7.0 Annual Inspection of the Green River, Utah, UMTRCA Title I 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 20, 2012. The disposal cell was in excellent condition. A missing perimeter sign was replaced during the inspection. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

7.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Green River, Utah, Disposal Site* (DOE/AL/62350–89, Rev. 2, U.S. Department of Energy [DOE], July 1998; LTSP) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 7–1 lists these requirements.

Table 7–1. License Requirements for the Green River Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 7.4
Follow-Up or Contingency Inspections	Section 7.0	Section 7.5
Routine Maintenance and Repairs	Section 8.0	Section 7.6
Groundwater Monitoring	Section 5.2	Section 7.7.1
Corrective Action	Section 9.0	Section 7.8

7.3 Institutional Controls

The 25-acre site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site. Institutional controls at the site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

7.4 Inspection Results

The site, southeast of Green River, Utah, was inspected on March 20, 2012. J. Price and R. Johnson of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. M. Kautsky, the DOE Office of Legacy Management (LM) site manager, attended the inspection.

The purposes of the inspection were to confirm the integrity of visible features at the site, to identify changes in conditions that may affect site integrity, and to determine the need, if any, for maintenance or additional inspections and monitoring.

7.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 7–1. 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 on Figure 7–1 by photograph location (PL) numbers.

7.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The site can be accessed either from the town of Green River or from U.S. Interstate Highway 70 via a paved road. The access route crosses State land and U.S. Army property. Perpetual access has been granted to DOE through right-of-way agreements with both agencies.

Entrance to the site is through a locked steel gate in the access road right-of-way fence; DOE does not own the gate. Past this gate, a dirt access road maintained by DOE leads across State land to the disposal site. The access road divides at the disposal cell security fence, with one branch entering the enclosure and providing access around the base of the disposal cell (PL–1) and the other providing access around the disposal cell security fence. The access road was in good condition, and no maintenance or deferred maintenance needs were identified for this real property asset.

An entrance sign is positioned on the site property boundary where the access road enters the disposal site. The sign was in excellent condition.

7.4.1.2 Perimeter Fence and Perimeter Signs

The disposal cell is enclosed within a chain-link security fence. The chain-link fence is set back between 50 and 250 feet from the site boundary. Two vehicle access gates are installed in this fence at the south and east corners of the fence line. A personnel gate is at the north corner of the fence line. The security fence and gates were in excellent condition (PL–2). Four offsite groundwater monitoring system telemetry towers have chain-link security fence enclosures (each with a locked personnel gate) to inhibit vandalism; the enclosures were in excellent condition.

Seventeen perimeter signs are positioned on steel posts set in concrete along the unfenced site boundary. Perimeter sign P6 was missing and was replaced during the inspection. Perimeter sign P12 has a bullet dent but is legible. The other signs were in excellent condition.

7.4.1.3 Site Markers

Two granite site markers are on the site. Site marker SMK–1 is on the ground inside the southwest security fence line. Its concrete base has several minor cracks, but there is no need for repairs at this time; overall the site marker was in good condition (PL–3). Site marker SMK–2, located on the crest of the disposal cell, was in excellent condition (PL–4).

7.4.1.4 Survey Monuments and Boundary Monuments

Eleven boundary monuments and three survey monuments are along the site perimeter. All of the monuments were in excellent condition.

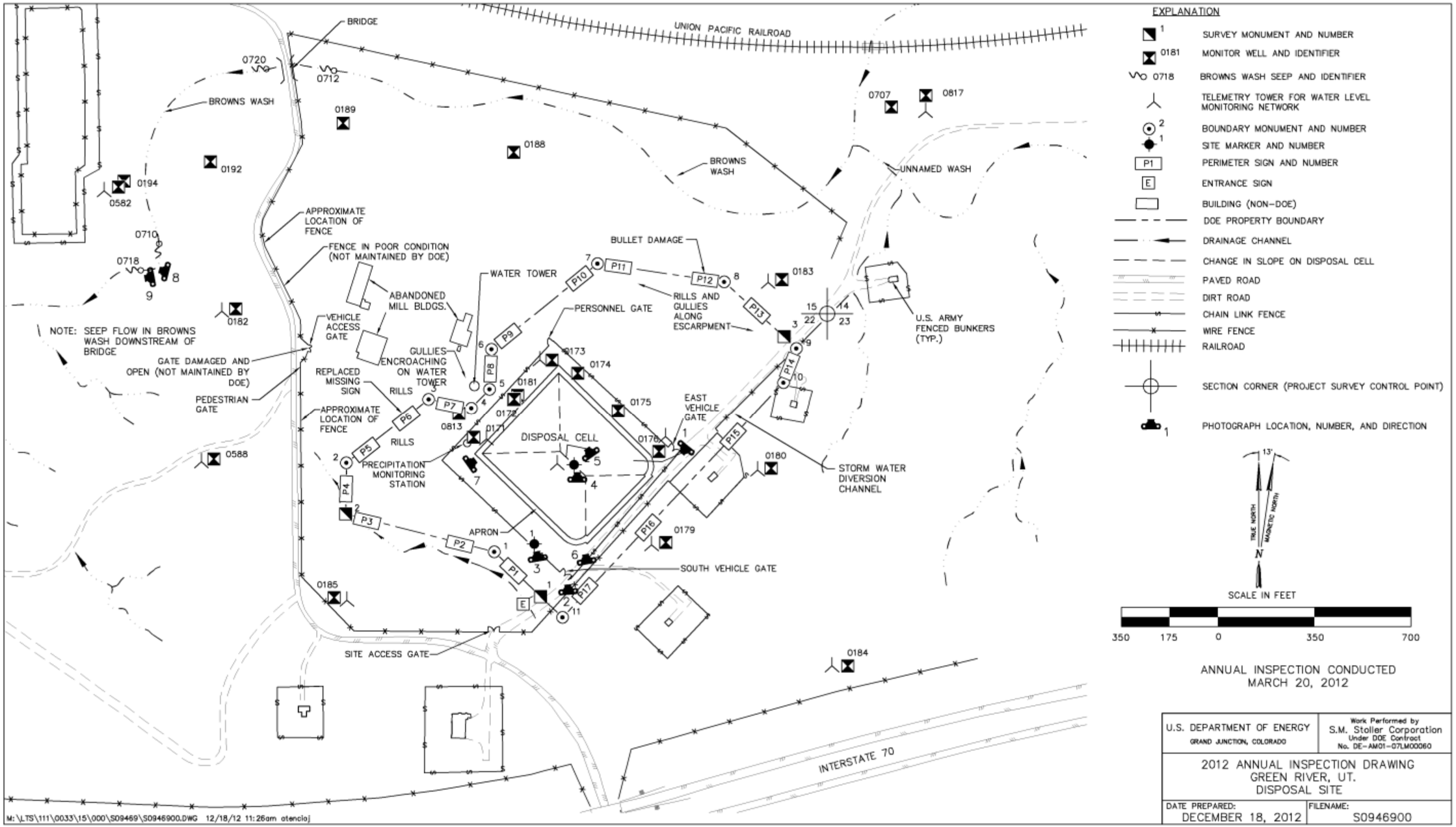

Figure 7–1. 2012 Annual Compliance Drawing for the Green River Disposal Site

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7.4.1.5 Monitoring Wells

Twenty-one groundwater monitoring wells are on or adjacent to the site. A network of 13 telemetry towers has been installed to relay and transmit continuous groundwater-level monitoring data to the LM office in Grand Junction.

The wells were secure at the time of the inspection, and the visible portions of all wells and telemetry system components were in good condition (PL–5).

7.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (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.

Within each area, inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect site integrity or long-term performance.

7.4.2.1 Disposal Cell and Adjacent Area Inside the Security Fence

The 6-acre disposal cell was completed in 1989. The slopes of the disposal cell cover are armored with basalt rock. No evidence of any disturbance of the cell surfaces was observed. No vegetation was present on the cell. The quality of the rock is excellent, and the disposal cell cover was in excellent condition (PL–6). A basalt boulder-filled trench, called an apron, surrounds the disposal cell. The apron collects all runoff water from the cell, and the water is reduced by evaporation, evapotranspiration through deep-rooted shrubs that grow along the apron, and infiltration into the underlying bedrock and aquifer through the sides and bottom of the apron. The apron was in excellent condition (PL–7).

The area between the disposal cell and the security fence consists of the cell perimeter road, several monitoring wells and telemetry towers, and open space. This area was in excellent condition.

7.4.2.2 Site Perimeter Between the Security Fence and the Site Boundary

Rills and gullies are present on the west side of the property but do not encroach on disposal cell structures and currently are not affecting any site surveillance features. Rills and gullies are also present along the escarpment northeast of the disposal cell in the area between boundary monument BM–7 and survey monument SM–3. Maximum gully depth in this area is approximately 3 feet. The rill and gully erosion does not encroach on disposal cell structures but could eventually damage perimeter signs and boundary monuments; therefore, the erosion features in this area will continue to be monitored.

Trespassing occurs on the site from several access points through State land. The barbed-wire stock fence on the surrounding State-owned property provides only minimal security; the fence west of the site is in poor condition, and a gate providing access to the former mill buildings and the DOE site is broken off its hinges. The site is also accessible through remote open access points north and east of the property. DOE property will continue to be monitored for adverse public use indicated by trash, tire ruts, and vandalism.

7.4.2.3 Outlying Area

The area extending outward from the site for a distance of 0.25 mile was checked for signs of erosion, development, or other disturbance that might affect site security or integrity. Areas of erosion noted during recent and previous inspections include the natural drainage southwest of the site, and rills and gullies northwest of the water tower. Minor erosion continues but currently does not threaten the integrity of the disposal cell or site surveillance features.

Abandoned buildings and a water tower associated with the former milling activities at the site are northwest and upwind of the DOE property. The buildings are in a severe state of disrepair, and debris (e.g., roofing materials, siding, trash) tends to be blown from the buildings onto the DOE property. Accumulation of materials blown onto DOE property was not significant but will continue to be monitored; debris will be removed as necessary.

Representatives of the U.S. Department of the Army were inspecting Army assets adjacent to and near the site. The Army is planning to disposition land and structures because they are no longer being used or needed.

The conditions of Browns Wash were observed during the inspection. Flow was occurring in the channel between the road bridge and the backwater area near the confluence with the Green River (PL–8). The streambed upstream of the bridge was dry; therefore, the flow downstream of the bridge was from seeps. The backwater area near the mouth of Browns Wash is important because of its potential to be a fish-spawning location (PL–9). The conditions of Browns Wash channel and the backwater area change substantially after each runoff event as sediment is either scoured or deposited along the channel bottom.

7.5 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No need for a follow-up or contingency inspection was identified during the inspection.

7.6 Maintenance and Repairs

7A Missing perimeter sign P6 was replaced during the inspection.

7.7 Environmental Monitoring

7.7.1 Groundwater Monitoring

7B In compliance with 40 CFR 192, Subpart A, and as stipulated in the LTSP, the groundwater monitoring network consists of four point-of-compliance (POC) wells northwest of the disposal cell (0171, 0173, 0181, and 0813). Two additional POC wells (0176 and 0179) have been added to the compliance network. The purpose of the monitoring is to evaluate the performance of the disposal cell. Additionally, wells 0188, 0189, 0192, 0194, and 0707 completed in the contaminated but low-yield Browns Wash alluvium, have been added to the groundwater monitoring network as a best management practice. The *Groundwater Compliance Action Plan*

for the Green River, Utah, Disposal Site (December 2011; GCAP) adds more best-management-practice wells. These wells (0182, 0184, 0185, and 0588) are completed in the basal unit of the Cedar Mountain Formation.

Monitoring wells 0171, 0173, 0176, 0179, 0183, 0813, and 0817 are currently providing continuous water-level measurements for the contaminated middle sandstone unit, and wells 0182, 0184, 0185, 0582, and 0588 are providing continuous water-level measurements for the uncontaminated basal sandstone unit in the Cedar Mountain Formation. A telemetry system was installed at these wells in January 2007 to send data to the LM office in Grand Junction. Wells 0817 and 0582, completed in the middle sandstone unit and basal sandstone unit, respectively, are capped to prevent artesian flow and to allow continuous measurements of the potentiometric surface through pressure transducers.

Based on the evaluation of several years of analytical data and associated risk, the alternate concentration limits (ACLs) listed in Table 7–2 have been proposed in the GCAP. If NRC accepts the GCAP, these proposed ACLs will apply to all POC wells.

Table 7–2. Proposed Alternate Concentration Limits for Point-of-Compliance Wells at the Green River Disposal Site

Constituent	Standard (mg/L)[a]	Proposed ACL (mg/L)
Arsenic	0.05	5.0
Nitrate + Nitrite as Nitrogen	10	1,000
Selenium	0.05	5.0
Uranium	0.044	4.4

[a] U.S. Environmental Protection Agency maximum concentration limit (40 CFR 192, Table 1).
Key: mg/L = milligrams per liter

Quarterly monitoring of the original four POC wells was conducted from 1998 through June 2007. Risk analyses have determined that there is no unacceptable risk to human health and the environment as a result of site-related contamination in groundwater near the site because the groundwater is not used and because site contaminants do not affect river water quality. Therefore, DOE determined that there was no health or cost benefit associated with continuing quarterly monitoring. Annual monitoring has been implemented instead.

7.7.1.1 Cell Performance Monitoring

Table 7–3 provides the analytical results for the June 2012 sampling event at the proposed POC wells. Time-concentration plots for the four target analytes—arsenic, nitrate, selenium, and uranium—are shown on Figures 7−2 through 7−5.

Table 7–3. 2012 Analytical Results for Point-of-Compliance Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L) ACL = 5.0	Nitrate[a] (mg/L) ACL = 1,000	Selenium (mg/L) ACL = 5.0	Sulfate (mg/L) ACL = None	Uranium (mg/L) ACL = 4.4
	Sample Result	Sample Result	Sample Result	Sample Result	Sample Result
0171	0.0015	51	0.18	4000	0.091
0173	0.0021	120	0.13	6600	0.016
0176	0.00034	64	0.86	3800	0.0026
0179	0.00065	20	0.3	3600	0.17
0181	0.005	5.8	0.0076	5700	0.012
0813	0.1	0.01	0.00073	3800	0.017

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: mg/L = milligrams per liter; ND = not detected (below laboratory detection limit)

Arsenic concentrations in groundwater remain below the U.S. Environmental Protection Agency (EPA) maximum concentration limit (MCL) of 0.05 milligram per liter (mg/L) in all POC wells except well 0813, and remain considerably below the proposed ACL of 5.0 mg/L in all POC wells. In well 0813, levels continue to exceed the MCL, as shown on Figure 7–2, but are substantially below the proposed ACL.

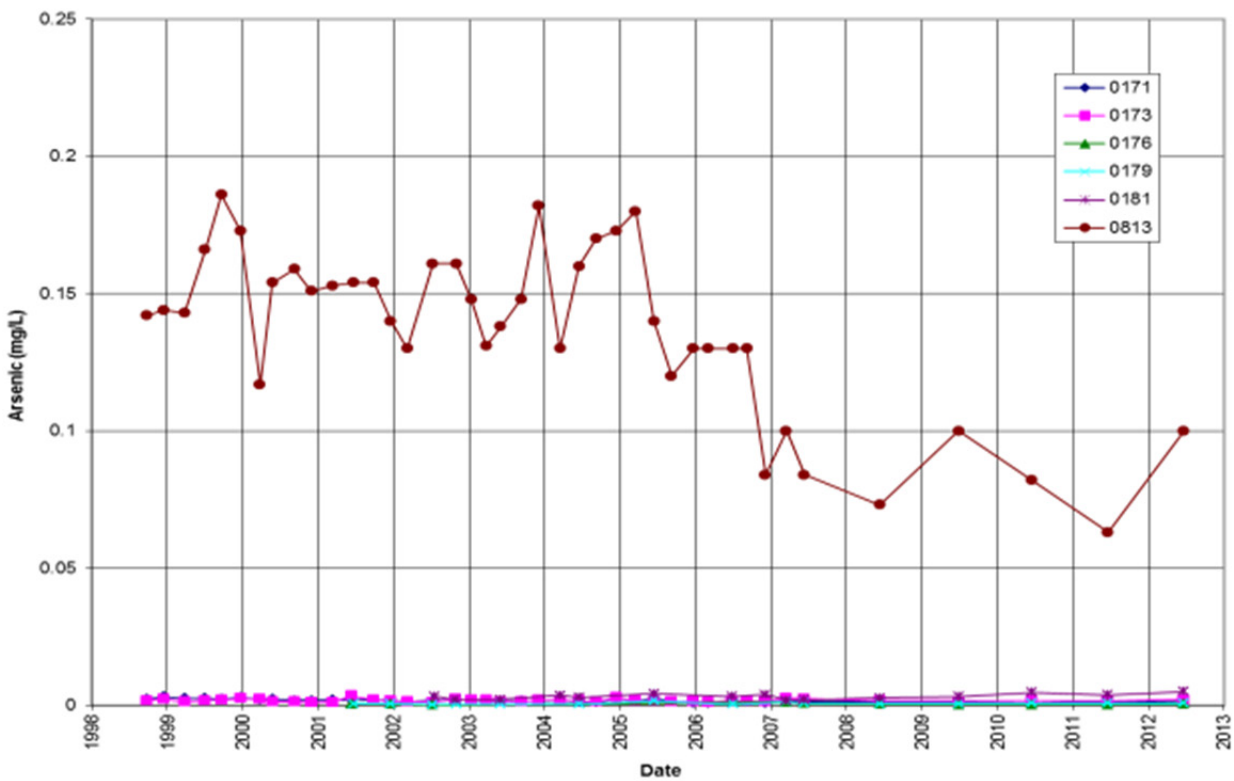

Figure 7–2. Time-Concentration Plots of Arsenic in Groundwater at the Green River Disposal Site

Nitrate concentrations have been measured as nitrate plus nitrite as nitrogen since early 2004 (before then, nitrate was measured as NO_3). Concentrations have continued to exceed the EPA MCL of 10 mg/L in all POC wells except well 0813, but they are considerably below the proposed ACL of 1,000 mg/L in all wells (Figure 7–3). Nitrate concentrations in well 0813 continue to be below the laboratory detection limit. Nitrate concentrations in the other wells are similar to previous measurements, and no trends are apparent.

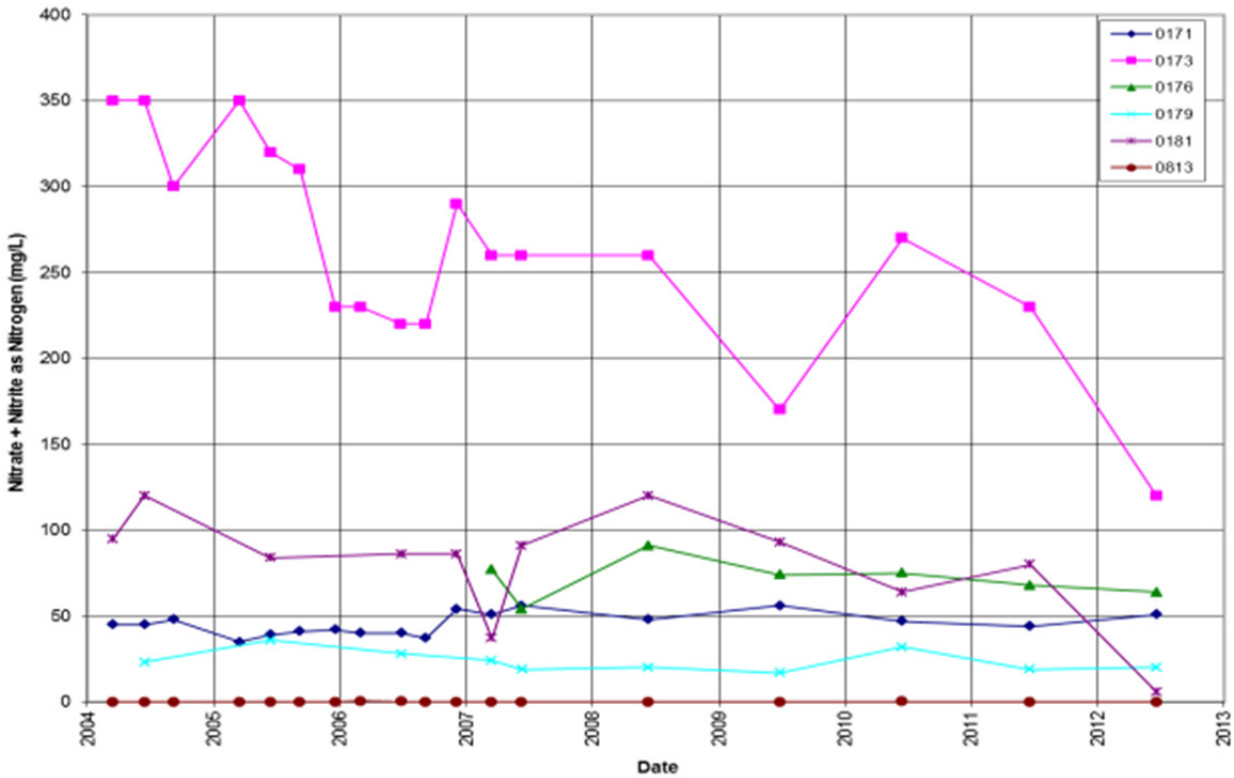

Figure 7–3. Time-Concentration Plots of Nitrate in Groundwater at the Green River Disposal Site

Selenium concentrations in wells 0181 and 0813 remain below the EPA MCL of 0.05 mg/L. Concentrations in the other wells continue to be above the standard but are substantially below the proposed ACL of 5.0 mg/L (Figure 7–4).

Uranium concentrations in groundwater remain below the EPA MCL of 0.044 mg/L in all POC wells except wells 0171 and 0179, and remain considerably below the proposed ACL of 4.4 mg/L in all POC wells. The highest uranium concentrations continue to occur in well 0179 (0.17 mg/L), which is upgradient of the disposal cell. The reason for the elevated concentration of uranium in well 0179 has not been determined, but it may be due to natural causes. At well 0171, concentrations exceed the MCL and indicate an upward trend since 1998 (Figure 7–5). Because uranium is the only constituent of concern that has indicated an upward trend in well 0171, no conclusions regarding the cause of the trend have been reached.

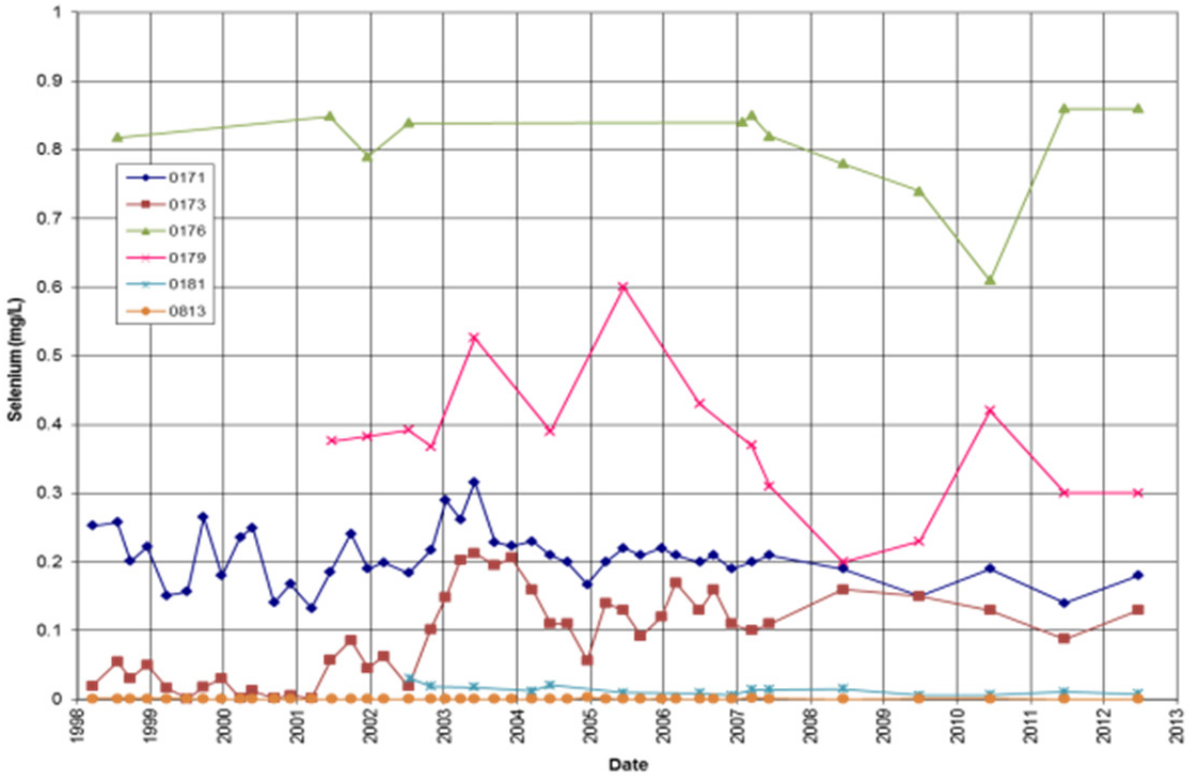

Figure 7–4. Time-Concentration Plot of Selenium in Groundwater at the Green River Disposal Site

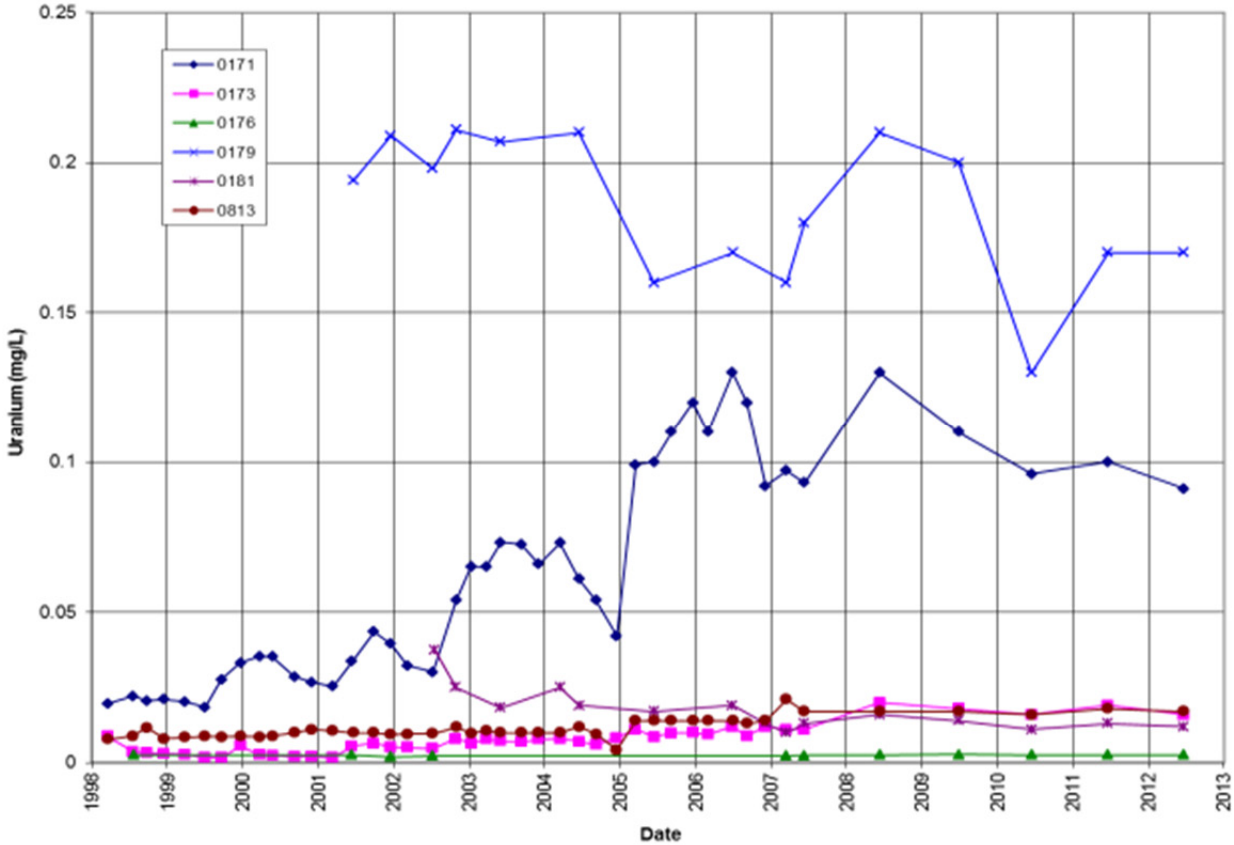

Figure 7–5.Time-Concentration Plot of Uranium in Groundwater at the Green River Disposal Site

7.7.1.2 Groundwater-Level Monitoring

Groundwater levels in several monitoring wells adjacent to the disposal cell have been measured manually since 1991, and continuously with down-hole dataloggers since 1999. Thirteen wells currently have dataloggers, and a telemetry system was installed in 2007 to transmit the continuous water-level monitoring data to the LM office in Grand Junction. The purpose of continuous monitoring is to evaluate the hydraulic gradient and flow directions in the two Cedar Mountain Formation aquifers near the disposal cell.

Water-level hydrographs of the POC wells, completed in the middle sandstone aquifer, indicate that the groundwater elevation decreased approximately 3 feet overall from 1998 through 2004, and then increased approximately 8 feet between 2004 and 2007. Water levels have decreased approximately 2 to 3 feet since 2007, although slight increases occurred in 2010 and 2011 (Figure 7–6).

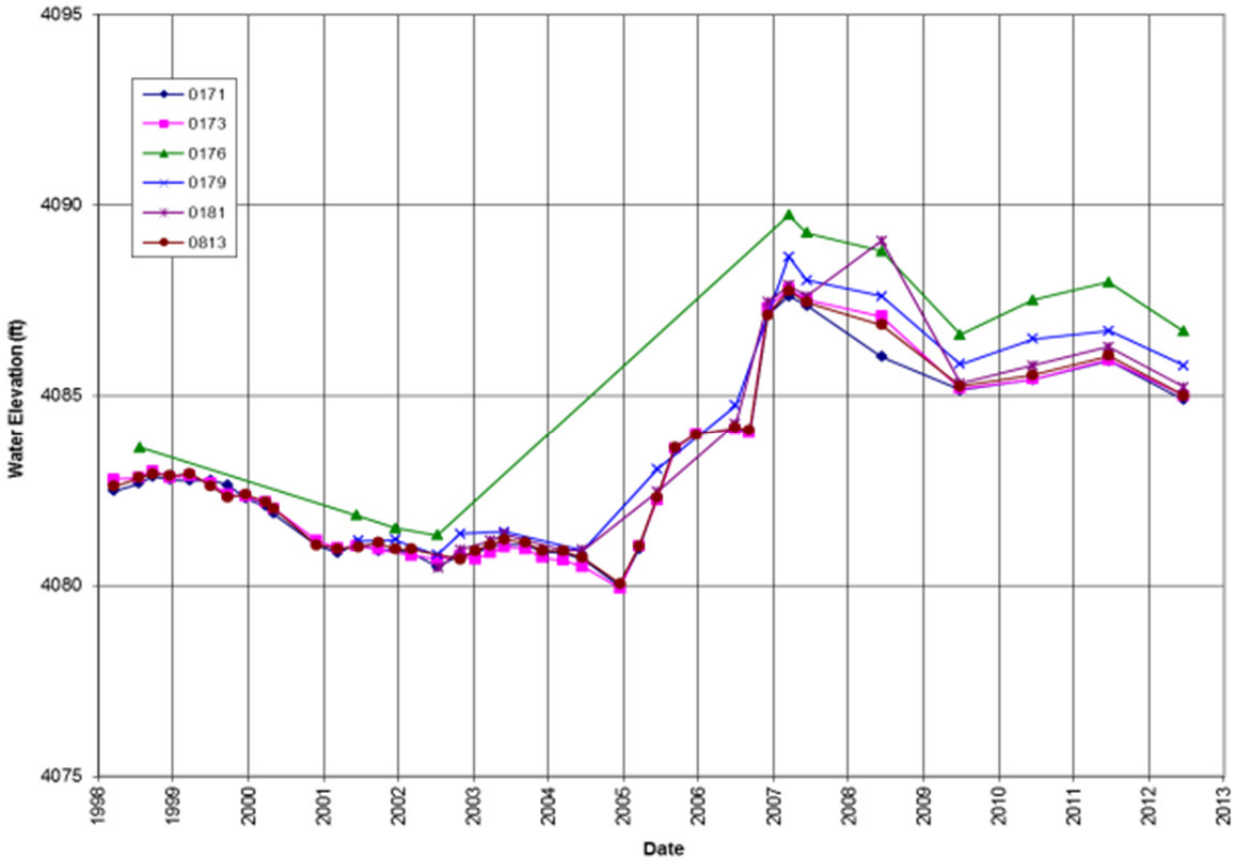

Figure 7–6. Groundwater Elevations at the Green River Disposal Site

The monitoring well locations in the two Cedar Mountain aquifers are not ideal (i.e., no nested well pairs in the upper and lower aquifers) to define both the groundwater flow directions and the hydraulic gradient between the aquifers. However, groundwater elevation data derived from the existing well network are adequate to determine that flow direction in the upper aquifer is toward the west-northwest, while flow direction in the lower aquifer is toward the southwest. The data also suggest that there is a neutral gradient between the two aquifers, therefore neither inducing nor retarding contaminant migration from the contaminated upper aquifer to the uncontaminated lower aquifer.

7.7.1.3 Browns Wash Alluvium Well Monitoring

Analytical results for the June 2012 sampling event at the wells completed in the Browns Wash alluvium are provided in Table 7–4. Because of the proposed application of supplemental standards, ACLs do not apply to the alluvium groundwater. Contaminants are expected to eventually be flushed out of the alluvium as the groundwater migrates toward the Green River alluvium and the Green River.

Table 7–4. 2012 Analytical Results for the Browns Wash Alluvium Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0188	0.00026	6.3	0.024	6100	0.068
0189	0.00057	34	0.065	6800	0.33
0192	0.00031	80	0.11	6300	0.54
0194	0.0027	220	0.022	24,000	4.9
0707	0.00033	2.8	0.092	7500	0.026

[a] Nitrate = nitrate plus nitrite as nitrogen

Concentrations of arsenic, nitrate, and uranium have been steady in wells 0188 and 0192 but variable in wells 0189 and 0194. The highest arsenic, nitrate, and uranium concentrations were in well 0194. The highest and most variable selenium concentrations have been occurring in well 0192. Generally, the groundwater quality degrades from east (upgradient) to west (downgradient). This condition may indicate that the contaminated alluvium groundwater is gradually moving downgradient.

7.7.1.4 Cedar Mountain Formation Basal Unit Well Monitoring

Analytical results for the June 2012 sampling event at the wells completed in the basal unit of the Cedar Mountain Formation are provided in Table 7–5.

Table 7–5. 2012 Analytical Results for the Basal Unit of the Cedar Mountain Formation Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0182	0.0034	0.023	0.000065	580	0.0011
0184	0.002	0.1	0.00032	650	0.0029
0185	0.0012	0.1	0.000032	450	0.00088
0588	0.011	0.01	0.000049	620	0.00015

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: ND = not detected (below laboratory detection limit)

Beginning in 2011, these wells were added to the list of wells that are sampled annually. Data from this sampling will be used to assess any downward migration of contaminants from the middle sandstone to the basal sandstone. Because sulfate is relatively unaffected by natural attenuation, it should be a good indicator of contaminant transport and therefore has been added to the analyte list.

7.7.2 Surface Water Monitoring

According to the site conceptual model, the ultimate point of exposure for groundwater in the middle sandstone unit is the Green River, while exposure to Browns Wash alluvium water is the Green River and Browns Wash backwater. Risk analyses have determined, however, that there are no unacceptable risks to potential receptors (human or ecological) at these locations. As a best management practice, DOE monitors the surface water at these two locations to verify that any contaminated groundwater would not harm ecological receptors in Browns Wash and the Green River. Table 7–5 provides proposed surface water standards in accordance with Utah Rule R317–2, Table 2.14.2.

Table 7–6. Proposed Surface Water Standards for the Browns Wash and Green River Sampling Locations

Constituent	Surface Water Standard (mg/L)
Ammonia as nitrogen	About 0.5 to 1.0 (pH- and temperature-dependent)
Arsenic	0.150 (4-day)
Nitrate + nitrite as nitrogen	4
Selenium	0.0046 (4-day)
Uranium	No standard

A location in the Green River immediately downstream of the mouth of Browns Wash (0846) and a location in the backwater area of Browns Wash (0847) are sampled annually. Historical upgradient Green River sample location 0801 was added in 2012. Analytical results for the June 2012 sampling event are provided in Table 7–7. To date, no surface water sample results have exceeded the standards, and there is no indication that site contamination has degraded the surface water quality at these locations.

Table 7–7. 2012 Analytical Results for the Surface Water Locations at the Green River Disposal Site

Location	Ammonia as Nitrogen (mg/L)	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Uranium (mg/L)
0846 (Green River)	ND	0.0017	ND	0.00077	0.0024
0847 (Backwater)	ND	0.0014	ND	0.00086	0.0073
0801 (Upgadient Green River)	ND	0.0014	ND	0.00074	0.0024

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: ND = not detected (below laboratory detection limit)

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 corrective action was required in 2012.

7.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	220	Disposal cell perimeter road along the southeast side of the cell.
PL–2	355	Vehicle entrance gate at the south corner of the disposal cell security fence.
PL–3	350	Site marker SMK–1.
PL–4	0	Site marker SMK–2.
PL–5	325	Telemetry relay station at the disposal cell crest.
PL–6	350	South corner of the disposal cell.
PL–7	55	West corner and apron of the disposal cell.
PL–8	285	Area of seep 0718 in Browns Wash.
PL–9	260	Downgradient view of Browns Wash toward Green River backwater area.

GRN 3/2012. PL–1. Disposal cell perimeter road along the southeast side of the cell.

GRN 3/2012. PL–2. Vehicle entrance gate at the south corner of the disposal cell security fence.

GRN 3/2012. PL–3. Site marker SMK–1.

GRN 3/2012. PL–4. Site marker SMK–2.

GRN 3/2012. PL–5. Telemetry relay station at the disposal cell crest.

GRN 3/2012. PL–6. South corner of the disposal cell.

GRN 3/2012. PL–7. West corner and apron of the disposal cell.

GRN 3/2012. PL–8. Area of seep 0718 in Browns Wash.

GRN 3/2012. PL–9. Downgradient view of Browns Wash toward Green River backwater area.

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