annual site inspection continue to be observed along lower portions of the disposal cell's northeast side slope and north side slope (as identified in 2018 inspections). Inspectors identified several minor maintenance needs and conducted follow-up inspections.

In response to the observed depressions, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) has continued investigations and performed geotechnical sampling and materials testing (GSMT) on the disposal cell side slope cover components in April 2019. Data obtained through the GSMT will be used to identify possible causes for the cover degradation features that have been observed at the site. Additionally, interim radon barrier protection (IRBP) was implemented at GSMT sampling areas that had radon barrier degradation. A series of test pits and one test strip were mechanically excavated and supplemented with a moisture-conditioned, bentonite-amended granular material to reconstruct the areas where radon barrier material had been eroded. All test areas were systematically screened for gamma radiation, 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(s) of the erosional features are in progress, and an interim cover protection (ICP) action was completed in September 2019.

LM conducted annual observational monitoring consisting of photographic documentation and observational description of seven designated seeps during the annual inspection. Seeps 0251 and 0264 were damp, and Seep 0248 exhibited typical conditions and was dripping. Upgradient (background) Seep 0261 was flowing; the remaining seeps were dry. Ephemeral drainages along the perimeter of the site were wet. Gypsum Creek had some areas of flowing surface water and contained evaporites throughout dry areas within and leading to its flow path. 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 April 30, 2019. The inspection was conducted by S. Hall, K. Lott, J. Manée, and D. Miller of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager), and J. Tallbull (Navajo Nation Abandoned Mine Lands/Uranium Mill Tailings Remedial Action) 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, including site surveillance features and inspection areas. Site features that are present but not required to be inspected are shown in italics. Observations from previous inspections that are currently monitored are shown in blue text, and new observations identified during the 2019 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are 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.

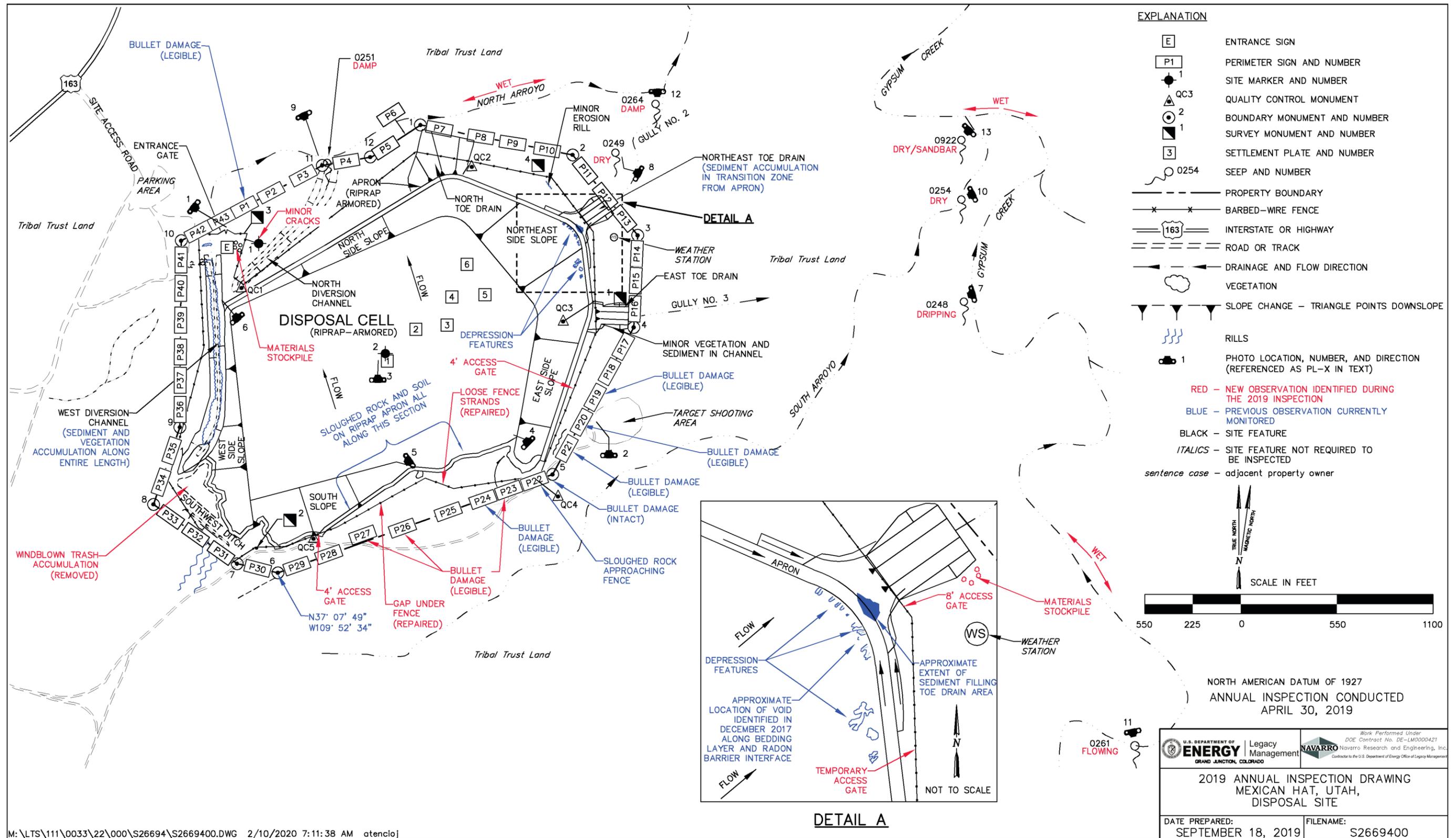


Figure 12-1. 2019 Annual Inspection Drawing for the Mexican Hat, Utah, Disposal Site

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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 (PL-1). The entrance gate was locked and functional. The entrance sign is affixed to a steel post immediately behind the entrance gate (PL-1). Before the inspection, two 4-foot access gates and one 8-foot access gate were permanently installed in the perimeter barbed-wire fence to support ongoing disposal cell cover evaluations and maintenance activities, including one temporary access gate within the fence line. 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. Loose fence strands were identified at a few locations across the site. Two small areas of fence line had loose fence strands and were repaired following the inspection.

There are 43 pairs of perimeter signs, designated P1 through P43 (each pair consisting of a higher 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 (PL-2), but some are affixed directly to the fence or immediately inside the fence. Several perimeter signs (P19, P20, P21, P23, P24, P26, and P27) have bullet damage but remain legible. Additionally, several perimeter signs are bent (presumably from animal contact) or are becoming faded and cracked (P14, P15, P19, P21, P27, P33, P34, P37, and P42) but do not require replacement. A gap was evident under the southern boundary fence and was fixed following the inspection. No other 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-3); 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. No immediate maintenance needs were identified.

12.4.1.4 Survey and Boundary Monuments

Four survey monuments were installed during construction of the disposal cell 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.

12.4.2 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-4).

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 in 2016 and are detailed in the *Mexican Hat UMRCA Disposal Cell Side Slope Cover Depressions Evaluation Report Mexican Hat, Utah* (DOE 2019b), also known as the Depressions Evaluation Report.

There was no noticeable increase of sloughed red rock and soil along the south apron of the disposal cell (PL-5). 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-6). 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 has not been evaluated but may be a result of the observed radon barrier erosion associated with the depression features in this area. Visual observations during the inspection did not identify any apparent increases in the sediment accumulation in this area compared to previous visual observations. Inspectors will continue to monitor this area concurrently with the observed depression features on the northeast side slope. Conversely, no sediment accumulation has been observed below the north side slope where depressions and radon barrier erosion have been identified. No 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. 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 accumulations of trash are along the access road and in the parking area, the areas on the site outside of the fence between perimeter signs P31 and P42, and the southern portion of the site between perimeter signs P22 and P27. Trespassing just inside the site boundary (outside the fence), as evidenced by vehicle and all-terrain vehicle tracks, occurs in the same areas where trash accumulations are present. One smaller area starting to accumulate trash is inside the barbed-wire fence, between perimeter signs P31 and P35; however, this trash is likely being transported onto the site by wind. The trash was removed as part of regular maintenance following the inspection.

Minor vandalism continues to occur, as indicated by bullet damage in several perimeter signs (P19, P20, P21, P23, P24, P26, and P27), but this is expected to be an ongoing problem because of the site's remote location and because access to these areas cannot be restricted. Damaged perimeter signs are replaced when they become illegible. No other maintenance needs were identified.

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. Several follow-up inspections have been performed to further evaluate the depression features since they were first identified in 2016. LM has provided NRC with a series of updates and details associated with follow-up inspections. Follow-up inspections performed through January 2018 are detailed in the Depressions Evaluation Report (DOE 2019b). Follow-up inspections, evaluations, and work performed and completed in 2019 will be detailed in a subsequent report.

12.6 Maintenance

In April 2019, before the annual inspection, LM performed the following maintenance items:

- GSMT on the disposal cell side slope cover components. Data obtained through the GSMT will be used to identify possible causes for the cover degradation features that have been observed at the site. Additionally, an IRBP was implemented in GSMT sampling areas that had radon barrier degradation as detailed in the *Geotechnical Sampling and Materials Testing Work Plan for the Mexican Hat, Utah, UMTRCA Title I Disposal Site* (DOE 2019a). A series of test pits and one test strip were mechanically excavated and supplemented with a moisture-conditioned, bentonite-amended granular material to reconstruct the areas where radon barrier material had been eroded. All test areas were systematically screened for gamma radiation, and no elevated readings were observed.
- A new perimeter chainlink fence was installed around the existing System Operation and Analysis at Remote Sites (SOARS) weather monitoring station. 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.

Two 4-foot access gates, and one 8-foot access gate were permanently installed in the perimeter barbed-wire fence to support ongoing disposal cell cover evaluations and maintenance activities, including one temporary access gate within the fence line (Figure 12-1).

During the annual inspection, inspectors documented several minor maintenance needs that were addressed following the inspection, including:

- Repairing loose fence strands
- Repairing a gap under the fence on the south side of the site
- Removing accumulated trash

The ICP project was performed in late summer 2019 as a temporary measure to replace and restore the depressional features back to the original design specifications until a long-term solution can be assessed. The entire ICP work area was systematically screened for gamma radiation, and no elevated readings were observed.

- 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, and 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.

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 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 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 2006). 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. The majority of seeps have exhibited dry conditions over the past 11 years of observational monitoring.

The LTSP required annual visual monitoring of the seven designated seep locations through 2016, at which time an evaluation was to be conducted whether to continue or discontinue visual seep monitoring; this report is in development. In the interim, observational seep monitoring has been performed in accordance with the LTSP during annual site inspections.

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 was observed dripping; since the seep was only dripping and did not exhibit steady flow, an estimated flow rate was not evaluated. Additionally, Seeps 0251 and 0264 were damp, and upgradient (background) Seep 0261 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, including the respective drainage in which each seep occurs and a reference to photographic documentation.

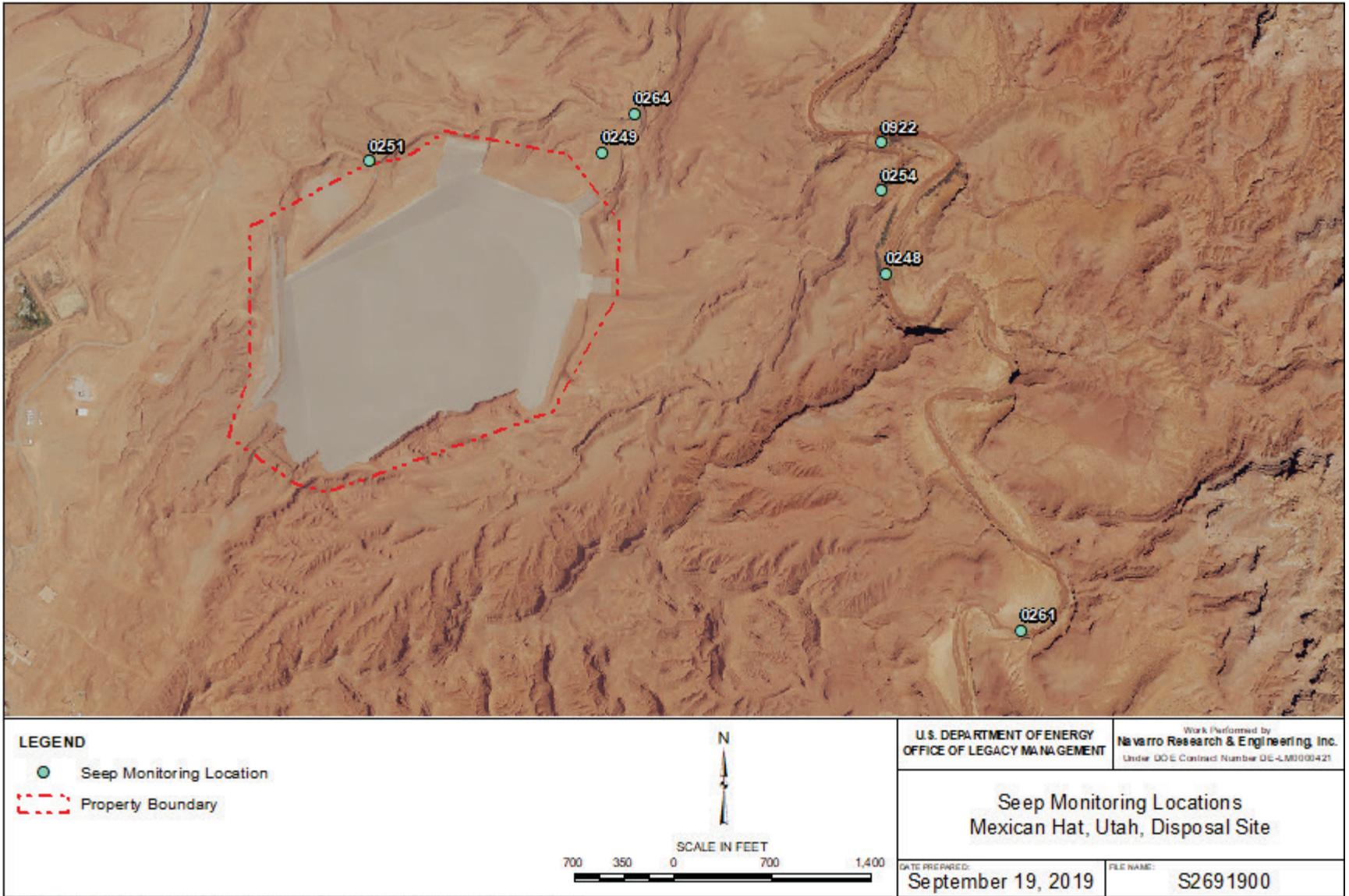


Figure 12-2. Seep Monitoring Locations at the Mexican Hat, Utah, Disposal Site

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-7	Seep was dripping at a much slower rate compared to previous visual observations (no flow rate measured).
0249	Gully No. 2	Downgradient	PL-8	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-9	Damp conditions (no evaporites present).
0254	South Arroyo	Downgradient	PL-10	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-11	Flowing conditions. This seep discharges directly into Gypsum Creek, which had surface water flow during the inspection. Warning sign not posted at this location since this seep is a background location.
0264	North Arroyo	Downgradient	PL-12	Damp conditions. Ephemeral wash near seep location was wet with no evidence of evaporites in the areas observed during the inspection.
0922	Gypsum Creek	Downgradient	PL-13	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.

Gypsum Creek had areas of flowing surface water during the inspection, including the North Arroyo.

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. With the exception of 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. 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.

12.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	130	Entrance Gate; Entrance Sign and Disposal Cell in Background
PL-2	—	Perimeter Sign P20
PL-3	—	Site Marker SMK-1
PL-4	315	Central Portion of Top Slope of Disposal Cell
PL-5	235	Sloughed Rock on South Apron of Disposal Cell
PL-6	320	West Diversion Channel
PL-7	255	Seep 0248 (Limited Dripping)
PL-8	300	Seep 0249 (Dry)
PL-9	155	Seep 0251 (Damp)
PL-10	245	Seep 0254 (Dry)
PL-11	170	Background Seep 0261 (Flowing)
PL-12	180	Seep 0264 (Damp)
PL-13	225	Seep 0922 (Dry/Sandbar)

Note:

— = Photograph taken vertically from above.



PL-1. Entrance Gate; Entrance Sign and Disposal Cell in Background



PL-2. Perimeter Sign P20



PL-3. Site Marker SMK-1



PL-4. Central Portion of Top Slope of Disposal Cell



PL-5. Sloughed Rock on South Apron of Disposal Cell



PL-6. West Diversion Channel



PL-7. Seep 0248 (Limited Dripping)



PL-8. Seep 0249 (Dry)



PL-9. Seep 0251 (Damp)



PL-10. Seep 0254 (Dry)



PL-11. Background Seep 0261 (Flowing)



PL-12. Seep 0264 (Damp)



PL-13. Seep 0922 (Dry/Sandbar)

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