

**U.S. NUCLEAR REGULATORY COMMISSION  
STAFF ACCEPTANCE REVIEW OF  
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION,  
GREEN RIVER GROUNDWATER COMPLIANCE ACTION PLAN**

DATE: April 29, 2019  
DOCKET: WM-00068  
LICENSEE: U.S. Department of Energy  
SITE: Green River, Utah, Disposal  
TECHNICAL REVIEWERS: George Alexander, Tom Lancaster

**BACKGROUND**

By letter dated November 11, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18171A290), U.S. Nuclear Regulatory Commission (NRC) requested additional information for the Green River Groundwater Compliance Action Plan (GCAP) dated December 2011 (ML12068A089). By letter dated March 28, 2019 (ML19091A053), the U.S. Department of Energy (DOE) responded to the NRC's request for additional information (RAI) for the GCAP dated November 11, 2018 (ML18171A290). The following documents NRC staff's acceptance review of DOE's response to RAIs

**ACCEPTANCE EVALUATION OF RAI RESPONSE**

RAI #1 Response

*DESCRIPTION OF RAI #1*

In the 2011 GCAP, DOE stated that the compliance strategy for the contamination within the Browns Wash alluvium is:

No further remediation with the application of supplemental standards based on limited yield (sustained continuous flow of less than 150 gallons per day) for groundwater in the Browns Wash alluvium.

On November 11, 2018, NRC staff requested additional information to justify DOE's determination that the Browns Wash alluvium is a limited use aquifer. NRC staff was concerned with the DOE's basis for considering Browns Wash alluvium as a limited use aquifer due to limited yield, because one of the eight monitoring wells had a yield of approximately 1,500 gallons per day, while four were dry, and three had pumping rates less than 50 gallons per day. In addition, these monitoring well observations were conducted during a regional drought. As a path forward, NRC staff requested additional justification to support DOE's determination that the Browns Wash alluvium should be considered a limited use aquifer in light of Well 0191, which has recorded yields from the Browns Wash alluvium exceeding 150 gallons per day. NRC staff commented that additional justification should include any information regarding well yields from the Browns Wash alluvium, in particular, well yield information during non-drought conditions.

## *DOE RESPONSE TO RAI #1*

In response to NRC staff's request for additional information, DOE stated:

DOE agrees that Well 0191 completed in Browns Wash alluvium (alluvium) produced more than 150 gallons per day. Review of well logs and pumping test records presented in the SOWP (DOE 2002) suggests the yield from Well 0191 during testing may have been due to contribution of water from the weathered Mancos shale underlying the alluvium. However, additional water level monitoring data collected since 2002 (when the testing of the aquifer was conducted) indicates water levels in the alluvium have increased as much as approximately 5 feet and the saturated thickness has increased by approximately 5 times in certain locations. The increase in water levels would result in an increase in transmissivity of the aquifer and ultimately greater yields. For this reason, it is possible yields from the alluvium would exceed 150 gallons per day in Browns Wash alluvium today. DOE agrees with NRC that the compliance strategy for Browns Wash alluvium should not be supplemental standards based on limited yield. However, DOE's compliance strategy will be as follows: Supplemental standards based on widespread ambient contamination. Selenium concentrations in well 0707 (background location) have consistently exceeded the UMTRCA standard of 0.01 mg/l and the State of Utah standard of 0.05 mg/L.

### *ACCEPTANCE EVALUATION OF RAI #1 RESPONSE*

NRC staff reviewed earlier DOE documents that provide additional insight on the background determination of well 0707. In the Final Site Observational Work Plan dated September 2002 (ADAMS Accession No. ML022820657), DOE stated:

Monitor Well 0707 is upgradient of the mill site in the Browns Wash alluvium, however, because it contains nitrate, uranium, and sulfate, the BLRA did not consider this well to be representative of background (DOE 1995). Historical Uranium concentrations in groundwater in monitor well 0707 are relatively low, ranging from 0.008 to 0.029 milligrams per liter (mg/L) for 25 measurements (Appendix C). Nitrate concentrations in groundwater monitor well 0707 range from 1 to 30 mg/L for 25 measurement, with two exceptions in 1986 and 1987 (prior to construction of the disposal cell) nitrate concentrations were 120 and 140 mg/L, respectively. Sulfate concentrations in ground water for the 25 measurements ranged from 4,770 to 6,549 mg/L. Monitor well 0707 was dry during the July 2002 sampling event.

The historical uranium concentrations in ground water in monitor well 0707 are relatively low and may not have been influenced by the mill site. The two high nitrate values may be analytical error, or nitrate could be derived from local sources such as septic systems, agricultural fertilizers, sewage lagoons, and munitions dumps. Sulfate concentrations in ground water in monitor well 0707 are higher than in the Cedar Mountain Formation wells near the disposal cell suggesting that some or all of the sulfate is derived from other sources. Therefore, it is reasonable that monitor well 0707 has not been affected by the milling process and may be representative of background.

In the Baseline Risk Assessment (BLRA) dated September 1994, the DOE stated:

There are currently no background ground water quality data for the alluvial system. The only upgradient monitor well screened in the alluvium is monitor well 707 (Figure 3.1). Water quality analysis of ground water from monitor well 707 shows that this water is consistently high in nitrate (9 to 140 milligrams per liter [mg/L]), uranium (0.01 to 0.03 mg/L), and sulfate (4800 to 6500 mg/L), the constituents common to the milling process. Even though monitor well 707 is upgradient from the current tailings area, the presence of these constituents, especially nitrate, in ground water raises suspicion as to whether ground water from this location has been affected by the milling process.

NRC staff agrees with the DOE's assessment in the 1994 BLRA, which stated that contaminant concentrations at well 0707 raise suspicion as to the whether groundwater at this location was affected by the milling process. For the relatively high nitrate values at well 0707 in 1986 and 1987, these observations did predate the current disposal cell. However, former mill operations were conducted between 1958 and 1961. Mill operations during this period could have reversed the local groundwater flow direction in the Browns Wash alluvium from the former tailings pile towards well 0707. In the Remedial Action Plan dated December 1989, the DOE reported that the water table elevation at well 808, which was completed in the Browns Wash alluvium beneath the former tailings pile, was 4068.1 ft and well 0707 was 4069.7 ft in 1987. Similarly, the higher sulfate concentrations at well 0707 versus the Cedar Mountain Formation could have been caused by former mill activities as the former tailings pile was located directly above the Browns Wash alluvium. Accordingly, it appears to be plausible that the contaminant concentrations observed at well 0707 are related to mill activities rather than representative of background conditions.

The DOE proposed including Browns Wash alluvium in the Area of Concern (AOC) with Institutional Controls (IC), which is discussed further below. Inclusion of Browns Wash alluvium into the AOC with ICs would be a significant change to the GCAP. For example, the proposed site-wide ACL in Table 10 of the GCAP for uranium of 4.4 mg/L is less than the observed value of 13.0 mg/L in Table 4 of the GCAP for Browns Wash alluvium monitoring. Depending on the path forward and implementation with respect to ICs, the DOE may need to revise aspects of the GCAP to account for the inclusion of Browns Wash alluvium within the AOC.

## RAI #2 Response

### *DESCRIPTION OF RAI #2*

NRC staff requested additional information on the proposed institutional control for the affected or potentially affected properties. NRC staff stated that it does not appear that DOE has adequate institutional controls beyond DOE- (or DOE- and Utah-) owned land within the area of concern (AOC), which includes land between the point of exposure and DOE- (or DOE- and Utah-) owned land. The NRC noted that while DOE can protest a proposal to drill a well in neighboring properties that are affected or potentially affected within the AOC, the Utah Division of Water Rights may ultimately permit such use.

In Section 4.2 of the 2011 GCAP, the DOE stated:

At the request of DOE (with concurrence from the Utah Division of Radiation Control), the State of Utah Division of Water Rights has included into their Area of Concern (AOC) program an area which falls mostly within a circle of approximate 3, 000-ft radius and

centered on the disposal cell (GCAP Figure 2). The AOC is established to restrict the use of groundwater in the Cedar Mountain Formation and the Green River alluvium within this prescribed area. Specifically, the restriction is that no wells shall be completed in the Cedar Mountain Formation within the area and groundwater extracted from the Green River alluvium shall not be used for domestic purposes. Therefore, by definition, a well drilled outside the AOC becomes a potential point of exposure.

The State of Utah updates the AOC program weekly; if a well permit is filed that falls within this area, both the Utah Division of Radiation Control and the DOE are notified. The Utah Division of Radiation Control and the DOE will then file a protest with the State engineers' office to deny the well permit application.

Figure 2 in the 2011 GCAP illustrates the AOC, and Figure 3-1 in the 2002 SOWP shows that there is privately-owned land downgradient of the Green River site between the Green River and the land held by the State of Utah that lies within the AOC.

For the Green River Site, it is not clear to NRC staff that filing a protest with the State of Utah's engineer's office to deny the well permit application is both a durable and enforceable institutional control and therefore protective of public health and safety. First, it is not clear to NRC staff that all private property owners will, currently and in the future, file for a well permit with the State of Utah's engineer's office prior to completing a groundwater well. Second, it is not clear to NRC staff what recourse DOE has to enforce denial of the well permit application if the State of Utah's engineer's office elects to permit the well application regardless of DOE's protest.

Additionally, although a permit for drilling private water production wells greater than 30 feet in depth and public water supply wells is required per Utah Administrative Code R655-4, "Water Wells," it is not clear to NRC staff that all private property owners will, currently and in the future, file for a well permit with the State of Utah's engineer's office prior to completing a groundwater well. It is not clear to NRC staff what recourse the State of Utah's engineer's office has to limit use of water produced from non-permitted water supply wells.

#### *DOE RESPONSE TO RAI #2*

In response to NRC's request for additional information, DOE stated:

DOE recognizes NRC's concern that the State Engineer could issue a well permit within the AOC regardless of protests by both the Utah Division of Waste Management and Radiation Control and DOE. However, the Assistant State Engineer is confident that such a well permit would be denied based on the types and concentrations of groundwater contaminants at the Green River site and that the State of Utah's primary purpose of the AOC designation is to be protective of human health and the environment.

As stated in the Draft GCAP, the Brown's Wash alluvium is excluded from the AOC designation; however, since the compliance strategy for this system will change, the Brown's Wash alluvium will be included in the AOC designation. An action to augment the AOC program would be the establishment of a Groundwater Management Policy administered by the State Engineers Office in Utah. DOE currently has such a policy at the Monticello Mill Tailings Site to restrict access to uranium milling related groundwater contamination. This policy is essentially a formal restriction on well drilling permits. DOE

will work with the State Engineer to develop a Groundwater Management Policy similar to the policy at the Monticello Mill Tailings Site.

The Assistant State Engineer has indicated a willingness to discuss the AOC program and the proposed Groundwater Management Policy in greater detail with NRC and DOE.

#### *ACCEPTANCE EVALUATION OF RAI #2 RESPONSE*

NRC staff remain concerned that the Area of Concern program as described in the 2011 GCAP does not appear to be both durable and enforceable. However, the formal restriction on well-drilling permits with a Groundwater Management Policy as proposed in DOE's response may be considered durable and enforceable. NRC staff notes that an acceptable IC is not currently in place and will need to be in place prior to NRC concurrence on the DOE GCAP for Green River.

#### **Conclusion**

The NRC staff has completed its acceptance review of DOE's response and finds that further information is needed before NRC staff can continue their review for NRC's concurrence of the GCAP.