1.0 Bluewater, New Mexico, Disposal Site

1.1 Compliance Summary

The Bluewater, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on March 18–20, 2024. This inspection included the engineered disposal cells and the areas around the disposal cells. The monitoring well network and monitoring well access roads, perimeter road, and boundary monuments were inspected on May 7–9, August 22, and September 24, 2024, respectively. Minor settlements on the side slopes of the main tailings disposal cell, as well as settlements on the north portion of the top slope continue to be observed. No new areas of concern were identified during the inspection, and previously observed features of concern had no significant changes. Inspectors found no cause for a follow-up or contingency inspection.

Groundwater was sampled in November 2023 and May 2024. Analytical results from the two sampling events indicate that alternate concentration limits (ACLs) were not exceeded for any of the constituents monitored at the site (uranium is the primary contaminant of concern). The ACLs for uranium in both the alluvial and bedrock aquifers were based on a site-specific health-based concentration of 0.44 milligram per liter (mg/L) at the site boundary or point of exposure (POE). The U.S. Nuclear Regulatory Commission (NRC), the sole regulator of the site, approved these ACLs in 1996 when the State of New Mexico groundwater standard was 5.0 mg/L. The state reduced this standard to 0.03 mg/L in 2004, a level equivalent to the U.S. Environmental Protection Agency (EPA) drinking water standard. As such, uranium concentrations in several onsite alluvial and bedrock aquifer monitoring wells exceed the current state standard. The U.S. Department of Energy (DOE) Office of Legacy Management (LM) continues to monitor these groundwater conditions to ensure protection of human health and the environment, especially for nearby offsite communities. Because the state has no regulatory authority at the site, any comparisons to standards other than ACLs provided in this report are for informational purposes only and do not indicate a need for further action under UMTRCA.

Results from the fall 2024 sampling event, conducted the week of November 11, 2024, will be documented in the 2025 Annual Inspection and Monitoring 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 (DOE 1997) (LTSP) in accordance with procedures established to comply with the requirements of the NRC general license at Title 10 *Code of Federal Regulations* Section 40.28 (10 CFR 40.28). Table 1-1 lists these requirements.

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

Requirement	LTSP	This Report	10 CFR 40.28
Annual Inspection and Report	Sections 3.3 and 3.4	Section 1.4	(b)(3)
Follow-Up Inspections	Section 3.5	Section 1.5	(b)(4)
Routine Maintenance and Emergency Measures	Section 3.6	Section 1.6	(b)(5)
Environmental Monitoring	Section 3.7	Section 1.7	(b)(3)

1.3 Institutional Controls

The 3300-acre site, identified by the property boundary shown in Figure 1-1 and Figure 1-2, 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 II sites, LM 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: disposal cells, disposal areas, dumps, the entrance gate and sign, the perimeter fence and signs, a site marker, boundary monuments, and monitoring wellhead protectors.

In addition to LM ICs, the New Mexico Office of the State Engineer implemented a well prohibition in the alluvial aquifer downgradient of the site in May 2018 (Romero 2018).

1.4 Inspection Results

The site, approximately 9 miles northwest of Grants, New Mexico, was inspected on March 18–20, 2024. The inspection was conducted by D. Atkinson, J. Graham, N. Lind, and C. Murphy of the Legacy Management Support (LMS) contractor. N. Olin (LM) and A. Rheubottom (New Mexico Environment Department [NMED]) attended the inspection in March. The monitoring well network and access road inspection was completed by G. Baer and S. Alires (LMS contractor) on May 7-9, 2024. The site perimeter road was inspected on August 22, 2024, by A. Barndt, J. Graham, and M. Madril (LMS contractor) and N. Olin (LM). The boundary monuments were inspected by C. Vidmar and Z. Wolfe (LMS contractor) on September 24, 2024. The purposes of the inspections were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate whether maintenance or follow-up inspection and monitoring are needed.

1.4.1 Site Surveillance Features

Figure 1-1 and Figure 1-2 show the locations of site features, including site surveillance features and inspection areas, in black and gray font. Some 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 2024 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 noted in the text and in Figure 1-1 and Figure 1-2 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 1.9.

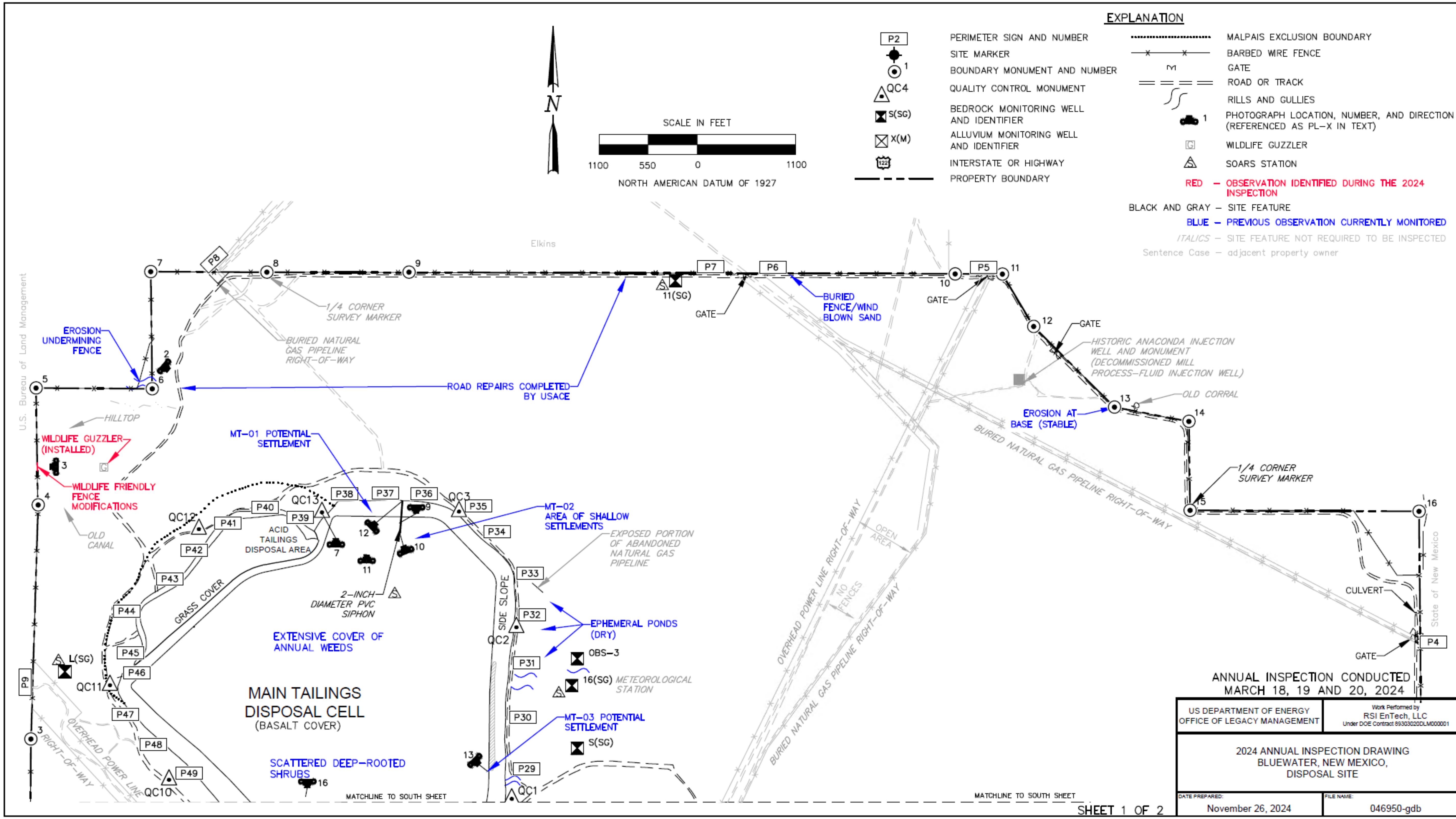


Figure 1-1. 2024 Annual Inspection Drawing for the Bluewater, New Mexico, Disposal Site (Northern Area)

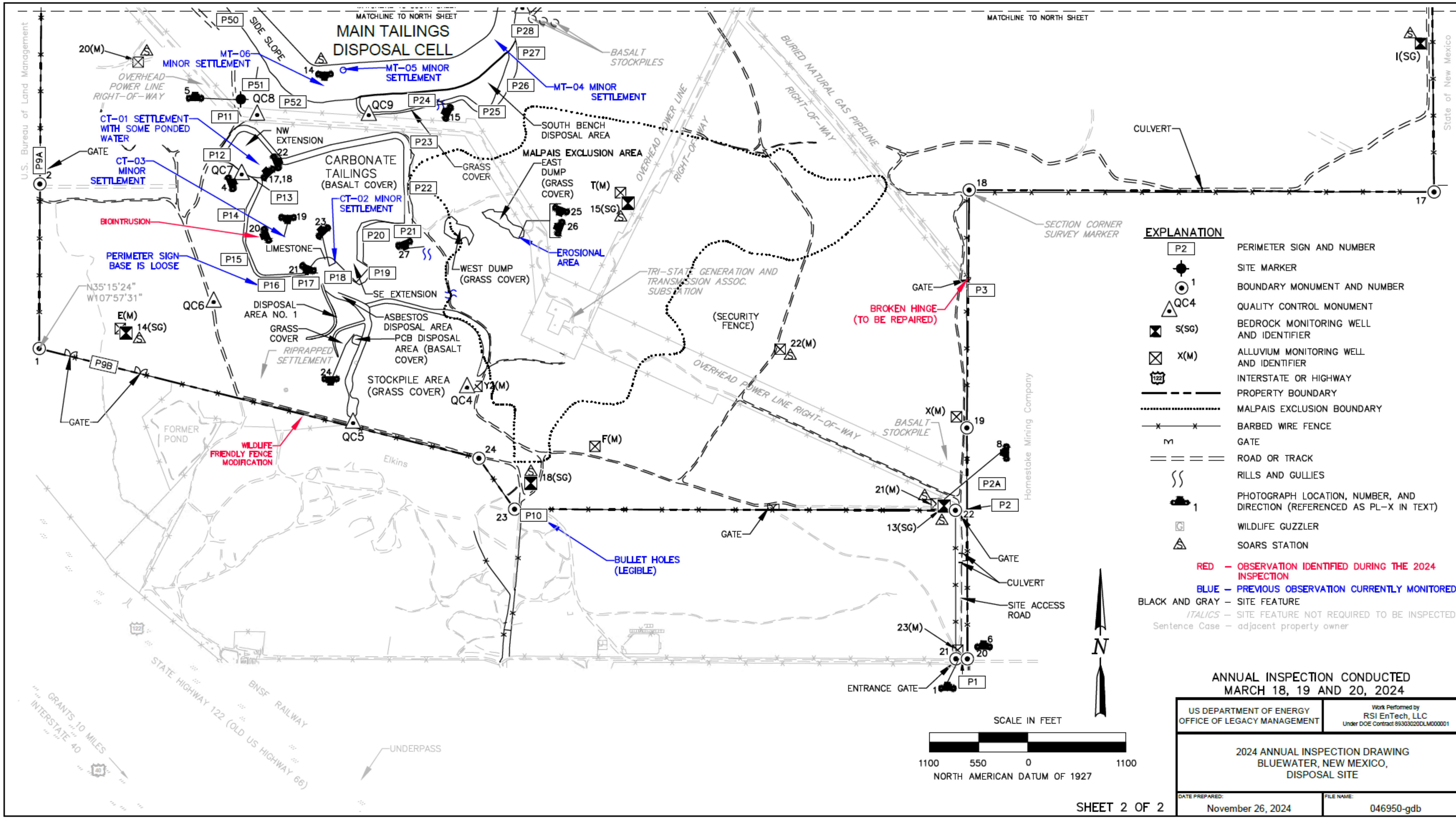


Figure 1-2. 2024 Annual Inspection Drawing for the Bluewater, New Mexico, Disposal Site (Southern Area)

1.4.1.1 Site Access, Entrance Gate, and Interior Roads

Access to the site is obtained from gravel-surfaced Cibola County Road 63 (also known as Anaconda Road); no private property is crossed to gain site access. The entrance gate is a tubular steel, double-swing gate secured by a chain and locks belonging to LM and the various utility companies that have rights-of-way across the site. Three new signs were installed on the entrance gate this year, which include a list of prohibited activities, information addressing uncrewed aircraft systems, and additional emergency site information (PL-1). The site access road is surfaced with crushed basalt and extends northward along a narrow strip of LM property for approximately 1700 feet (ft) from the entrance gate to the main site access road gate. Two culverts allow drainage of surface runoff under the road.

Interior roads used to access LM assets consist of a dirt track covered at places with crushed basalt. The roads are susceptible to erosion and are repaired when they become impassable. Erosion on the road northwest of the main tailings disposal cell and along the north and eastern portions of the access road were repaired by the U.S. Army Corps of Engineers (USACE) in a road repair project between April 2024 and September 2024 (PL-2). During the August 22, 2024, road repair inspection, LM identified an old cutoff gate pole sticking up at the edge of the new road surface near boundary monument BM-16. This pole was removed in September for vehicle safety. Maintenance staff will routinely top dress areas of the access road to improve roads worn away by inclement weather and to reduce erosion. No other maintenance needs were identified.

1.4.1.2 Perimeter Fence and Signs

A four-strand barbed-wire fence encloses the site to facilitate land management by LM, which retains a local subcontractor to periodically check the site perimeter fence, perform minor fence repairs, and remove trespassing cattle. Numerous sections of the fence are in remote areas of the site and cannot be observed from site access roads. Windblown sediment continues to be an issue along the northern portion of the site near perimeter sign P6. LMS contractor staff routinely dig out or extend the fence height in this area.

Wildlife-friendly fence modifications were completed on the perimeter fence on the west and south sides of the site during the weeks of April 15 and September 23, 2024. A total of 200 linear ft of fencing was modified. At these locations, the top fence strand was set at 36–38 inches, the lower strand was replaced with smooth wire and set at 14–16 inches off the ground, and the remaining strands were arranged evenly in between, approximately 6–8 inches apart. These areas were identified as wildlife crossings by subject matter experts and were installed to help reduce wildlife death and injury from fence crossings (PL-3).

Other routine fence maintenance was completed the week of September 23, 2024. A broken hinge was observed on a right-of-way gate near perimeter sign P3. LM assessed the repair need and will work with the utility company to determine maintenance responsibility for this gate. Inspectors observed the gullies, identified in the 2019 inspection, that are parallel to the perimeter fence northwest of the main tailings disposal cell. No significant changes were observed. LM will continue to monitor this area for damage to the perimeter fence.

Fifty-five perimeter signs (warning and no-trespassing signs) are mounted on steel posts along the site boundary and around the main and carbonate tailings disposal cells (PL-4). Perimeter sign P10 has bullet hole damage but is legible. Perimeter sign P16 has a loose base but remains functional. No maintenance needs were identified.

1.4.1.3 Site Marker

The site has one granite site marker between the southwest corner of the main tailings disposal cell and the northwest corner of the carbonate tailings disposal cell (PL-5). The site marker is in good condition, and no maintenance needs were identified.

1.4.1.4 Boundary Monuments

Twenty-four boundary monuments define the site boundary (PL-6). These monuments are typically inside the perimeter fence and several feet inside the true corner or boundary line. Some monuments have become covered by drifting sand, and metal T-posts have been driven at those locations to help locate them. Other boundary monuments are in remote sections of the site and cannot be observed from site access roads. All boundary monuments were inspected during the 2024 annual inspection. Boundary monument BM-16 was buried during USACE road construction activities and was located and inspected. Some erosion was observed at the base of boundary monument BM-13, but it is stable. No maintenance needs were identified.

1.4.1.5 Aerial Survey Quality Control Monuments

Thirteen aerial survey quality control monuments were installed in 2019, and an aerial survey was conducted by USACE in 2021. The aerial survey quality control monuments were inspected during the 2024 annual inspection (PL-7). No maintenance needs were identified.

1.4.1.6 Monitoring Wells

The site groundwater monitoring network consisted of nine monitoring wells when the site was transferred to LM in 1997. Two additional wells were installed in summer 2011, and eight more wells were installed in summer 2012 in response to elevated uranium concentrations in the two aquifers (alluvial and bedrock) at the site. The onsite groundwater monitoring network now consists of 19 monitoring wells; 10 are completed in the bedrock aquifer and 9 in the alluvial aquifer. Eleven wells (three alluvial and eight bedrock) have telemetry towers, known as System Operation and Analysis at Remote Sites (SOARS) stations to transmit groundwater level and weather data to the LM Field Support Center at Grand Junction, Colorado. The monitoring wells and SOARS stations are identified in Figure 1-2. The wellhead protectors and SOARS stations were observed to be undamaged and locked (PL-8). No maintenance needs were identified.

1.4.2 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 main tailings disposal cell, including the acid tailings and south bench disposal areas; (2) the carbonate tailings disposal cell, including the asbestos disposal area, the polychlorinated biphenyl (PCB) disposal area, and associated disposal areas and dumps; (3) the region between the disposal structures and the site perimeter; and (4) the site perimeter and 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 conformance with LTSP requirements.

1.4.2.1 Main Tailings Disposal Cell, Acid Tailings, and South Bench Disposal Areas

The 354-acre contiguous main tailings disposal cell, acid tailings, and south bench disposal areas constitute one large disposal area. The top slope of the main tailings disposal cell is covered with basalt riprap and was designed to shed runoff water over the north edge of the top slope. The top slope grade is 3% to 4% at the south end and decreases to less than 0.5% at the north end. The top slopes of the acid tailings and south bench disposal areas are nearly flat and covered by grass. Basalt riprap protects the side slopes of the disposal areas.

Plant encroachment (by annual weeds, perennial grasses, forbs, and scattered perennial shrubs) continues on the main tailings disposal cell top and side slopes (PL-9). Siberian elm saplings on the top slope are periodically treated with herbicide to prevent the establishment of trees that could damage the main tailings disposal cell cover materials. No live elms were observed during the inspection.

A large area of settlement is present at the north end of the top slope of the main tailings disposal cell and along the east and northwest edges of the top slope. This portion of the top slope overlies predominantly clay-rich tailings referred to as slimes. Although the former licensee attempted to dewater the slimes to consolidate them, that portion of the top slope continued to settle after the site transitioned to LM. Annual inspections indicated that the settlements have enlarged in area and depth over time. LM, therefore, conducted high-resolution light detection and ranging (lidar) surveys in 2012 and 2016 to determine if settlement continued and to gauge its magnitude (DOE 2017). The 2016 lidar results, when compared to the 2012 lidar results and the original topographic map developed in 1997, demonstrated that settlement measures up to 4 ft in places. The rate of settlement since 2012 (an average of 0.72 inch per year between 2012 and 2016) is much less than the rate before 2012 (an average of 1.8 inches per year between 1997 and 2012). Another lidar survey was conducted by USACE in April 2021. The data from this survey and previous surveys are being evaluated to assess the rate of settlement and degree of consolidation.

Seasonal ponds occasionally develop in the settlements from stormwater and can coalesce into one large pond after a series of storm events. This area is monitored continuously using a remotely operated webcam to detect the presence of ponded water. No ponding was observed on the main tailings disposal cell during the inspection. No algae were present during the inspection even though algae have been noted in previous reports.

A 2-inch-diameter siphon was installed in fall 2015 to dewater as much of the ponded water as possible (PL-10). The siphon is manually started when the webcam indicates that a large pond has developed. The intent is to avoid potential erosion of the main tailings disposal cell cover materials if the pond surface reaches an elevation high enough to spill over the north side slope. Water would start to spill over at the lowest point along the north edge of the top slope, which could initiate erosion in that area.

The siphon is usually operated at least once a year, depending on precipitation, and it successfully removes nearly all the water; any remaining water tends to evaporate. When operated, the siphon discharges water at a rate of approximately 100 gallons per minute at the toe of the north side slope where runoff water was intended to discharge (PL-11). The discharged water ponds over a large area north of the main tailings disposal cell and eventually either evaporates or infiltrates into the soil. The discharged water does not flow off the site. Due to the lack of significant precipitation during the 2024 monsoon season (4.46 inches were measured by the onsite rain gauge), the siphon did not require operation this year. The last time the siphon was operated was in October 2022.

LM entered into an interagency agreement with USACE in October 2019 to evaluate settlement, design a repair to the depressions, and ensure continued positive drainage from the main tailings disposal cell. In October 2023, USACE completed a geotechnical investigation on the top slope of the disposal cell to collect data on the condition of the cell cover and underlying material. USACE performs cone penetration testing at 86 locations on the top slope of the disposal cell using a Site Characterization and Analysis Penetrometer System, or SCAPS, truck (PL-12). Analysis of the data indicated a relatively weak soil layer at approximately 20 ft below the surface that extends to the foundation. There is indication that the weak soil layer is an artifact of construction techniques from placement of super-saturated slimes material overlain by a thick layer of windblown tailings that was indirectly and nonuniformly compacted. The full results of this investigation will be submitted to NRC in the *DOE-LM Bluewater Disposal Site, Cibola County, New Mexico, Subsurface Characterization Report* anticipated later in 2024. NRC will be involved in reviewing designs as they are developed and will concur upon the final design before construction.

The top slope, side slopes, and toe of the main tailings disposal cell were inspected for signs of erosion or sediment deposition. Table 1-2 includes a list of potential settlement or depression features that are identified in Figure 1-1 and Figure 1-2. These features have been assigned a feature number starting with MT followed by a unique number. This identifies the feature as being on the main tailings disposal cell. These feature numbers are designated for the purpose of discussion in this report. No apparent changes were observed in any of the potential settlement areas. All identified settlements features will continue to be monitored and will be evaluated using lidar when it is available.

Table 1-2. Monitoring Status of Settlement Features on the Main Tailings Disposal Cell at the Bluewater, New Mexico, Disposal Site

Settlement No.	General Description	Initial Observation	Monitoring Status (Y/N)	Notes	Approximate Dimensions
MT-01	Area of potential depression was observed on the north side slope	2020	Y	None.	12 ft long × 1.5 ft wide
MT-02	Area of ponding that occurs on the northern top slope of the cell	1997	Y	During annual inspections, inspectors monitor for ponded water and presence of algae. Changes in the settlement area are periodically monitored using lidar survey results.	908 ft long × 440 ft wide × 4 ft deep
MT-03	Area of potential settlement on the southeastern portion of the top slope	2023	Y	Photograph PL-13.	8 ft long × 3 ft wide
MT-04	Area of minor settlement on the eastern end of the south side slope	2021	Y	None.	20 ft long × 10 ft wide × 10–12 inches deep
MT-05	Area of minor settlement on the south side slope	2018	Y	This feature is very minor and was not located by field teams in 2021 or 2023. In 2025, if no significant changes are observed, settlement feature MT-05 will be removed from tracking.	10 ft long × 10 ft wide
MT-06	Potential settlement feature on the western side of the south side slope	2022	Y	Photograph PL-14.	15 ft long × 30 ft wide

Abbreviations:
MT = main tailings
N = no
Y = yes

During the 2019 annual inspection, minor rills with a maximum depth of 6 inches were observed at the base of the east side slope and minor rills with a maximum depth of 8 inches were observed at the base of the south bench of the main tailings disposal cell. The rills to the east of the disposal cell showed no significant change. The rilling at the south bench appeared to be less severe than when observed in 2023 (PL-15). LM will continue to monitor the rills for potential impact to the main tailings disposal cell and south bench area. A potential animal burrow or root trace was observed in 2024 on the top slope of the main tailings pile (PL-16). Animal burrows observed on the top slope of the acid tailings disposal area in 2023 were not present during the 2024 inspection and will not be tracked in 2025. No sediment deposits were present along the toe. No maintenance needs for the side slopes, acid tailings, or south bench disposal areas were identified.

1.4.2.2 Carbonate Tailings Disposal Cell, Other Disposal Areas, and Dumps

The 54-acre carbonate tailings disposal cell is south of the main tailings disposal cell. Basalt riprap covers the top and side slopes of the carbonate tailings disposal cell. The top slopes gently eastward. The carbonate tailings disposal cell includes extensions to the northwest and southeast. Table 1-3 includes a list of potential sediment or depression type features that are identified in Figure 1-2. These features have been assigned a feature number starting with CT followed by a unique number. This identifies the feature as being on the carbonate tailings disposal cell. These feature numbers are designated for the purpose of discussion in this report. These areas of settlement do not appear to be enlarging but will continue to be visually inspected or evaluated using periodic lidar survey results.

Table 1-3. Monitoring Status of Settlement Features on the Carbonate Tailings Cell at the Bluewater, New Mexico, Disposal Site

Settlement No.	General Description	Initial Observation	Monitoring Status (Y/N)	Notes	Approximate Dimensions
CT-01	A shallow settlement on the northwest extension	2012	Y	Photographs PL-17 and PL-18. Stormwater runoff occasionally ponds at this location. Settlement was observed to have standing water below the riprap surface during the 2024 inspection.	73 ft long × 63 ft wide
CT-02	A settlement on the north side slope	2019	Y	None.	9.5 ft long × 1.5 ft wide
CT-03	Minor settlement observed on the south-central top slope of the carbonate cell	2023	Y	Photograph PL-19.	8 ft long × 3 ft wide × 0.3 ft deep

Abbreviations:
CT = carbonate tailings
N = no
Y = yes

A biointrusion area was identified west of minor settlement CT-03 (PL-20) that appears to be caused by animals digging small potholes into the top slope riprap layer. Due to recent rains at the site, two areas of concentrated water drainage or ponding were identified on the southern and northern portions of the carbonate cell. These areas will be monitored for future rills or ponding issues (PL-21, PL-22). Annual weeds, perennial grasses, and scattered woody shrubs were on the carbonate tailings disposal cell and its extensions. Siberian elm saplings are periodically treated with herbicide. No saplings were observed during the inspection. No additional maintenance needs were identified.

The 2-acre asbestos disposal area is a bowl-like feature just south of the carbonate tailings disposal cell. The north, west, and south side slopes of this feature are covered by limestone riprap; the asbestos cell cover is covered with grass. A settlement on the north side slope, CT-02, that was first identified during the 2019 annual inspection had no observed changes in 2024 (PL-23). The settlement will continue to be monitored, and repairs will be made as necessary. No immediate maintenance needs were identified.

An 11-acre grass-covered disposal area is south of the asbestos disposal area. A small riprap-covered PCB cell is within the disposal area (PL-24). Two grass-covered dumps, totaling approximately 2 acres, are east of the carbonate tailings disposal cell. Inspectors observed a minor erosional area along the basalt flow at the southern interface of the east dump that was first identified in 2019 (PL-25, PL-26). The erosional area was measured in 2022 at approximately 11.3 ft long × 5.1 ft wide × 4 ft deep. Wooden stakes were placed at the edges of the feature to monitor future growth. Radon gas concentration and radiation dose rate surveys were completed near the erosional area by an LMS radiological control technician in 2023. The measurements were consistent with background levels. This area is showing evidence that riprap continues to slump into the settlement, but the area affected area has not grown in size. The erosional area will continue to be monitored. No immediate maintenance needs were identified.

1.4.2.3 Area Between the Disposal Cells and the Site Perimeter

Other areas inside the site were inspected by driving the site perimeter road and other roads and tracks. Much of the southern and western portions of the site are inaccessible by vehicle because they are covered by basalt flows.

Small ephemeral ponds often form in an area along the east side of the main tailings disposal cell and in other low spots following storms. The areas of ponding are far enough from the main tailings disposal cell that they do not have any impact. These areas did not have standing water but were wet from recent rain events during the inspection.

A small ephemeral pond area was observed near the southwest side slope of the main tailings disposal cell near perimeter sign P50 in 2023. This pond was not present during this inspection and will be removed from tracking. Scattered tamarisk shrubs and other plants listed as noxious weeds by the State of New Mexico are onsite. Noxious weeds were treated with herbicide following the inspection. Additional rilling and animal burrows are present in the area between the disposal cell and site perimeter but do not threaten any site features (PL-27).

A self-sustaining wildlife drinking water system was installed in the northwest area of the site in 2024 to help maintain and improve resident wildlife and pollinator habitat and improve water access in an important migratory corridor.

The decommissioned mill process-fluid injection well near the northeast corner of the site features a monument consisting of a steel well casing set in concrete. Information about the well is welded onto the monument. No maintenance needs were identified.

Several utility companies have rights-of-way that cross the site. These rights-of-way are bordered by stock fences with locked gates where the rights-of-way cross the site boundary. Roads along the rights-of-way typically are covered with crushed basalt to provide the utility companies with all-weather access. LM is not responsible for maintaining the right-of-way roads or fences. An electric power substation, enclosed by a security fence, is near the center of the site. Utility company personnel visit the substation frequently. LM is not responsible for maintaining the substation or its security fence and access road.

1.4.2.4 Site Perimeter and Outlying Areas

The surrounding land is used for livestock grazing and wildlife habitat. The area beyond the site boundary for 0.25 mile was visually observed for erosion, development, changes in land use, or other phenomena that might affect conformance with LTSP requirements. No such changes were observed.

1.5 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 during the inspection.

1.6 Routine Maintenance and Emergency Measures

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

- Treat the noxious weeds
- Continue to top dress roads to improve weather access and reduce erosion along the road to the main tailings disposal cell
- Perform minor fence repairs
- Add erosion control around the new wildlife guzzler

The broken hinge identified on the gate near perimeter sign P3 will be repaired at a later date. No other maintenance needs were identified.

Emergency measures are corrective actions that LM will take in response to unusual damage or disruption that threatens or compromises site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were identified.

1.7 Environmental Monitoring

Groundwater monitoring is required at the site (DOE 1997). The monitoring well network acquired by LM at the time of site transition and included in the LTSP consisted of wells E(M), F(M), T(M), X(M), Y2(M), L(SG), OBS-3, S(SG), and I(SG). Wells with an "(M)" suffix are screened in the alluvial aquifer, while wells with an "(SG)" suffix and well OBS-3 are screened in the San Andres-Glorieta (SAG) or bedrock aquifer. The LTSP requires triennial sampling for molybdenum, selenium, and uranium in the alluvial aquifer background and point of compliance (POC) wells. The LTSP also requires triennial sampling of the SAG (bedrock) aquifer background and POC wells for selenium and uranium. Alluvial aquifer well X(M) and bedrock aquifer well I(SG), which are POE wells along the east property boundary, are to be sampled only if specified ACLs are exceeded at POC wells (DOE 1997).

In 2008, NMED requested LM's assistance in investigating and evaluating regional groundwater contamination associated with the former Grants Mineral Belt uranium mining industry. NMED suspected that contaminants from the site had migrated offsite. In response to NMED, LM reinitiated annual sampling at most onsite monitoring wells, including the POE wells, in fall 2008. In 2009, to support NMED's regional groundwater investigation, LM began reevaluating the hydrogeology and groundwater quality at the site and also expanded the analytical scope to include a larger suite of constituents than required by the LTSP.[1]

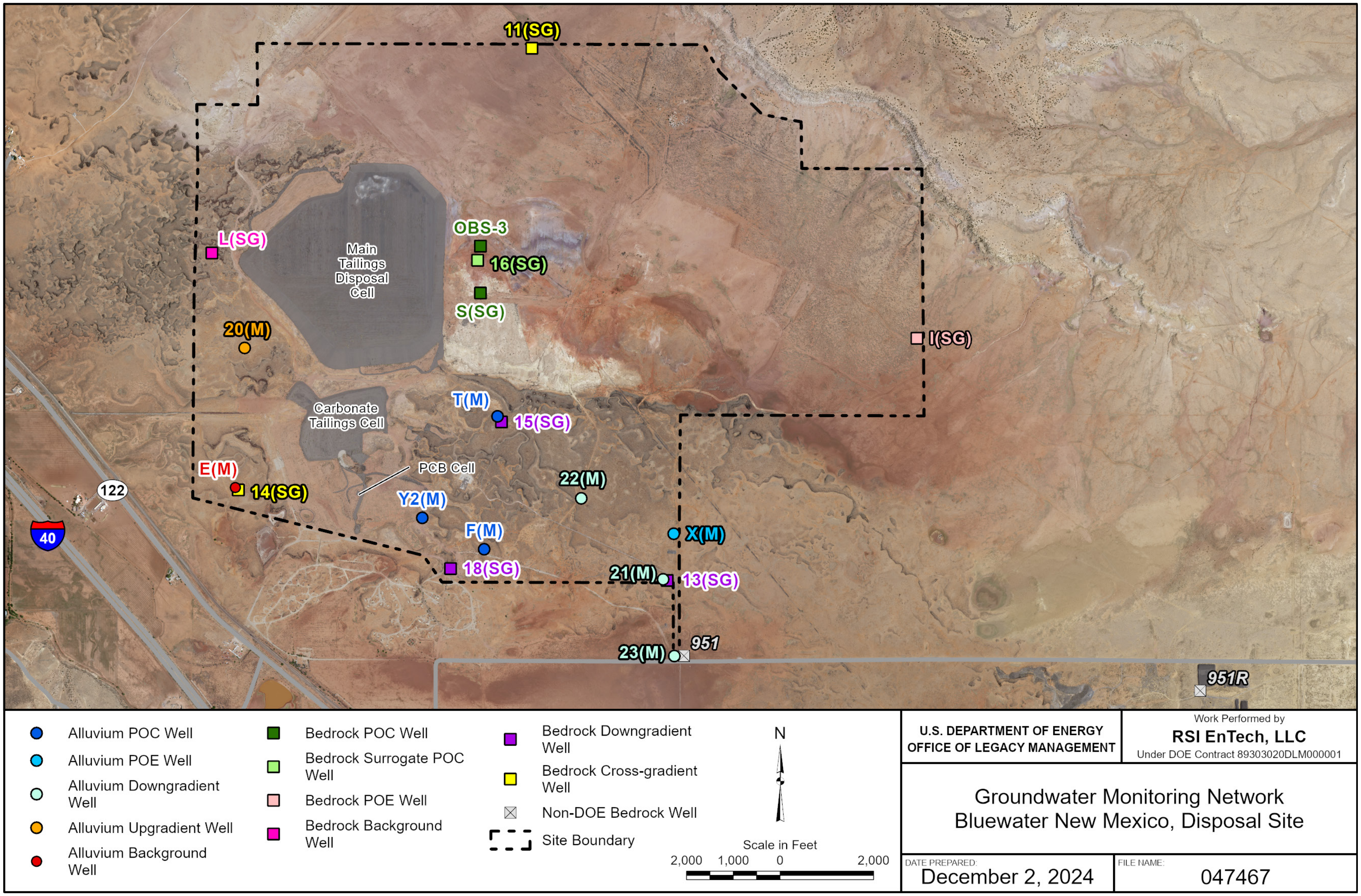
To address stakeholder concerns and in consultation with NRC, LM installed 10 additional monitoring wells in 2011–2012 and, in response to the initial exceedance of the uranium ACL in alluvial well T(M) in 2010 (discussed further in Section 1.7.1), began semiannual (versus annual) sampling at all wells at that time.

The current groundwater monitoring network, including the 10 additional wells installed in 2011–2012, is shown in Figure 1-3. Currently, all 19 site wells, including POC and POE wells, are sampled semiannually for an expanded list of constituents as described in the following sections. Because of the lack of variation between spring and fall sample results observed in the 2010–2022 dataset, LM notified NRC in August 2023 of its intent to reduce the sampling frequency to annually (DOE 2023). LM will continue semiannual sampling until it receives concurrence from NRC.

The events addressed in this report are the fall semiannual sampling that occurred on November 13–15, 2023, and the spring 2024 semiannual sampling that occurred on May 7–8, 2024. Results from the fall 2024 sampling event, conducted the week of November 11, 2024, will be documented in the 2025 Annual Inspection and Monitoring Report. Table 1-4 lists the monitoring wells routinely sampled at the Bluewater site.

Under Title II, contaminant concentrations must be below corresponding UMTRCA standards or as low as reasonably achievable (ALARA) upon transfer. Pursuant to the Atomic Energy Act (Title 42 *United States Code* Section 2011 et seq. [42 USC 2011 et seq.]) (AEA), NRC has sole regulatory authority over groundwater issues at the site. ACLs for molybdenum (alluvial aquifer only), selenium, and uranium are listed in Table 1-5. The ACLs for uranium, the primary contaminant of concern, were based on a health-based concentration limit (0.44 mg/L) in POE wells for both aquifers at the site's east boundary.

[1] In addition to molybdenum, selenium, and uranium (the primary constituents addressed in the LTSP), groundwater samples are analyzed routinely for chloride, nitrate + nitrite as nitrogen, sulfate, total dissolved solids, major cations, and field parameters (e.g., total alkalinity and dissolved oxygen).



Notes: Well T(M) has been dry or had insufficient water to sample since November 2012; well X(M) has been dry since May 2021. Well Y2(M) was identified as a POC for PCB monitoring given proximity to the PCB cell. Based on provisions in the LTSP (no detectable levels), PCB monitoring was discontinued in 2018.

Figure 1-3. Groundwater Monitoring Network at the Bluewater, New Mexico, Disposal Site

Table 1-4. Groundwater Monitoring Network at the Bluewater, New Mexico, Disposal Site

Monitoring Well	Date Installed	Description
Alluvial Aquifer		
E(M)	5/30/1978	Background well
F(M)	6/2/1978	POC
T(M)	11/14/1980	POC (dry since 2012)
X(M)	12/11/1980	POE (dry since 2021)
Y2(M)	9/10/1996	POC for PCB monitoring[a]
20(M)	7/19/2012	Upgradient well
21(M)	7/7/2011	Downgradient well, intended as surrogate for POE well X(M)
22(M)	7/12/2011	Surrogate POC well replacing T(M)
23(M)	6/28/2012	Downgradient well
SAG (Bedrock) Aquifer		
I(SG)	7/15/1979	POE
L(SG)	12/19/1980	Background
OBS-3[b]	2/2/1981	POC
S(SG)[b]	1/19/1981	POC
11(SG)	7/12/2012	Cross-gradient well
13(SG)	6/21/2012	Downgradient well
14(SG)	7/1/2012	Cross-gradient well
15(SG)	6/15/2012	Downgradient well
16(SG)	6/13/2012	Surrogate POC well
18(SG)	6/2/2012	Downgradient well

Notes:
[a] Well Y2(M) was designated as a POC well for PCBs given proximity of the PCB disposal cell. After 20 years of annual sampling indicated no detectable concentrations, PCB monitoring was discontinued in 2018 in accordance with provisions of the LTSP (DOE 1997).
[b] Low (≤0.005 mg/L) uranium concentrations measured in POC wells S(SG) and OBS-3 between 2004 and 2010 were later found to be unrepresentative of the aquifer. Downhole videos identified severe iron scaling in both wells. Well 16(SG) now serves as a surrogate POC well.

Table 1-5. Groundwater ACLs at the Bluewater, New Mexico, Disposal Site

POC Well	Constituent	ACL (mg/L)[a]
Alluvial aquifer wells F(M) and T(M)	Molybdenum Selenium Uranium	0.10 0.05 0.44[b]
Bedrock aquifer wells OBS-3 and S(SG)	Selenium Uranium	0.05 2.15[b]

Notes:
[a] Source: Table 3-4 of the LTSP (DOE 1997). The ACL for molybdenum is equivalent to the UMTRCA standard (40 CFR 192). The ACL for selenium is the same as the EPA (and state) drinking water standard.
[b] The uranium ACL for both aquifers is based on a human health-based risk standard of 0.44 mg/L at the site boundary as approved by NRC (NRC 1996).

Previous groundwater evaluations included an assessment of the main tailings disposal cell performance (DOE 2013) and development of a conceptual model of contaminant transport processes in the aquifers impacted by the Bluewater site (DOE 2014). LM updated the uranium plume maps for both the alluvial aquifer and the SAG aquifer in a 2019 report (DOE 2019). This analysis was followed by an evaluation of the influence of high-volume pumping wells near the site on groundwater flow and contaminant trends in the SAG aquifer (DOE 2020). In these reports, the extent of the uranium plumes for both aquifers is defined not by the ACLs (Table 1-5) but by the area with uranium concentrations exceeding 0.03 mg/L, the EPA maximum contaminant level for drinking water. DOE inherited the site when the state groundwater standard for uranium was 5 mg/L, a standard later reduced in 2004 when the state adopted the more stringent EPA standard.

Because DOE is committed to ensuring protection of human health and the environment for nearby offsite communities, the 0.03 mg/L state standard is applied as a context for interpreting uranium concentration trends in this report. However, neither the state nor EPA have regulatory authority at the site, so these comparisons are for informational purposes only and do not indicate a need for further action under UMTRCA regulations. LM continues to update the site conceptual model describing groundwater flow and contaminant transport using three-dimensional data visualization approaches and regularly updates stakeholders about the findings of these ongoing evaluations. Historical water quality data addressed in previous reports and in the following sections are available at https://gems.lm.doe.gov through the Geospatial Environmental Mapping System (GEMS).

1.7.1 Alluvial Aquifer

Alluvial aquifer analytical results from sampling events in November 2023 and May 2024 are provided in Table 1-6. POC well T(M) and POE well X(M) were not sampled during either event because they were dry or had insufficient water to sample. Well T(M) has been dry since 2012; well X(M) has been dry since May 2021.

Because concentrations of molybdenum and selenium in all alluvial wells have been consistently below corresponding ACLs (Figure 1-4), the remainder of this section focuses mainly on uranium concentration trends. Figure 1-4 (and the remaining time-concentration plots presented in this section) use a faceting approach, whereby data are partitioned into a matrix of panels with each panel plotting data for a single well. In each facet plot, a nonparametric smoothing method—locally estimated scatterplot smoothing (LOESS)—is used. The surrounding shaded area represents the 95% pointwise confidence interval. Using this approach, overall trends in the data are more apparent and not obscured by “noise” or random variation.

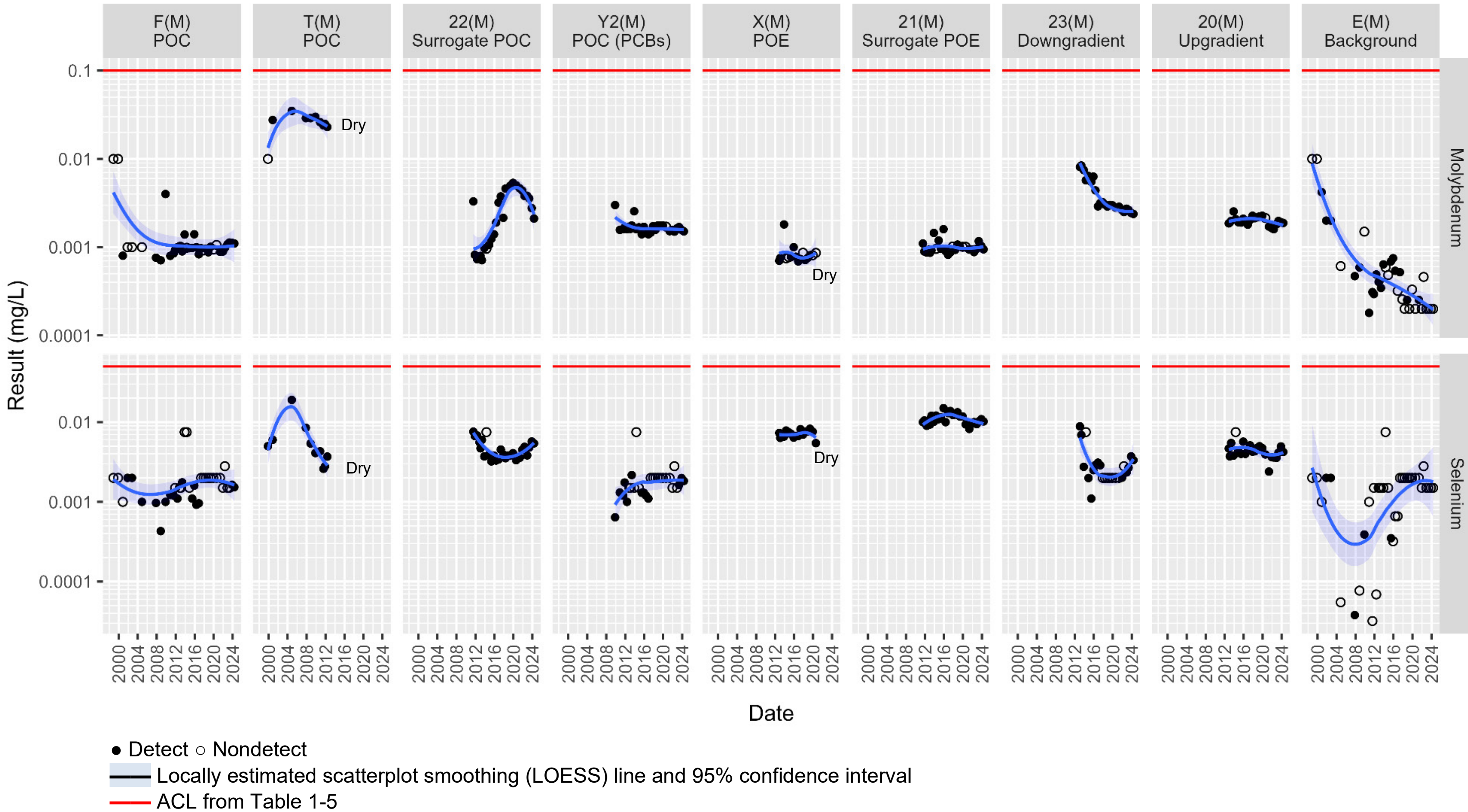
To support interpretation of these figures, Mann-Kendall trend analysis was performed for each well-parameter combination to characterize whether trends in uranium (the primary site contaminant), molybdenum, or selenium are upward, stable (no trend), or declining. Detailed Mann-Kendall trend test results for Bluewater site alluvial wells are documented in Table 1-7.

Table 1-6. Alluvial Aquifer Monitoring Results from November 2023 and May 2024 at the Bluewater, New Mexico, Disposal Site

Monitoring Well	Purpose	Molybdenum (mg/L) ACL = 0.10 mg/L		Selenium (mg/L) ACL = 0.05 mg/L		Uranium (mg/L) ACL = 0.44 mg/L	
		November 2023	May 2024	November 2023	May 2024	November 2023	May 2024
E(M)	Background	ND	ND	ND	ND	ND	ND
F(M)	POC	0.0011	0.0011	0.0016	0.0015	0.0056	0.0056
T(M)[a]	POC	Not sampled (last sampled in May 2012)					
X(M)[a]	POE	Not sampled (last sampled in August 2020)					
Y2(M)	POC[b]	0.0016	0.0015	0.0020	0.0018	0.0041	0.0041
20(M)	Upgradient well	0.0019	0.0019	0.0050	0.0042	0.011	0.011
21(M)	Surrogate POE	0.0010	0.00095	0.011	0.010	0.089	0.080
22(M)	Surrogate POC, replacing T(M)	0.0028	0.0021	0.0057	0.0054	0.35	0.31
23(M)	Downgradient well	0.0024	0.0024	0.0037	0.0033	0.014	0.014

Notes:
Results are rounded to two significant figures. Detection limit values for ND results are reported in GEMS, as are the results of duplicate analyses; the original sample results are reported above.
[a] Wells T(M) and X(M) were not sampled during this reporting period because they were dry or there was insufficient water to sample.
[b] POC for monitoring of PCBs (only). LTSP requirements were met in 2018 when 20 years of sampling indicated no detectable concentrations, at which point LM discontinued monitoring for PCBs.

Abbreviation:
ND = not detected (below laboratory detection limit)



Notes: Data are plotted since 1998, the first sampling event after the LTSP was issued (DOE 1997). Wells are ordered by purpose as follows: POC and POE wells are listed first, followed by the remaining alluvial wells. Data for upgradient well 20(M) and the original background well E(M) are plotted last. As noted in Table 1-4, well 22(M) is a surrogate POC well replacing T(M).
Abbreviation: mg/L = milligrams per liter

Figure 1-4. Molybdenum (top) and Selenium (bottom) Concentrations in Alluvial Aquifer Monitoring Wells at the Bluewater, New Mexico, Disposal Site: 1998–2024

Table 1-7. Mann-Kendall Trend Analysis Results for Uranium, Molybdenum, and Selenium in Bluewater Site Alluvial Monitoring Wells

Well	Initial Trend Analysis Date	Final Trend Analysis Date	No. of Samples	No. of Nondetects	Kendall's tau	p-value	Trend
Uranium							
20(M)	11/14/2012	5/8/2024	24	0	−0.41	0.005	Decreasing
21(M) (POE*)	7/27/2011	5/7/2024	27	0	−0.78	<0.001	Decreasing
22(M) (POC*)	7/27/2011	5/7/2024	27	0	0.03	0.85	No Trend
23(M)	1/28/2013	5/7/2024	23	0	−0.68	<0.001	Decreasing
E(M)	11/14/1998	5/8/2024	38	25	−0.24	0.023	Decreasing
F(M) (POC)	11/14/1998	5/7/2024	38	0	−0.68	<0.001	Decreasing
T(M) (POC)	11/11/1999	5/15/2012	12	0	0.88	<0.001	Increasing
X(M) (POE)	11/15/2012	8/5/2020	16	0	−0.76	<0.001	Decreasing
Y2(M) (POC)	5/13/2009	5/8/2024	30	0	−0.55	<0.001	Decreasing
Molybdenum							
20(M)	11/14/2012	5/8/2024	24	1	−0.10	0.50	No Trend
21(M) (POE*)	7/27/2011	5/7/2024	27	4	0.08	0.55	No Trend
22(M) (POC*)	7/27/2011	5/7/2024	27	1	0.50	<0.001	Increasing
23(M)	1/28/2013	5/7/2024	23	0	−0.87	<0.001	Decreasing
E(M)	11/14/1998	5/8/2024	37	18	−0.35	0.002	Decreasing
F(M) (POC)	11/14/1998	5/7/2024	37	9	0.21	0.066	No Trend
T(M) (POC)	11/11/1999	5/15/2012	10	1	−0.27	0.32	No Trend
X(M) (POE)	11/15/2012	8/5/2020	16	5	<0.001	1	No Trend
Y2(M) (POC)	11/10/2009	5/8/2024	29	1	−0.14	0.27	No Trend
Selenium							
20(M)	11/14/2012	5/8/2024	24	1	−0.16	0.28	No Trend
21(M) (POE*)	7/27/2011	5/7/2024	27	0	−0.01	0.97	No Trend
22(M) (POC*)	7/27/2011	5/7/2024	27	1	−0.08	0.56	No Trend
23(M)	1/28/2013	5/7/2024	23	9	−0.08	0.62	No Trend
E(M)	11/14/1998	5/8/2024	37	32	−0.08	0.47	No Trend
F(M) (POC)	11/14/1998	5/7/2024	37	21	−0.01	0.98	No Trend
T(M) (POC)	11/11/1999	5/15/2012	10	0	−0.56	0.03	Decreasing
X(M) (POE)	11/15/2012	8/5/2020	16	0	0.21	0.28	No Trend
Y2(M) (POC)	11/10/2009	5/8/2024	29	16	0.06	0.64	No Trend

Notes:
Trend tests were performed using the "NADA: Nondetects and Data Analysis for Environmental Data" package in R,version 1.6-1.1 (Lee 2022). The NADA trend test is similar to the traditional Mann-Kendall trend test except that it accounts for the presence of nondetects at multiple detection limits. Trend analyses were conducted at the 0.05 significance (or alpha) level using a two-sided test. The test statistic, Kendall's tau, is a measure of the strength of the association between two variables, with values always falling between −1 and +1.
Results for uranium are listed first as concentrations of molybdenum and selenium have been well below corresponding ACLs in all wells as shown in Figure 1-4.
***** Denotes surrogate POC or POE designation (refer to Table 1-4).

Figure 1-5 shows historical uranium concentrations measured in all Bluewater site wells screened in the alluvial aquifer and listed in Table 1-4. Uranium concentrations in alluvial wells are currently below the corresponding ACL and NRC-approved health-based standard of 0.44 mg/L (Table 1-6). The only well in which the uranium ACL has been exceeded is POC well T(M) (uranium concentrations in well T(M) began trending upward in 1999), which increased from 0.096 mg/L to 0.56 mg/L in November 2010 (Figure 1-5). This measurement was the first of five results from this well that exceeded the ACL of 0.44 mg/L. LM notified NRC of the exceedance upon receiving the 2010 results from the laboratory (DOE 2010; DOE 2011a). Well T(M) was last sampled in May 2012, and the well has since been dry.

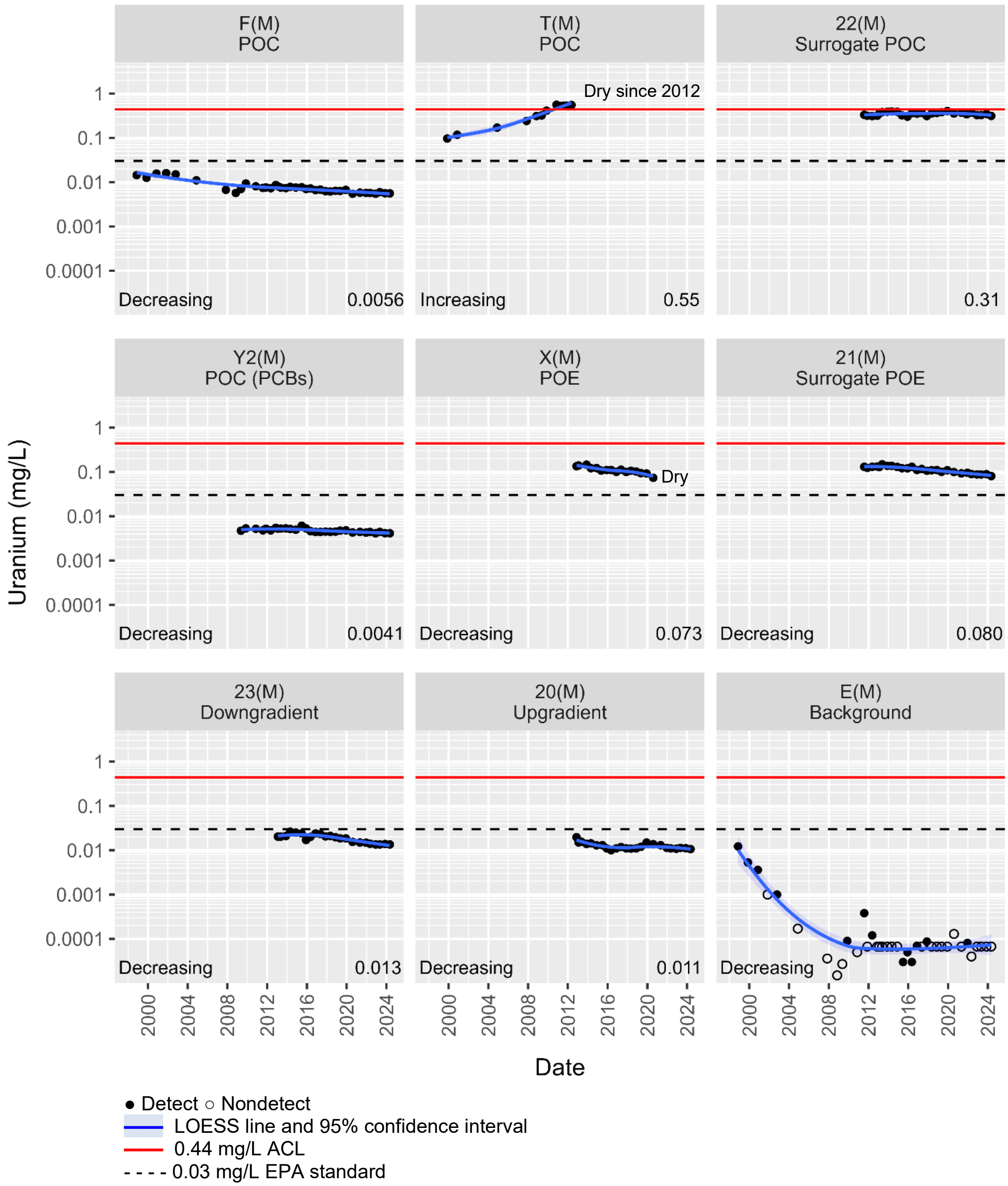
Wells 21(M) and 22(M) were installed in 2011 as a direct response to the ACL exceedance in well T(M) and to better monitor the alluvial aquifer downgradient of well T(M) (Table 1-4; Figure 1-3). Well 22(M) was intended as a surrogate for well T(M), which was observed to be nearly dry in 2010. Well 21(M) was intended as a surrogate for POE well X(M), which was dry in 2010 and 2011 (DOE 2011b). Although below the ACL, uranium concentrations in these two wells continue to exceed the 0.03 mg/L state drinking water standard (Table 1-6; Figure 1-5). Uranium concentrations in well 22(M), at the approximate midpoint between POC well T(M) and downgradient well 21(M), have been stable between 0.30–0.40 mg/L, just below the 0.44 mg/L ACL.

Uranium concentrations in surrogate POE well 21(M), at the southeast corner of the site, have been slightly lower (0.09–0.15 mg/L) and have, along with most other alluvial wells, a statistically significant decreasing trend (Table 1-7). Uranium concentrations in well X(M) have been similar, with levels ranging from 0.073 to 0.15 mg/L (Figure 1-5). This well has not been sampled since August 2020 because it has been dry or had insufficient water to sample.

Although of no regulatory relevance, especially given the prohibition of groundwater use in the alluvial aquifer (Romero 2018), uranium concentrations in five of the nine alluvial wells have been consistently below the 0.03 mg/L state standard: POC wells F(M) and Y2(M), well 20(M), southeasternmost well 23(M), and background well E(M). Statistically significant decreasing trends in uranium concentrations were identified for all wells except T(M) (increasing trend before going dry) and well 22(M) (no trend) (Table 1-7).

1.7.2 SAG Bedrock Aquifer

To gain a better understanding of the hydrogeological characteristics of the SAG aquifer at the site, wells 11(SG), 13(SG), 14(SG), 15(SG), 16(SG), and 18(SG) were installed in summer 2012 at the locations shown in Figure 1-3. Wells 11(SG) and 14(SG) are cross-gradient of the disposal cell; all the other new wells are downgradient. Before installing the new SAG wells, POC wells OBS-3 and S(SG) were found to have highly corroded well screens, resulting in samples with anomalously low uranium concentrations. Therefore, well 16(SG) was installed in the same vicinity (Figure 1-3), intended as a surrogate or replacement POC well. Although wells OBS-3 and S(SG) continue to be sampled in accordance with the LTSP (DOE 1997), they are no longer considered representative of aquifer conditions in this region.



Notes: The most recent results, excluding nondetects, are labeled in the lower right corner of each plot. For wells with statistically significant trends (see Table 1-7), the direction of the trend is also indicated. Wells are ordered by purpose: POC and POE wells are listed first, followed by the remaining alluvial wells.

Figure 1-5. Uranium Concentrations in Alluvial Aquifer Monitoring Wells at the Bluewater, New Mexico, Disposal Site: 1998–2024

Table 1-8 lists analytical results for selenium and uranium in all onsite SAG aquifer wells for groundwater samples collected in November 2023 and May 2024. As has been the case historically, selenium and uranium concentrations did not exceed corresponding ACLs in any of the site wells during the 2023–2024 reporting period.

Table 1-8. SAG Aquifer Monitoring Results for November 2023 and May 2024 at the Bluewater, New Mexico, Disposal Site

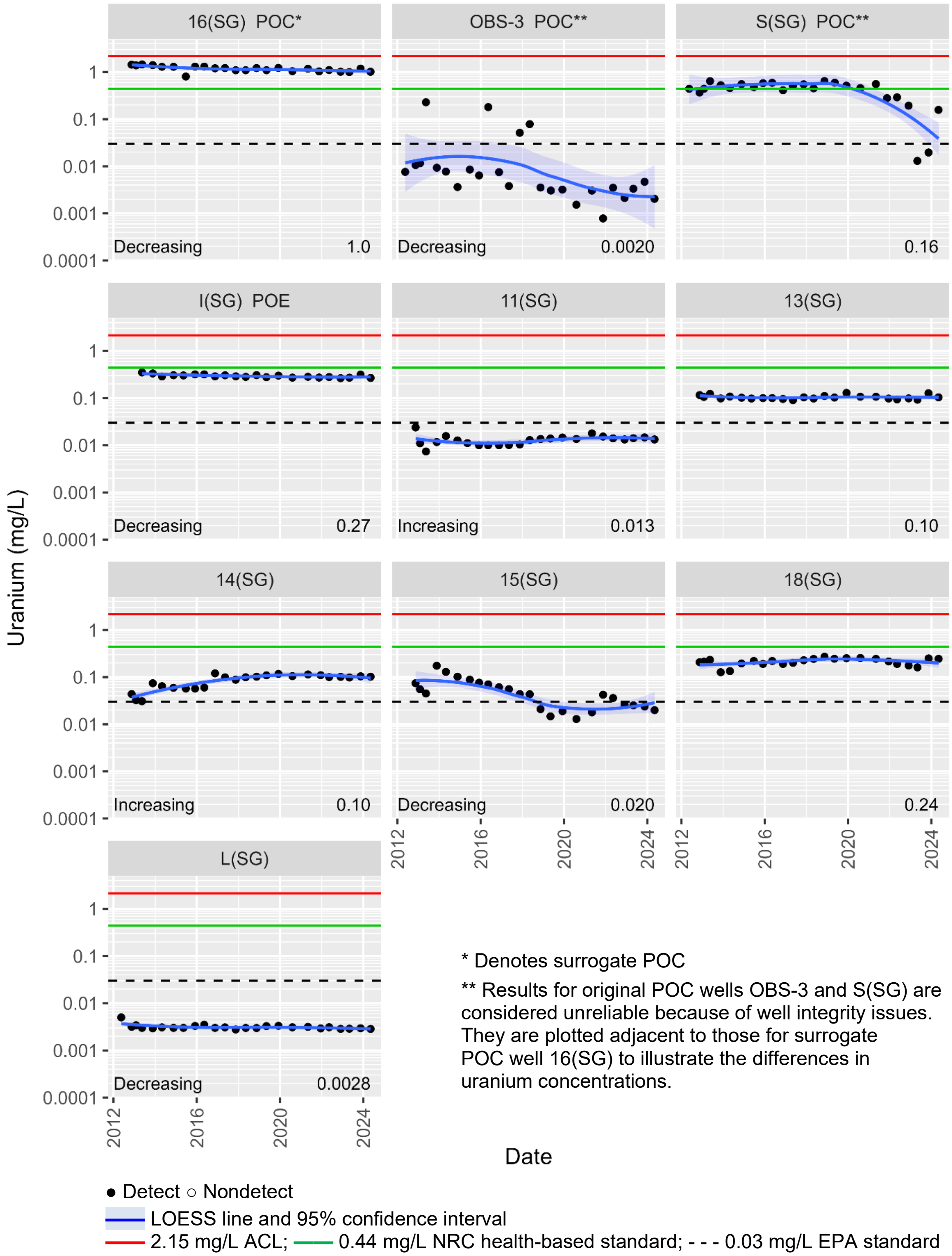
Monitoring Well	Selenium (mg/L) ACL = 0.05 mg/L		Uranium (mg/L) ACL = 2.15 mg/L	
	November 2023	May 2024	November 2023	May 2024
11(SG)	ND	ND	0.015	0.013
13(SG)	0.0070	0.0070	0.13	0.10
14(SG)	ND	ND	0.10	0.10
15(SG)	ND	ND	0.024	0.020
16(SG) (Surrogate POC)	0.016	0.015	1.2	1.0
18(SG)	0.0071	0.0075	0.25	0.24
I(SG) (POE)	0.0079	0.0076	0.32	0.27
L(SG)	ND	ND	0.0030	0.0028
OBS-3 (POC)[a]	ND	ND	0.0047	0.0020
S(SG) (POC)[a]	ND	0.0034	0.020	0.16

Notes:
Results are rounded to two significant figures. Detection limit values for ND results are reported in GEMS, as are corresponding data qualifiers and the results of duplicate analyses; the original sample results are reported above. GEMS can be accessed at https://gems.lm.doe.gov.
[a] Results for POC wells OBS-3 and S(SG) (shaded cells) are not considered representative of aquifer conditions due to corrosion in the well screen and other factors. Results for surrogate POC well 16(SG) are considered most representative of aquifer conditions in this region of the site.

Abbreviation:
ND = not detected (below laboratory detection limit)

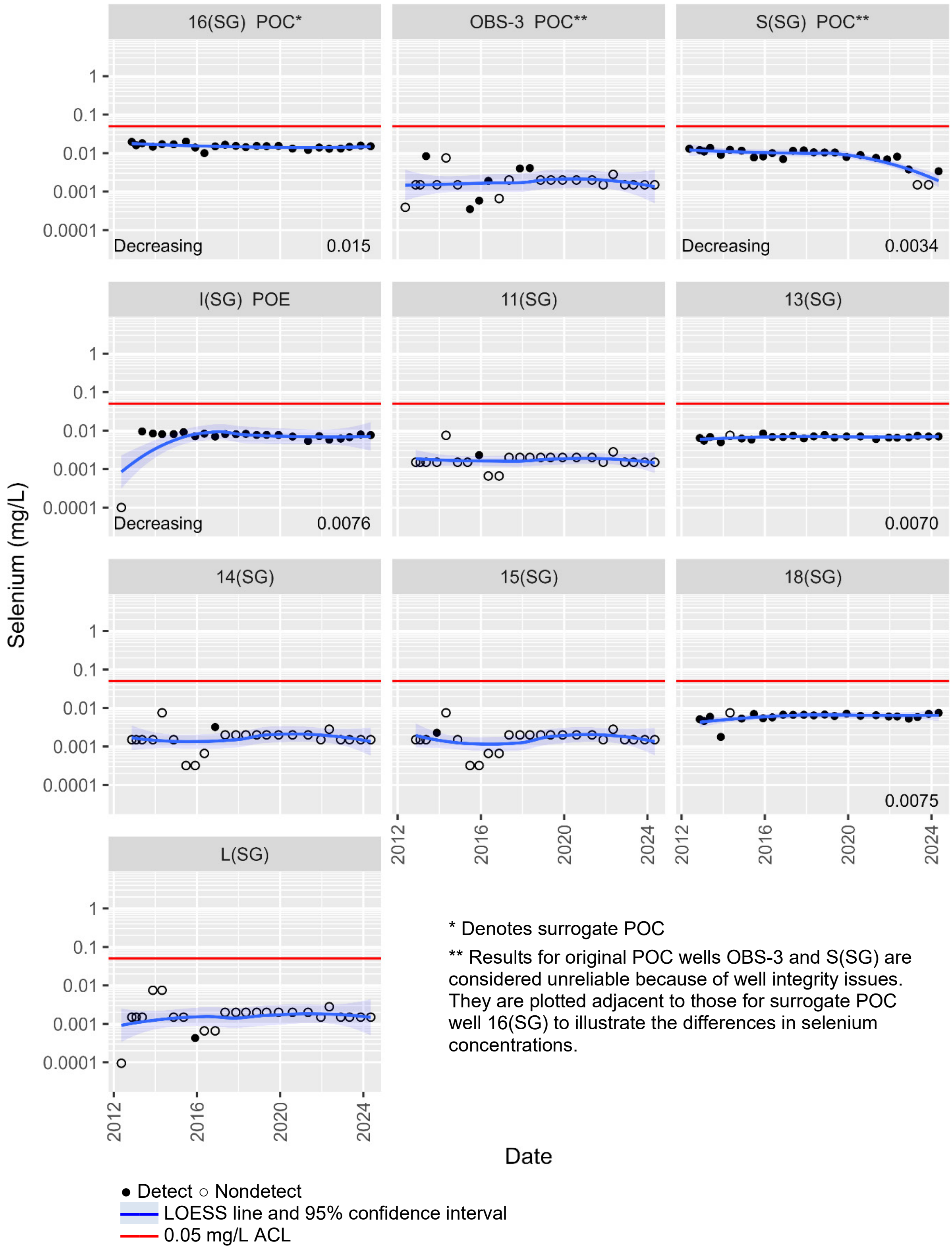
As shown in Table 1-8, in 2023–2024, selenium results for half of the 10 SAG wells currently monitored were below detection limits (<0.0015 mg/L). Consistent with the historical record, selenium concentrations in the five remaining wells are well below the 0.05 mg/L ACL. Uranium concentrations in site wells continue to be below the 2.15 mg/L ACL. For all wells except surrogate POC well 16(SG), with current levels of about 1 mg/L, uranium concentrations are also below the 0.44 mg/L NRC-approved health-based standard.

Figure 1-6 and Figure 1-7 plot concentrations of uranium and selenium, respectively, in the SAG aquifer monitoring wells for 2012–2024. This time frame was chosen because (1) monitoring at most of the wells—11(SG) through 18(SG)—did not begin until November 2012 (following installation) and (2) some results for remaining wells with a longer monitoring history are considered erroneous due to either insufficient sample depths or well integrity issues. For example, previous results for well I(SG) are not shown because incorrect sampling depths in the well led to erroneously low results from 2008 to 2013 (DOE 2014). Uranium concentrations measured in POC wells S(SG) and, in particular, OBS-3 are not considered representative of aquifer conditions. Although results for these wells are shown alongside those for surrogate POC well 16(SG) in Figure 1-6, these data are not addressed in the following interpretations.



Notes: The date scale begins in 2012, coinciding with the installation of the 11–18(SG) well series. The most recent results are labeled in the lower right corner of each plot. For wells with statistically significant trends (see Table 1-9), the direction of the trend is also indicated.
Wells are ordered by purpose: POC and POE wells are listed first, followed by the remaining wells; data for background well L(SG) are plotted last.

Figure 1-6. Uranium Concentrations in the SAG Aquifer at the Bluewater, New Mexico, Disposal Site



Notes: The date scale begins in 2012, coinciding with the installation of the 11–18(SG) well series. For results above the detection limit, the most recent selenium concentrations are labeled in the lower right corner of each plot. For wells with statistically significant trends (see Table 1-9), the direction of the trend is also indicated. Wells are ordered by purpose: POC and POE wells are listed first, followed by the remaining wells listed in Table 1-4; data for background well L(SG) are plotted last.

Figure 1-7. Selenium Concentrations in the SAG Aquifer at the Bluewater, New Mexico, Disposal Site

Uranium concentrations in all Bluewater site SAG wells have been consistently below the 2.15 mg/L ACL (Figure 1-6). Also, uranium concentrations in POE well I(SG) have been consistently below the site-specific NRC-approved health-based standard of 0.44 mg/L (applied to groundwater leaving the site boundary). However, most onsite SAG wells, including SAG wells near the downgradient (eastern) site boundary, have consistently exceeded the 0.03 mg/L EPA drinking water standard for uranium. Exceptions are well 11(SG) at the northern site boundary, background well L(SG), and, periodically, well 15(SG) (Figure 1-6).

Mann-Kendall trend analysis identified statistically significant decreasing uranium trends in five SAG wells: 15(SG), installed near alluvial well T(M); surrogate POC well 16(SG); OBS-3; POE well I(SG); and background well L(SG) (Table 1-9). Uranium concentrations in well I(SG), at the eastern site boundary downgradient of the disposal cell, have ranged from 0.15–0.35 mg/L; the most recent (May 2024) result was 0.27 mg/L (Table 1-8).

Statistically significant increasing trends in uranium concentrations were identified for two SAG wells: cross-gradient wells 11(SG) (northern site boundary) and 14(SG), at the southwestern site boundary. The significant increase in well 14(SG) reflects an increase from 0.031 mg/L in 2013 to 1.2 mg/L in November 2016, but since then, concentrations have remained relatively constant at about 0.l mg/L; the most recent result was 0.10 mg/L. No significant trend was found for three wells: 13(SG), 18(SG), and S(SG) (Table 1-9).

Uranium concentration trends in offsite wells, including privately owned and nearby municipal drinking water wells monitored by Homestake Mining Company (Homestake) or NMED, were described in *Evaluating the Influence of High-Production Pumping Wells on Impacted Groundwater at the Bluewater, New Mexico, Disposal Site* (DOE 2020). Offsite wells either had a decreasing statistically significant trend or no statistical trend in uranium concentration between 2012 and 2018. At that time, all offsite wells had uranium concentrations below the EPA standard of 0.03 mg/L except for two wells (951 and 951R) owned by Homestake, with uranium concentrations slightly exceeding the EPA standard.

Well 951 is just outside the southeastern boundary of the Bluewater site (Figure 1-3) and is routinely monitored by LM (and was previously intermittently monitored by Homestake). Using validated data since 2013, uranium concentrations in this well have been stable (no significant trend), with a mean and standard deviation of 0.031 ± 0.005 mg/L. The November 2023 result for this well, 0.034 mg/L, slightly exceeded the standard; the May 2024 result was 0.028 mg/L. Monitoring well 951R also had no trend (DOE 2020) and is approximately 2 miles southeast of the site, nearer to the Homestake site (Figure 1-3). LM continues to monitor groundwater quality in offsite wells completed in the SAG aquifer as part of the Cooperative Agreement between DOE and NMED and to assess potential offsite migration of contaminants.

Although monitoring of the SAG aquifer at the site has focused on uranium, selenium is also a required analyte in accordance with the LTSP (Table 1-5). Selenium concentrations in most wells continue to be well below the 0.05 mg/L ACL and are often below detection limits (Figure 1-7). The highest selenium concentrations have been measured in well 16(SG), where results have ranged from 0.01–0.02 mg/L (most recent result of 0.015 mg/L) and a statistically significant decreasing trend was identified (Table 1-9). Significant decreasing trends were also identified for well I(SG) and S(SG). No significant trends in selenium concentrations were found for the remaining SAG aquifer wells.

Table 1-9. Mann-Kendall Trend Analysis Results for Uranium and Selenium in Bluewater Site SAG Monitoring Wells, 2012–2024

Well	Initial Trend Analysis Date	Final Trend Analysis Date	No. of Samples	No. of Nondetects	Kendall's tau	p-value	Trend
Uranium							
11(SG)	11/14/2012	5/8/2024	24	0	0.32	0.029	Increasing
13(SG)	11/15/2012	5/7/2024	24	0	−0.11	0.47	No Trend
14(SG)	11/14/2012	5/8/2024	24	0	0.51	<0.001	Increasing
15(SG)	11/13/2012	5/8/2024	24	0	−0.62	<0.001	Decreasing
16(SG) (POC)[a]	11/13/2012	5/7/2024	24	0	−0.60	<0.001	Decreasing
18(SG)	11/14/2012	5/8/2024	24	0	0.22	0.14	No Trend
I(SG) (POE)	5/15/2013	5/8/2024	22	0	−0.56	<0.001	Decreasing
L(SG)	5/15/2012	5/8/2024	25	0	−0.34	0.019	Decreasing
OBS−3 (POC)[b]	5/15/2012	5/7/2024	25	0	−0.52	<0.001	Decreasing
S(SG) (POC)[b]	5/15/2012	5/7/2024	25	0	−0.26	0.072	No Trend
Selenium							
11(SG)	11/14/2012	5/8/2024	24	23	−0.03	0.81	No Trend
13(SG)	11/15/2012	5/7/2024	24	1	0.23	0.12	No Trend
14(SG)	11/14/2012	5/8/2024	24	23	−0.02	0.89	No Trend
15(SG)	11/13/2012	5/8/2024	24	23	−0.05	0.69	No Trend
16(SG) (POC)[a]	11/13/2012	5/7/2024	24	0	−0.37	0.013	Decreasing
18(SG)	11/14/2012	5/8/2024	24	1	0.28	0.061	No Trend
I(SG) (POE)	5/15/2012	5/8/2024	23	1	−0.39	0.010	Decreasing
L(SG)	5/15/2012	5/8/2024	25	24	0.003	1	No Trend
OBS−3 (POC)[a]	5/15/2012	5/7/2024	25	19	−0.05	0.70	No Trend
S(SG) (POC)[a]	5/15/2012	5/7/2024	25	2	−0.63	<0.001	Decreasing

Notes:
Trend tests were performed using the "NADA: Nondetects and Data Analysis for Environmental Data" package in R, version 1.6-1.1 (Lee 2022). The NADA trend test is similar to the traditional Mann-Kendall trend test except that it accounts for the presence of nondetects at multiple detection limits. Trend analyses were conducted at the 0.05 significance (or alpha) level using a two-sided test. The test statistic, Kendall's tau, is a measure of the strength of the association between two variables, with values always falling between −1 and +1.
[a] Surrogate POC well for wells OBS-3 and S(SG).
[b] Trend analysis results for initial POC wells OBS-3 and S(SG) should be interpreted with caution because these wells are no longer considered representative of aquifer conditions. Results for surrogate POC well 16(SG) are considered most representative of aquifer conditions in this region of the site.

1.8 References

Note: Previous compliance reports and other key site-related documents are available on the LM public website at: https://lmpublicsearch.lm.doe.gov/SitePages/default.aspx?sitename=Bluewater.

10 CFR 40.28. U.S. Nuclear Regulatory Commission, "General License for Custody and Long−Term Care of Uranium or Thorium Byproduct Materials 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.*

42 USC 2011 et seq. "Atomic Energy Act of 1954," *United States Code*.

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DOE (U.S. Department of Energy), 2011a. A. Gil, site manager, letter (about Notification of Alternate Concentration Limit Exceedance at the Bluewater, New Mexico, UMTRCA Title II Disposal Site) to deputy director, U.S. Nuclear Regulatory Commission, March 1.

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1.9 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	0	Entrance Gate with New Signs
PL-2	130	USACE Road Repair Area: Low Water Crossing
PL-3	270	Wildlife-Friendly Fence Modification
PL-4	67	Perimeter Sign P13
PL-5	0	Site Marker
PL-6	—	Boundary Monument BM-20
PL-7	—	Quality Control Monument QC-3
PL-8	270	Monitoring Well 21(M)
PL-9	180	Overview of Vegetation on Main Tailings Disposal Cell
PL-10	337	Siphon
PL-11	0	Siphon Outflow
PL-12	45	USACE SCAPS Truck
PL-13	135	Potential Settlement MT-03
PL-14	180	Minor Settlement MT-06
PL-15	292	Riling near the South Bench
PL-16	—	Animal Burrow
PL-17	315	Shallow Settlement CT-01
PL-18	310	Bioturbation on the Northwestern Extension of the Carbonate Cell
PL-19	180	Minor Settlement CT-03
PL-20	247	Biointrusion Area
PL-21	202	Drainage off South Side of Carbonate Cell
PL-22	67	Ponded Water on North Side of Carbonate Cell
PL-23	315	Minor Settlement CT-02 in Asbestos Cell
PL-24	180	Overview of PCB Cell
PL-25	202	Erosional Area on the East Dump—Close-Up
PL-26	290	Erosional Area on the East Dump—Overview
PL-27	157	Rilling Between the Carbonate Cell and West Dumps

Note:
— = Photograph taken vertically from above.

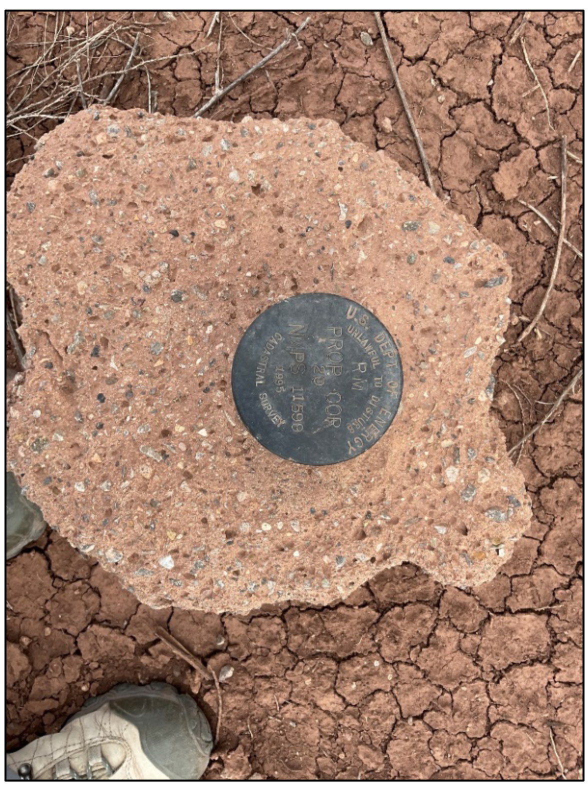
PL-1. Entrance Gate with New Signs

PL-2. USACE Road Repair Area: Low Water Crossing

PL-3. Wildlife-Friendly Fence Modification

PL-4. Perimeter Sign P13

PL-5. Site Marker



PL-6. Boundary Monument BM-20

PL-7. Quality Control Monument QC-3

PL-8. Monitoring Well 21(M)

PL-9. Overview of Vegetation on Main Tailings Disposal Cell

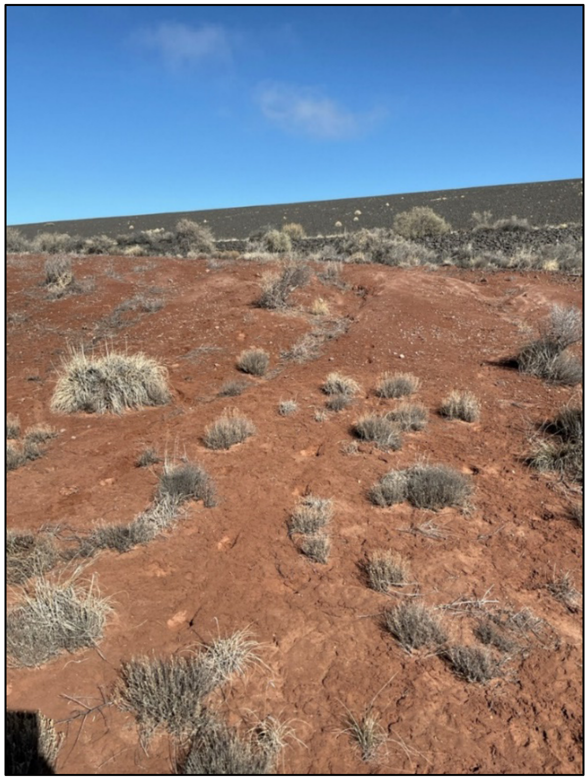
PL-10. Siphon

PL-11. Siphon Outflow

PL-12. USACE SCAPS Truck

PL-13. Potential Settlement MT-03

PL-14. Minor Settlement MT-06



PL-15. Rilling near the South Bench

PL-16. Animal Burrow

PL-17. Shallow Settlement CT-01

PL-18. Bioturbation on the Northwestern Extension of the Carbonate Cell

PL-19. Minor Settlement CT-03

PL-20. Biointrusion Area

PL-21. Drainage off South Side of Carbonate Cell

PL-22. Ponded Water on North Side of Carbonate Cell

PL-23. Minor Settlement CT-02 in Asbestos Cell

PL-24. Overview of PCB Cell

PL-25. Erosional Area on the East Dump—Close-Up

PL-26. Erosional Area on the East Dump—Overview

PL-27. Rilling Between the Carbonate Cell and West Dumps