

## 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 was inspected on March 18, 2021. No changes were observed on the disposal cell or in the associated drainage features. Inspectors identified several minor maintenance issues at the site but did not identify 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 (DOE 1998) (LTSP). 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 from NRC and is addressing the commission's comments. Groundwater analytical results presented in this report are evaluated with respect to LTSP requirements until the GCAP is finalized. Groundwater monitoring was last completed in June 2021. 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. No cause for a follow-up inspection was identified.

### 7.2 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 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, 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: 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 March 18, 2021. The inspection was conducted by P. Lemke and M. Williams of the Legacy Management Support (LMS) contractor. A. Denny (LM site manager) and H. Mickelson (State of Utah representative) 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 whether maintenance or additional inspection and monitoring are needed.

### **7.4.1 Site Surveillance Features**

Figure 7-1 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 2021 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 S 1600 E Street. The paved access road crosses property owned by the state and the U.S. Army. Access was 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. No maintenance needs were identified.

#### ***7.4.1.2 Security Fence, Perimeter Signs, and Warning Signs***

A chainlink security fence encloses the portion of the site that contains the disposal cell. Vehicle gates are at the south and east corners of the security fence, and a personnel gate is at the north corner of the security fence. The security fence (PL-1 and PL-2) was intact, and the gates were operable and locked at the time of the inspection.

Seventeen perimeter signs, attached to steel posts set in concrete, are positioned along the unfenced property boundary. All perimeter signs were legible, although inspectors noted that perimeter sign P6 contained graffiti (PL-3). Because the sign is legible, it will not be replaced at this time.

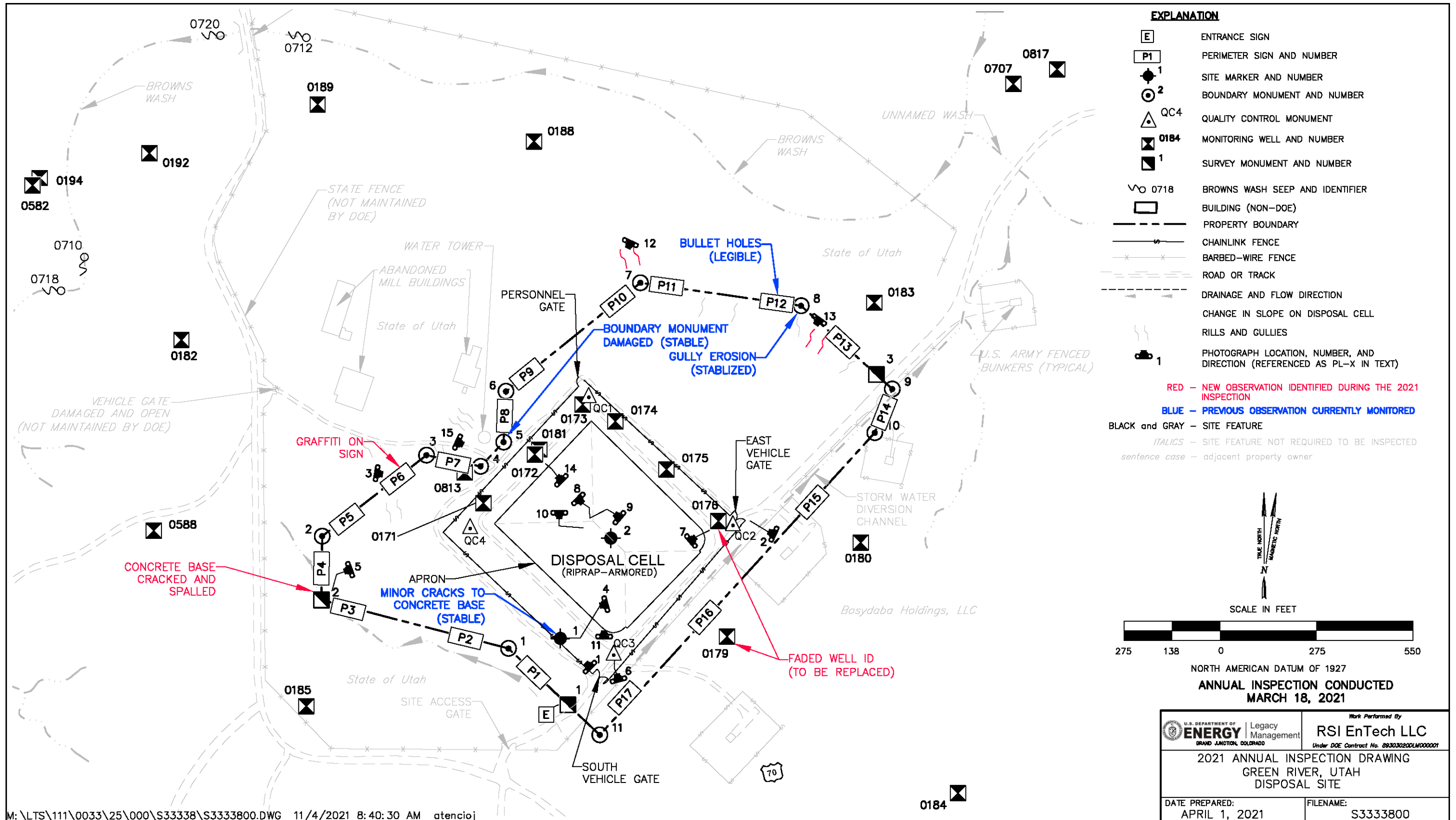


Figure 7-1. 2021 Annual Inspection Drawing for the Green River, Utah, Disposal Site

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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, and SMK-2 is on the crest of the disposal cell. The concrete base of SMK-1 has several minor cracks (PL-4), but they do not compromise the integrity of the base, and repairs are not necessary at this time.

### **7.4.1.4 Survey and Boundary Monuments**

Eleven boundary monuments and three survey monuments delineate the property boundary. Boundary monument BM-5 is bent from being hit by a vehicle, and the concrete base around survey monument SM-2 is cracked and spalled on the ground (PL-5). Repairs of these monuments are not needed at this time.

### **7.4.1.5 Aerial Survey Quality Control Monuments**

Four aerial survey quality control monuments were installed near the four corners of the disposal cell in October 2020 (PL-6). No maintenance needs were identified.

### **7.4.1.6 Monitoring Wells**

Twenty-two monitoring wells are on or near the site. The LTSP establishes four POC wells at the site for postclosure groundwater monitoring. All wellhead protectors observed during the inspection were undamaged and locked. Some of the concrete monitoring well collars were cracked, but the wellhead protectors were stable, and repairs are not necessary. Well identification numbers were faded or missing on several wells (PL-7). Well identification numbers will be reapplied before the next inspection.

## **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. A small percentage of the rock, including basalt and sedimentary rock, has degraded, but the riprap cover is functioning as designed. Inspectors found no evidence of settling, slumping, erosion, or other modifying process that might affect the integrity of the disposal cell (PL-8, PL-9, and PL-10).

A boulder-filled trench, known as an apron, surrounds the disposal cell. The apron was intact and stable, with no observed erosion along the base of the side slopes. Small erosion rills and soil

pipng features (PL-11) were present along portions of the outside edge of the apron. The rills and piping features form as stormwater runoff along the 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 contains the 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 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 site property boundary is not fenced, and trespassing occurs on the site from several access points through state- and privately-owned 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 to the north and east. The site will continue to be monitored for adverse public use typically indicated by trash, tire ruts, and vandalism. Inspectors did not find new trash dumps or indications of vandalism (except for graffiti on perimeter sign P6) during the 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 site surveillance features. Rills and gullies are also present along the escarpment northeast of the disposal cell between boundary monument BM-7 and survey monument SM-3 (approximately 400 feet [ft] from the base of the disposal cell) (PL-12 and PL-13). 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 its integrity. Inspectors will continue to monitor these features. 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-14). 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; it will continue to be monitored, and trash will be 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-15). 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. Well ID numbers will be reapplied 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 but has yet to receive NRC's concurrence. As a best management practice, LM implemented provisions of the draft GCAP to expand the groundwater monitoring requirements (i.e., additional monitoring wells and analytes). The most recent sampling event occurred in June 2021.

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. The LTSP included monitoring well 0172, but its construction integrity was suspect, and the well was replaced with monitoring well 0181 in 2001 (PL-14). Well 0181 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*

<b>Groundwater Monitoring Purpose</b>	<b>Monitoring Wells</b>
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 (<https://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 in the POC wells have been measured manually every year since 1991. The groundwater levels as measured from 1998 to present range from 4085 ft to 4090 ft, with two spikes of 4092.2 ft in 2006 and 2008. (Figure 7-3). The sharp drop in water levels shown in 2004 may have been due to instrument error or human error in recording the original field record. While it is likely this outlier is a result of an error, there is no definitive evidence of error and the data as shown are consistent with available documentation.

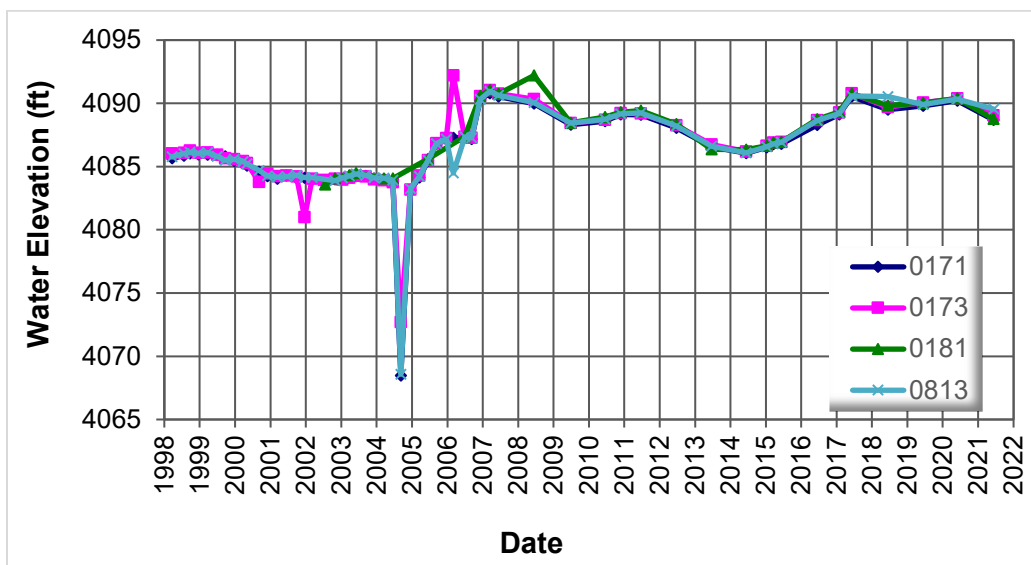


Figure 7-3. Groundwater Elevations at the Green River, Utah, Disposal Site

### 7.7.2 Disposal Cell Performance Monitoring

Table 7-3 presents the concentration limits in milligrams per liter (mg/L) for POC wells established in the LTSP. The concentration limits determined 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). Table 7-4 provides the analytical results at the POC wells for the June 2021 sampling event.

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

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

**Note:**

<sup>a</sup> Nitrate = nitrate plus nitrite as nitrogen.

<sup>b</sup> MCL (40 CFR 192 Table 1 Subpart A).

Table 7-4. 2021 Analytical Results for POC Wells at the Green River, Utah, Disposal Site

Monitoring Well	Nitrate <sup>a</sup> (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0171	46	4200	0.099
0173	46	5300	0.012
0181	50	7500	0.029
0813	0.056 U	3900	0.051

**Notes:**

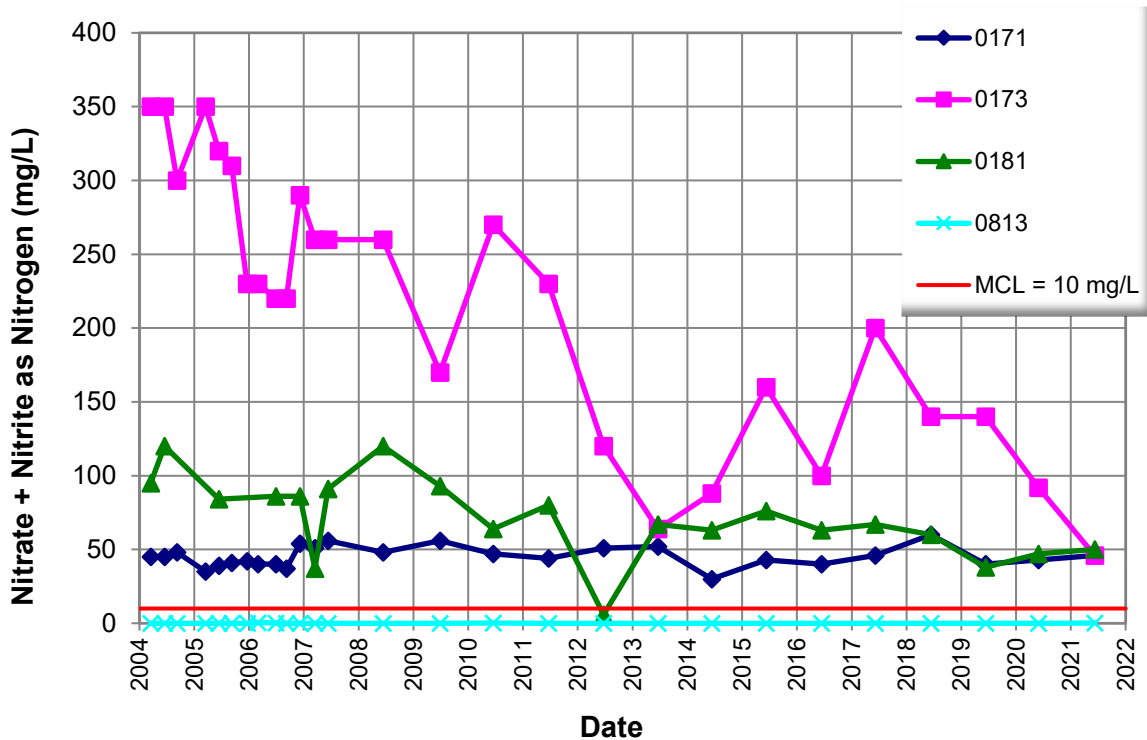
<sup>a</sup> Nitrate = nitrate plus nitrite as nitrogen.

Red = equal to or exceeding LTSP-driven concentration limit.

**Abbreviation:**

U = not detected

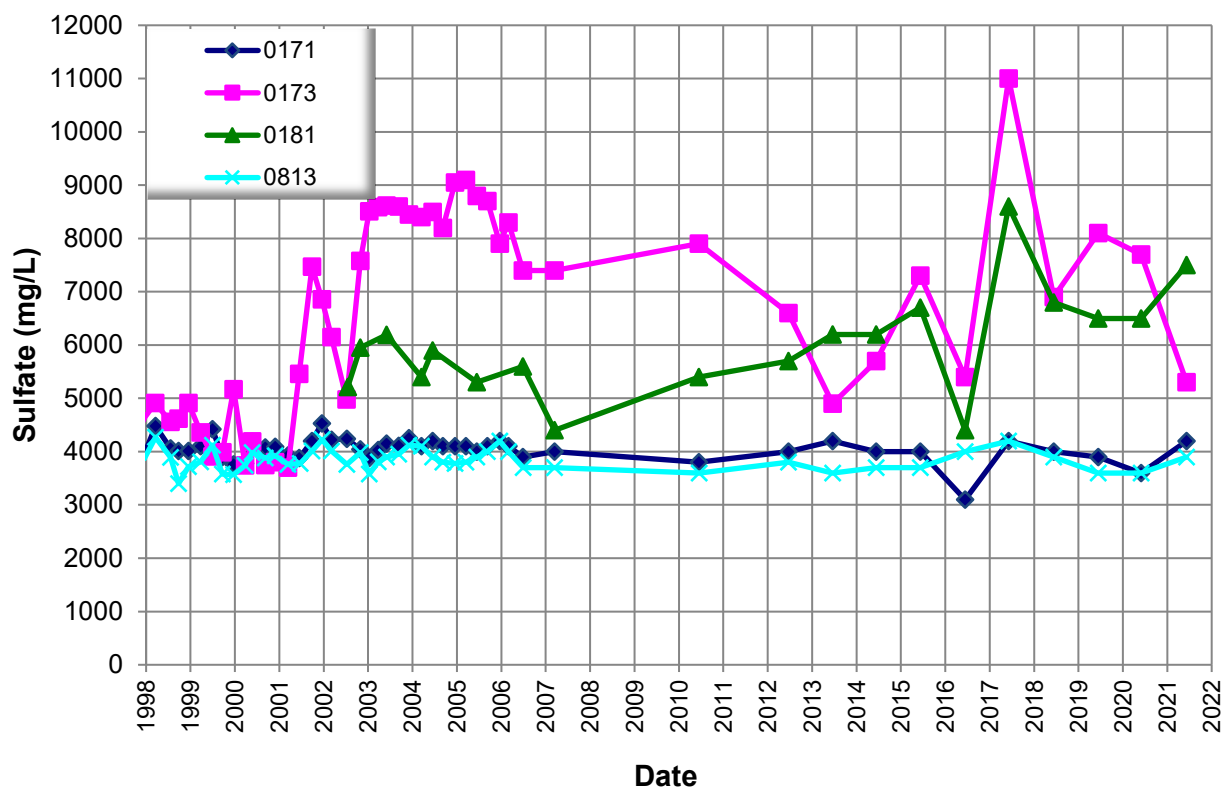
Figure 7-4 through Figure 7-6 show the time-concentration plots for nitrate, sulfate, and uranium along with corresponding MCLs. Nitrate concentrations continue to exceed the MCL in POC wells 0171, 0173, and 0181. The 2021 nitrate concentrations were within the range of historical values for all POC wells (Figure 7-4).



**Notes:** Results include validated data only; results below the detection limit are presented at the laboratory reported value. Well 0813 is plotted at the detection limit of 0.056 mg/L.

Figure 7-4. Nitrate Concentrations at POC Wells at the Green River, Utah, Disposal Site

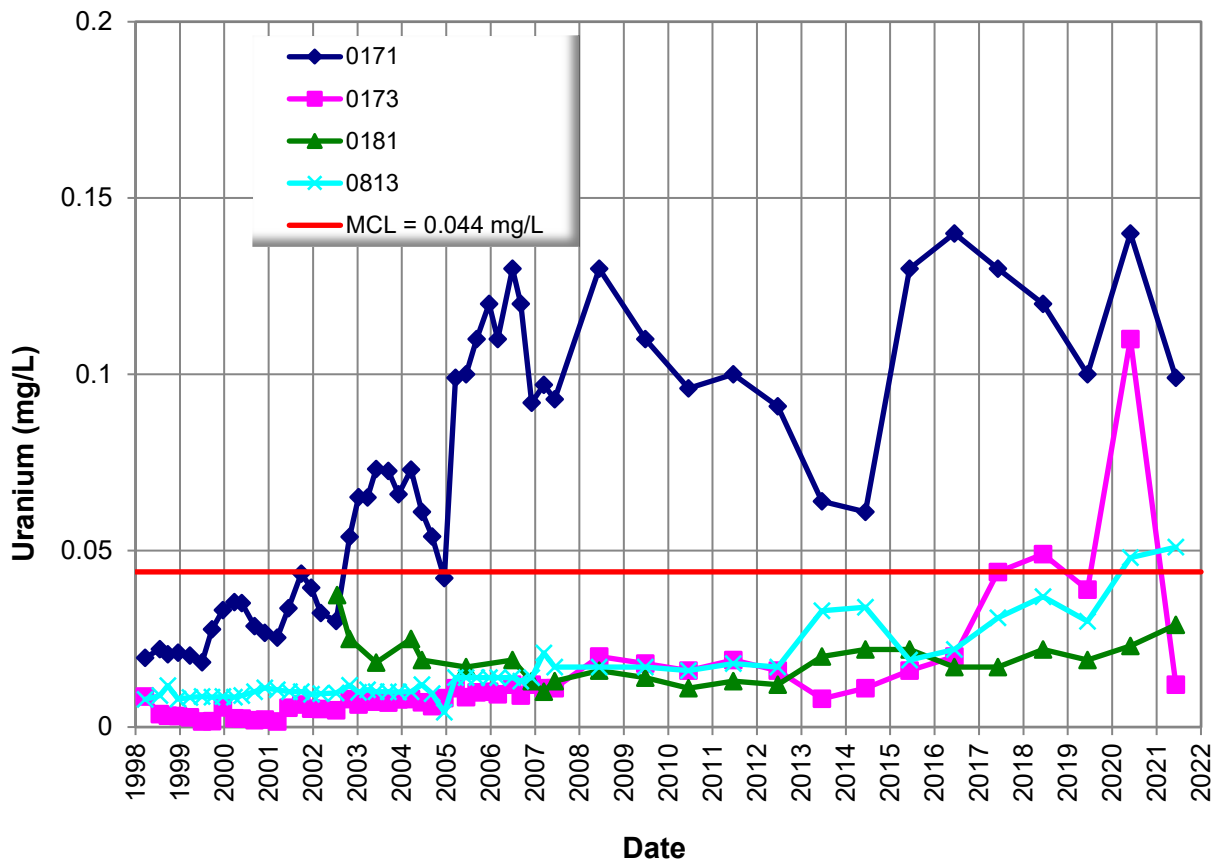
Sulfate concentrations exceeded the LTSP background concentrations in all POC wells except POC well 0813. The 2021 sulfate concentrations were within the range of historical values for all POC wells (Figure 7-5).



**Note:** Results include validated data only; results below the detection limit are presented at the laboratory reported value.

Figure 7-5. Sulfate Concentrations at POC 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 the MCL of 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 and again in the 2021 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 2021 uranium concentrations are within the range of historical values in POC wells 0171, 0173, and 0181 and exceed the highest historical values in POC well 0813.



**Note:** Results include validated data only; results below the detection limit are presented at the laboratory reported value.

Figure 7-6. Uranium Concentrations at POC 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 (well 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), 2011. *Draft Groundwater Compliance Action Plan for the Green River, Utah, Disposal Site*, LMS/GRN/S07892, December.

## 7.10 Photographs

<b>Photograph Location Number</b>	<b>Azimuth</b>	<b>Photograph Description</b>
PL-1	315	Chainlink Security Fence and Site Marker SMK-1 in Background
PL-2	295	East Vehicle Gate and Fence
PL-3	100	Graffiti on Perimeter Sign P6
PL-4	255	Minor Cracks in the Base of Site Marker SMK-1
PL-5	250	Cracked and Spalled Concrete Around Survey Monument SM-2
PL-6	345	Aerial Survey Quality Control Monument
PL-7	50	Faded Identification Numbers on Monitoring Well 0176
PL-8	135	Site Marker SMK-2 on Disposal Cell Top Slope
PL-9	310	Disposal Cell Northwest Side Slope
PL-10	180	Disposal Cell Southwest Side Slope
PL-11	0	Soil Piping on Edge of Rock Apron
PL-12	205	Soil Erosion by Boundary Monument BM-7 (Offsite)
PL-13	215	Soil Erosion by Boundary Monument BM-8 (Onsite)
PL-14	315	Monitoring Wells 0172 and 0181 (Onsite) and Abandoned Mill Buildings (Offsite)
PL-15	115	Soil Erosion (Offsite)



*PL-1. Chainlink Security Fence and Site Marker SMK-1 in Background*



*PL-2. East Vehicle Gate and Fence*



*PL-3. Graffiti on Perimeter Sign P6*



*PL-4. Minor Cracks in the Base of Site Marker SMK-1*



*PL-5. Cracked and Spalled Concrete Around Survey Monument SM-2*



*PL-6. Aerial Survey Quality Control Monument*





*PL-7. Faded Identification Numbers on Monitoring Well 0176*



*PL-8. Site Marker SMK-2 on Disposal Cell Top Slope*



*PL-9. Disposal Cell Northwest Side Slope*



*PL-10. Disposal Cell Southwest Side Slope*



*PL-11. Soil Piping on Edge of Rock Apron*



*PL-12. Soil Erosion by Boundary Monument BM-7 (Offsite)*



*PL-13. Soil Erosion by Boundary Monument BM-8 (Onsite)*



*PL-14. Monitoring Wells 0172 and 0181 (Onsite) and Abandoned Mill Buildings (Offsite)*



*PL-15. Soil Erosion (Offsite)*

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