Safety Evaluation Report for
Cimarron Corporation
Decommissioning Plan, Revision 3
Amendment 22
Guthrie, Oklahoma

Materials License No. SNM-0928

Docket No. 070-00925

December 2024

Table of Contents

1. Introduction

The U.S. Nuclear Regulatory Commission (NRC) received, by letter dated October 7, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. (ML22284A145), an application from the Cimarron Environmental Response Trust (CERT) to amend Special Nuclear Materials License SNM 928, which authorizes the possession of byproduct, source, and special nuclear material. The amendment requests approval of Revision 3 of the proposed facility decommissioning plan (DP) for the Cimarron facility in Guthrie, Oklahoma, and incorporation of DP, Rev. 3, into its license, by license amendment.

Since the Cimarron site has been in decommissioning status, materials and equipment, buildings and structures, and surface and subsurface soils have been decommissioned and much of the original site has been released from the license. Previously, the site used monitored natural attenuation (MNA) to reduce uranium concentrations in the groundwater to levels that would meet the groundwater release criteria specified in the license. However, in some portions of the site, uranium in the groundwater exceeds those levels. In 2015, the CERT therefore requested revisions to the DP to modify the plan from MNA to, instead, allow for active groundwater remediation with the goal of meeting the previously approved 180 picocuries per liter (pCi/L) total uranium criteria for unrestricted use. In the intervening years, CERT revised the DP several times to address additional technical and funding issues regarding the active groundwater remediation plan, but previously, the information submitted was not sufficient to support a complete review. The licensee now seeks approval of Revision 3 of the DP, which provides further details regarding the active groundwater remediation plans that specifically target areas for groundwater remediation where the concentration of uranium in groundwater exceeds the NRC criterion in License Condition 27.b. for unrestricted release (NRC criterion), which is 180 picocuries per liter (pCi/L) total uranium criteria for unrestricted use.

In addition to incorporating the revised DP, Rev. 3, into the license, CERT requests several other revisions to SNM-928. The license amendment would also be revised to authorize the possession of Technetium-99 (TC-99) as a contaminant in groundwater. SNM-928 does not stipulate unrestricted release criteria for Tc-99. However, Tc-99 exists in the groundwater as a contaminant from the residual Tc-99 in the hexafluoride (UF6) cylinders used at the facility. Adding Tc-99 to the license would allow the licensee to possess and dispose of any contaminated material because treatment of the groundwater may result in concentrating the Tc-99 in the ion exchange (IX) media above acceptable limits. Any waste stream containing detectable Tc-99 would have to be disposed of as low-level radioactive waste (LLRW).

The license amendment would also distinguish between the possession limit for “in-process” Uranium-235 (U-235) and U-235 in packaged waste that complies with fissile exemption criteria. Making this distinction will clarify the requirements for each type of material that is possessed to avoid any future confusion during operation of the groundwater treatment facility. Additionally, the license amendment would clarify the authorized place of use to include subsurface areas where the groundwater exceeds the NRC criterion, and areas where such licensed material will be transported or managed. Clarifying the authorized place of use to include areas previously released from the license, in which groundwater exceeding the NRC criterion is present in the subsurface, and areas where such licensed material will be transported or managed, will clearly define the authorized places of use requiring radiological controls and surveillance during the life of the treatment facility (ML24192A319). This will also inform the areas needing characterization in future final status surveys (FSSs) to eventually terminate the license at the end of the groundwater treatment process.

Finally, the license amendment would eliminate references to documents relevant to previous decommissioning activities for facilities and soil that are no longer relevant to ongoing decommissioning activities. Removing such references will eliminate confusion in identifying program requirements that are relevant to the operation of the groundwater treatment facility and not to preexisting and released facilities.

An NRC administrative completeness review found the application acceptable for a technical review (ML23074A100).

2. Facility Operating History

Regulatory Requirements

Sections 16.2.1 through 16.2.5 of NUREG-1757, Volume 1, Revision 2, "Consolidated Decommissioning Guidance-Decommissioning Process for Materials Licensees, Final Report" (ML063000243) identify Title 10 of the *Code of Federal Regulations* (10 CFR) 70.25(g)(3)(iii) and 10 CFR 70.38(g)(4)(i) as the regulatory requirements applicable to the NRC staff's review of the licensee's description of the facility operating history. In 10 CFR 70.25(g)(3)(iii), the NRC requires a licensee to maintain records for all areas outside the restricted area where current and previous waste are buried. In 10 CFR 70.38(g)(4)(i), the NRC requires the submitted DP to provide sufficient information describing the conditions of the site, separate building, or outdoor area to allow it to evaluate the acceptability of the plan.

Grandfathered Sites

In Section 6.5 of NUREG-1757, Volume 1, Revision 2 (ML063000243), sites being decommissioned under approved DPs submitted before August 20, 1998, are grandfathered from the provisions of 10 CFR Part 20, "Standards for Protection Against Radiation," Subpart E, "Radiological Criteria for License Termination." Specifically, the criteria in the Site Decommissioning Management Plan (SDMP) Action Plan (57 FR 13389) are reasonably consistent with the dose-based criteria and are within the range of measurable values that could be derived through the site-specific screening and modeling approaches used in dose-based site analysis. Section 15.6 discusses SDMP sites. If a licensee makes *significant* changes to the DP—those requiring formal NRC approval—or cannot demonstrate compliance with approved residual concentrations, the grandfathering provisions regarding license termination will not continue and, instead, the revised DP will be subject to 10 CFR Part 20, Subpart E.

As the NRC explained in a letter dated November 10, 2005 (ML053140316)),revision 3 to the original DP to address groundwater contamination at the site through means other than MNA is not considered a significant change to the DP. In a letter dated September 21, 2005 (ML23119A005), the licensee indicated that, based on groundwater monitoring data from the facility, the MNA remedial approach would not be able to achieve the release criteria in License Condition (LC) 27.b. of 180 pCi/L total uranium. LC 27.a. contains a "tie-down" provision authorizing Cimarron to remediate its facility in accordance with the DP and supplemental correspondence. Although Cimarron's proposed change to its DP required NRC approval, the NRC determined that such decontamination activities can be undertaken without subjecting it to the license termination provisions (10 CFR Part 20, Subpart E; specifically, 10 CFR 20.1401,

"General provisions and scope"), since it does not change the NRC-approved release criteria of 180 pCi/L.

However, because the proposed change in the method of groundwater remediation was not the type of change, test, or experiment permitted under LC 27.e. to be made without NRC approval, Cimarron was required to submit this license amendment request to change its approved method of groundwater remediation from MNA to excavation or "pump and treat." As part of the license amendment application, Cimarron had to address the environmental impacts of each proposed method of groundwater remediation.

Regulatory Acceptance Criteria
The licensee should submit sufficient information on the site to allow the NRC to fully understand the types of radioactive material and hazardous chemicals used on-site, the nature of the authorized use at the site, and the activities that could have contributed to residual radioactive material being present.

Staff Review and Analysis

2.1 License Number/Status/Authorized Activities

The licensee provided information associated with license numbers SNM-928 and SNM-1174, the status of both licenses, and current and previous activities associated with the licenses in DP Section 1.0. Section 1.2.1 of the DP. Rev. 3, contains a brief discussion of SNM-1174, indicating that the mixed oxide (MOX) license was terminated, and the decommissioning associated with that license was completed in 1993 (ML20128K384). The current DP focuses on the decommissioning activities for SNM-928. Section 1.0 includes information associated with the site and its division into 16 separate subareas, most of which were released under a phased approach. Only subareas F, G, and N remain under the NRC license. The other subareas are no longer licensed by the NRC; rather, they underwent decommissioning and were approved by the NRC for unrestricted release from the license.
.
According to the DP, the site was originally owned by Kerr-McGee Nuclear Corporation (KMNC) and consisted of 800 acres of land. Between 1970 and 1993, the facility held two licenses, one for the production of MOX fuel and one for uranium fuel. MOX fuel production was halted in 1975, decommissioning activities were completed in 1993, and the license was terminated. The uranium fuel production activities were discontinued in 1976, and decommissioning is in progress.

2.2 License History

KMNC manufactured nuclear fuel under two NRC licenses at the Cimarron facility near Crescent, Oklahoma. The facility produced uranium fuel under SNM-928 and MOX fuel under SNM-1174. Waste was buried in three locations, and wastewater containing licensed material was stored in impoundments and discharged to the Cimarron River, all in accordance with the regulatory requirements of that time.

Mixed Oxide (MOX) fuel was produced in the Mixed Oxide Fuel Fabrication (MOFF) facility from 1970 through 1975. Liquid uranyl nitrate and plutonium nitrate solutions were blended, coprecipitated, calcined, milled, pressed into pellets, and assembled in fuel pins. The MOFF facility was decommissioned and released for unrestricted use in 1993.

Enriched uranium fuel was produced at the Uranium Plant from 1966 through 1975. Process facilities included a main production building, several one-story ancillary buildings, five process-related collection ponds, two original sanitary lagoons, one new sanitary lagoon, a waste incinerator, several uncovered storage areas, and three burial grounds. The site performed high enrichment and low enrichment production. Operations at the facility included a solvent extraction process to recover uranium from the processing of scrap and from material that did not meet contract specifications. The site disposed of wastewater from other facilities in Uranium Ponds 1 and 2. In the 1970s, stored wastewater received from the U.S. Department of Energy (DOE) Paducah facility leaked from these ponds and resulted in the contamination of the groundwater with Tc-99.

In September 1976, KMNC informed the NRC that it was placing the facility in standby. The facility began limited decontamination and cleanup activities in January 1977. The license was last renewed in March 1983 and has been amended 21 times since then. The licensee provided details on each amendment in Section 1.1 of the DP.

2.3 Previous Decommissioning Activities

Revision 3 of the DP does not address decommissioning activities associated with the MOX facility. Buildings decommissioned under the uranium fuel license (SNM-928) include Uranium Building 1, Uranium Tank Storage Building 2, Solvent Extraction Building 3, Uranium Warehouse Building 4, the UF6 Receiving Room, and the Emergency Response Building. Impoundments included the Plutonium Waste Pond, Plutonium Emergency Pond, Uranium Emergency Pond, Uranium Waste Pond 1, Uranium Waste Pond 2, the East and West Sanitary Lagoons, and the “New” Sanitary Lagoon.

The site was divided into 15 subareas (subareas A through O); 12 of those subareas were either determined to be nonimpacted (subareas A, B, C, D, and E) or have completed remediation and have been removed from the radioactive material license by the NRC (subareas H, I J, K, L, M, and O). Only subareas F, G, and N currently remain on the license. Although FSSs and confirmatory surveys have determined that these areas are releasable for surface soils and subsurface soils, the subareas require groundwater remediation prior to release.

2.4 Spills

Section 1.4 of the DP identifies the following sources for the transfer of contamination to the environment: (1) leaking drain lines from the buildings, resulting in contamination of soils or groundwater (2) groundwater contamination from leaking ponds (3) groundwater contamination resulting from buried wastes, and (4) rainwater contamination through Well 1319.

Subsurface drain lines, including underground piping carrying wastewater to the ponds, leaked in quantities too small to detect during operations, but this leakage resulted in elevated scan or soil sample results upon excavation and removal of the pipelines beneath Uranium Building 1. Uranium Ponds 1 and 2 (evaporation ponds) were lined but wastewater seeped through the liners and contaminated the groundwater. Additional groundwater contamination resulted from the burial of waste in trenches in the three burial areas (BAs) used during operations (1966 to 1975 for uranium fuel and 1970 to 1975 for MOX fuel). Contaminated equipment was also stored in a storage yard east of Uranium Building 1. An unused water well (Well 1319), also

located in the storage yard, was cut off at ground level, but the well casing was not capped. This open wellhead piping at ground surface potentially allowed contamination in the storage yard area to have an access point to migrate to groundwater.

2.5 Prior On-site Burials

Section 1.5 of the DP identified BA1 through BA4. Soil contamination concentrations are discussed in terms of the Branch Technical Position (BTP), Disposal or On-site Storage of Residual Thorium or Uranium (Either as Natural Ores or without Daughters Present) from Past Operations (ML19363A009), Option 2 value (100 pCi/g U_{total}). Soils with concentrations above the BTP Option 2 value were shipped off site for disposal; soils with concentrations below that level were stockpiled on-site pending placement in BA4.

BA1 was designated for disposal of radioactive material wastes, including thorium waste from the KMNC facility in Cushing, Oklahoma. It was closed and capped in 1970. Records indicate that 1,303 kilograms(kg) of depleted uranium waste, 148 kg of enriched uranium waste, and 5,555 kg of natural thorium was disposed of in BA1. Investigation and remediation began in 1984. Approximately 65,000 cubic feet (ft^3) of material was removed and stockpiled east of Uranium Building 1 for placement in an on-site cell. Another 65,000 ft^3 was packaged and shipped off site for disposal. Confirmatory surveys by Oak Ridge Associated Universities (ORAU) resulted in another 14,000 ft^3 of soils being added to the stockpile east of Uranium Building 1. BA1 was backfilled with soils containing less than 30 pCi/g uranium and less than 10 pCi/g of thorium.

BA2 was used in the 1970s for the disposal of solid industrial waste. In May 1999, soil sampling identified the presence of licensed material in BA2. Remediation began in 1991. Approximately 20,000 ft^3 of soils was added to the stockpile near Uranium Building 1. BA2 was backfilled with soils from unaffected areas in 1997.

BA3 was designated for disposal of nonradioactive waste, but in 1990, sampling and characterization work led to the removal of approximately 100 ft^3 of waste exceeding the BTP Option 2 value (100 pCi/g U_{total}). This material was shipped off site for disposal. Other materials excavated from BA3 were added to the stockpile near Uranium Building 1.

BA4 is an on-site disposal cell containing materials in concentrations between 30 pCi/g and 100 pCi/g total uranium. The NRC-approved the onsite disposal cell as part of Amendment 10 (ML092660294 and ML092660295), to the radioactive material license and issued an environmental assessment (EA) (ML092660296) and a safety evaluation report (SER) (ML092660328), associated with the approval. Soils above the 100 pCi/g levels were shipped off site for disposal. The interior of the BA4 cell consists of three trenches. Trench 1 (roughly 50 feet (ft) by 425 ft) was filled with stockpile soils and completed in February 1995; Trench 2 (roughly 60 ft by 470 ft) was filled with stockpile soils and completed in September 1996. Both of these trenches were capped with 4 ft of cover soil. Trench 3 (roughly 60 ft by 470 ft) was filled with excavated soils from decommissioning activities and capped with 6 ft of cover soil, taken from unaffected areas of the site. All cover soil was then covered by several inches of topsoil and seeded with a winter mix. Approximately 16,740 cubic yards(cy) of stockpiles or excavated soils with an average concentration between 35.7 and 45 pCi/g were placed in BA4, with a total activity of 0.98 curie (Ci). An LC required the licensee to place a note in the deed regarding the presence of BA4. Aboveground markers are in place for BA4, and the licensee was required to perform inspections for at least 5 years after closure (calendar year 2000) to check for signs of subsidence and erosion and the status of the vegetative cover. The licensee has inspected for

more than 5 years and year-to-date has seen no evidence of erosion and vegetative cover remains healthy and dense. The release of BA4 for this site predates the License Termination Rule Subpart E—Radiological Criteria for License Termination 62 FR 39088, July 21, 1997 and, as detailed in 20.1401(b), for grandfathered sites under the SDMP, approvals such as this revision to the DP does not subject it to the license termination provisions (10 CFR Part 20, Subpart E)..

Evaluation and Findings

The NRC staff has reviewed the information in the "Facility Operating History" Section of the DP for the Cimarron facility, docket number 070-00925, located near Crescent, Oklahoma, according to Section 16.2 of NUREG-1757, Volume 1, Revision 2. The licensee provided information at a sufficient level of detail to allow the NRC staff to understand the site operating history, as well as the decommissioning activities that have been completed on-site, and to assess the proposed plan to complete the necessary groundwater remediation efforts. Based on this review, the staff has determined that the licensee, CERT, has provided sufficient information to aid in evaluating the acceptability of the DP, to ensure that decommissioning can be conducted in accordance with NRC requirements.

3. Facility Description

The Cimarron site is located close to Cimarron City, Oklahoma (figure 3-1). The original 840-acre (ac) site is along the southern bank of the Cimarron River about 1 kilometer (km) [0.5 miles (mi)] north of the Oklahoma State Highways 33 and 74 intersection and 40 km (25 mi) north of Oklahoma City, Oklahoma. The area is primarily rural with rolling hills and incised drainages. Vegetation in the area consists of native grasses and various stands of trees along and near drainages. The Cimarron site was used to fabricate enriched uranium and MOX fuels for nuclear reactors from 1965 through 1975. The site contained several buildings, collection ponds, sanitary lagoons, storage areas, and BAs. Originally, KMNC owned and operated the complex. Later, Cimarron Corporation, a wholly owned subsidiary of KMNC, became responsible for the site. In 2005, ownership of Cimarron Corporation was transferred to Tronox Incorporated, which filed for bankruptcy in 2009. In 2011, CERT assumed responsibility for the Cimarron site, including completion of the decommissioning activities.

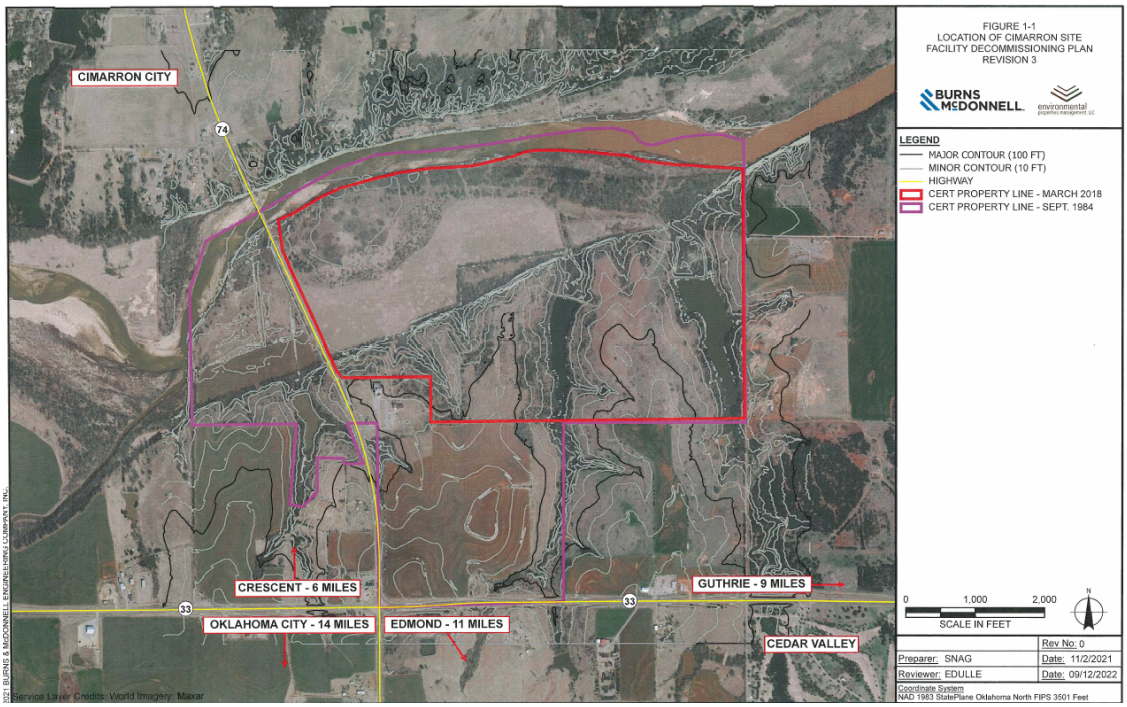


Figure 3-1 Location of Cimarron site facility

The Atomic Energy Commission (AEC) issued Radioactive Materials License SNM-928 in 1965 to KMNC for the uranium fuel fabrication facilities at the Cimarron site. The AEC issued Radioactive Materials License SNM-1174 in 1970 to KMNC for the MOFF facilities at the Cimarron site. Production of nuclear fuels continued until 1975, when all production operations ceased. Nuclear activities affected less than 20 percent of the 340 -ha (840-ac) site.

Decommissioning efforts were initiated in 1976. Characterization activities and decommissioning were first conducted for the MOFF building and associated areas, which included evaporation ponds, emergency ponds, sanitary lagoons, underground tanks, a septic tank, and a fenced area around the MOFF building. In 1990, Cimarron Corporation submitted a final survey of the MOFF building and associated areas to the NRC, which is the successor of the AEC, and requested termination of SNM-1174. The NRC had a final confirmatory survey conducted and based on the results, terminated the MOFF License, SNM-1174, consistent with regulations at the time in 1993. However, the land and the exterior of the MOFF building were not released for unrestricted use because they were within the bounds of the uranium fuel fabrication license, SNM-928.

In the following years, characterization activities continued, and DPs were developed and approved by the NRC for the facilities associated with SNM-928. The site was divided into three areas that included affected and unaffected areas. The areas were further subdivided into subareas. Cimarron Corporation submitted an FSS report (FSSR) for each subarea when the decommissioning activities were complete for each subarea. Following NRC review and acceptance, the subareas were released for unrestricted use and removed from SNW-928. By the early 2000s, the NRC had released the majority of the site for unrestricted use.
MNA was used to remediate uranium in the groundwater at the site. However, unrestricted release standards were not achieved as the. uranium concentrations in groundwater were in

excess of release criteria for BA1, the Western Alluvial Area (WAA), and the Western Upland Area (WUA). Plans were developed to lower the uranium concentration through groundwater remediation, and bioremediation was proposed as an alternative in 2008. The NRC staff had concerns about the use of bioremediation at the site and progress resolving these concerns was delayed because Tronox Incorporated filed for bankruptcy in 2009. After CERT became the trustee and licensee for SNM-928 in 2011, discussions were conducted with the NRC to evaluate alternative remediation methodologies.

By mid-2014, the trustee had determined that pump and treat was the best option for groundwater remediation. In June 2015, the NRC staff met with the trustee and the Oklahoma Department of Environmental Quality (ODEQ) to discuss the trustee's conceptual model for groundwater remediation. The trustee submitted its license amendment request to approve a remediation plan in December 2015. The NRC staff reviewed the submittal and transmitted requests for additional information. In response, the trustee conducted additional studies related to groundwater remediation and submitted a revised remediation plan in November 2018. The licensee retracted this remediation plan on August 28, 2020, based on a cost analysis of remediating both the NRC-licensed material and the biomass concerns of ODEQ.

Revision 2 of the DP was submitted on February 26, 2021, incorporating a phased approach to cleaning the site, first to address the NRC-licensed material and, secondly, to address any remaining biomass issues at the site if sufficient funding was available. The NRC rejected Revision 2 to the DP on August 11, 2021, based on a lack of adequate and complete information for the NRC staff to begin a detailed technical review, indicating that supplemental information was needed.

The licensee submitted a draft of Rev. 3 of the DP to the NRC in December 2021 for a preapplication audit on January 7, 2022. The NRC commented on the draft on January 31, 2022. On March 29, 2022, the licensee requested further clarification, and the NRC responded on April 5, 2022, and May 18, 2022.

The NRC staff received the CERT DP, Rev. 3, in a letter dated October 7, 2022, asking to amend SNM-928 for the CERT Cimarron site near Crescent, Oklahoma (ML22284A145), as well as other supporting documents, submitted October 7, 2022–February 3, 2023. In its amendment request, CERT requested approval of its revised DP, Rev. 3, for the Cimarron site.

Regulatory Requirements

Sections 16.3.1 through 16.3.8 of NUREG-1757, Volume 1, Revision 2 (ML063000243) identifies 10 CFR 70.38(g)(4)(i) as containing the regulatory requirements applicable to the NRC staff's review of the licensee's description of the facility. In 10 CFR 70.38(g)(4)(i), the NRC requires the submitted DP to describe the conditions of the site, separate building, or outdoor area with sufficient information to allow an evaluation of the acceptability of the plan.

Regulatory Acceptance Criteria

Sufficient information on the site should allow the NRC to evaluate the licensee's estimate of doses on-site and off-site, impacts of the proposed decommissioning activities at the site and its surrounding areas, and impacts on the environment at the site in the event of a natural disaster (e.g., flood, tornado, earthquake).

3.1 Site Location and Description

As discussed in Section 2.0 of the DP, Rev. 3 (ML22284A150), the site currently consists of approximately 500 ac of property located in Logan County, Oklahoma. The currently owned property is located in Sections 11 and 2, Township 16N, Range 4W, of the Indian Meridian. Its actual acreage varies based on the location of the Cimarron River, which forms the northern property line. Before 2015, the site included property located west of Highway 74, and south of the current property line, occupying approximately 800 ac. Approximately 117 ac west of the highway and approximately 24 ac containing the former processing buildings were sold in 2015. Those two areas included portions of subareas E, H, I, J, K, and L.

The southwest quarter of Section 12, at the intersection of Highways 74 and 33, representing most of unimpacted Subarea A, was sold in 2017. The property on which the CERT office is located, containing slightly less than 1 ac in Subarea I, was sold in 2018. All of these subareas had been released from SNM-928 before their sale, as described in Section 1, Introduction. These properties are no longer owned by the licensee, and for the purposes of this plan are no longer considered part of the site.

In the sale of the 24-ac property, the CERT retained the environmental liability associated with groundwater, which does not require remediation under SNM-928, but which contains concentrations of nitrate exceeding State criteria. The concentration of nitrate in groundwater exceeds State criteria in areas that do not require groundwater remediation for NRC decommissioning purposes. However, plans for reducing the concentration of nitrate in these areas are included herein to eliminate the duplication of effort that would be required to develop a separate groundwater remediation plan for only those areas.

The city of Cedar Valley, Oklahoma, extends to approximately 0.5 mi east of the site. Cimarron City extends to the northern bank of the Cimarron River. Crescent is located approximately 6 mi north of the site. Guthrie is located approximately 9 mi east of the site. Edmond extends to approximately 11 mi southeast of the site, and Oklahoma City extends to approximately 14 mi south of the site. Figure 1-1 of the DP, Rev. 3, Figures - Sections 1-5 (ML22285A091), shows the location of the site relative to these cities. Figure 2-1 of the DP, Rev. 3, Figures - Sections 1-5 (ML22285A091), presents an aerial image of the site with the topographic contours of the property.

Figure 2-2 of the DP, Rev. 3, Figures - Sections 1-5 (ML22285A091), presents a topographic map of an area extending 2 mi around the site, showing the locations of residences and other facilities, ponds, streams, lakes, the Cimarron River, water wells, and oil and gas wells. The locations of residences and other facilities were obtained from GoogleEarth®. Table 2-1, of DP, Rev. 3, Tables (ML22285A109), lists water wells located within 2 mi of the site (based on the Oklahoma Water Resources Board water well registry as of February 8, 2021). Table 2-2. DP, Rev. 3, Tables (ML22285A109), lists the locations of all oil and gas production or injection wells (based on the Oklahoma Corporation Commission Oil and Gas Well Data System, as of February 8, 2021).

The site consists of gently rolling hills, leading northward to the floodplain of the Cimarron River. Ground elevation varies from approximately 925 ft above mean sea level (amsl) at the northeastern property line to approximately 1,015 ft amsl near the southern property line. Two surface water reservoirs are present on the site. Unnamed ephemeral streams feed these reservoirs, which discharge to the floodplain of the Cimarron River.

3.2 Population Distribution

Generally discussed in Section 2.2 of the licensee submission, DP, Rev.3 (ML22284A150), the estimated population for Logan County, Oklahoma, as of July 1, 2019, was 48,011. This represents a 15 percent increase since 2010. Guthrie, Oklahoma, located approximately 9 mi east of the site, had an estimated population of 11,661 on July 1, 2019; this represents growth of 14 percent since 2010. Edmond, Oklahoma, located approximately 11 mi southeast of the site, had an estimated population of 94,054 on July 1, 2019. This represents a 16 percent increase since 2010. Oklahoma City, Oklahoma, located approximately 14 mi south of the site, had an estimated population of 655,057 on July 1, 2019; this represents a 13 percent increase since 2010. Within Logan County, Cimarron City, which extends northward from the northern bank of the Cimarron River, had a 2010 population of 150. Crescent, Oklahoma, located approximately 6 mi north of the site, had a 2010 population of 1,411. The U.S. Census Bureau does not routinely update population data for towns with a population below 5,000.

3.3 Current and Future Land Use

Section 2.3 of the DP, Rev. 3 (ML22284A150), discusses this topic generally. The DP, Rev. 3, is submitted to facilitate installation and operation of a groundwater treatment facility to remove the uranium from the groundwater using ion exchange (IX). Preconstruction, construction, and operation of this treatment facility are estimated to take 15 years, followed by 3 years of post-remediation monitoring, demobilizing, and conducting FSSs to support termination of the NRC license. It is anticipated that upon license termination, the area where the treatment facility building remains will be released for industrial use and the other areas will be returned to either agricultural or industrial use.

The property owned by the CERT currently lies fallow. Portions of the site containing grasses that are beneficial for cattle feed are periodically mowed and baled. The bales are removed from the site for use as cattle feed. Mowing of large portions of the site is intended to minimize the fire hazard associated with tall prairie grass as well as to maintain access to groundwater monitoring wells. An office building (not continuously occupied) is maintained for periodic use by personnel when at the site.

The area surrounding the site is primarily used for farming and ranching. The 24-ac property near the office building was developed and used for aerospace industry manufacturing until these operations ceased in 2020. The southwest quarter of Section 12 has been returned to agricultural use.

A small commercial development with a service station/convenience store, a building housing several shops, a storage facility, and an oil and gas production facility are located near the intersection of Highways 33 and 74. A golf course is located within 1 mi of the southeastern corner of the site. Fewer than 100 people live within 1 mi of the site. Figure 2-2, DP, Rev. 3, Figures - Sections 1-5 (ML22285A091), presents a topographic map of an area extending 2 mi around the site, showing the locations of residences, other facilities, ponds, streams, lakes, the Cimarron River, and offsite water wells. Table 2-1 lists water wells located within 2 mi of the site.

3.4 Meteorology and Climatology

As generally discussed in Section 2.4 of Revision 3 to the DP (ML22284A150), Adams and Bergman (1995) summarized the precipitation for the Cimarron River from Freedom to Guthrie, Oklahoma. Their study showed that precipitation ranges from an average of 24 inches per year (in/yr) near Freedom, Oklahoma, in the northwest part of the Cimarron River floodplain, to 32–42 in/yr at Guthrie, Oklahoma. Wet years between 1950 and 1991 were in 1973–1975, 1985–1987, and 1990–1991. The wettest months are May through September, while the winter months are generally the dry months. The period from 1973 to 1975 was 23 in. above the normal total for the 3-year period (Carr and Marcher, 1977).

Precipitation data collected by the National Oceanic and Atmospheric Administration (NOAA) for Guthrie in Logan County, Oklahoma, and used to calculate the 1981 to 2010 "Climate Normals," indicate that the annual average precipitation is 38.38 in. The minimum monthly average precipitation is 1.43 in. (January) and the maximum monthly average is 5.38 in. (June). The 1981–2010 Climate Normals, found in NOAA's National Centers for Environmental Information, are the latest three-decade averages of climatological variables. NOAA's computation of Climate Normals is in accordance with the recommendation of the World Meteorological Organization (WMO), of which the United States is a member. While the WMO mandates that each member nation compute 30-year averages of meteorological quantities at least every 30 years, the WMO recommends a decadal update, in part to incorporate newer weather stations.

3.5 Geology and Seismology

Section 2.5 of Revision 3 to the DP (ML22284A150) discusses these topics.

The bedrock geology of Logan County is dominated by Permian-age clastic sedimentary rocks of the Garber-Wellington Formation, as shown in figure 3-2. These units dip to the west at 30 to 40 ft/mi. The Permian-age Garber Sandstone and underlying Wellington Formation, which comprise the Garber-Wellington Formation, include lenticular channel and sheet-flood sandstones interbedded with shales and mudstones. The combined thickness of the Garber Sandstone and the Wellington Formation is about 1,000 ft. Because the two formations are difficult to distinguish in drill core and in outcrop and have similar water-bearing properties, they are often treated as a single mappable formation and grouped into a single hydrostratigraphic unit, the Garber-Wellington Aquifer (Sandstone A (SSA), Sandstone B (SSB), and Sandstone C (SSC)) (Wood and Burton, 1968).

Structurally, the Cimarron area is part of the Nemaha Uplift (also referred to as the Nemaha Ridge) of Central Oklahoma. The Nemaha Uplift trends northward across Oklahoma and was formed during a period of uplift, faulting, and erosion that occurred between the Mississippian and Pennsylvanian Periods in the Oklahoma area. The Nemaha Uplift consists of north-northwest trending normal faults and anticlinal structures that influenced early Pennsylvanian-age sedimentation in the Oklahoma region. By middle Pennsylvanian time, the Nemaha Uplift was not active. During the Permian, when the Garber-Wellington Formation was deposited, Central Oklahoma was part of the eastern shelf of a shallow marine sea. The sandstones and shales of the Garber-Wellington Formation were deposited as part of a westward-advancing marine delta fed by numerous streams flowing to the west and northwest. Thus, the sands of the Garber-Wellington Formation are often sinuous and discontinuous and exhibit the rapid facies changes typical of a deltaic channel and overbank depositional system. Sand accounts for 35 to 75 percent of the Garber-Wellington Formation (Carr and Marcher, 1977).

The recorded historical seismic activities have increased significantly in recent years within 200 mi of the facility. The number of earthquakes with a magnitude of at least 3.0 increased from 120 in 1994–2008 to 3,098 in 2009–2021, with a magnitude between 4.0 and 5.0 from 10 to 97 during the same periods. Four earthquakes with magnitudes between 5.0 and 5.8 (maximum) were recorded during 2009–2021. The increase in seismic activity within this area has been largely attributed to injection of wastewater from oil and gas production activities into the Arbuckle Formation. Following the initiation to limit the injection of wastewater into the Arbuckle in September 2013 by the Oklahoma Corporation Commission's Oil and Gas Conservation Division, seismic activities within a 200-mi radius of the facility have decreased since the high of 2015 (Oklahoma Geological Survey, 2017).

There is no evidence of subsidence, karst terrain, or land sliding within several miles of the site. Bank erosion is present along streams and the Cimarron River. Floodplain and upland erosion rates are typically insignificant due to the heavy vegetation throughout the area, although agricultural fields are subject to sediment erosion during heavy precipitation events. No human-made geologic features such as mines and quarries exist within several miles of the site.

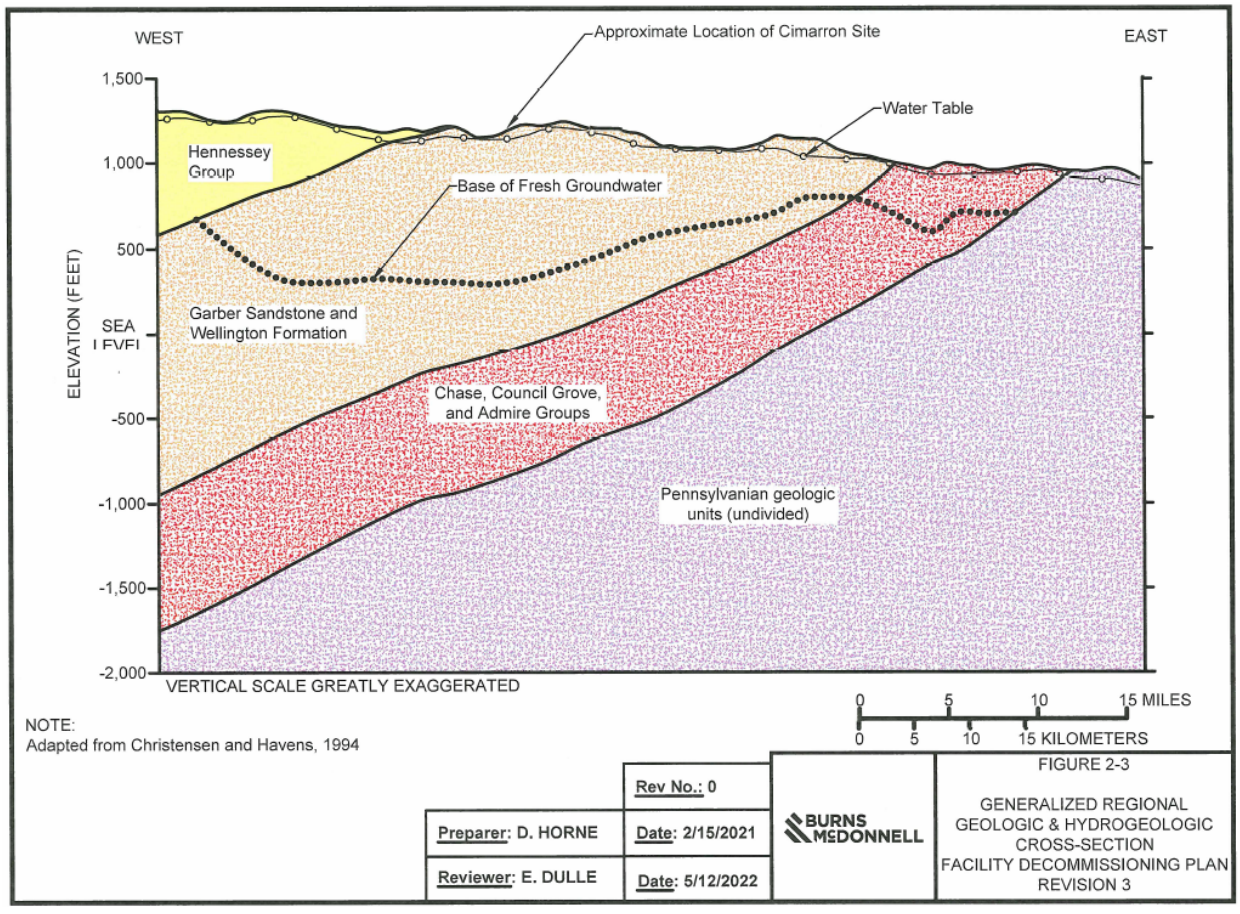


Figure 3-2 Generalized regional geologic and hydrogeologic cross-section

3.6 Surface Water Hydrology

Section 2.6 of Revision 3 to the DP discusses the surface water hydrology in the general area of the Cimarron facility (ML22284A150). The site is situated within the 25 square mi Gar Creek-Cimarron River (Hydrologic Unit Code 110500021108) hydrologic unit subregion, a smaller localized watershed within the Lower Cimarron River regional watershed (Hydrologic Unit Code 1005). The Cimarron River originates from the headwaters in northeastern New Mexico and extends across four States through central Oklahoma, where it flows into Keystone Lake (west of Tulsa, Oklahoma) and joins the Arkansas River.

The Cimarron River is a perennial river, gaining water over its entire course from Freedom, Oklahoma (west of the site), to Guthrie, Oklahoma (east of the site), from base flow from the alluvial and terrace aquifers and from the Permian-age sandstone units that border the river. Water flow in the Cimarron River exhibits seasonal fluctuation, with the highest flow in the winter months and lowest from late summer through early winter, primarily due to the variation of evapotranspiration and water levels in the aquifers. From 1990 to 2017, the Guthrie gage, located approximately 10 mi east of the site, recorded from 287.1 to 3,695 cubic feet per second (cfs) average annual flow rates with a reported low-water median flow rate of approximately 100 cfs and a high-water median flow rate of 600 cfs (Adams and Bergman, 1995). Based on the watershed area ratio, the estimated lowest 7-day average flow that occurs (on average) once every 10 years, 7Q10, for the Crescent gage just upstream of the project area, was 43.6 cfs.

Peak flow ranges from a 2-yr flood with a discharge of 26,700 cfs to a 500-yr flood with a discharge of 237,000 cfs (Tortorelli and McCabe, 2001). As a function of heavy precipitation upstream of the watershed, floods most typically occur in this area in May–June or October, with the extent of flooding for the 100-yr flood covering the entire alluvial valley but not the upland areas of the site. In May 2019, flood waters inundated the alluvial areas of the site but stopped short of reaching the upland area. The alluvial valley adjacent to the Cimarron River at the site is classified as Zone A, subject to inundation by the 1 percent annual chance (100-yr) flood event where no Base Flood Elevation (BFE) or flood depths are shown on the Flood Insurance Rate Map (FEMA, 2021). Based on the flood modeling with inputs of ground elevation data and flood flow calculations, the estimated BFE or flood depths of the alluvial valley at the site for a 1 percent (100-yr) flood event is approximately 951.0 ft amsl (ML22284A150).

Other surface water features at the site and in its close proximity include springs located at Indian Springs and small ponds at Crescent Springs to the north side, Gar Creek to the east, and Cox Creek to the west side of Cimarron River. Most of the other drainages within and near the site are ephemeral in nature and flow only in response to heavy rainfall or from groundwater base flow when groundwater levels are relatively high. Within the site, two unnamed drainages have been dammed to form small ponds, referred to as the East and West Pond. Both ponds maintain a pool elevation of approximately 960 ft amsl, which is above the groundwater elevation in SSB, and SSA does not extend beneath the ponds. Both ponds represent recharge sources for groundwater in SSB (ML22284A150).

3.7 Groundwater Hydrology

Groundwater occurs in the Permian-age Garber Sandstone Formation and the underlying Wellington Formation in the area. Groundwater at depths of 200 ft or less is generally fresh and mostly unconfined, whereas the deeper groundwater can be confined to semiconfined (Carr and Marcher, 1977). The fresh groundwater zone at the site is approximately 150 ft thick. Data from the site show that the generally more saline groundwater found in SSC at an elevation around 900 to 920 ft amsl may represent the upper boundary of the saline groundwater zone in the

Garber Formation, somewhat lower than estimated (Carr and Marcher, 1977) for this part of the Garber Formation.

Recharge to shallow groundwater in the Permian-age Garber Formation near the site has been estimated at approximately 10 percent of annual precipitation (Carr and Marcher, 1977; Adams and Bergman, 1995). A regional groundwater high is located south of the site between the Cimarron River and Cottonwood Creek at around 1,050 ft amsl (Carr and Marcher, 1977), with groundwater flowing north toward the Cimarron River. In the Quaternary-age floodplain alluvium and the Permian-age Garber Formation (bedrock), the groundwater is not affected by the pre-Permian structural changes (e.g., deeper, older Nemaha Uplift and interpreted faults) in the vicinity of the site.

The uplands at the site are within a major recharge area for the Garber Formation. The regional groundwater flow in the freshwater zone of the Garber Formation is vertically upward to discharge to the Cimarron River, which acts as a groundwater drain in this part of central Oklahoma (Carr and Marcher, 1977). However, the nature of vertical groundwater flow in the deeper saline groundwater zone of the Garber Formation to the Cimarron River is unknown.

At the Cimarron site, the Garber Formation consists of three water-bearing sandstones: SSA, SSB, and SSC, which are separated by relatively continuous siltstone and mudstone units (Mudstones A and B), with the sandstone units frequently interbedded, with discontinuous, red-brown shale and mudstone lenses:

- SSA is the uppermost sandstone unit, generally red-brown to tan in color and up to 35 ft in thickness, with an elevation of the bottom of SSA at approximately 950–970 ft amsl.

- Mudstone A is a red-brown to orange-brown, sometimes tan, mudstone and claystone that separates SSA and SSB. It ranges from 6 to 20 ft thick.

- SSB is the second sandstone unit, underlying Mudstone A, and similar in color and sedimentary features to SSA. It is found at elevations between 925 and 955 ft amsl and is up to 30 ft in thickness.

- Mudstone B consists of mudstone and claystone separating SSB and SSC. It is similar in color to Mudstone A and ranges from 6 to 14 ft thick.

- SSC is the lowermost sandstone in the Garber-Wellington Formation, similar in color and sedimentary features to the overlying sandstones. This unit varies in thickness from 10 to 25 ft at the site to at least 100 ft thick regionally.

The sandstone units are fine to very fine-grained, well-sorted subangular to rounded grains with variable amounts of silt (from 10 to 50 percent). The sand grains are mostly quartz with minor amounts of feldspar and occasional magnetite and mica. The intergranular porosity varies with the silt content. The sandstones are weakly cemented with calcite and hematite, with some thin intervals that are well cemented with gypsum and barite in the local site area. Inspection of outcrops at the site and core samples revealed minimal joints and fractures (ML20202A435).

The upland areas terminate where the floodplain of the Cimarron River exists. The river has carved a floodplain nearly 0.5 mi wide at the site. The erosional escarpment is evident in the western half of the site and rises over 30 ft above the floodplain in areas. To the east, the

escarpment is present only as a shallow slope. The Cimarron River floodplain alluvium consists of sand and silt. Near the present river channel, buried oxbow meanders can be expected. Near the escarpment, buried channels would be expected to be the continuation of present drainages incised into the escarpment sandstones. The alluvium is about 30 to 40 ft thick. Along the present escarpment face, there are local transition zones from the sandstones of the Garber Formation to the coarser alluvial materials. These transition zones can be clay-rich, as is the case with the transitional zone identified with borings in BA1.

The uppermost water-bearing unit is generally unconfined, although locally, it can be under semiconfined conditions due to the presence of overlying mudstone and shale units. The two lower units, SSB and SSC, are either confined or semiconfined, depending on the thickness and continuity of the overlying mudstone unit. The local groundwater flow in the uppermost water-bearing unit is primarily influenced by the topographic features, with topographic high areas as recharge areas and topographic low areas as the discharge areas or drainages.

In the WUA, the piezometric maps constructed with water levels measured from monitoring wells installed at the site indicate that the groundwater in both the shallow (SSA) and deeper (SSB and SSC) areas beneath the site generally moves north-northwest toward to the Cimarron River and discharges to the bluffs and the alluvium (figures 3-3 and 3-4). In the area of 1206 Drainage (between former sanitary lagoons-uranium/plutonium emergency ponds area and Uranium Pond 1 and BA3) and a small drainage northeast of BA2, the groundwater moves under a relatively steep hydraulic gradient toward these drainages and seeps from the interface between SSA and the underlying mudstone layer from both the east and west and becomes surface water flowing to the transition zone between the upland sandstone and mudstone and the floodplain alluvial aquifer.

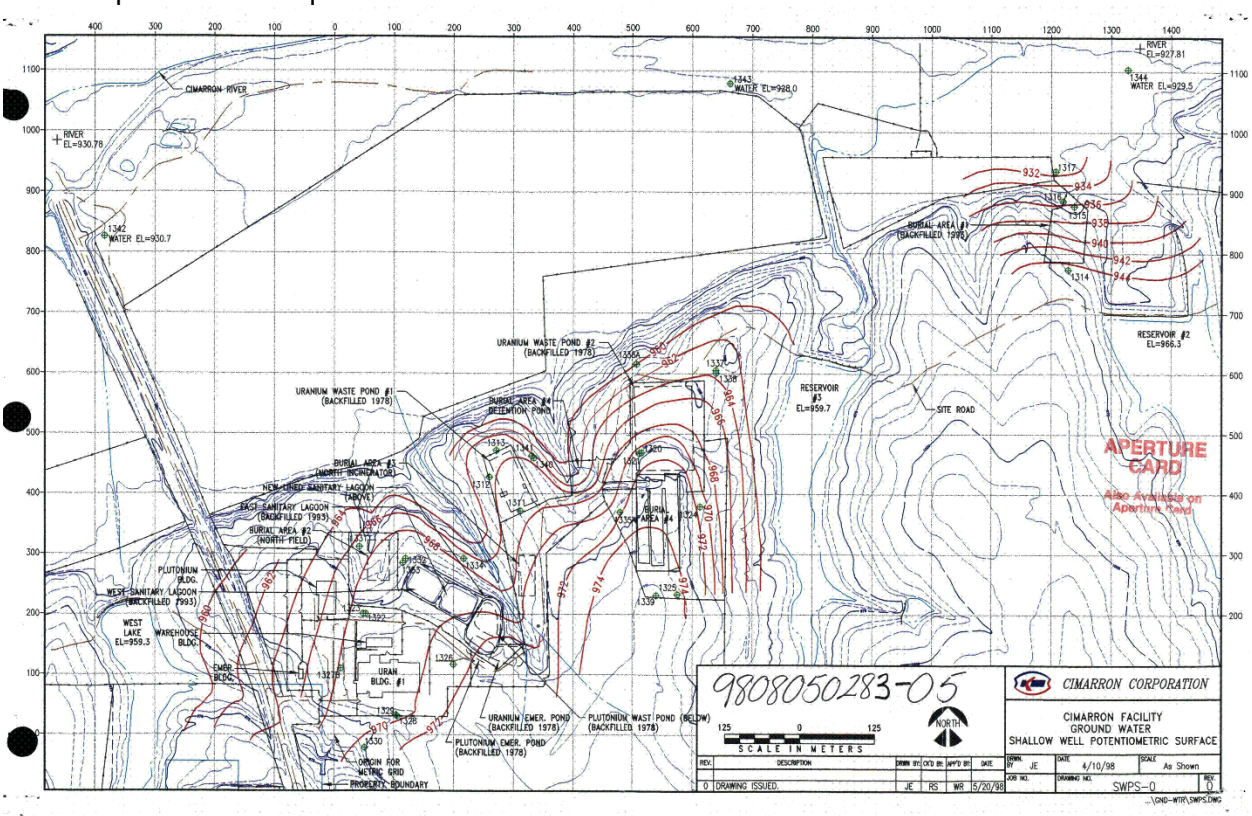
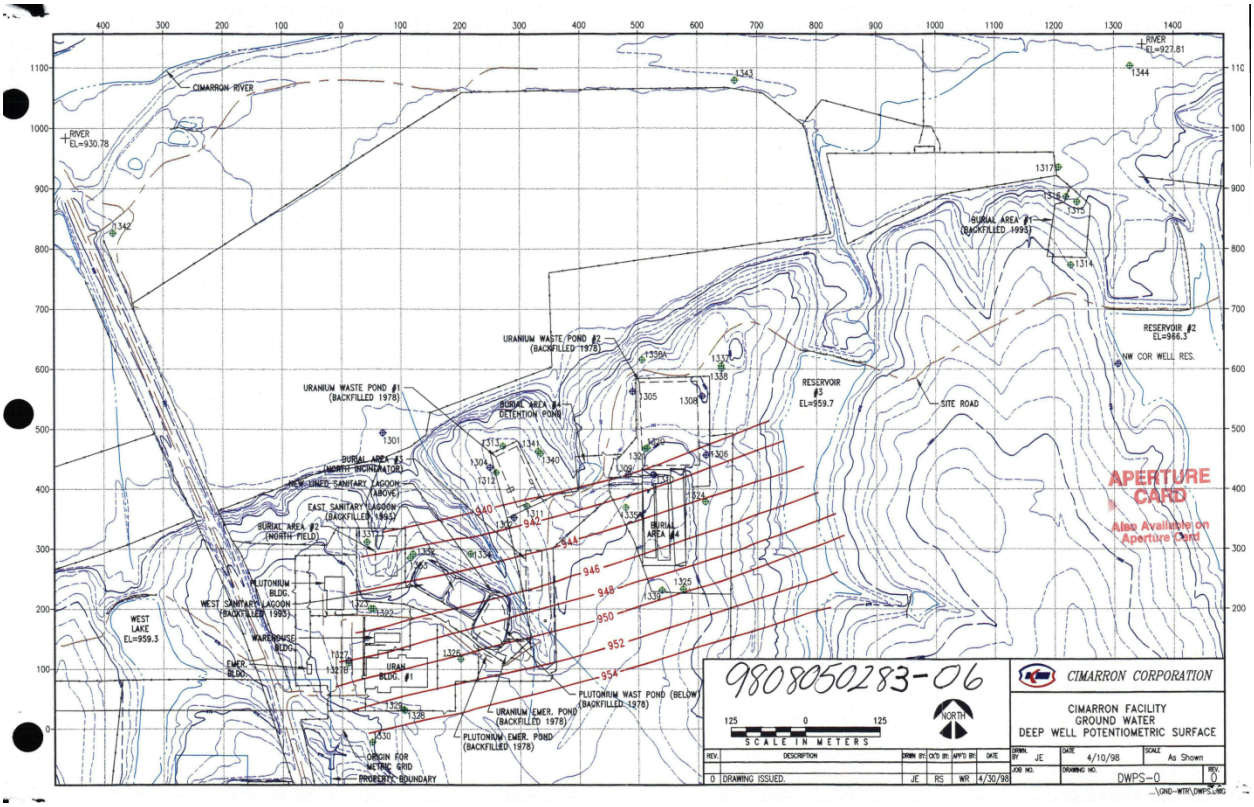


Figure 3-3 Groundwater elevation contour map of shallow aquifer system (Sandstone A)



Source: KMNC, 1998b (ML092710399).

Figure 3-4 Groundwater elevation contour map of deep aquifer (SSB and SSC)

Along the bedrock escarpment, shallow groundwater in SSA flows north to northwest toward the floodplain and discharges in numerous small seeps. Groundwater gradients in SSA vary significantly, due to the presence of the drainages but average approximately 0.01 ft/ft toward the drainage to the northwest and about 0.02 ft/ft toward the north. As SSB and SSC are found below the base of the escapement in the WUA, the groundwater from these sandstones does not discharge to seeps located along the escarpment.

The groundwater in the unconfined aquifer of the alluvial floodplain moves northeast toward the Cimarron River. There is expected upward groundwater flow from the underlying bedrock sandstone units to the alluvial aquifer discharging to the Cimarron River. The estimated average linear groundwater velocity is approximately 0.9 ft/day (using a hydraulic gradient of approximately 0.002 ft/ft and assumed porosity of 33 percent for the alluvium).

In BA1, SSB is the uppermost bedrock unit beneath the former radioactive waste disposal trenches. Groundwater originating from precipitation at the site and upgradient moves northward across a buried escarpment (the interface between bedrock SSB and the floodplain alluvium) into a gully into the underlying bedrock, partially filled primarily with fine-grained silt and clay lenses (transition zone), and then to the more permeable sands of the floodplain alluvium. The eastern margin of the gully has not been defined at BA1. Analysis of the existing boring logs suggests that the transition zone consists of an upper silt-rich unit with a zone or lenses of sand and silty sand deposits at the base and an underlying basal clay-rich unit (ML18100A297). The licensee proposes that groundwater travels through the transition zone primarily within the sandy lense(s) between the upper silt-rich unit and the lower clay-rich unit (ML18100A297).

The NRC staff review indicates that the downgradient sand and silty sand lenses appear mostly in the basal section of the transition of silt/silty sand with interbedded clayey sand, and their direct hydraulic connections through the transition zone may be limited based on the current site characterization data (see Figures 2A – 2H) (ML18100A297), for a geologic cross-section through the transition zone soils). It is possible that preferential flows may occur in these sand and sandy lenses within the transition zone. The interaction of groundwater between the sandy lenses and the less permeable matrix may be limited, potentially requiring longer timeframes for groundwater movement into and out of the lower permeability matrix. This may result in slower progress on the groundwater remediation within the transition zone (ML24046A197 and ML24046A198). To address this possibility, the licensee proposed the installation and operation of injection and extraction trenches in the transition zone to artificially increase the local hydraulic gradient and therefore enhance the overall groundwater movement in the transition zone (Section 6.2.7 of this SER).

A contrast in permeability among the SSB, transition zone, and alluvial sand deposit may have resulted in a change of groundwater flow direction from a primarily north-northwest in the former to a predominantly north-east in the sandy alluvium in the floodplain. As a result, the hydraulic gradient deceases from one that is relatively steep in SSB (0.10 ft/ft), to a smaller gradient (approximately 0.023 ft/ft) in the transition zone, and further, to a very flat (0.0007 ft/ft) in the sandy alluvium. The estimated hydraulic conductivity ranges from 10^{-4}–10^{-5} cm/s in SSB to 10^{-1}–10^{-4} cm/s for the transition zone. The estimated average linear groundwater velocities vary from 0.6 ft/day for SSB, 0.03 ft/day for the transition zone, to 0.3 ft/day for the alluvium (ML22284A150).

In summary, the site is within a recharge area for the upper freshwater zone of the Garber-Wellington Formation with a generally downward vertical hydraulic gradient. However,

groundwater, especially from the deeper units, moves upward under regional influence to discharge to the Cimarron River. In the upper water-bearing sandstone units, the groundwater moves predominantly in a horizontal or lateral direction as a result of the low permeability interbedded mudstone units, with only a minor component of vertical flow across units. The Cimarron River also receives groundwater from its floodplain alluvium downgradient of the uplands area of both the Western Area (WA) and BA1 at the site. The presence of the heterogeneous, interbedded sands, silts, and clays of the transition zone at the buried escarpment between the upland shallow bedrock and the sandy, floodplain alluvial aquifer increases the complexity of the site hydrogeology and the groundwater remediation efforts.

Evaluation and Findings

Sufficient site information provided previously has allowed the NRC to estimate doses on-site and off-site under unrestricted criteria in accordance with the SDMP and are specified in LC 27 (Section 5.1 of the SER). Based on this review, the NRC staff determined that the licensee provided sufficient information for NRC to evaluate impacts of the proposed decommissioning activities at the site, in adjacent areas, and the environment in the event of a natural disaster (e.g., flood, earthquake among others). The submitted information includes the conceptual site hydrogeologic model of the groundwater flow systems, supported with site-specific data collected from both WA and BA1 areas (e.g., extent and hydraulic parameters of the aquifers, groundwater flow among others) that provide the technical and environmental bases for the proposed groundwater extraction and remediation system design, locations and construction, and operation.

4. Radiological Status of Facility

Regulatory Requirements

Sections 17.1.1–17.1.4 of NUREG-1757, Volume 1, Revision 2, identifies 10 CFR 70.38(g) as the regulatory requirement applicable to the NRC staff's review of the licensee's description of the radiological status of the facility. The NRC staff determined that the appliable regulation is 10 CFR 70.38(g)(4)(i). This regulation requires a licensee to submit a DP that describes the conditions of the site sufficiently to evaluate the acceptability of the plan. In this section, the NRC staff determines whether the licensee's description has demonstrated that the current radiological status of the Cimarron facility complies with this requirement regarding groundwater remediation activities.

Regulatory Acceptance Criteria

The staff reviewed the licensee's description of the radiological status of the remaining licensed Cimarron facility subareas F, G, and N (Figure 12 of the DP, Rev 3), (ML22285A091) for compliance with 10 CFR 70.38(g)(4)(i) by comparing it to the recommended information to be submitted in Sections 16.4.1 through 16.4.6 of NUREG-1757, Volume 1, Revision 2.

Staff Review and Analysis

Unless otherwise stated, the NRC reviewed the information provided by the licensee as part of its revised DP, Rev.3 (ML22284A150).

4.1 Contaminated Structures

As stated in Sections 1.3.2 and 3.1 of the DP, Rev. 3 (ML22284A150) and SER Section 2.3, there are no contaminated structures within the remaining licensed Cimarron facility subareas (F, G, and N).

The licensee will construct new facilities for groundwater remediation activities that have the potential to become contaminated (ML22284A150). These include the Western Area Treatment Facility (WATF) and the BA1 Remediation Facility (BARF). The licensee stated, in Section 5.6.1 of the DP that the WATF building will remain on-site and be transferred to a subsequent owner for potential commercial use after disposition of the property. Section 15.4 of the DP states that the WATF building, the WATF slab for areas outside the building, and the concrete slab for the BARF building will remain on-site. Section 8.1.6 of the DP commits the licensee to performing an FSS of the WATF building and those portions of the BARF that will remain on-site. Section 15.4 of the DP details the radiation surveys that will be performed to ensure the WATF building and the concrete slabs outside the WATF and associated with the BARF can be released for commercial use. Specifically, the licensee commits to conducting surveys in accordance with the requirements of LC 27.c., which requires that "Buildings, equipment and outdoor areas be surveyed in accordance with NUREG/CR-5849, 'Manual for Conducting Radiological Surveys in Support of License Termination,'" issued June 1992 (ML090640319).

4.2 Contaminated Systems and Equipment

The licensee described the status of the system and equipment associated with the remaining licensed Cimarron facility subareas (F, G, and N) in Sections 1.3, 3.1, and 3.2 of the DP. As described in Section 3.3 of the DP, the NRC previously confirmed that subareas G and N are releasable for unrestricted use because of the licensee's decommissioning efforts but will not be released until groundwater remediation is complete. The NRC staff reviewed its recent inspection and trip reports (ML18060A168, ML18060A410, ML18156A478, ML18352B257, ML20233B018, and ML20233A507) for the Cimarron facility. The staff finds nothing to invalidate the previous findings regarding the radiological status of subareas G and N and, therefore, the NRC's previous conclusions remain valid. As a result, the NRC staff focused its review on Subarea F and addresses groundwater remediation activities only.

The licensee stated, in Section 3.2 of the DP, Rev. 3 (ML22284A150), that all radiologically contaminated systems and equipment associated with the former processing buildings were decontaminated and removed during the decommissioning of the buildings. There are no systems or equipment currently existing within Subarea F (ML22284A150). However, the licensee previously placed concrete rubble in areas within Subarea F for erosion control purposes (ML090140299). This concrete rubble originated in onsite buildings and structures undergoing decommissioning (ML090140299). According to the licensee, the concrete met all the applicable surface contamination criteria for unconditional release when it was relocated to Subarea F draining ways for erosion control (ML090140299). The specific locations of the concrete rubble placed in Subarea F are shown in table 2.1 of the "Sub-Area F Final Status Survey Report," issued August 2005 (ML090130553).

The licensee identified the potential radionuclides present in the concrete rubble as U-234, U-235, and U-238 (ML090140299). The uranium is composed of enriched forms, with an average enrichment above the naturally occurring levels (ML090140299). The average U-235 enrichment at the Cimarron site has been previously established to be approximately 2.7 weight percent (wt.%) (ML090140299). The licensee previously provided the radiological status (survey results) of the concrete rubble, including background values during characterization studies (ML090140299). These surveys included gross alpha and gross beta-gamma surface contamination measurements, exposure rate measurements, and dose estimates (ML092650512, ML092610651, ML092710481, and ML090140299).

Based on the review of the records indicated above, the NRC staff concludes that the information provided by the applicant describing the radiological status of systems and equipment is sufficient to fully understand the types and activity of radioactive material contamination present, as well as the extent of this contamination. Therefore, the staff finds the information related to systems and equipment provided by the licensee to be consistent with the guidance in Section 16.4.2 of NUREG-1757, Volume 1, Revision 2 (ML063000243), and, therefore, acceptable.

4.3 Surface and Subsurface Soil Contamination

Surface soil refers to soil with the top 15 cm (6 in.) of the soil column. Subsurface soil refers to soil within the next 15 cm (6 in.) after the surface soil (below ground surfaces). The licensee described the status of the surface soil associated with the remaining licensed Cimarron facility subareas (F, G, and N) in Sections 1.3 and 3.3 of the DP, Rev.3 (ML22284A150). As described in SER Section 2.3, the NRC previously confirmed that subareas G and N are releasable for unrestricted release as a result of the licensee's decommissioning efforts but will not be released until groundwater remediation is complete. The NRC staff reviewed its recent inspection and trip reports for the Cimarron facility (ML18060A168, ML18060A410 ML18156A478, ML18352B257, ML20233B018, ML20233A507, and ML22217A025). The NRC staff finds nothing to invalidate the previous findings regarding the radiological status of subareas G and N; therefore, its previous conclusions, that subareas G and N are releasable, remain valid.

The NRC staff focused its review for this section on Subarea F, consisting of affected and unaffected areas (refer to drawing 95MOST-RF3F ML092680496)). The affected areas include BA1, a drainage area, and a site road leading to the former BA1 area.

The NRC staff described the history of BA1 in its review and approval of the licensee's DP, Revision 1 (ML092680913). According to the licensee (ML092720449), material contaminated with depleted uranium, enriched uranium, and natural thorium was placed for disposal in the former BA1 area from 1966 to 1970 (ML090130553). Beginning in 1986, the licensee excavated the burial trenches, disposed of the former contents according to the license requirements, and began surveying BA1 for unrestricted release. In 1992, the NRC staff released BA1 for backfilling with clean soil (ML20126H787).

The NRC staff approved the FSS plan (FSSP) for Phase II areas (ML092680642 and ML092680270), which included Subarea F, in March 1997 (ML092610871). The licensee submitted the FSSR for Subarea F in August 2005 (ML090130553). The FSSR provides the subsurface soil data and exposure rate data for affected and unaffected areas in Subarea F.

The licensee identified the potential radionuclides present in the surface and subsurface soils as U-234, U-235, U-238, and natural thorium (ML090130553). The uranium is composed of natural, depleted, and enriched forms with an average enrichment of 2.7 wt. % (ML090130553). The license identified locations of surface soil sampling and the results of those samples, as well as the exposure rate measurement at those locations, in figures 4.1–4.5 of the FSSR (ML090130553). Table 4-1 lists the background levels used during FSS of Subarea F.

Table 4-1 Subarea F Background Values

Radiological Measurement	Background Value
U-total	4.0 pCi/g
Th-natural	1.5 pCi/g
Exposure Rate	7.0 µR/hr

The licensee summarized the maximum and average surface soil activities for the affected and unaffected areas within Subarea F in table 4.1 of the FSSR (ML090130553). Table 4.3 of the FSSR presented the maximum and average exposure rate measurement for the same areas within Subarea F (ML090130553). There was no surface soil activity or exposure rate measurement in Subarea F above its respective value for unconditional release.

The FSSR provides subsurface soil data for the drainage area and the site road. The licensee summarized the maximum and average radionuclide activities for these areas in table 4.2 of the FSSR (ML090130553). The locations and depths of subsurface soil samples for the drainage area and roadway are depicted in figures 4.2 and 4.3, respectively, of Appendix A to the FSSR (ML090130553). There was no subsurface soil activity in the drainage area or the site road above the value for unconditional release.

The licensee did not include subsurface soil results for BA1 in the FSSR, as they were included in the 1994 radiological characterization report (ML092720449). The licensee described the subsurface soil sampling details for the excavated BA1 in Section 7.0 of the 1994 radiological characterization report. Results for soil samples at depths from 1 to 4 ft are depicted in drawings 91POB1SS-1 through 91POB1SS-4. The licensee also discussed maximum and average radionuclide concentrations for these subsurface soil samples (refer to Section 7 of the 1994 report) (ML092720449). Based on confirmatory surveys performed by ORAU in December 1991, the NRC released BA1 for backfilling with clean soil in December 1992 (ML20126H787). The NRC staff finds nothing to invalidate the previous findings regarding the radiological status of BA1 and, therefore, its previous conclusions remain valid.

The FSSP for Phase II areas (ML092680496 and ML092680270). approved by the NRC staff (ML092610871), did not require subsurface soil sampling for Subarea F. However, subsurface soil was evaluated as part of the licensee's efforts to assess groundwater contamination adjacent to and downgradient of BA1 (ML20043D187 and ML16250A243). According to the licensee, not one of the 2,000 data points was above the value for unconditional release.

The licensee also provided drawings (ML21076A479 and ML21123A290) that depict the locations of the uranium plume, the areas of disturbance (trenches and wells used for groundwater remediation), and their relationship to the subareas that were developed for the purpose of conducting an FSS (see, for example, figure 95MOST-RF3 in (ML090130462)).

Based on the review of the records indicated above, the NRC staff concludes that the information provided by the licensee describing the radiological status of the surface and subsurface soils is sufficient to fully understand the types and activity of the radioactive material contamination present as well as the extent of this contamination. Therefore, the NRC staff finds the information related to surface and subsurface soil provided by the licensee consistent with the guidance in Sections 17.1.1 through 17.1.4 of NUREG-1757, Volume 1, Revision 2 (ML063000243), and therefore acceptable.

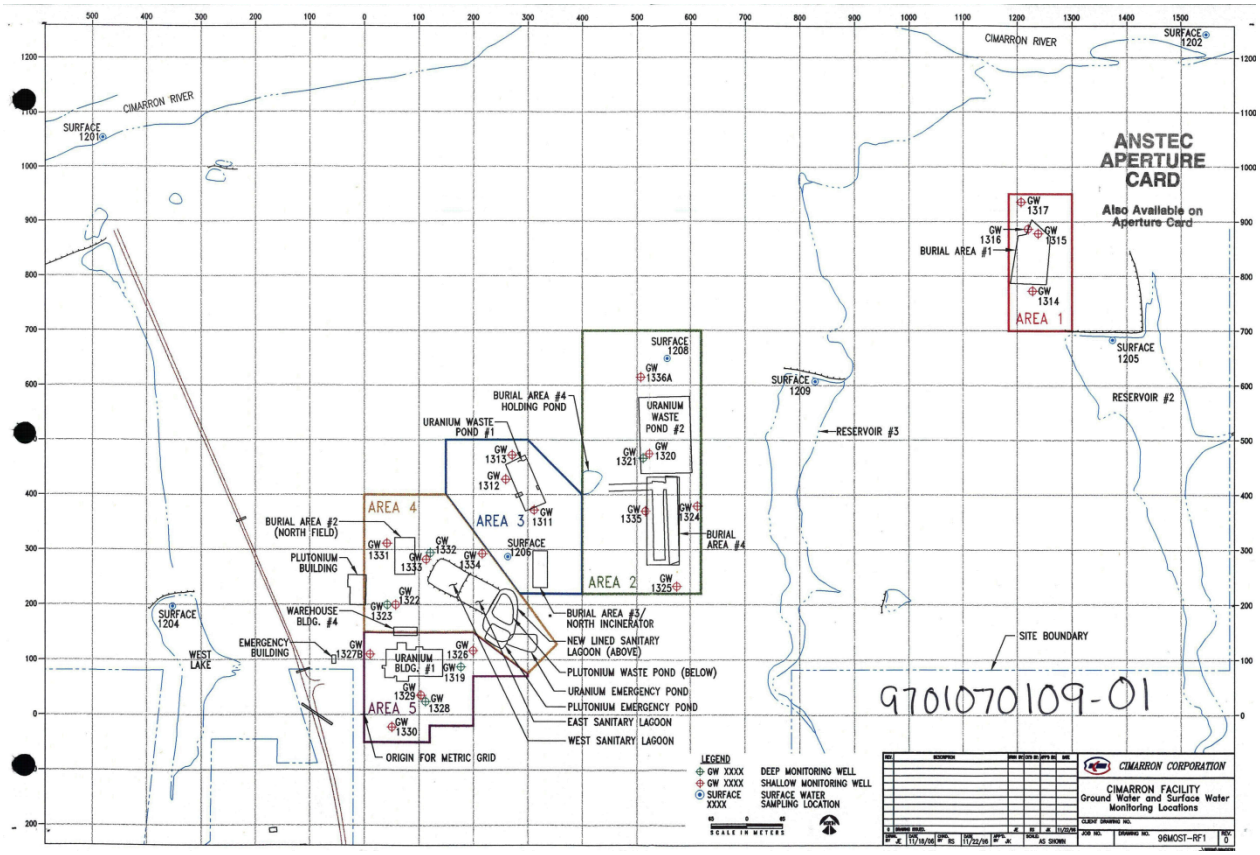
4.4 Surface Water

Section 2.6 of the DP states that the site and its adjacent area contain two freshwater ponds, known as the eastern and western ponds, and the Cimarron River, which is located along the northern boundary of the site.

From 1990 to 1996, as a component of the environmental monitoring program, samples were taken from both the eastern and western freshwater ponds on the site. The eastern pond showed total uranium levels ranging from 0.6 to 1.4 pCi/L, while the western pond had levels from 0.7 to 2.4 pCi/L. Monitoring of the Cimarron River's total uranium levels at the upstream location (1201) showed variations from 1.2 to 7.9 pCi/L, and at the downstream location (1202) from 3.0 to 7.5 pCi/L during the same period. Over the decade following the license transfer to CERT, total uranium levels ranged from 1.6 to 8.8 pCi/L upstream and from 1.8 to 8.0 pCi/L downstream. Therefore, the NRC staff determined that the Cimarron River and both ponds are unaffected by licensed materials and the uranium observed in these surface water bodies is from background. The NRC staff reached this conclusion because the uranium concentrations measured in the two site ponds and in the Cimarron River downstream of the site are below the uranium concentration observed in the Cimarron River upstream from the site. Additionally, these surface water uranium concentrations are significantly below the unrestricted release criteria for the site groundwater of 189 pCi/L.

4.5 Groundwater

Extensive investigations into the impact of uranium on groundwater at the Cimarron facility have been conducted in the areas of Uranium Plant yard, closed uranium ponds, waste BAs, and sanitary lagoons (figure 4-1). These included the installation of limited monitoring wells before 1985 (e.g., wells no. 1311 through 1317 near Uranium Pond 1 and BA1), an initial comprehensive groundwater assessment of the Uranium Plant yard, closed waste ponds and BAs, and sanitary lagoons in 1989 (J.L. Grant and Associates, 1989, ML20202A435), radiological characterization of surface water and bedrock aquifers (SSA, SSB, and SSC) in 1994 and 1996 (Chase Environmental Group, Inc., 1994, ML20199M359; 1996, ML092680621), and further subsurface characterization in BA1 in 2003 (Cimarron, 2003, ML030360314).



Source: KMNC, 1998b

Figure 4-1 Locations of waste ponds and BAs, and early phase investigation monitoring wells at the Cimarron facility

In addition to total uranium, Cimarron tested for Pu^{239}, radium (Ra^{226} and Ra^{228}), and thorium (Th^{232} and Th^{228}) (James L. Grant and Associates in 1989, ML20202A435; and Chase Environmental Group, Inc., 1996, ML092680621). It further analyzed -radium, thorium, and Resource Conservation and Recovery Act metals (arsenic, lead, cadmium, chromium, barium, selenium, silver, and mercury) in 1996 (Chase Environmental Group, Inc., 1996 (ML092680621). The investigations confirmed that these substances are not present in groundwater in concentrations exceeding background levels (Chase Environmental Group, Inc., 1994 (ML20199M359); and 1996 (ML092680621).

Based on its review, the NRC staff concludes the magnitude and extent of uranium-impacted groundwater extending primarily from the former waste trenches in the western upland areas to the downgradient transition zone area and alluvium aquifer have been adequately defined to support the groundwater remedial design for WA and BA1 at the Cimarron site.

Characterization of uranium groundwater impact is described for each of those areas as follows.

(1) Area of Uranium Pond 2 and Burial Area 4

Figure 4-1 shows the general area of Uranium Pond 2 and BA4 (labeled as Area 2). Uranium Pond 2 was decommissioned in 1978, with the removal of process-related sludges. BA4 is an NRC-approved onsite BTP Option 2 disposal cell and is located upgradient of former waste

pond 2. BA4 contains contaminated soil at an average concentration of approximately 46 pCi/g total uranium (with a total source term of approximately 1 Ci of activity), which is below the BTP Option 2 limit of 100 pCi/g for soils.

In the early phase characterization, the monitoring wells installed associated with this area include an upgradient well (well 1325) and downgradient locations of Uranium Pond 2 and BA4 (wells 1324, 1335, 1320, and 1336/1336A in SSA, and 1321 in SSB).

Since the early phase investigations, wells have been added to the monitoring network in both SSA and SSB (well series from 1337, 1387, to 1340 series) in Uranium Pond 2 and BA4 to further define the extent of uranium impact on groundwater. The maximum uranium concentration in these wells was detected at 134.6 pCi/L (well 1336/1336A) during 1985–1996. The NRC staff reviewed the recent quarterly groundwater monitoring results from 2011 to 2017 and noted that the highest uranium concentrations ranged from 81.9 micrograms per liter (µg/L) to 24.2 pCi/L in SSA among the wells sampled (wells 1381, 1401, 1347, and 1393) during this period (figure 4-2; EPM, 2020 (ML22284A150)). All these uranium concentrations are significantly below the NRC release criteria of 180 pCi/L (or approximately 201 µg/L for this part of WA for uranium.

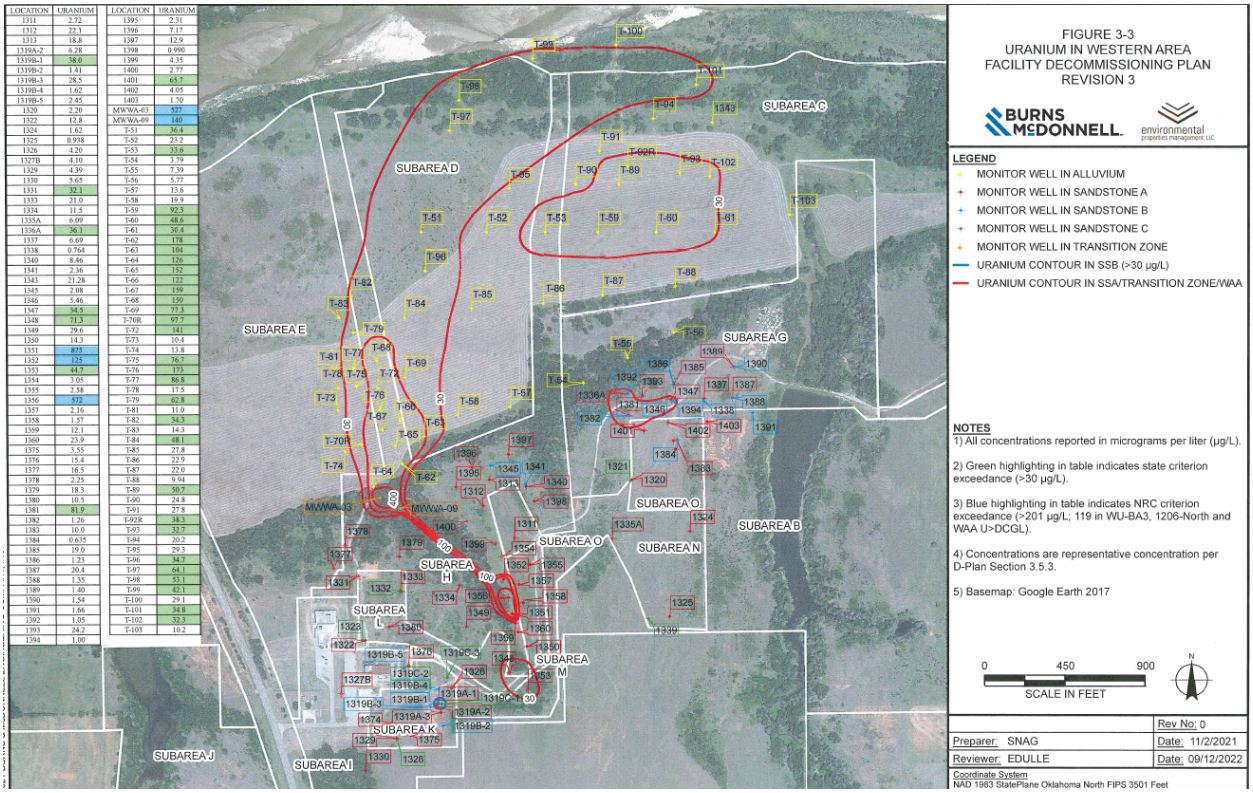


Figure 4-2 Extent of uranium impact in the upland bedrock and alluvium in WA

(2) Area of Uranium Pond 1 and BA3

As shown in figure 4-1, this general area includes Uranium Pond 1 and BA3. Uranium Pond 1 was decommissioned and backfilled in 1978, with removal of liquids and sludges. BA3 was found with approximately 100 ft^3 of radioactive industrial wastes (e.g., resin and scrap metal)

that were later excavated and disposed of either off site at a licensed LLRW disposal facility or in onsite BA4 (under the BTP Option 1 criteria of 30 pCi/g above background).

Early phase monitoring wells were installed in the area of Uranium Pond 1 and BA3 (wells 1311, 1312, and 1313). Elevated uranium concentrations are detected downgradient of Uranium Pond 1, with the highest level of 357.6 pCi/L observed in 1992 (well 1313). In 1996, the uranium concentration in well 1313 decreased to 28.5 pCi/L, significantly less than the derived concentration guideline level (DCGL) of 180 pCi/L.

Following the early phase of the groundwater characterization, the groundwater monitoring well network in the area of Uranium Pond 1 and BA3 was considerably expanded, primarily in the downgradient direction of Uranium Pond 1 in SSA and, to a lesser degree, in SSB (well 134x and 139x series), as well as in SSA around BA3 (well 134x and 135x series). The NRC staff reviewed the recent updated groundwater monitoring results in the 2011–2017 period ML22284A150). The data show that the highest uranium concentrations exceeding the DCGL (119 µg/L, or 180 pCi/L) are found only at three monitoring wells in SSA in BA3, namely, well 1351 at 874.5 µg/L, well 1356 at 572.4 µg/L, and well 1352 at 124.9 µg/L (figure 4-2). Taking into consideration the previous excavation and removal of radioactive industrial wastes and impacted soil from BA3 and the available groundwater monitoring data, the NRC staff concludes that the areal extent of uranium-impacted groundwater above the DCGL in BA3 has been adequately characterized for remedial design.

(3) Area of BA2, Sanitary Lagoons, and Plutonium/Uranium Emergency Ponds

This area includes BA2, former unlined sanitary lagoons (East and West Lagoons, the new lined sanitary lagoon), and waste ponds (Plutonium Emergency Pond/Waste Pond, Uranium Emergency Pond) (figure 4-1). BA2 was used in the 1970s for the disposal of onsite-generated industrial solid waste that was found to contain radioactive materials (approximately 47 kg U-235 at greater than 5 percent enrichment and thorium concentrations up to 150 pCi/g) in 1990. Remediation in BA2 began in 1991, with waste material excavated and disposed of at an offsite commercial LLRW disposal facility.

The unlined East and West Sanitary Lagoons received all liquid waste from the Uranium Plant from 1966 to 1970, then from the MOFF Plant and the Uranium Plant (e.g., septic tank, Uranium Plant laundry, dock drain, and floor drains) from 1975 until 1985. The New Sanitary Lagoon was constructed to replace the East and West Lagoons in 1986. The contaminated sediments in the East and West Sanitary Lagoons were removed and shipped off site to a commercial LLRW disposal facility.

In the early phase of detection monitoring, wells were installed in SSA and SSB in the downgradient or adjacent to BA2, Plutonium Waste and Emergency Ponds and Uranium Emergency Pond, and sanitary lagoon ponds (wells 1331, 1332, 1333, and 1334).

The highest uranium concentration of 388.5 pCi/L was detected immediately downgradient of BA2 (well 1331) in 1991, with the rest of the maximum uranium concentrations from other wells below the DCGL between 1985 and 1989–1996. The subsequent annual groundwater monitoring data up to 2017 show that uranium concentrations in all monitoring wells in BA2 (including well 1331 and additional wells 1377, 1378, and 1379, which only began monitoring in 2014) had been below the DCGL since approximately 2000 (ML17187A610). In the former unlined sanitary lagoons (East and West Lagoons, the new lined sanitary lagoon), and waste pond (Plutonium Emergency Pond/Waste Pond, Uranium Emergency Pond) areas, the highest

uranium levels are found at later installed wells 1348 and 1353, with maximum concentrations of 73.5 µg/L and 44.7 µg/L, respectively (Appendix K, ML22308A076) during 2011–2017. However, the uranium levels in these wells have been consistently below the DCGL for uranium (201 µg/L, or 180 pCi/L) for the former sanitary lagoons and emergency ponds area at the Cimarron site. The downgradient of this area includes the 1206 Drainage and alluvium. Upland of WA, two drainages converge, discharging to the Cimarron River floodplain in the western part of the site. As part of the environmental monitoring program, surface water samples were collected from the 1980s to the early 2000s from a pool, designated as "1206" in the eastern branch of the drainage (1206 East Drainage). The western branch of the drainage is herein referred to as the "West 1206 Drainage." Collectively, they are referred to herein as the "1206 Drainage." The uranium concentrations at location 1206 had been below the NRC's release criterion (180 pCi/L), fluctuating around 30 pCi/L. However, a groundwater sample collected in 2014 from a drive point piezometer installed in the unconsolidated material or sediment in the further downgradient of 1206 drainage near the flood plain exhibited a uranium concentration of 570 pCi/L, which exceeded the NRC's release criterion (Attachment 1, ML18165A411). It is hypothesized that the licensed material previously buried in trenches in BA3 located east of the upstream (south) end of the 1206 East Drainage may have primarily contributed to the uranium contamination observed in the drainage and unconsolidated material in the downstream of the 1206 Drainage and flood plain (figure 4-2). The recent groundwater monitoring data show that the highest uranium concentrations are observed from 666.0 µg/L at Well MWWA-03 to 156.0 µg/L at well MWWA-09 from 2011–2017 in the downgradient 1206 Confluence (Appendix K, ML22308A076). As discussed, with regard to BA3 above, the contaminated groundwater from the trenches in BA3, as observed in some of the monitoring wells (wells 1351, 1352, and 1356) migrates in SSA toward and discharges into the 1206 East Drainage. The NRC staff reviewed the recent groundwater monitoring data collected in 2011–2017 from other wells in SSA where groundwater may flow into the 1206 Drainage. None of those existing monitoring wells were found to have elevated uranium concentrations. The drainage sediment with adsorbed uranium from the contaminated groundwater from BA3 may present a secondary source for groundwater impact. To support further evaluation of remedial options for 1206 Drainage, EPM conducted a field investigation in 2018 with a soil probe to assess the sediment spatial distribution (e.g., thickness and volume) in the upstream reaches of both drainages. It is estimated that approximately 140 cubic yards (cy) of potentially uranium-contaminated sediment is present in the 1206 West Drainage, and approximately 2,000 cy of sediment in the 1206 East Drainage (ML18165A411; ML18092A397). The fine-grained sediment in the 1206 Drainage is impacted with uranium levels that are below the NRC criterion as a result of seepage from former Uranium Pond 1 and BA3. As this fine-grained sediment impedes the contaminated groundwater flow from the upgradient groundwater injection in BA3 to the downgradient recovery trench (GETR-WU-01) during groundwater remediation, the sediment in the 1206 Drainage will be excavated and disposed of on-site and off-site, if required in a low-level radioactive waste disposal facility based on the survey results and NRC criterion (BTP Option 2 limit of 100 pCi/g for soils).

(4) Area of Uranium Plant and Yard

This area includes the Uranium Plant and yard area (also known as Area 5 in figure 4-1). The enriched uranium fuel fabrication process involved the use, storage, and transport of liquids, gases, and powders in the uranium process buildings and adjacent facilities, and accidental spills and leaks from drain lines in the Uranium Plant and yard area. As noted in the DP (ML22284A150), contaminated soil found beneath Uranium Building 1 due to leaking drain lines or migration of licensed material from accidental spills through cracks in the concrete floor or electrical conduit has been removed. All drain lines associated with the uranium building and

contaminated soil under the laboratory, the scrap area floor, and along the north wall of the uranium building were removed and surveyed in 1990–1997. The liquid waste drain lines from the uranium building to the emergency ponds and uranium ponds were also removed, along with contaminated soil during decommissioning. The monitoring wells were installed in SSA and SSB underlying the Uranium Plant and yard area (e.g., wells 1326, 1327B, 1329, 1330, and 1322 in SSA and 1329 and 1328 in SSB).

During the early phase of investigation, the highest uranium concentrations detected in the shallow aquifer (SSA) from two wells adjacent to the uranium building are 80 µg/L (or 84.3 pCi/L) and 14 µg/L (or 21.2 pCi/L), respectively (wells 1329 and 1326), from 1985–1996, significantly below the NRC's DCGL of 201 µg/L (or 180 pCi/L). In the years following the early phase of groundwater investigation, more wells (e.g., wells 1380, 1376, 1375, and 1374) were added to the monitoring network in the Uranium Plant and yard area. The NRC staff reviewed the recent groundwater monitoring data and found that the uranium levels in all wells monitored from 2011–2017 are below the NRC's groundwater release criterion (ML22284A150). Taking into consideration the previous removal of impacted soils beneath the Uranium Plant during decommissioning, the NRC staff concludes that groundwater uranium levels in the former Uranium Plant and yard area will remain below the release criterion.

(5) BA1

In the early phase of detection monitoring, wells were installed in SSB immediately downgradient and upgradient of the burial trenches (wells 1314 through 1317) (figure 4-1). The total uranium concentrations observed in the immediate downgradient of BA1 ranged from approximately 8,800 pCi/L (well 1315 in March 1990) to 498.9 pCi/L (well 1317) in 1985–1996 (ML092680621). The highest uranium concentration (at well 1315) decreased to 2,200 pCi/L in 1998 and to 4,510 µg/L in 2011–2017 (Appendix K, ML22308A076).

The NRC staff notes that the groundwater monitoring network in the BA1 area has significantly expanded since the initial investigation (to approximately 82 monitoring wells in SSB in the former waste trench area, downgradient transition zone, and alluvial aquifer) to define the extent of uranium-impacted groundwater (ML22284A150). The uranium-impacted groundwater has migrated further downgradient from the former waste trench area well into the alluvial aquifer (Figure 4-3). However, the peak uranium concentration of 8,800 µg/L observed near the former waste trenches (former well 1315) in 1985–1996 decreased to 3,760 µg/L (well TMW-09) in 2011–2017. This shows that high levels of uranium are still persistent in SSB above the site release criteria at the former waste trench area. As the uranium plume migrates away from the former waste trench area, the highest level of uranium in groundwater, however, is found further downgradient in the transition zone at 4,510 µg/L (TMW-13) (Appendix K, ML22308A076). Based on its review, the NRC staff concludes the magnitude and extent of uranium-impacted groundwater extending from the former waste trench area to the transition zone area and alluvium aquifer have been adequately defined to support the groundwater remedial design for BA1. As discussed in SER Section 3.7, a potentially limited hydraulic connection between the permeable and less permeable units may limit the removal of uranium in the less permeable unit and result in a longer groundwater remediation time in some areas than estimated, based on the chemical equilibrium assumption within the transition zone. The installation and operation of injection and recovery trenches in the transition zone, combined with NRC oversight as required in the license (LC 31.C) will ensure uranium reduction below the DCGL in the transition zone groundwater.

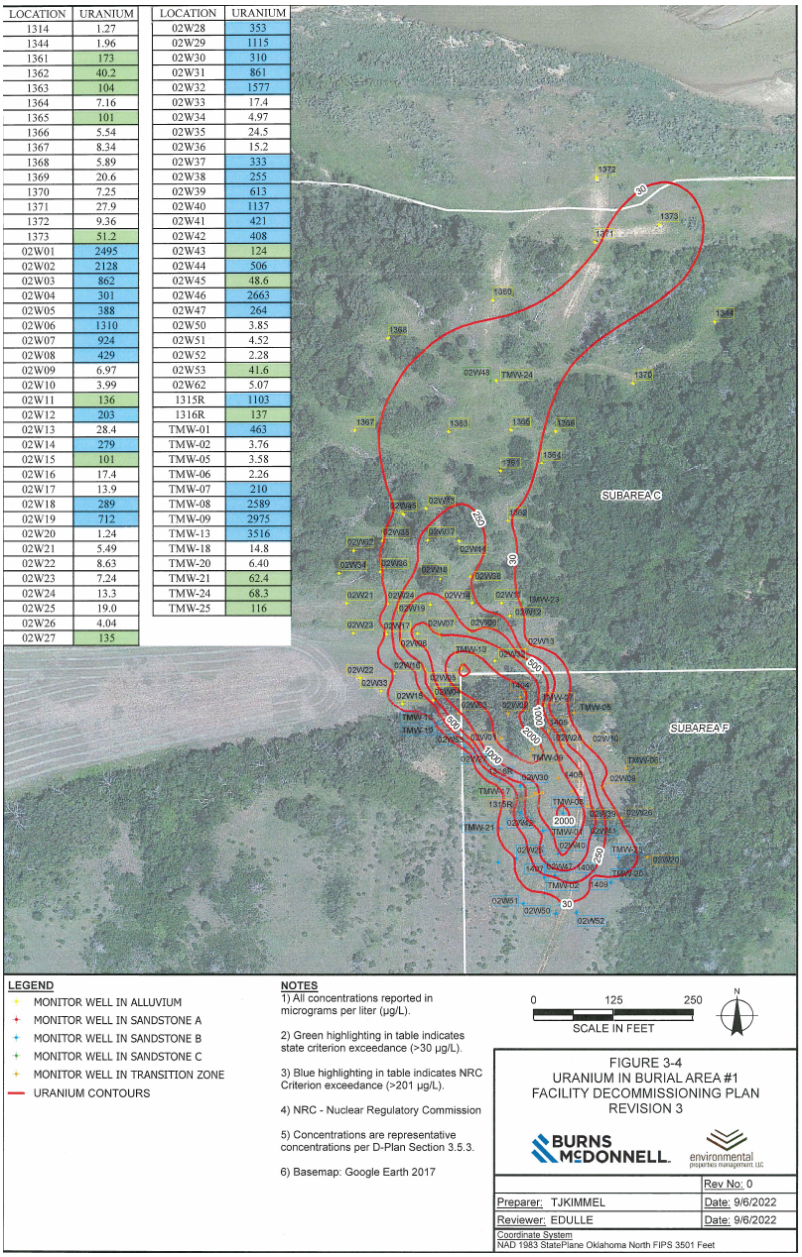


Figure 4-3 Extent of uranium in groundwater in BA1

In summary, the extent of the uranium in the groundwater above the NRC DCGL of 180 pCi/L in the WA and BA1 areas is fully delineated (ML22284A150). As the uranium concentrations were observed to show spatial and temporal variations, the extent of uranium concentrations depicted in figures 4-2 and 4-3 is based on the 95 percent upper confidence level (UCL) (representative concentration) at each monitoring location, within the groundwater monitoring data collected from 2011 to the second quarter of 2017. In certain cases, the average concentration for locations with fewer than four data points, the maximum concentration when the 95 percent UCL exceeds the highest value, and a single data point when that is the only one available (wells 1395 through 1403 installed in 2017) are used.

Based on the groundwater uranium levels described in table 4-1 for WA and BA1, the estimated mass of uranium expected to be recovered is approximately 271 kg for WA and 589 kg for the BA1 area.

Table 4-1 The Maximum and Average Representative Concentration of Uranium within Each of WA and BA1 Remediation Areas Exceeding the NRC DCGL of 180 pCi/L

Remediation Area		Maximum Representative Concentration, µg/L	Average Representative Concentration, µg/L
WA	WAA U>DCGL	178	85.0
	1206-NORTH	527	333
	WU-BA3	875	203
BA1 Area	BA1-A	2975	599
	BA1-B	3516	388

Note: The subremediation areas of WA and BA1 are shown in figure 8-1 and 8-2, ML22284A150.

The NRC staff has reviewed the extent estimates of uranium concentration in the WA and BA1 areas, using the 95 percent UCL, based on monitoring data collected over a 5-year period, and determined that they are acceptable. Using the 95 percent UCL helps to minimize the potential for individual data points to exert excessive influence on the estimated uranium concentrations in the treatment influent. The estimate might be conservative, considering it is influenced by earlier obtained higher concentrations, which have likely decreased over time due to dispersion.

Evaluation and Findings

Based on this review, the NRC staff determined that the licensee has completed decommissioning and FSSs for all soils and buildings present on-site. Surface soils up to 3 ft in depth where soil contamination was detected in the top 6 in. of soil in all 16 areas of the site have been demonstrated to comply with the criteria for unrestricted use. Surface and subsurface soils have been demonstrated to comply with NRC sitewide criteria.

In determining the dose to the average member of the critical group, the licensee used assumptions inherent in the screening analysis; the parameter uncertainties have been previously evaluated on a generic basis by the staff as part of the process of establishing the default screening analysis; and the dose is, therefore, acceptable.

In characterizing the uranium impact on the groundwater, the licensee, based on the historical site operations and soil radiological surveys, fully delineated the extent of uranium concentrations in groundwater exceeding the NRC's DCGL of 180 pCi/L (see SER Section 5.0) in both the WA and BA1 areas. This was achieved through approved or acceptable methods and procedures, such as the installation of monitoring wells, groundwater sampling, and laboratory analysis, in accordance with the site's established operating procedures

.

5. Dose Analysis

Regulatory Requirements

Section 5.5 of -NUREG-1757, Vol.2, Rev.2 (ML22914A859), identifies the license termination criteria of 10 CFR Part 20, Subpart E, as the regulatory requirements that must be met for dose analysis. These regulations are, specifically, 10 CFR 20 Subpart E, "Radiological Criteria for

License Termination". However, consistent with the NRC correspondence dated November 10, 2005, Cimarron may continue decommissioning under the SDMP, since this type of pump and treatment system to address groundwater contamination is not considered a significant change to the DP and will, therefore, not be subject to 10 CFR Part 20, Subpart E.

Regulatory Acceptance Criteria

The purpose of the dose analysis review is for the NRC staff to determine whether assumptions and modeling provided by the licensee as the dose analysis offer reasonable assurance that the final (actual) results of remediation will comply with the previously approved criteria established for the site under the SDMP and that were previously incorporated into the license in LC 27.

Staff Review and Analysis

5.1 Unrestricted Release Criteria

The DP contains unrestricted release criteria for building surfaces and equipment, subsurface and surface soil, and groundwater. These criteria were established in accordance with the SDMP and are specified in LC 27 and in the DP. Section 4.0 of the DP, Rev.3 (ML22284A150), States that the SDMP would be carried forward and as such dose modeling was not used to develop release criteria.

5.2 Unrestricted Release Criteria for Facilities and Equipment

The unrestricted release criteria for facilities and equipment described in Section 4.1 of the DP are the same as the previously approved criteria in LC 27(c) of SNM-928. This LC cites the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material," issued August 1987 (NRC, 1987), as the basis for these criteria.

The following release criteria are specified in the DP and in LC 27(c) for the surfaces of buildings and equipment:

- 5,000 disintegrations per minute (dpm) alpha/100 cm^2 (15.5 $in.^2$), averaged over 1 m^2 (10.8 ft^2)
- 5,000 dpm beta-gamma/100 cm^2 (15.5 $in.^2$), averaged over 1 m^2 (10.8 ft^2)
- 15,000 dpm alpha/100 cm^2 (15.5 $in.^2$), maximum over 1 m^2 (10.8 ft^2)
- 15,000 dpm beta-gamma/100 cm^2 (15.5 $in.^2$), maximum over 1 m^2 (10.8 ft^2)
- 1,000 dpm alpha/100 cm^2 (15.5 $in.^2$), removable
- 1,000 dpm beta-gamma/100 cm^2 (15.5 $in.^2$), removable

The exposure rate limit specified in the DP and in LC 27(c) for surfaces of buildings and equipment is 5 microroentgens per hour (μR/hr) above background at 1 m (3.3 ft).

5.3 Unrestricted Release Criteria for Soil

The unrestricted release criteria for soils and soil-like materials in the DP for the Cimmaron site described in Section 4.2 of the DP are the same as the previously approved criteria listed in LC 27 (c). These criteria are from the BTP, "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations," dated October 23, 1981 (ML19363A009). The following are the unrestricted release criteria in the DP and in LC 27(c) for soils and soil-like materials:

- natural uranium: 0.37 becquerel per gram (Bq/g) (10 pCi/g) total uranium
- enriched uranium: 1.1 Bq/g (30 pCi/g) total uranium
- depleted uranium: 1.3 Bq/g (35 pCi/g) total uranium
- natural thorium: 0.37 Bq/g (10 pCi/g) total thorium
- exposure rate of 2.6 pCi/kg (10 μR/hr) average, above background at 1 m (3.3 ft)
- exposure rate of 5.2 pCi/kg (20 μR/hr) maximum, above background at 1 m (3.3 ft)

LC 27 further states, "Soils and soil-like materials with elevated activities exceeding the unrestricted use criteria shall be investigated to determine compliance with the averaging criteria in NUREG/CR-5849 (ML090640319). These criteria address averaging concentrations over any 100 m^2 (1,070 ft^2) area and use the (100/A)1/2 elevated area method."

The DP indicates that the only known area on-site at which the above criteria are exceeded is in the onsite disposal cell BA4. LC 23 contains the authorization for the burial of material on-site and associated requirements for disposal cells.

5.4 Unrestricted Release Criteria for Groundwater

In Section 9.4.3 of the DP, Rev.3 (ML22284A150), the licensee committed to conducting dose modeling after groundwater remediation to determine the residual radiological dose to the average member of the public based on the resident farmer scenario. The modeling will use the groundwater concentration data from the last post-remediation groundwater monitoring event and the soil data from the FSS results). Cimarron, with ODEQ agreement, indicated that the poor quality of the groundwater and surface water at the site make it unlikely that the groundwater will ever be used for domestic or agricultural purposes, so irrigation will not be included as an exposure pathway in the modeling.

Preliminary modeling done in the WAA, WA-BAS, and 1206 North areas indicates that the dose may be less than 25 millirem per year (mrem/yr) using the current soil and groundwater concentrations if the ingestion of plants produced through irrigation (using the groundwater) is eliminated as a pathway. Therefore, the licensee anticipated that the dose modeling after remediation will demonstrate that the residual dose to the public will be less than 25 mrem/yr. If the post-remediation modeling indicates the dose will be greater than 25 mrem/yr but less than 100 mrem/yr, the licensee has committed to collecting surface and subsurface soil samples to generate current soil data for input into the model to quantify the extent that groundwater remediation activities might have reduced the concentration of uranium in saturated soils.

5.5 NRC Staff Evaluation and Findings: Unrestricted Release Criteria

The NRC staff has reviewed the unrestricted release criteria as part of the review of Cimarron's DP and confirmed that they are unchanged from the criteria that were developed under the SDMP and were previously incorporated into Cimarron's license. As previously agreed to (ML053140316), the NRC found it to be acceptable for Cimmaron to continue using the SDMP criteria for its decommissioning.

6. Planned Decommissioning Activities

Regulatory Requirements

Sections 17.1.1–17.1.5 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identify 10 CFR 70.38(g) and (h) as the regulatory requirements applicable to the NRC staff's review of the licensee's planned decommissioning activities at the Cimarron facility and its request for an alternative decommissioning schedule. The NRC staff determined that the applicable regulations for the review of the planned decommissioning activities at the site are 10 CFR 70.38 (g)(1)– (g)(4)(v) and (h)(2)(i). These regulations contain requirements for the licensee to submit a DP if required by an LC describing (1) planned decommissioning activities (2) methods to ensure worker protection (3) the final radiation survey, and (4) the NRC approval of an alternative decommissioning schedule.

Regulatory Acceptance Criteria

The staff reviewed the licensee's description of the planned remediation activities at the Cimarron facility and the request for an alternate decommissioning schedule for compliance with 10 CFR 70.38(g)(1), 10 CFR 70.38 (g)(4)(i)– (v), and 10 CFR 70.38(h)(2)(i) by comparing them to the recommended information to be submitted in Sections 17.1.1-17.1.5 of NUREG-1757, Volume 1, Revision 2 (ML063000243).

Staff Review and Analysis

Unless otherwise stated, the NRC reviewed the information, data, and maps submitted by the licensee in its revised facility DP, Rev. 3 (ML22284A150).

6.1 Contaminated Structures

As discussed in SER Section 3.1, no contaminated structures are present within the remaining licensed Cimarron subareas (subareas F, G, and N). The licensee will construct two new facilities for groundwater remediation activities that have the potential to become contaminated as a result of these activities (see Sections 8.7.3 and 9.2.2 of the DP, Rev. 3 (ML22284A150)). These are the WATF and BARF. In accordance with Section 8.9 of the DP, the WATF building will remain on-site after groundwater remediation and be transferred to the subsequent owner after decommissioning is completed. In accordance with Section 15.4 of the DP, the WAFT building, its surrounding exterior concrete slab, and the BARF slab will also remain on-site and be transferred to the subsequent owner after disposition of the property. The licensee committed to performing an FSS for these three areas (WATF building, WAFT exterior slab, and BARF slab) in Section 8.1.6 of the DP, Rev. 3 (ML22284A150). Section 15 of the DP, Rev.3 (ML22284A150) includes details on the FSS. Before performing the FSS, the licensee committed to the submission of a final survey plan to the NRC for approval (Section 15.4 of the DP, Rev.3) (ML22284A150).

In Section 3.1. of the DP, Rev.3, the licensee stated that the WAFT building is the only "structure that will have the potential to become contaminated" and further indicated that "engineering controls incorporated into the design of the operating systems provide sufficient control of licensed material that contamination of the building can only result from leaks or spills during transfer of licensed material in waste streams." The Radiation Protection Plan (RPP) (ML22286A230), provided as Appendix M to the DP, identifies measures that will be taken to address contamination during WAFT operations. These measures include the conduct of weekly radiological control surveys for occupied areas in the restricted areas or areas adjacent to or surrounding restricted areas to identify potential contamination and monthly surveys of radioactive material areas that are not occupied. Radioactive material areas that are entered less than monthly will be surveyed upon entry. Additional controls include establishment of an action level for removeable contamination, judicious use of postings, and working to contain and minimize contamination by practicing the as low as reasonably achievable (ALARA) philosophy.

Section 8.1.6 of the DP indicates that the WATF building, and parts of BARF will be subject to an FSS. In Section 15.4 of the DP, the licensee stated that the WAFT building, concrete slabs outside the WATF building, and the BARF will remain on-site within the licensed area. Therefore, an FSS will be conducted for the WAFT building and the slabs, as detailed above.

6.2 Contaminated Systems and Equipment

No contaminated systems or equipment associated with the previously licensed activities are present within the remaining licensed Cimarron facility subareas (F, G, and N). The licensee described the planned decommissioning activities, referred to as demobilization of the potentially contaminated system and equipment used to treat the groundwater, in DP Section 15.4. The licensee further stated that it will conduct the surveys in accordance with LC 27. c., which ties the licensee to NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination" Draft (ML090640319).

The licensee described its radiation safety program associated with the extraction and treatment of uranium-impacted groundwater in various parts of the DP, including Section 11 (Radiation Protection Program), Appendix M (RPP), and Appendix O (Quality Assurance Plan). The radiation protection program includes the use of approved procedures for various aspects of radiological operations at the Cimarron facility.

6.2.1 Uranium Treatment and Resin Processing Systems

In accordance with Section 8.3 of the DP, uranium treatment systems and spent resin processing systems will be located at the WATF. Groundwater recovered from the BA1 treatment facility will be conveyed along the pipe and conduit system to the WATF for treatment. The WATF water treatment systems are composed of IX trains, as detailed in Appendix J to the DP, Rev.3 (ML22286A217). Major components of the WATF include a 5,000-gallon double-walled acid tank, a 700-gallon scriber, a 12,000-gallon double-walled influent tank for WA and one for BA influent, two back-flushable particulate filters, two uranium IX treatment trains (consisting of three 48 in. diameter resin vessels designed for flowrates between 100 to 125 gallons per minute (gpm), a 9,000-gallon single-walled backwash collection tank, and a 12,000-gallon single-walled effluent tank. Major components at the BARF include one 12,000-gallon double-walled influent tank, an influent groundwater transfer pump skid, a 12,000-gallon single-walled effluent tank, and a treated effluent water transfer pump skid. The

WA and BA1 uranium treatment trains each include a feed pump that transfers groundwater from the respective influent and through separate multimedia filters. Each filtration system is equipped with a secondary containment with sufficient capacity such that any leak from the filters will be visually identified and captured. Differential pressure monitoring provides data to the control system and initiates automatic backwashing for the filters. The filtered water is pumped from the filters through the respective uranium treatment train.

Each treatment train contains a lead (primary), lag (secondary), and polishing (tertiary) resin vessel. All resin vessels are the same size and configuration and include ports for collecting water samples at the influent of each resin vessel and the effluent of the treatment train. The WA and BA1 influents are treated separately. A portion of the WA treated water is directed to the WA injection system, and a portion of the BA1 treated water is directed to the BA1 injection system. The remaining treated water from both uranium treatment systems is combined and directed to the WATF effluent tank for discharge through Outfall 1.

The licensee stated that once all resin has been removed from the vessels, empty resin vessels and all process equipment that cannot be surveyed for unrestricted release will be packaged and shipped for disposal as LLRW. Section 13.1 of the RPP (ML22285A189) includes the release criteria for materials and equipment. The criteria in the RPP for unrestricted release of materials and equipment are consistent with those values identified in LC 27.c. of the Cimarron radioactive material license.

Empty resin vessels can be surveyed and either released, decontaminated for release, or packaged as shipped for disposal as LLRW. The licensee will process the resin from the uranium treatment system to make the resulting waste acceptable for disposal as LLRW. This resin processing system is located at the WATF. Process equipment will be classified and handled as previously described for the empty resin vessels. Before demobilization, fresh or unused resin will be analyzed for uranium concentrations to establish a background level of resins. Resins from all three tanks will be checked for uranium and, if results are below the concentration levels, it will be disposed of as a nonradioactive solid waste. Spent resins will be disposed of off-site as LLRW.

6.2.2 Groundwater Extraction and Injection Infrastructure

In Section 8.3 of the DP, Rev. 3 (ML22284A150), the licensee stated that groundwater extraction and treatment systems at the WATF and BA will run using the IX processes until, individually, each system has an influent groundwater concentration less than 30 µg/L uranium for a minimum of 2 consecutive months. When a treatment system reaches that trigger point, the IX process will be bypassed and the influent groundwater will be rerouted, with a portion going to injection and the remainder being discharged to the Cimarron River. Once extraction ends, it is possible that uranium concentrations will rebound, so the licensee committed to doing eight quarters (2 years) of monitoring. If the uranium concentrations rebound above NRC criteria, then treatment will resume. If the uranium concentrations do not rebound above NRC criteria, then decommissioning will be initiated. Influent and effluent tanks and groundwater transfer equipment will be surveyed to determine whether they meet the criteria for release for unrestricted use. If releasable for unrestricted use, they will be recycled, salvaged, or disposed of as solid waste. If not releasable, they will be packaged and shipped for disposal as LLRW to a licensed facility. The decommissioning cost estimate (DCE) assumes that the tanks and groundwater transfer equipment will be releasable for unrestricted use.

6.2.3 Extraction and Monitoring Wells

Groundwater extraction wells will be removed and surveyed for release for unrestricted use. The boring will then be plugged in accordance with Oklahoma Water Resources Board regulations. If the well materials are releasable for unrestricted use, they will be disposed of as solid waste. If not releasable, they will be packaged and shipped for disposal as LLRW. Groundwater extraction sumps will be cut off approximately 3 ft below grade; the cut off casing will be removed and surveyed for release for unrestricted use. If the sump material is releasable for unrestricted use, it will be disposed of as solid waste and the extraction sump will be plugged in place. If not releasable, the sump will be removed from the trench and packaged and shipped for disposal as LLRW. The DCE assumes that all well and sump material will be releasable for unrestricted use. Monitoring wells located within the licensed area will be over-drilled with a hollow stem auger and removed so they can be surveyed and disposed of in the same manner as groundwater extraction wells. After pulling the well materials from the auger, the boring will be plugged in accordance with Oklahoma Water Resources Board regulations. For purposes of cost estimation, the DCE assumes they will be releasable.

6.2.4 Utilities

The licensee stated that electric power lines, control wiring, and piping will be removed from each area in conjunction with removal of the groundwater extraction and injection infrastructure. Trenches containing wire, cables, and piping above the water table in soil are considered to be releasable for unrestricted use for areas already released by the NRC. The licensee committed to performing surveys for subsurface materials brought to the surface to determine whether there is contamination exceeding the release criteria. Therefore, because of the low probability of radioactive soil contamination above the release limits and the licensee's commitment to conduct surveys, the NRC has reasonable assurance that infrastructure items placed into the ground above the water table will meet the requirements for unrestricted use. Accessible piping will be considered releasable and will be surveyed to verify that no contamination is present above the release limit before it is removed for recycling, salvage, or disposal as solid waste. Sub-ground piping will be cut, capped, and abandoned in place.

6.2.5 Soil

Although the NRC staff has not approved the release of soils in subareas F, G, and N for unrestricted use, the licensee has completed soil remediation activities at the site. Soils will be disturbed in the areas where the groundwater remediation activities are occurring (see figures 1 through 4 in ML21123A290). The licensee will install groundwater extraction and injection wells as well as trenches. In addition, it will install piping and utilities to control the extraction and injection systems in the trenches in areas of groundwater remediation. In Section 12.5 of the RPP, included as Appendix M to the DP, Rev. 3 (ML22286A230), the licensee indicated it will survey soils in the areas that are disturbed as a result of groundwater remediation activities. Revision 5 to the RPP (ML22286A230) provides additional details addressing these surveys and states, “walkover gamma surveys will be performed of subsurface soils from trenches excavated for the installation of instrumentation, piping and utilities.” This is consistent with the licensee commitments in Section 13.1.3 of the DP, which states, “gamma surveys shall be performed when subsurface soil is brought to the surface during trenching for the installation of instrumentation, piping and utilities,” and “gamma surveys shall be performed when subsurface soil is brought to the surface during the installation of extraction and injection trenches and other excavations.”

In addition, the licensee previously stated that area disturbed as a result of groundwater remediation activities will be subjected to an FSS (ML021360011). Section 12.5.2 of the RPP, provided as Appendix M to the DP, Rev.3 (ML22286A230), provides details on the conduct of walkover gamma scans for foreign or suspect materials, shallow excavations, soils removed from deep excavations, well cores from dwelling, and sediment and soils from 1206 Drainage and the BARF and WATF areas.

6.2.6 Groundwater

Section 8.0 of the DP describes the planned groundwater decommissioning activities (ML22284A150). EPM evaluated a range of potential groundwater remedial alternatives to meet the site groundwater release criterion for uranium at the Cimarron site (ML21239A136). These remedial alternatives include MNA (ML20202A437; ML20043F213), permeable reactive trenches and barriers, injection of reactive agents (e.g., zero-valent iron and hydroxyl-apatite), and bioremediation,(ML091040289), to reduce chemicals of concern over time, and/or immobilize uranium under either its natural condition or a reduced geochemical environment induced through injection of organic carbon into the saturated zone to achieve the site groundwater release criteria. Due to lengthy cleanup timeframes with some of these remedial alternatives and the associated high cost and uncertainty of achieving adequate distribution of reactants and maintaining long-term reduced conditions in a highly heterogeneous aquifer system in a flood plain, these remedial alternatives were not likely feasible. In addition, the option of dewatering and limited excavation to remove the portions of the aquifer with the highest levels of contamination represented significant challenges in the excavation implementation and management of a large volume of spoils in a floodplain, along with high cost and concern of regulatory acceptance. The dewatering with limited excavation alternative was not a feasible remedial choice. Taking into consideration effectiveness, public and regulatory acceptance, and schedule and cost, groundwater extraction and injection in BA1 and WA, combined with treatment, was recommended as the most economical alternative for reducing the levels of chemicals of concern to less than the criteria within a reasonable time frame (ML22284A150; and ML21239A136). EPM conducted laboratory treatability tests to evaluate IX

resins and media to remove uranium from groundwater. Different types of resins and media, including strong base organic anion exchange resins, granular active carbon, polystyrene, and hydroxy-apatite were evaluated in equilibrium batch experiments with source groundwater collected from BA1 and WA. Based on the relative performance of the six resins or media being tested, as determined by uranium loading capacity and potential occurrence of scaling, three resins (DOWEXTM 1, DOWEX 21K 16/20, and Spherical Resin Bead Gel #2) were selected for dynamic column tests, with DOWEXTM 1 and Resin Bead Gel #2 under pH adjustment (to 6.80) to prevent carbonate mineral precipitation (ML19095B790). The results of the column tests showed that DOWEXTM 1, a strong base organic anion exchange resin, had the best performance of all resins and media tested, which is consistent with the uranium predominantly as negatively charged uranyl complexes around a pH neutral condition (e.g., carbonate complexes) in the site groundwater. EPM conducted trench pilot tests to explore the effectiveness of employing trenches to support the groundwater remedial design (ML18171A300, ML18171A305, ML18171A309, ML18171A310, and ML18171A316). A trench can potentially expose and intercept a large number of fractures to increase the hydraulic connectivity of otherwise low permeable bedrock in SSA and SSB, and interconnect permeable zones within the transition zone with an overall low hydraulic conductivity. The use of an extraction trench combined with an injection trench will potentially increase the local groundwater flow and uranium desorption from the matrix within the targeted areas. Pilot tests conducted at the site demonstrated that injection trenches constructed in SSA and SSB are capable of delivering more water per square foot of saturated trench surface than had been estimated based on borehole packer test results and the groundwater flow model (ML18171A300, ML18171A305, ML18171A309, ML18171A310, and ML18171A316).

6.2.7 Groundwater Extraction System

Appendix I to the DP, Rev. 3 (ML22285A208, ML22285A210, and ML22307A307), provides the design specifics of the proposed groundwater remedy, including groundwater extraction and treated water injection through wells and trenches, and removal of uranium with IX and treated water discharge. All groundwater extraction and injection trenches will be excavated to a minimum width of 2 ft (with maximum depths up to 25 ft below ground surface) using standard excavation and earthmoving construction equipment. The excavations will extend to the base of the transition zone material, generally located at the bedrock interface, and may be over excavated to allow sumps and gravel backfill to extend deeper than the invert elevation of the lateral trench drainpipes. Excavator-mounted pneumatic hammers or other rock excavation equipment will be employed, if necessary, to achieve the required trench depths. An inorganic high-density slurry or other physical trench stabilization equipment (e.g., sliding trench box) will be used if necessary to maintain an open trench during excavation, especially within the unconsolidated transition zone materials.

The treated water with uranium concentrations less than its maximum contaminant level will be delivered through injection wells located within injection trenches and then propagate through the targeted formation under raised hydrostatic heads developed by a higher water level in trenches or wells above the ambient groundwater elevation.

The WA groundwater remediation areas include WAA U>DCGL and WU-BA3/1206-NORTH areas, as shown in figure 6-1. The BA1 remediation area is divided into BA1-A and BA1-B remediation areas, as indicated in figure 6-2. The subsections below discuss remedial specifics for each of the remediation areas.

WAA U>DCGL Area

The groundwater extraction system in the WAA U>DCGL area will consist of four extraction wells (GE-WAA-02 through GE-WAA-05) and one extraction trench (GETR-WU-01). The extraction trench will be approximately 275 ft by 75 ft and will be installed in transition zone material in the 1206-NORTH area within the 100-year floodplain. Treated groundwater will be injected into SSA through trench GWI-WU-01 in the WU-BA3 area to enhance the hydraulic gradient and drive impacted groundwater to groundwater extraction components. This injection trench will be approximately 225 ft long and installed in SSA in the WU-BA3 area.

WU-BA3/1206-NORTH

Injection trench GWI-WU-01 will be placed across the former BA3 disposal trenches upgradient of the 1206 Drainage (east branch). This trench will be approximately 225 ft long, with a depth of approximately 25 ft, extending through SSA. One injection well installed in the approximate center of the trench will be used to deliver a nominal 8 gpm of treated water into this trench. Uranium-impacted groundwater primarily within the fractured SSA will be flushed out and recovered further downgradient.

Results of the particle tracking analysis using the groundwater flow model show that all groundwater exceeding the NRC criterion in the WAA U>DCGL and 1206-NORTH areas will be captured under the pumping scenario of a combined rate of approximately 107 gpm (ML22308A076 and ML22286A235).

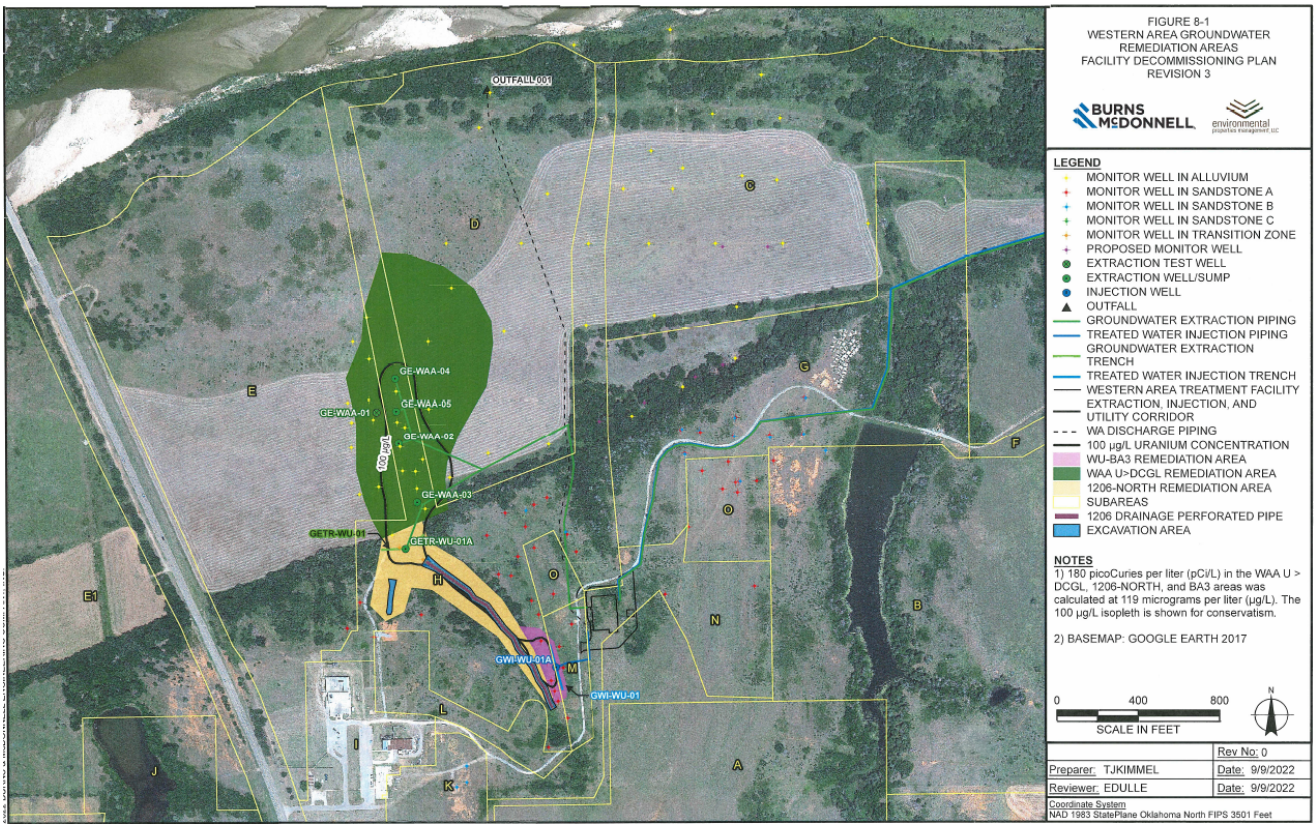


Figure 6-1 WA groundwater remediation areas of the Cimarron site

BA1 Area:

In BA1, groundwater extraction system includes three groundwater extraction wells (GE-BA1-02 through GE-BA1-04), with a well screen installed within alluvial material, and two groundwater extraction trenches, GETR-BA1-01 and GETR-BA1-02. Extraction trench GETR-BA1-01 was constructed in the BA1 transition zone material during the 2018 trench pilot test and is approximately 184 ft long. Trench GETR-BA1-02, approximately 200 ft by 75 ft, will be installed in BA1 transition zone material, west of GETR-BA1-01, within the 100-year flood plain.

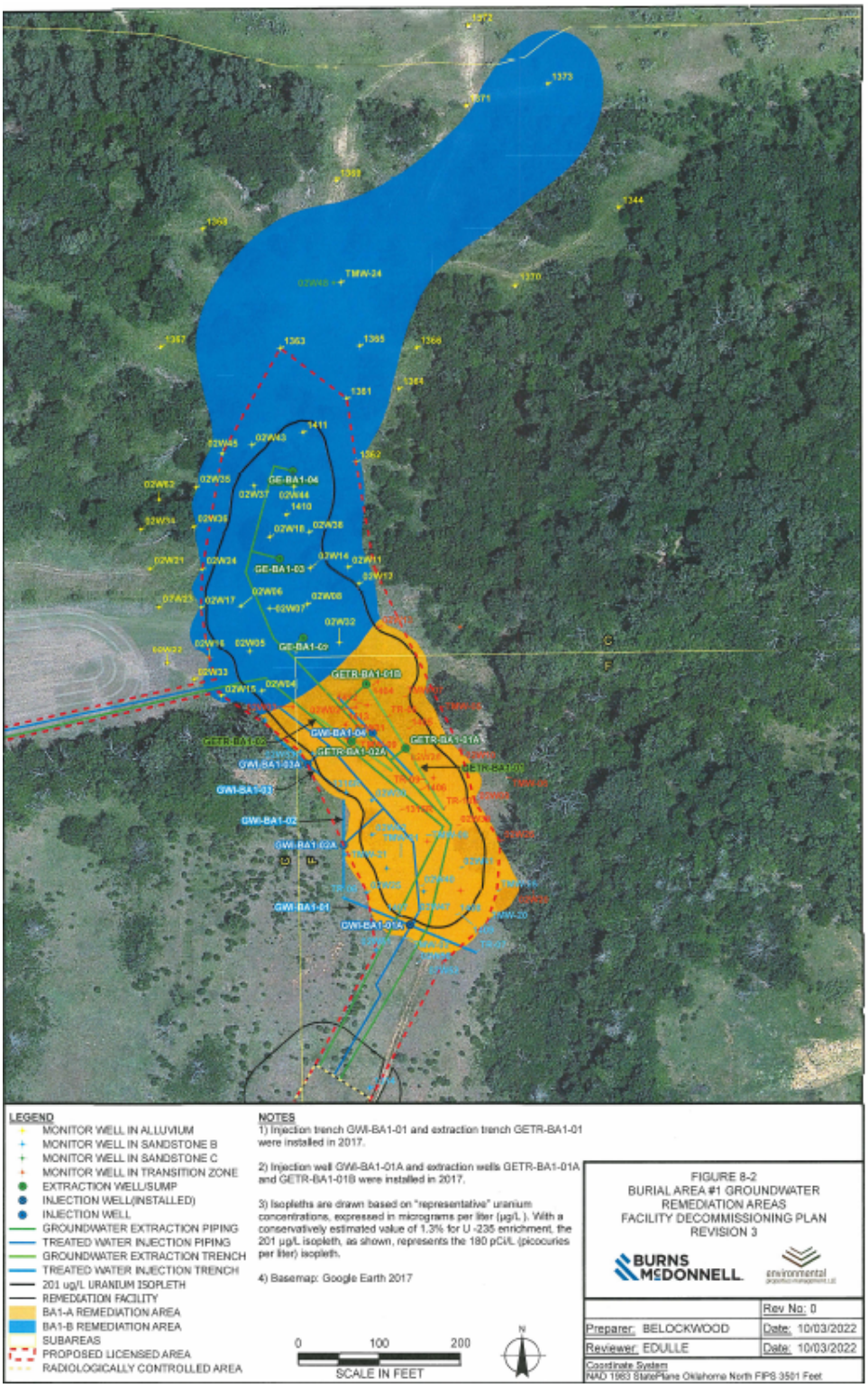


Figure 6-2 BA1 groundwater remediation area at the Cimarron site

The treated groundwater injection system in BA1 includes three injection trenches (GWI-BA1-01, GWI-BA1-02, and GWI-BA1-03) installed in SSB, and one injection trench (GWI-BA1-04) installed in the transition zone. The length of these injection trenches varies from approximately 100 ft to 175 ft. GWI-BA1-01 is approximately 20 ft deep and oriented to interconnect the former BA1 waste disposal trenches, with one injection well located in the approximate center of the trench. The designed injection rate is at a nominal 10 gpm of treated water delivered through the injection well into the trench. Both injection trenches, GWI-BA1-02 and GWI-BA1-03, are designed to drive residual uranium in SSB toward the downgradient transition zone for capture using groundwater extraction trenches, and toward the BA1-B area for capture using groundwater extraction wells. A nominal 4 gpm of treated water will be injected into each trench.

Injection trench GWI-BA1-04 will be excavated, extending to the base of the transition zone material at the bedrock interface. It will be placed between extraction trenches GETR-BA1-01 and GETR-BA1-02 to flush uranium-impacted groundwater toward both of these two extraction trenches. A nominal 10 gpm of treated water will be injected into this trench.

The stratigraphy analysis of BA1 area shows that the distribution and interconnection of more permeable deposits within the transition zone matrix are highly heterogeneous. This spatial heterogeneity significantly impacts the ability of groundwater flow models to predict the effect of groundwater extraction and treated water injection on groundwater elevations in the BA1 transition zone area. The DP and supporting documentation indicated that the 2018 pilot testing results were primarily used to inform the design of the extraction and injection trenches in the transition zone, rather than groundwater flow modeling with particle tracking (ML22285A091, ML22308A076, ML22286A225).

A particle tracking analysis supported by the groundwater flow model was conducted to optimize positions and flow rates for extraction wells located within the Cimarron River flood plain (Figure 8-3, ML22285A100; drawing P205 of Appendix I-3, ML22285A210). Results of particle tracking analysis show that all groundwater exceeding the release criterion in the alluvial aquifer areas within the floodplain will be captured under the proposed combined extraction rates of approximately 100 gpm (attachment 3 in Appendix K, ML22308A076).

The staff reviewed and evaluated the groundwater remedial options to meet the NRC's unrestricted release criterion and concluded that groundwater pump and treat, with treated water injection, is technically feasible and supported by site characterization data and laboratory treatability study and field pilot tests. The proposed groundwater remediation system provides reasonable assurance that the remedial actions will adequately address the risk to the public and the environment from uranium-contaminated groundwater. The NRC anticipates that the uranium concentration limits required for unrestricted release will initially be achieved within the more conductive alluvial aquifer located within the Cimarron River floodplain. The much lower hydraulic conductivities observed in the upland bedrock (SSA and SSB) and the transition zone with higher elevated uranium concentrations (particularly in BA1), will likely require more time for the groundwater uranium concentrations in some small areas to be reduced to the unrestricted release criterion level. The active remediation progress will be constantly monitored, and periodically reported to the NRC as required by the license (LC 31.C). The NRC staff will review and evaluate the data obtained from in-process monitoring of groundwater and the water treatment system and may require modifications to the proposed remediation infrastructure or process for optimization or effectiveness, or both. Any modifications will be evaluated in accordance with LC 27.e. before implementing those modifications.

Groundwater Treatment System

Section 8.3 of the DP details the remedial system design and treatment facility. The WATF will house two uranium IX treatment trains, for WA and BA1. Other components, such as influent and effluent tanks and transfer pump skids, will be located at both WATF and BARF. The WA and BA1 influents are treated separately. The WA and BA1 IX trains each have a feed pump that moves groundwater from their respective influent tanks through individual multimedia filters, each equipped with secondary containment. Each train comprises three resin vessels, lead, lag, and polishing of 48 in. in diameter, with designed flow rates between 100 and 125 gpm. Sampling ports will be installed to collect water samples at the influent and effluent points of the treatment train. An in-line pH meter at the inlet will maintain the influent groundwater's pH between 6.8 and 7.0 by automatically adjusting the hydrochloric acid injection rate into the influent line. This adjustment prevents carbonate scaling in the resin vessels and keeps most of the uranium in negatively charged uranyl carbonate complexes. Each resin vessel will hold approximately 38 ft^3 of strong anion exchange resin with chloride.

The replacement of the lead IX resin vessel is initiated when the uranium concentration in the effluent from the lead vessel surpasses 80 percent of that in the influent. Subsequently, the lead vessel is removed from the treatment train, the lag vessel takes over as the lead, and the polishing vessel becomes the lag vessel. A new vessel filled with fresh resin is then designated as the polishing vessel. The duration for the effluent from the lead IX vessel to reach the trigger concentration, which is 80 percent of the influent concentration, depends on both the flow rate and the uranium concentration. Section 8.3.2 of the DP provides the estimated annual average resin usage, including hydrochloric acid. Appendix J-3 (drawing P-115, ML22286A217) illustrates the IX vessel and valve configuration details.

Groundwater extracted from wells and trenches in WA and BA1 is directed to separate influent tanks (TK-101 and TK-201, each with a 12,000 -gallon capacity) and treated in distinct IX trains (IX trains 1 and 2). This treatment continues until the uranium concentration in TK-101 and TK-201 falls below 30 µg/L for at least 2 consecutive months. Once achieved, the influent groundwater may circumvent IX treatment, and a segment of the effluent from WA and BA1 will be channeled directly to the respective injection skid tank for reinjection into WA and BA1.

In-Process Monitoring

In-process monitoring includes the monitoring of groundwater remediation and treatment, and treated water injection and discharge (ML22284A150). The in-process monitoring collects data to evaluate remedial progress, including capture of impacted groundwater, identification of issues related to the water extraction and injection, and IX operation, and optimization of overall remedial operation performance.

Groundwater Treatment Monitoring

Water treatment monitoring encompasses the pumping rates, pH levels, and uranium concentrations in both influent and effluent streams. These parameters are critical for assessing the IX systems' performance and the resins' adsorption capacity. The monitoring process informs operational decisions for the IX system, including acid injection and IX resin vessel

replacement and reconfiguration. It also ensures compliance with license possession limits, spent resin disposal regulations, and effluent injection and discharge criteria.

As influent water from tanks (TK-101 in WA, and TK-105 in BA1), enters the IX skids, continuous pH monitoring occurs before and after acid injection at the in-line mixer to ensure the pH of the influent remains within the optimal range of 6.8 to 7.0. Additionally, weekly water samples for uranium analysis are collected from the sampling ports situated between the filter and the lead resin vessel, as well as between the lag and polishing vessels, and the effluent of the polishing vessel. The NRC staff recognizes that the frequency of effluent sampling can be adjusted from weekly to semimonthly after demonstrating consistent compliance with effluent discharge standards. The replacement and reconfiguration of the IX train will occur when the uranium concentration in the effluent of the lead vessel surpasses 80 percent of the influent's concentration. This trigger threshold will be assessed and adjusted as necessary during operations to optimize resin use and reduce the quantity of spent resin requiring disposal.

Treated Water Injection and Discharge Monitoring

The objectives of treated water injection and discharge monitoring are to support the remediation operation and comply with 10 CFR 20.2001, "General requirements," effluent discharge criteria and the Oklahoma Pollution Discharge Elimination System (OPDES) permit. As detailed in Section 8.6.3 of the DP, Rev.3 (ML22284A150), EPM will record the flow rate (under gravity) and water elevation for all injection wells and trenches in BA1 (total of 4) and WA (1), and the combined discharge outfall (Outfall 001) of WA and BA1, located in WA. A semimonthly monitoring of treated water will be conducted for analysis of uranium (U-235 and U-238 with the U.S. Environmental Protection Agency (EPA) Method 200.8), along with pH, fluoride, and nitrate, as required by the State.

Groundwater elevation data will be evaluated periodically to optimize the capture of impacted groundwater through maximizing the hydraulic head in injection wells and trenches, while minimizing the potential for the spread of contamination to areas beyond the boundaries of capture zones. The NRC staff concurs with EPM on the use of chemical equilibrium assumption in concluding that the effluent discharge to the Cimarron River would comply with 10 CFR 20.2001, including the unit rule. However, EPM will need to use the effluent uranium data measured during remediation to confirm the compliance status with the discharge criteria.

Groundwater Remediation Monitoring

The in-process groundwater monitoring will be carried out to evaluate the remediation progress of impacted aquifers in meeting the NRC's DCGL and to ascertain the appropriate time to cease groundwater extraction operation and initiate post- remediation monitoring. Table 6-1 shows the locations of the proposed in-process monitoring wells (also see table 8-2–Revision 1; figures 8-7A, 8-7B, 8-8A, and 8-8B (ML23346A262).

Table 6-1 In-Process Groundwater Monitoring Wells

Remediation Area	Plume Segment	**Monitoring Locations**	**Uranium**	**Water Level**
WAA U>DCGL		T-62, T-63, T-64, T-65, T-68, T-72, T-104, T-105	Quarterly	Quarterly

Remediation Area	Plume Segment	**Monitoring Locations**	**Uranium**	**Water Level**
		T-66, T-69, T-75, T-76, T-77, T-79, T-84, 1427, 1428	Annually	Quarterly
WU-BA3		1351, 1352, 1356,	Quarterly	Quarterly
		1359	Annually	Quarterly
		1358	--	Quarterly
1206-NORTH		MWWA-09, 1429, 1430	Quarterly	Quarterly
		1431	Annually	Quarterly
BA1-B	**Floodplain Alluvium**	02W04	Annually	Quarterly
		02W32, TMW-13	Quarterly	Quarterly
		02W07, 02W-08, 02-W19	Quarterly	Quarterly
		02W14	Annually	Quarterly
		02W18, 02W37, 02W38	Annually	Quarterly
		02W44, 1410	Quarterly	Quarterly
		02W43	Annually	Quarterly
		1411	Quarterly	Quarterly
BA1-A	**Sandstone B**	02W25, 02W30, 02W41, 02W42, 02W50, 02W51, 1409, 1421, 1422, TMW-01, TMW-02, TMW-08, TMW-18, TMW-25	Annually	Quarterly
		02W40, TMW-20	Quarterly	Quarterly
		02W47, 1416, 1417, 1418, 1419, 1420	--	Quarterly
	Sandstone C	TWM-17	Annually	Quarterly
	Transition Zone	02W10,02W25, 02W28, 02W39, TMW-05, TMW-07	Annually	Quarterly
		02W03, 02W20, 02W26, 1315R, 1404, 1405, 1412, 1413, 1414, 1415, 1423, 1424, 1425, 1426, TMW-06	Quarterly	Quarterly
		02W06	--	Quarterly

Groundwater samples will be collected either quarterly or annually to analyze uranium levels, accompanied by water level elevation measurements within each remedial area (table 6-1). The data on uranium concentrations, together with water elevation data, are used to evaluate the decline of uranium levels towards meeting the DCGL and to ensure that the groundwater capture zones are adequately developed as designed for extracting contaminated groundwater. Should there be any discrepancies, the operations of extraction and injection will be adjusted and optimized, which includes modifying the pumping and injection rates, the operation schedules, or a combination of them for different remediation areas. EPM indicated that the in-process groundwater monitoring at certain locations may be modified, including a potential cessation or reduction in frequency, based on the progress of remediation status.

The NRC staff has assessed the locations for proposed in-process groundwater monitoring. The proposed monitoring wells are situated at and within the uranium plumes above the DCGL, focusing on areas with observed elevated uranium levels or close to the sources in each remediation area. In BA1, elevated groundwater uranium levels have been observed immediately downgradient of the former waste disposal trenches (TMW-09), necessitating sampling during in-process monitoring. Monitoring well TMW-09 needs to be abandoned due to the construction of injection trench GWI-BA1-04 and one alternative nearby Well 02W28 is included in the in-process monitoring. Two replacement wells, 1412 and 1413, will be installed slightly further downgradient from the source area, situated between extraction trenches GETR-BA1-01 and GETR-BA1-02, and will be incorporated into the in-process groundwater monitoring network. At the leading edge of the BA1 uranium plume, two new wells, 1410 and 1411, will also be installed immediately upgradient and downgradient of the extraction well GE-BA1-04, as a component of the in-process groundwater monitoring network.

During its review, the NRC staff raised concerns about data gaps within the proposed monitoring network in the vicinity of the two extraction trenches and injection trench GWI-BA1-04 of the BA1-A remediation area, given the complex, heterogenous subsurface materials in the transition zone (ML23251A211). In its response to the NRC's requests for additional information (RAIs), EPM further evaluated the proposed in-process groundwater monitoring well network for the BA1 and WA remediation areas and added another 17 new monitoring wells in BA1 and 5 new monitoring wells in the 1206-NORTH remediation area. These added wells will be monitored for groundwater elevations and uranium concentrations (ML23346A262). Among these new wells, SSC monitoring well, TWM-17, in the transition zone area will be used to confirm that the injection activities in the SSB injection trenches are not facilitating vertical migration of uranium contamination into the deeper water-bearing unit.

The NRC staff recommends that EPM assess and confirm in the annual report the vertical capture zone at select groundwater extraction wells in the WAA>DCGL and BA1 remediation areas using groundwater elevation data from multilevel piezometers. This necessitates the installation of multilevel piezometers with short well screens (for groundwater elevation monitoring only). Evaluating both horizontal and vertical capture zones will yield a more accurate assessment of the removal of uranium-contaminated groundwater, particularly in the highly heterogeneous transition zone of BA1. In addition, the NRC staff reviewed the remediation reporting schedules and contents proposed by EPM (ML23346A262) and found they are acceptable. The reporting schedules cover remedial system construction, startup, operation and maintenance, and assessment of groundwater capture zones within each remediation area; performance of injection trenches and the IX system; and measures taken to improve the performance and operations of the overall remedial system at the site.

Post-remediation Groundwater Monitoring

Section 8.8 of the DP, Rev.3 (ML22284A150), describes the details of post-remediation groundwater monitoring, required to demonstrate compliance with the NRC's criteria for license termination. The uranium concentration must be below the DCGL of 180 pCi/L in every post-remediation monitoring well for eight consecutive quarters in accordance with LC 27.b. If the uranium concentration in any of the post-remediation groundwater monitoring wells exceeds the DCGL during post-remediation monitoring, groundwater remediation efforts will resume. The post-remediation monitoring will be successfully completed when uranium levels are below the DCGL in all of the post-remediation monitoring wells for eight consecutive quarters.

The NRC staff assessed the revised proposed post-remediation groundwater monitoring in response to the NRC RAIs (ML23251A211, ML23346A262) for the WA and BA1 remediation areas (Table 8-1). These post-remediation monitoring wells are generally situated in potential stagnation zones formed between extraction wells, where reduced groundwater circulation is expected, at the leading edge of uranium plumes, and adjacent to the former waste disposal trench area where elevated uranium levels have been detected in groundwater. The uranium concentrations in the groundwater within these stagnation zones and waste trenches may be more persistent compared to the affected groundwater in other sections of the remediation areas as the remediation advances. Monitoring in the vicinity of wells TMW-13 and TMW-09 in BA1, which show the highest uranium concentrations in site groundwater, is included in the licensee's proposed post-remediation groundwater monitoring plan. In its response to the NRC's RAIs (ML23251A211), monitoring wells TWM-8 and TWM-13 are included in the post-remediation monitoring (ML23346A262). In addition, groundwater level measurements will be performed during the quarterly post-remediation sampling.

Table 6-2 Quarterly Post-remediation Groundwater Monitoring

Remedial Area	Monitoring Location	Uranium Analysis	Tc-99 Analysis	Water Level
BA1-A Sandstone B	TMW-08, TMW-18, 1416, 1417, 1419, 1420, 1422	**x**		**x**
BA1-A Transition Zone	02W28, 1315R, 1412, 1413, 1414, 1415, 1423, 1424, 1426	x		x
BA1-B	TMW-13, 02W08, 02W19, 1411, 02W43,	x		x
1206-NORTH	MWWA-09, 1429, 1430, 1431	x		x
WAA U>DCGL	T-62, T-104, T-105, T-68, 1427, 1428	x		x
WU-BA3	1351, 1356	x		x
Uranium Pond 2	1336A, 1402, 1346		x	x

The NRC staff has determined that a steady-state condition must be achieved following the cessation of extraction operations before post-remediation groundwater monitoring can begin. The groundwater flow rate and transport pathways altered by the extraction operations need to return to ambient or steady-state conditions to ensure that post-remediation monitoring accurately reflects natural conditions. Site groundwater elevations before initiation of the remediation may be used as a reference in determining whether post-remediation steady-state conditions in the groundwater have been reached (EPA, 1994).

The NRC staff requires that EPM demonstrate with high confidence that the post-remediation monitoring data have met the site release criteria with statistical analysis. Some of the acceptable statistical methods are well documented in the literature (e.g., EPA, 2009).

6.3 Schedule

The licensee submitted a schedule that is contingent upon NRC approval of the DP, Rev. 3. Furthermore, circumstances that affect the project schedule can change during decommissioning. If it is determined that decommissioning cannot be completed as outlined in the schedules presented in this section, the licensee will provide an updated schedule to the NRC and the ODEQ (LC 31.C). The schedule is broken into four components: preconstruction, construction, remediation, and post-remediation. The licensee does not believe that the decommissioning of the groundwater can be completed in the 2-year time frame and requested consideration and approval of an alternative schedule. Figures 9-1 through 9-4 of the DP, Rev. 3 (ML22285A100), show the schedules for each of the four components. Preconstruction is estimated to take 1.92 years (23 months) to complete. Construction is estimated to take 0.92 year (11 months). Remediation is estimated to take 11 years for the WATF and 12.5 years for the BARF. Post-remediation activities are estimated to take 2.5 years. Since work on the WATF and BARF will run concurrently, the total estimated time to complete groundwater remediation is estimated at 17.84 years (approximately 535 months). It should be noted that the estimated remediation time to complete the groundwater cleanup is dependent on the efficiency of the proposed remediation system in reducing uranium concentrations in all impacted areas to the license-required level. Any slower than expected cleanup to the unrestricted release criteria for uranium in groundwater, which is a distinct possibility within the relatively impermeable material of the BA1 transition zone, will extend the estimated remediation timeframe.

6.4 Evaluation and Findings

The NRC staff has determined that the licensee has described the planned decommissioning activities at the Cimarron facility in sufficient detail to allow the staff to evaluate the potential safety issues associated with remediating the facility. In addition, the licensee has provided sufficient information for the NRC to determine the need for an alternative decommissioning schedule. Therefore, the NRC staff concludes that the licensee's description of the planned decommissioning activities at the Cimarron facility and the requirements for an alternative decommissioning scheduled as described in the DP, Rev. 3, comply with the requirements of 10 CFR 70.38 (g) (1) (i)– (iv) (2) (3) (g) (4) (i)– (v), and 10 CFR 70.38 (h) (2) (i).

7. Project Management and Organization

Regulatory Requirements

Section 17.2 of NUREG-1757, Volume 1, Revision 2 (ML063000243), describes the requirements for reviewing the project management and organization. The staff's review of the information supplied by the licensee is focused on determining whether its description of the decommissioning project organization and management structure is sufficient to allow the staff to fully understand how the licensee will ensure that it will exercise adequate control over the decommissioning project. The relevant regulatory requirements are found in 10 CFR 70.38(g)(4)(ii).

Regulatory Acceptance Criteria

The material to be reviewed is informational in nature and thus, not subject to a detailed technical analysis. The staff reviews the information qualitatively to assess whether the description of the proposed decommissioning project management and organization structure is

adequate to serve as the basis for concluding that the management program will ensure that the licensee will exercise the appropriate control during decommissioning operations.

Staff Review and Analysis

The NRC staff has reviewed the description of the decommissioning project management organization, position descriptions, management and safety position qualification requirements, training, and the manner in which the CERT, for license SNM-928, will use contractors during the decommissioning of its facility located in Guthrie, Oklahoma, according to Section 17.2 of NUREG-1757, Volume 1, Revision 2 (ML063000243), and found the description acceptably detailed.

The Licensee proposes to use a Decommissioning Management Organization. Decommissioning activities are being and will be performed in the following phases:

- Pre-construction
- Construction and startup
- Remediation
- Post-remediation monitoring and license termination

Nearly all decommissioning tasks will be performed by contractors. The Trust Administrator and the Trustee PM may be the only employees of the CERT; they will retain companies that will provide the resources for each position (e.g., RSO, QAC), project (e.g., construction, assessment), and operation (e.g., groundwater extraction, water treatment). All contractors must be qualified by evaluation by both the Trustee and the QAC. Contracts will require monthly reports on activities completed, cost and schedule status, activities to be performed during the next month(s), and issues identified and/or resolved during the reporting period.

Contractor managers (e.g., RSO, QAC, EPC Lead, Activity Leaders, and Front-Line Supervisors) will be responsible to ensure that their personnel receive training as described above, commensurate with the work they will perform. All contractor personnel will have stop work authority if conditions, procedures, or work practices threaten the safety or quality of the work.

Each phase of Decommissioning will be subject to Management Oversight including the Trust Administrator, the Trustee Project Manager, the Radiation Safety Officer, the Quality Assurance Coordinator (QAC), and the ALARA Committee.

During construction and start up, contractors performing quality significant work will be managed by Activity Leaders and engineering, procurement, and construction (EPC) Contractors, both or which will be overseen by the Trustee Project Manager.

Activity Leaders typically report to the Trustee PM. Should construction work be performed, ALs may report to a Construction Project Manager as described in Section 10.4 of DP, Rev.3 (ML22284A150). They are indirectly responsible to the RSO and QAC. As do all workers, ALs have authority and the responsibility to stop work if conditions or the performance of work pose a risk to safety and health or the environment, or compliance with license, decommissioning plan, or quality requirements.

The EPC Lead will oversee the management of construction and procurement projects and will report directly to the Trustee PM and indirectly to the RSO and the QAC.

Front-Line Supervisors will be responsible for the procurement of materials and the performance of decommissioning operations. Front-Line Supervisors will ensure that all personnel performing work have received the training required for the work they perform, and have been task-qualified to perform the work for which they are responsible. Front-Line Supervisors are responsible for monitoring the schedule, cost, and quality of the operations for which they are responsible. Front-Line Supervisors and Activity Leaders will report directly to the Trustee PM and indirectly to the RSO and QAC. As with all workers, Front-Line Supervisors have authority to stop work if conditions or the performance of work pose a risk to safety and health or the environment, or compliance with license, decommissioning plan, or quality requirements.

Construction includes installation of groundwater remediation (extraction, injection, and discharge) infrastructure, the construction of foundations and facilities, the fabrication and installation of water treatment and waste processing systems, and the installation of utility and control systems. This work will be managed as a combination of projects directed by an engineering, procurement, and construction (EPC) Contractor. The Trustee PM will maintain responsibility for the oversight of the EPC Contractor.

Contractor managers (e.g., RSO, QAC, EPC Lead, Activity Leaders, and Front-Line Supervisors) will be responsible to ensure that their personnel receive training as described above, commensurate with the work they will perform. All contractor personnel will have stop work authority if conditions, procedures, or work practices threaten the safety or quality of the work.

In reviewing this information, the staff verified that the licensee will control decommissioning tasks through the use of written procedures. These procedures will be developed by individuals and units familiar with the physical and safety requirements necessary to complete the tasks safely. The procedures will be reviewed and approved by units responsible for physical, radiological, chemical, and occupational safety, as well as decommissioning project management. The program appears to be acceptable as written; however, the NRC and Oklahoma Department of Environmental Quality will continue to receive monthly status reports via teleconference on the sight activities. Additionally, to ensure that the program is being implemented as written, the NRC will continue to inspect the licensed activities to ensure that the program has been implemented and is effective.

8. Radiation Safety and Health Program

8.1 Radiation Safety Controls and Monitoring for Workers

8.1.1 Workplace Air Sampling Program

Regulatory Requirements

Section 17.3.1.1 of NUREG-1757, Volume 1, Revision 1 (ML063000243), identifies 10 CFR 20.1204, “Determination of internal exposure”; 10 CFR 20.1501 (a)–(b); 10 CFR 20.1502 (b); and 10 CFR 20.1703 (a) (3) (i)–(ii) as the requirements applicable to the NRC staff review of the licensee’s workplace air sampling program. The NRC staff determined that 10 CFR 20.1501 (a) contains the applicable regulations for reviewing the licensee’s program. This requirement specifies the need for the licensee to evaluate the actual and potential radiological hazards presented by the activities involving radioactive materials.

The requirements of 10 CFR 20.1204 pertain to the determination of internal exposures. SER Section 8.1.3 gives the NRC staff's review related to the requirements of 10 CFR 20.1204.

The NRC revised 10 CFR 20.1501, "General," after the publication of NUREG-1757, At that time, the current requirements of 10 CFR 20.1501 (b), related to the retention of survey records for decommissioning, did not exist and the current requirement in 10 CFR 20.1501 (c), related to instrumentation, was identified as 10 CFR 20.1501 (b). SER Section 8.1.7 contains the NRC staff's review related to 10 CFR 20.1501 (c) for the instrumentation program.

The current citation of 10 CFR 20.1703 (a) (3) (i)–(iii) does not reflect the current regulatory requirements listed in 10 CFR 20.1703, "Use of individual respiratory protection equipment." The correct citation is 10 CFR 20.1703 (c) (1)– 2). These requirements address evaluating a worker's intake of radioactive material and estimating doses for licensees that implement a respiratory protection program. While the licensee does not anticipate the need for respiratory protection equipment, it does have provisions in case it is necessary to use such equipment. The NRC staff addresses the requirements of 10 CFR 20.1703 (c) (1)– (2) in SER Section 8.1.2.

Regulatory Acceptance Criteria

The NRC reviewed the air sampling program description to verify that the licensee has a program adequate to demonstrate compliance with the dose assessment criteria of 10 CFR 20.1204; the survey requirements of 10 CFR 20.1501 (a)–(b); and the requirements of 10 CFR 20.1502, "Conditions requiring individual monitoring of external and internal occupational dose," when respirators are to be worn.

NRC Staff Review and Analysis

Unless otherwise stated, the NRC reviewed the information, data, and maps submitted by the licensee in its revised DP, Rev.3 (ML22284A150), or its revised RPP (ML22286A230).

The licensee described its air sampling program in Section 11.1 of the DP, Rev.3 (ML22284A150), and Section 10.8 of the RPP (ML22286A230). As discussed in SER Section 8.1.3, the licensee calculated a potential intake to an occupational worker that was significantly less that what would require individual monitoring of the intake of radioactive material required by 10 CFR 20.1502 (b) (1). The calculation for inhalation of Class Y uranium was calculated to be 0.002 times the annual level of intake (ALI), while table 1 in Regulatory Guide 8.25, "Air Sampling in the Workplace," recommends routine air sampling be conducted at a concentration of 0.1 ALI or higher. Therefore, routine air sampling is not required, but confirmatory air sampling would be appropriate.

The licensee stated, in Section 10.8 of the RPP (ML22286A230), that the calculation supporting the evaluation of potential occupational intakes of radioactive material will be reviewed after the design of the groundwater processing is close to completion and updated if necessary. The need for air sampling will be prospectively determined based on the final process system design. In addition, the licensee will periodically review the calculation during operations to ensure that it reflects operational experience and determine whether changes to the RPP are necessary.

General air sampling will be performed throughout the resin unloading and packaging area for a least the first three resin exchanges, based on the information provided in Section 10.8 of the RPP (ML22286A230). The RPP provides that air monitoring will be required when airborne

radioactivity levels exceed 1 percent of the derived air concentration (DAC) for four percent enriched uranium. This air monitoring criterion is less than 10 percent of the ALI and greater than 1 percent of the DAC, is consistent with the recommendations in Table 1 of Regulatory Guide 8.25 and is therefore acceptable.

As defined in 10 CFR 20.1003, “Definitions,” a survey is an evaluation of the radiological conditions and potential hazards. Surveys may include measurements of calculations or concentrations or quantities of radioactive material present (see NUREG-1736, “Consolidated Guidance: 10 CFR Part 20-Standards for Protection Against Radiation,” issued October 2001 (ML013330179)). The NRC staff finds that the licensee’s proposed workplace air sampling program meets the NRC definition of survey because the evaluation conservatively estimates the potential intake of radioactive material, measurement of air samples will be used to confirm the licensee’s survey assumptions, and the licensee has committed to reevaluating the survey assumptions based on operational experience.

Evaluation and Findings

The NRC staff has reviewed the information in the DP against the criteria in Section 17.3.1.1 of NUREG-1757, Volume 1, Revision 2 (ML063000243), related to the workplace air sampling program. Based on this review, the NRC staff has determined that the licensee has provided sufficient information on when air samples will be taken in work areas, the types of air sample equipment to be used and where they will be located in work areas, the calibration of flow meters, the minimum detectable activities of equipment to be used for analyses of radionuclides collected during air sampling, and action levels for airborne radioactivity (and corrective actions to be taken when these levels are exceeded) to allow the NRC staff to conclude that the licensee’s air sampling program will comply with 10 CFR 20.1204, 10 CFR 20.1501 (a)–(b), 10 CFR 20.1502 (b), 10 CFR 20.1703 (a) (3) (i)–(ii), and Regulatory Guide 8.25.

8.1.2 Respiratory Protection Program

Regulatory Requirements

Section 17.3.1.2 of NUREG-1757, Vol.1, Rev.2 (ML063000243) identifies 10 CFR 20.1101 (b); 10 CFR 20.1701, “Use of Process or Other Engineering Controls”; 10 CFR 20,1702, “Use of Other Controls”; 10 CFR 20.1703; and 10 CFR 20,1704, “Further Restrictions on the Use of Respiratory Protection Equipment,” as the requirements applicable to the NRC staff’s review of the licensee’s workplace respiratory protection program. The NRC staff determined that the applicable regulations for the review of the licensee’s program are 10 CFR 20.1101 (b), 10 CFR 20.1701, 10 CFR 20.1702, 10 CFR 20.1703, and 10 CFR 20.1704.

Regulatory Acceptance Criteria

The NRC staff reviewed the description of the respiratory protection program to verify that measures used by the licensee in its respiratory protection program adequately limit intakes of airborne radioactive materials by workers in restricted areas and keep the total effective dose equivalent ALARA.

Staff Review and Analysis

Unless otherwise stated, the NRC reviewed the information, data, and maps provided by the licensee in the DP, Rev 3 (ML22284A150).

Section 11.2 of the DP, Rev. 3 (ML22284A150), indicates that the need for a respiratory protection program is not anticipated for remaining decommissioning efforts at the Cimarron site. Sections 10 and 14 of the RPP, provided as Appendix M to the DP Rev.3 (ML22286A230), contains additional details on respiratory protection.

Section 10.8.1.5 of the RPP, submitted as Appendix M to the DP, Rev. 3 (ML22286A230), establishes action levels associated with using respiratory protection, collecting bioassays, and stopping work due to air sampling results. These action levels are as follows: (1) respiratory protection shall be considered if a worker's intake is expected to exceed 40 DAC-hours in a week (2) a bioassay program must be implemented for any worker whose intake is expected to exceed 10 percent of the ALI or 40 DAC-hours in a week, and (3) work shall be stopped if air sampling results show greater than 10 percent of the DAC is present. The radiation safety officer (RSO) shall evaluate the situation and provide recommendations related to returning to work with the approval of the EPM project manager.

Section 14 of the RPP (ML22286A230), states that, based on-site conditions and the proposed work, the need for respiratory protection is not anticipated. But this section also details what would be in place if the RSO determined that a respiratory protection program needed to be implemented. Section 14 also indicates that, if conditions or operations change, the RSO will perform an evaluation to determine potential intakes. If the potential intakes are at 2 percent or greater on the ALI, then the RSO will determine whether engineering controls or procedural changes can address the issue or if implementation of a respiratory protection program is needed to keep doses ALARA. If the evaluation shows that implementation of a respiratory protection program is ALARA, then the RSO will implement the program.

The NRC staff has reviewed the program described in Sections 10.8 and 14.0 of the RPP (ML22286A230) associated with the action levels to initiate an RSO review to determine whether a respiratory protection program is needed, the elements of the respiratory protection program that will be put in place if it is determined that such a program is needed, and the documentation that would be required to initiate and maintain that program.

Evaluation and Findings

Based on this review, the NRC staff has determined that it has sufficient information to allow it to conclude that the licensee's program will comply with 10 CFR 20.1101 (b), 10 CFR 20.1701 through 10 CFR 20.1704, and Appendix A, "General Provisions," to 10 CFR Part 20, as well as the guidance provided in NUREG-0041, Revision 1, "Manual of Respiratory Protection Against Airborne Radioactive Material," issued January 2001 (ML010310331); Regulatory Guide 8.15, Revision 1, "Acceptable Programs for Respiratory Protection," issued October 1976 (ML003739512); and Regulatory Guide 8.25, issued June 1992 (ML13051A671).

8.1.3 Internal Exposure Determination

Regulatory Requirements

Section 17.3.1.3 NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1101 (b), 10 CFR 20.1201 (a) (1) (d) and (e), 10 CFR 20.1204, and 10 CFR 20.1502 (b) as the requirements applicable to the licensee's internal exposure determination program.

Regulatory Acceptance Criteria

The staff reviewed the internal exposure determination program to verify that the licensee's measures to determine a worker's internal exposure comply with 10 CFR Part 20 and NRC guidance documents, focusing on techniques used to estimate the intake of radionuclides by workers and calculations necessary to convert an intake to either a committed effective dose equivalent or an organ dose equivalent.

Staff Evaluation and Analysis

Unless otherwise stated, the NRC reviewed the information, data, and maps provided by the licensee in its revised DP, Rev. 3 (ML22284A150).

Onsite monitoring of personnel for exposure was discontinued in 2006 due to doses being well below the threshold requiring monitoring, as detailed in 10 CFR 20.1502. Section 11.3 of the DP, Rev. 3,(ML22284A150), indicates that, based on the site conditions and scope of work, the need for an internal exposure determination is not anticipated. This document further indicates that Section 6.1 of the RPP (ML22286A230) provides additional details on an internal exposure determination.

In Section 6.1 of the RPP (ML22286A230), the licensee indicated that an evaluation of the work activities for the proposed groundwater extraction and treatment and the site historical data served as the basis for determining that internal monitoring of workers is not needed. In addition, the licensee calculated a potential intake to an occupational worker that was significantly less than what would require individual monitoring of the intake for radioactive material. Specifically, 10 CFR 20.1502 (b) (1) requires individual monitoring for concentrations of 0.1 ALI, and the licensee's calculation using Class Y uranium (insoluble) indicated the highest potential intake for inhalation Class Y would be 0.002 ALI. Appendix A to the RPP (ML22286A230) contains the calculation supporting this determination.

In Appendix A to the RPP (ML22286A230), the licensee evaluated the need for an air sampling program by estimating potential worker intakes of radioactive materials. The licensee used the methodology described in NUREG-1400, "Air Sampling in the Workplace," issued September 1993 (ML13051A671), for two different uranium enrichments—1.5 percent and 5 percent. These enrichment values appear reasonable based on the licensee's maximum enrichment values in table 1 of Appendix N to the DP, Rev. 3 (ML22286A244), which provided average enrichment values of between 1.51 percent and 3.48 percent and maximum enrichment values (at a 95 percent UCL) between 1.88 percent and 4.19 percent.

The licensee originally calculated an ingestion dose related to the annual limit on intake using Class Y material, but when the NRC staff requested justification (ML23251A211), for not using Class D uranium due to the toxicity issues when addressing the ingestion dose, the licensee responded by letter dated December 8, 2023 (ML23346A262), by reassessing the ingestion

dose using Class D and comparing the results to the intake limit for soluble uranium of 10 milligram (mg)/week, established in 10 CFR 20.1201 (e).

Assuming the maximum value for uranium concentration in the groundwater (3516 µg/L), and the ingestion of Class D uranium (soluble and a conservative choice due to the toxicity of the uranium), the licensee calculated that an individual would have to drink 2.84 liters of contaminated groundwater in a week to reach the 10 mg/week limit. A second calculation was made using the average concentration in the groundwater of 1,018 µg/L, and in this case, an individual would have to drink 9.82 liters of contaminated groundwater in a week to reach the 10 mg/week limit. Both of these consumption values are less than the 14 liters of water per week assumed to be consumed by a reference man. The calculations are not included in the RPP or the CERT letter (ML23346A262), responding to the RAI, dated October 2, 2023 (ML23251A211), but the NRC staff was able to verify the calculations, and the licensee made a commitment to provide the detailed changes to the RPP once the DP, Rev. 3, is approved. Taking into account that Appendix A to the RPP (ML22286A230), indicates that the RPP prohibits the consumption of groundwater at the site, and the licensee stated in its December 2023 response to the RAI,(ML23346A262), that engineering controls are or will be in place to limit workers' access to groundwater from the wellheads or during the treatment process, the licensee's decision to not monitor for oral ingestion also seems reasonable.

The NRC staff calculated the estimated airborne concentration of 0.002 as a fraction of the DAC for Class Y uranium. This concentration of uranium, if breathed continuously for 40 hours per week, would result in approximately 10 mrem internal dose to the worker over the course of a year. This is a very small dose compared to the threshold requiring individual occupational monitoring (500 mrem) and the annual occupational dose limit (5,000 mrem). This 10 mrem internal dose over the course of a year is also well below the individual monitoring requirements for minors and declared pregnant workers (100 mrem). Overall, there is a significant margin of error from the regulatory limits requiring individual monitoring for all categories of workers. Therefore, unless operational conditions change, the NRC staff has reasonable assurance that the licensee's air sampling program will meet the requirements of 10 CFR 20.1401 (a).

Section 10.8 of the RPP (ML22286A230), indicates that air sampling will be conducted to confirm that internal monitoring is not needed and provides details on how air sampling may be used to determine worker intakes, if necessary. This air sampling protocol determination includes the collection of general area air sampling and lapel sampling.

As stated in Section 6.6 of the RPP (ML22286A230), bioassay collection shall be performed whenever a calculated intake of 40 DAC-hours may have occurred, determined by air sampling data, or an individual may have received an intake of 10 mg/week. Other triggers for the collection of a bioassay sample or initiation of the bioassay program include accident conditions, equipment failure, external contamination, or other conditions, such as radiation worker termination. The RSO or RSO-designee is responsible for making the determination of whether bioassay sample collection is needed using the criteria provided in 10 CFR 20.1204.

Furthermore, Section 6.6 of the RPP (ML22286A230) commits the licensee to preparing and implementing procedures that include the following information, if the RSO determines that internal monitoring is needed. The procedures will consider the guidance provided in Regulatory Guide 8.9, Revision 1, "Acceptable Concepts, Models, Equations, and Assumptions," issued July 1993 (ML003739554); Regulatory Guide 8.15, Revision 1; Regulatory Guide 8.34, Revision 0, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses," issued August 2022 (ML22132A083); and Regulatory Guide 8.36, Revision 9, "Radiation Dose

to the Embryo/Fetus," issued July 1992 (ML003739548), as the application and procedures will specifically address the following topics:

- Describe how worker intakes are determined using measurements of radionuclides excreted from or retained in the body and how frequencies for bioassay measurements for baseline, periodic, special, and termination bioassays are assigned.

- Describe how conversion of radioactivity measured in the body by bioassay techniques are converted into worker intake and identify action levels for bioassay samples, actions to be taken when those levels are exceeded, and the technical basis and conversion of bioassay measurement results into worker intake and dose.

- Describe the process for determining worker intakes using concentrations of airborne radioactive materials in the workplace. Specifically, describe how are worker intakes determined by measuring the concentration of airborne materials in the workplace, how airborne concentrations are measured, and how airborne concentrations are converted to intake, action levels for intake based on dose, and actions when limits are exceeded as well as action levels for worker intakes of soluble uranium.

- Describe how worker intakes for adults, minors, and declared pregnant workers (and the associated embryo/fetus) are determined.

- Describe the process for converting these worker intakes into a committed effective dose equivalent and an organ dose equivalent.

Evaluation and Findings

The NRC staff reviewed the information in the DP, Rev. 3, for the Cimarron facility according to NUREG-1757, Section 17.3.1.3. Based on this review, the NRC staff has determined that the licensee provided sufficient information on methods to calculate the internal dose of the worker based upon measurements from air sampling and bioassay sampling (if determined by the RSO to be needed) to allow the staff to conclude that the licensee's program to determine internal exposure will comply with the regulatory requirements of 10 CFR 20.1101 (b), 10 CFR 20.1201 (a) (1) (d), and (e); 10 CFR 20.1204; and 10 CFR 20.1502 (b). This conclusion is based on the licensee using Class Y uranium ALI and DAC values for internal doses due to inhalation and other radiation safety determinations and decisions but using Class D uranium when demonstrating internal doses from ingestion and to demonstrate compliance with 10 CFR 20.1201 (e).

8.1.4 External Exposure Determination

Regulatory Requirements
Section 17.3.1.4 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1101 (b); 10 CFR 20.1201, "Occupational dose limits for adults"; 10 CFR 20.1203, "Determination of external dose from airborne radioactive material"; 10 CFR 20.1501 (a) (2) (i) and (c); 10 CFR 20.1502 (a), and 10 CFR 20.1601, "Control of access to high radiation areas," as the regulatory criteria that must be met related to the licensee's external exposure determination.

Regulatory Acceptance Criteria

The NRC staff's review verified that measures used to determine a worker's external exposure are in compliance with the requirements of 10 CFR Part 20 identified above, as well as NRC Regulatory Guide 8.4, "Personnel Monitoring Device-Direct-Reading Pocket Dosimeters"; Regulatory Guide 8.28, "Audible-Alarm Dosimeters"; and Regulatory Guide 8.34.

Staff Review and Analysis

Unless otherwise stated, the NRC reviewed the information, data, and maps submitted by the licensee in its revised DP, Rev. 3 (ML22284A150).

As stated in Section 6.1 of the RPP (ML22286A230), personnel monitoring has not been performed at the site since 2006 because there was no potential to receive a dose that would require monitoring under the requirements of 10 CFR 20.1502. During the design of the groundwater extraction and treatment services, the licensee evaluated the work activities to determine whether they could result in exposure levels that would require personnel monitoring. The threshold for occupational monitoring (500 mrem or 10 percent of the annual 5,000 mrem limit) will not be approached; therefore, monitoring of workers is not required for external or internal occupational exposure.

The licensee committed to performing both general air sampling and lapel sampling when the first three resin exchanges take place to verify that the air sampling data gathered support the decision to not monitor for external or internal dose.

Evaluation and Findings

The NRC staff reviewed the information in the DP, Rev. 3, for the Cimarron facility according to NUREG-1757, Volume 1, Revision 2, Section 17.3.1.4 (ML063000243). Based on this review, the NRC staff has determined that the licensee has provided sufficient information on the methods that will be used to measure or calculate the external dose of the worker if the RSO implements an external monitoring program, based upon measurements from air sampling. The proposed program details were sufficient to allow the NRC staff to conclude that the licensee's proposed program to determine external exposure, if implemented, will comply with 10 CFR 20.1101 (b), 10 CFR 20.1201 (c), 10 CFR 20.1203, 10 CFR 20.1501 (a) (2) (i) and (c), 10 CFR 20.1502 (a), and 10 CFR 20.1601, as well as the guidance in Regulatory Guides 8.4, 8.28, and 8.34, if or when the RSO makes the determination that an external monitoring program for occupational workers is needed.

8.1.5 Summation of Internal and External Exposures

Regulatory Requirements

Section 17.3.1.5 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1202, "Compliance with requirements for summation of external and internal doses"; 10 CFR 20.1208 (c) (1) and (2); and 10 CFR 20.2106, "Records of individual monitoring results," as the regulatory criteria that must be implemented for the summation of internal and external exposures.

Regulatory Acceptance Criteria

In addition to the regulatory requirements, guidance as detailed in Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data"; Regulatory Guide 8.34; and Regulatory Guide 8.36 should also be considered. The purpose of this review is to ensure that calculations and procedures used to sum external and internal doses satisfy the requirements of 10 CFR Part 20.

Staff Review and Analysis

As discussed in Sections 6.5 and 6.6 of the RPP, provided as Appendix M to the DP, Rev. 3 (ML22286A230), the need for internal or external monitoring is not envisioned during the planned groundwater treatment process. However, Section 6.8 of the RPP (ML22286A230), states that the licensee will prepare and implement procedures that will provide the following information for the summation of internal and external exposures, if the RSO determines that internal and external monitoring of occupational workers is needed:

- a description of how the internal and external monitoring results are used to calculate total organ dose equivalent and total effective dose equivalent doses to occupational workers
- a description of how internal doses to the embryo or fetus, which is based on the intake of an occupationally exposed, declared pregnant woman, will be determined
- a description of the monitoring of the intake of a declared pregnant woman if determined to be necessary
- a description of the program for the preparation, retention, and reporting of records for occupational radiation exposures

Evaluation and Findings

The NRC staff reviewed the information in the DP, Rev. 3, and the RPP for the Cimarron facility, according to Section 17.3.1.5 of NUREG-1757, volume 1 Revision 2 (ML063000243). Based on this review, the NRC staff has determined that the licensee has provided sufficient information on methods to measure and calculate internal and external doses of the worker based upon measurements from air sampling and bioassay sampling to allow the staff to conclude that the licensee's program to determine internal exposure will comply with 10 CFR 20.1202, 10 CFR 20.1208 (c) (1) and (2), and 10 CFR 20.1206, as well as the guidance in Regulatory Guides 8.7, 8.34, and 8.36, if the RSO determines that an internal or external monitoring program is needed.

8.1.6 Contamination Control Program

Regulatory Requirements

Section 17.3.1.6 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1501; 10 CFR 20.1702; 10 CFR 20.1906 (b) (d), and (f); and 10 CFR 20.2103, "Records of surveys," as the regulatory criteria that must be implemented for contamination control. In addition, the NRC staff should consider the information in Information Notice 97-55,

"Calculation of Surface Activity for Contaminated Equipment and Materials," dated July 23, 1997 (ML031050243); Regulatory Guide 8.21, "Health Physics Surveys for Byproduct Material at NRC -Licensed Processing and Manufacturing Plants" (ML003739577); Regulatory Guide 8.24, "Health Physics Surveys during Enriched Uranium -235 Processing and Fuel Fabrication" (ML110400305); Regulatory Guide 8.25 (ML003739616); and NUREG-1660, "Specific Schedules for Requirements for Transport of Specified Types of Radioactive Material Consignments, " issued January 1999 (ML21229A046).

Regulatory Acceptance Criteria

The NRC staff reviewed the licensee's description of its contamination control program for compliance with 10 CFR 20.1501 (a); 10 CFR 20.1702; and 10 CFR 20.1906 (b) (d), and (f), as well as the guidance in Regulatory Guides 8.21; 8.23; 8.24, Revision 1; and 8.25, and the BTP for leak testing sealed sources, by comparing it to the information to be submitted as recommended in Section 17.3.1.6 of NUREG-1757, Volume 1, Revision 2 (ML063000243).

Staff Review and Analysis

Unless otherwise specified, the NRC reviewed the information and data provided by the licensee in its revised DP, Rev.3 (ML22284A150).

Section 12 of the RPP, included as Appendix M to the DP, Rev.3 (ML22286A230), provides details on the contamination control program that will be in place at the Cimarron site during the groundwater treatment processes. The RPP stated that the purpose of a contamination control program is to prevent or minimize the spread of contamination to individuals, areas, or equipment and to prevent or minimize the possible inhalation or ingestion of radioactive material by personnel, skin doses from radioactive particulate, and the spread or buildup of radioactive material in the facility or the environment. To achieve these objectives, the licensee established actions levels that it listed in table 12-1 of the RPP. Action levels were established for alpha or beta/gamma radiation, whether fixed or removeable, and differentiated between contamination in the restricted area or the unrestricted area. Despite this segregation of areas, radiation type, and contamination type, the actions levels were established at 1,000 dpm/100 cm^2 for all categories.

As stated previously in this SER and in the licensee's DP, Rev. 3, the building surfaces have been surveyed and released for unrestricted use and the soils (surface and subsurface) have been demonstrated to meet the criteria for unrestricted release. The groundwater remediation project is not anticipated to increase the concentrations or levels of contamination found in the building surfaces or soils.

Evaluation and Findings

The NRC staff reviewed the information in the DP, Rev.3, and the RPP for the Cimarron facility according to NUREG-1757, Volume 1 Revision 2 (ML063000243) Section 17.3.1.6. Based on this review, the NRC staff has determined that the licensee has provided sufficient information on the methods that will be used to control or prevent the spread of contamination at the site during the groundwater remediation process to conclude that the licensee's program to control the spread of contamination will comply with 10 CFR 20.1501; 10 CFR 20.1702; 10 CFR 20.1906 (b) (d), and (f); and 10 CFR 20.2103.

8.1.7 Instrumentation Program

Regulatory Requirements

Section 7.3.1.7 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1501 (b) and (c) as the requirements applicable to the NRC staff review of the licensee's radiological instrumentation program. The NRC staff determined that the applicable regulation for the review of the licensee's instrumentation program is 10 CFR 20.1501 (c). This regulation contains a requirement to periodically calibrate instruments and equipment for quantitative measurements.

The NRC staff notes that it issued NUREG-1757, Volume 1, Revision 2 (ML063000243), before it revised 10 CFR 20.1501. When it issued NUREG-1757, Volume 1, Revision 2, the (now) current requirements in 10 CFR 20.1501 (b) did not exist and the (now) current requirement in 10 CFR 20.1501 (c) was identified as 10 CFR 20.1501 (b). The requirements in 10 CFR 20.1501 (c) of the previous version of 10 CFR Part 20 are not addressed in 10 CFR 20.1501 (d). SER Section 8.1.4 addresses the 10 CFR 20.1501 (d) requirements.

Staff Review and Analysis

Unless otherwise specified, the NRC reviewed the information, data, and maps provided by the licensee in its revised DP, Rev. 3 (ML22284A150). When available, information regarding instruments includes manufacturer, model number, type of probe, and a short description of the instrument.

Description of Instruments

The licensee provided a table in the RPP (ML22286A230), listing available instruments at the site for performing radiological surveys (table 7-1). The table includes the manufacturer, model number, probe type (if applicable), and a description of the instruments, including type of instrument.

General Calibration Program

The licensee stated that the calibration frequency for radiation monitoring, counting, and air sampling instruments will be in accordance with the manufacture's recommendations unless otherwise approved by the RSO. For portable radiation monitoring instruments and portable air monitoring equipment, Section 7.1 of the RPP (ML22286A230), established a frequency of at least every 12 months. Benchtop smear or sampling instrumentation will also be calibrated at least annually. An approved vendor will perform calibration of radiation protection instruments and annual calibration of air sampler flow rate indicators.

Instruments used to perform release surveys must be calibrated using a National Institute of Standards and Technology-traceable or equivalent standard for energies and geometries similar to the material being released. The energy dependence of the instruments to alpha, beta, and gamma radiation, as applicable, shall be known and documented. The staff reviewed previous inspection reports for the licensee that document the licensee's instrument calibration program was in compliance with these requirements.

Personnel trained in the use of the instrument and following approved procedures will perform operation and response testing. These tests will be performed on each day the instrument is

used. Testing and observation include (1) good physical condition (2) verification of current calibration (3) battery check (4) source check, and (5) background determination.

Routine maintenance and limited field repairs on instrumentation may only be performed by individuals authorized to do so by the RSO. Other maintenance and repairs are required to be performed by an approved vendor.

The NRC staff reviewed the last few inspection reports for the Cimarron facility (ML18060A168, ML18060A410, ML18156A478, ML18352B257, ML20233B018, and ML20233A507) that documented that the licensee's instrument calibration program was in compliance with the applicable license and regulatory requirements.

Minimum Detectable Concentration

In Section 7 of the RPP, the licensee provided the following equation for calculating the minimum detectable concentration (MDC):

$$MDA = \frac{3 + 3.29\sqrt{R_b T_s (1 + {}^{T_s}/_{T_b})}}{(E \times T_s) \times (\frac{P_A}{100})}$$

Where:

R_b is background count rate (counts/minute)
T_s is sample count time (minutes)
T_b is background count time (minutes)
E is instrument efficiency (counts/disintegration)
P_A is the probe area(cm^2)

The licensee stated that the equation above is essentially equivalent to equation 3-11 of NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," issued August 2020. The surface efficiency is taken into account in determining the instrument efficiency. The following surface efficiency factors are used to develop the instrument efficiency: alpha emitters (0.25); beta emitters (0.3), and gamma emitters (1.0). This equation is applicable to static measurements but not appropriate for a scanning MDC. Scanning MDC values for beta emitters and alpha emitters in Section 7.0 of the RPP were taken, respectively, from Section 6.2.4.1 in NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys," issued June 1998, and Equation 6.14 in the draft of NUREG-1575, Revision 2, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)."

Evaluation and Findings

The NRC determined that the MDC equation is equivalent to equation 3-11 of NUREG-1507 because, even though the NUREG uses *Ts+b* and the equation above uses *Ts*, both annotations represent the counting time for the sample. The NUREG-1507 equation 3-11 also uses *K* in the denominator, but *K*, the proportionality constant, is equivalent to instrument efficiency *E* and probe area so the equation is consistent with the one used in the NUREG. The NRC staff also found that the alpha scan rate formula is from a draft revision to a NUREG that is

specifically marked as “do not cite or quote” and is, therefore, not appropriate for use by the licensee at this time.

These concerns were discussed with the licensee, which committed to making the following changes to the RPP to address these issues:

- The licensee made a commitment to the NRC during the review and approval of Revision 2 to the DP that scan surveys will only be used to identify the location of the maximum total surface contamination, and static measurements and removeable smears taken in the areas of elevated surface concentrations will be used to demonstrate compliance with the limits for releasing materials and equipment. The licensee will revise the RPP to reflect this commitment regarding the use of scan surveys.

- The licensee will replace the formula for alpha scan rate with equation 6.10 from NUREG-1507 instead of equation 6.14 from NUREG-1575, Volume 2, since the latter is a draft document. The licensee is authorized under LC 27 (e) of the radioactive material license to revise this commitment to the formula in NUREG-1757, Volume 2, Revision 2, when that draft document is published final, as the equations are equivalent. The change should be documented in accordance with the requirements of the LC.

- The licensee will revise the example calculation for surface efficiency of beta emitters shown on pages 7–8 of the RPP to show a surface efficiency of 0.3 rather than 0.5 to demonstrate consistency with the note on page 7-6, which states that the scan MDC for beta emitters is 0.3. These commitments allow the instrumentation program to be consistent with NRC regulations and guidance.

$$MDC\left(\frac{\mu Ci}{mL}\right) = \frac{\frac{3}{T_s} + 3.29\sqrt{\frac{R_b}{T_s} + \frac{R_b}{T_b}}}{EVC}$$

Where:

R_b is background count rate (counts/minute)
T_s is sample count time (minutes)
T_b is background count time (minutes)
E is instrument efficiency (counts/disintegration)
V is volume of air of air sampled (mL)
C is conversion of µCi to dpm (i.e., 2.22E+06)

With these proposed changes, the NRC staff has reasonable assurance that the instrumentation program for the detection of radioactive contaminants during and after groundwater remediation will be in compliance with the requirements of 10 CFR 20.1501 (b) and (c).

8.2 Nuclear Criticality Safety

Regulatory Requirements

Section 17.3.2 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identified 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," and 10 CFR Part 76, "Certification of Gaseous Diffusion Plants," as the regulations that address nuclear criticality safety.

Regulatory Acceptance Criteria

Section 17.3.2.4 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies the guidance in Regulatory Guide 3.71, "Nuclear Criticality Safety Standards for Nuclear Materials Outside Reactor Cores," and endorsed the standards of American National Standards Institute/American Nuclear Society Series 8 as information to be considered during the staff analysis.

Staff Review and Analysis

Cimarron Decommissioning Plan—Nuclear Criticality Safety

The CERT decommissioning site formerly produced uranium and MOX fuel on an 800-ac plot of land close to Crescent, Oklahoma, on the banks of the Cimarron River. Efforts to decommission materials, equipment, buildings, structures, and surface and subsurface soil are ongoing. To treat the contaminated water on the site, CERT has proposed a plan to extract uranium from groundwater through a resin filtering system. As the groundwater is filtered, the uranium concentration within the resin will rise, posing a potential criticality hazard if uranium concentration within the resin exceeds that of a limiting critical mixture density. Currently the site is licensed under SNM-928, which authorizes the possession of 1,200 grams (g) U-235 within any compound containing uranium enriched to less than or equal to 5 wt. % U-235 and 10 g of U-235 within any compound containing uranium enriched to greater than 5 wt. %. The requested activities will be conducted within two processing locations and operated under limitations on uranium concentration to ensure subcriticality of operations. Packaged waste will not contain concentrations greater than 1 g of U-235 per 2,000 g of non-fissionable material to maintain fissile exempt status.

Description of Normal and Credible Abnormal Conditions

The decontamination process involves first extracting water from subsurface aquifers before being transferred to one of two treatment facilities. The water is treated by flowing across a hydrocarbon-based IX resin (DOWEX 1), extracting the uranium contained within the water into a resin. After treatment, the adsorbed uranium and resin compound is mixed with a drying agent and stored.

The licensee performed an analysis to provide assurance of subcriticality for all credible criticality hazards associated with the requested activities. The licensee's analysis described five potential bounding upset conditions for the groundwater extraction and process operations:

(1) major resin spill

(2) major groundwater spill

(3) equipment rearranged to consolidate all within one building, including waste containers from storage location

(4) external event, such as earthquake or high winds, disrupting building integrity and process equipment integrity and location

(5) operational errors during the operation of the process equipment such as misaligned valves

The licensee performed a set of nuclear criticality safety calculations using Monte Carlo N-Particle Transport Code. The calculations used a 7 ft tall rectangular prism with a homogenized resin-UO_2 mixture and a 1 ft thick water reflector above and below the slab. The model used reflective boundary conditions along the rectangular prism to simulate an infinite slab. The fissionable material concentration within the slab was varied from 1 to 10 g of U-235 per kg of resin with modeling assumptions on hydrogen-to-carbon (H/C) ratio, presence of groundwater or lack thereof, resin density, and uranium adsorption.

Hydrogen-to-Carbon Ratio. The resin was assumed to be composed of carbon and hydrogen with an atomic ratio of 1.0. DOWEX 1 IX resin is a copolymer of styrene and divinylbenzene that contains an acid group to facilitate the IX. The molecular formula is $C_{29}H_{34}CIN$, which has a hydrogen/carbon ratio of 1.18. The licensee stated that the resin-UO_2 mixture is over moderated under all credible conditions, meaning that an assumption of a hydrogen/carbon ratio of 1.0 would be conservative. Additionally, the licensee assumed a dry configuration with no additional Monte Carlo N-Particle application with the ENDF/B-VII.1 continuous energy cross-section library. The staff analyzed a system with the same geometry, a resin density of 1.1 g/cm^3, and a uranium enrichment of 7.33 percent U-235. The H/C ratio was varied to evaluate the response in k_{eff} to changes in moderation. The results are shown in figure 8-1, groundwater present. To evaluate whether these assumptions were appropriate, the NRC staff verified that the system would be over moderated under normal and credible abnormal conditions through an independent analysis using the SCALE 6.2.4/KENO-VI.

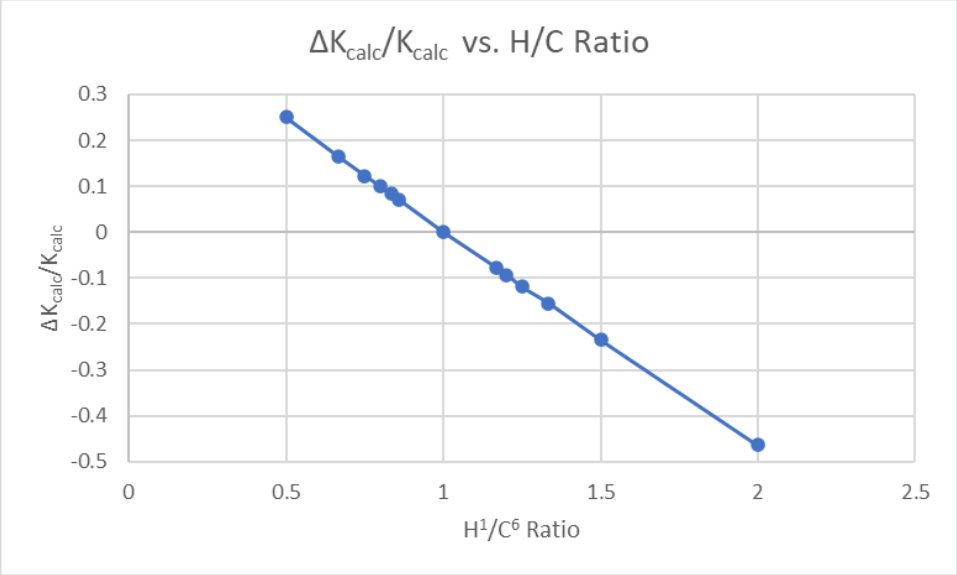


Figure 8-1 $\Delta k_{calc}/k_{calc}$ vs. H/C ratio for infinite slab system

The staff determined that the reactivity of the system decreases as a function of increasing H/C ratio, confirming over moderation, and that any and all credible moderation upsets would result in a decrease in reactivity. Therefore, the staff determined that the licensee's assumption of no additional groundwater and an H/C ratio of 1.0 would be conservative.

Resin Density. The licensee's analysis assumed a theoretical resin density of 1.1 g/cm^3 with a 70 percent packing fraction. According to manufacturer specifications, DOWEX has a range of densities between 1.05 and 1.2 g/cm^3 depending on the specific resin used. During its scoping studies, the licensee found that the DOWEX resin with the most favorable characteristics for uranium extraction has the density of 1.1 g/cm^3. The staff performed a set of scoping calculations and determined that a resin density of 1.05 g/cm^3 would represent the most reactive credible resin density; however, the staff confirmed through independent analysis that the system would be substantially subcritical ($k_{calc} + 3\sigma << 0.95$) under normal and credible abnormal conditions even under the assumption of 1.05 g/cm^3.

Uranium Adsorption. The licensee used experiments to determine the amount of uranium adsorption on the DOWEX resin (ML19095B790). The experiments used water solutions comparable (ML19095B790) to that found in the wells on the Cimarron site. The DOWEX resin with the greatest uranium loading capacity was determined to be DOWEX1, with an extrapolated maximum capacity of roughly 200 g uranium per kg resin, which corresponds to 14.22 g U-235 per kg resin for a 7.11 wt. % U-235 system. The maximum loading is dependent upon the concentration of uranium within the influent. The 200 g uranium per kg value was determined with a µg/L influent concentration of approximately 4,500 µg/L, whereas the influent U-235 per kg resin well at the Cimarron site has a uranium concentration of 4,841 µg/L at a 95 percent UCL. The highest uranium enrichment found through a historical study of the site has a 95 percent UCL of 5.5% wt. % U-235; however, this well has a 95 percent UCL influent concentration of 593 µg/L. This is significantly less than the uranium concentration necessary to obtain the 200 g uranium per kg resin value, keeping the concentration below 8 g U-235 per kg resin. The staff reviewed the loading and enrichment studies and determined that the licensee's assumptions regarding uranium adsorption were acceptable.

The licensee's analysis determined that a uranium concentration of 8 g U-235 per kg resin would be required to exceed a k_{eff} of 0.90 ($k_{calc} + 3\sigma_{calc} = 0.90127$). Although not necessary, as the requested activities do not present any credible criticality hazards, the licensee imposed operational restrictions to limit uranium concentration to 8 g U-235 per kg resin or less.

The staff reviewed the licensee's analysis and determined that the normal and credible abnormal conditions associated with the requested activities are bounded by the licensee's analysis. The staff determined that all credible upset conditions involving changes in fissionable material geometry would represent a less reactive system than that evaluated in the licensee's analysis. For upset conditions involving changes in uranium concentration, the staff determined that all credible abnormal conditions would result in a loss of uranium on the resin material, decreasing U-235 concentration and moving the system further from criticality. The licensee analyzed uranium concentration accident scenarios in which all the influent groundwater is sourced from a single well with the highest uranium concentration. Using historical uranium

concentration data from each area, the highest uranium content well was chosen, along with an added 2σ uncertainty to increase the conservative bounds. The following train number, well number, and maximum influent uranium concentration were considered:

- Train 1, Well MWWA-03: 593 (µg/L)
- Train 2, Well T-63: 139 (µg/L)
- Train 3, Well TMW-13: 4,841 (µg/L)

Using enrichment data from these wells and the loading capacity of the resin, the maximum U-235 loading was calculated to be 3.4 g of U-235 per kg of resin for train 3. This loading is within the bounds given by the licensee's criticality analysis, showing that, under all credible abnormal conditions, there is no credible criticality risk for this type of concentration upset.

10 CFR 70.24 Exemption

The licensee currently has an exemption from the requirements of 10 CFR 70.24, "Criticality accident requirements" (LC 19). Given the decision that no credible criticality hazards associated with the requested activities exist, the staff determined that the licensee's existing exemption from the requirements of 10 CFR 70.24 is not affected by the licensee's request and remains valid and acceptable.

Evaluation and Findings

The NRC staff reviewed the licensee's application and criticality safety analysis. The staff determined that the requested activities do not present any credible criticality hazards. Furthermore, the licensee has committed to imposing operational limits on uranium concentration, providing additional assurance that the requested activities will be subcritical under normal and credible abnormal conditions. Based on the review discussed in this report, the NRC staff concluded that the licensee's request provides reasonable assurance of subcriticality under normal and credible abnormal conditions, provides reasonable assurance of adequate protection against the risk of criticality accidents, and otherwise satisfies the applicable requirements of 10 CFR Part 70. The NRC staff concluded that the licensee's existing exemption from the requirements of 10 CFR 70.24 is not affected by the licensee's request and, therefore, remains valid and acceptable.

8.3 Health Physics Audits and Recordkeeping Program

Regulatory Requirements

Section 17.3.3 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1101, "Radiation protection programs," and 10 CFR 20.2102, "Records of radiation protection programs," as the regulatory requirements applicable to the NRC staff's review of the licensee's proposed audit, internal inspection, and recordkeeping procedures. The NRC staff determined that the applicable regulations for reviewing the proposed licensee's audit, internal inspection, and recordkeeping procedures are 10 CFR 20.1101 (c) and 10 CFR 20.2102. These regulations contain requirements for a licensee to periodically review (at least annually) the radiation protection program content and implementation and maintain records associated with the RPP. In this section, NRC staff evaluates whether the licensee has demonstrated that its

proposed audit, internal inspection, and recordkeeping procedures comply with these requirements in regard to groundwater remediation.

Regulatory Acceptance Criteria

The staff reviewed the licensee's description of its proposed audit, internal inspection, and recordkeeping procedures for compliance with 10 CFR 20.1101 and 10 CFR 20.2102 by comparing the information submitted to the information recommended for submittal in Section 17.3.3 of NUREG-1757, Volume 1, Revision 2 (ML063000243). SER Section 9 discusses management participation and oversight associated with the ALARA committee and audit program.

Staff Review and Analysis

The RPP, Revision 5, provided as Appendix M to the DP, Rev. 3 (ML22286A230), details the audit and recordkeeping program for Cimarron. The licensee committed to conducting radiation safety audits of the program annually, as required by 10 CFR 20.1101 (c). Section 5.2 of the RPP includes the audit and recordkeeping requirements but specifies that the audit will be conducted using a checklist like the one in Appendix H to NUREG-1556, "Consolidated Guidance about Materials Licenses," Volume 7, "Specific Guidance about Academic, Research and Development, and Other Licenses of Limited Scope, including Electron Capture Devices and X-Ray Fluorescence Analyzers," issued February 2018. Appendix H to Volume 7 of NUREG-1556 is not an audit checklist but rather provides details on animal protocols for veterinary medicine. Appendix H to Volume 1, Revision 1, of NUREG-1556, Volume 7 is a radiation protection audit checklist but is not the best fit for reviewing the radiation protection program for a proposed groundwater remediation project, as it does not address the requirements of 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," financial assurance, environmental monitoring, waste management, and effluent monitoring. As a result, the use of the referenced checklist was part of the RAIs submitted to the licensee in a letter dated October 2, 2023, and discussed with the licensee in a meeting on October 16, 2023. At this meeting, the licensee committed to using the audit checklist from NUREG-1556, Volume 17, "Program-Specific Guidance About Special Nuclear Material of Less than Critical Mass Licenses-Final Report," issued July 2018 (ML18190A207), Appendix E, for the performance of audits rather than the Appendix H audit checklist from NUREG-1556, Volume 7. The Appendix E audit checklist in NUREG-1556, Volume -17, includes the information in the Appendix H checklist in Volume 7, as well as additional items for criticality safety and licensed material security. Furthermore, in the written response to the October 2, 2023, RAI (ML23346A262), dated December 8, 2023 (ML23346A262), the licensee committed to revising the DP, Rev. 3, and the RPP to reflect the use of the audit checklist in Appendix E to Volume 17 of NUREG-1556.

Evaluation and Findings

Based on this review, the NRC staff has determined that the licensee has provided sufficient information to allow the agency to evaluate the executive management and RSO audit and recordkeeping program to determine whether decommissioning can be conducted safely and in accordance with NRC requirements.

9. Environmental Monitoring and Control Program

9.1 Environmental ALARA Evaluation Program

Regulatory Requirements

Section 17.4.1 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1101 (b) and (d) as the regulatory criteria that must be implemented to ensure the licensee has a program adequate to demonstrate compliance with the requirements in 10 CFR Part 20 to maintain releases of radioactive material to the environment at ALARA levels. In addition, this section of NUREG-1757, Volume 1, Revision 2, identifies Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," and Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors," for consideration when evaluating the program.

Regulatory Acceptance Criteria

The NRC staff reviewed the application to verify that the licensee's program for management of radioactive materials released to the environment complies with the NRC requirements in 10 CFR Part 20 and uses appropriate methods and procedures based on recognized guidance documents. The NRC staff's review also looks to see if the program includes a commitment to conducting annual reviews of the environmental radiation protection program, including trend analysis, evaluation of monitoring data, and a determination of whether operational changes need to be made to achieve ALARA effluent goals, as well as reporting requirements associated with the annual review.

Staff Review and Analysis

The licensee was required to establish an ALARA committee under LC 27 to SMN-928. The NRC added this LC to the license as part of Amendment 15, dated August 20, 1999.

Under LC 27.e., the composition of the ALARA committee is at least a minimum of three individuals: (1) one member with management expertise who has managerial and financial responsibilities associated with the decommissioning of the site (2) one member with decommissioning expertise, who has responsibility for the decommissioning program at the site, and (3) the RSO who is responsible for ensuring compliance with the radiological and environmental requirements for decommissioning the site. The ALARA committee is authorized to make certain changes to the NRC-approved DP and RPP without NRC approval, provided that these changes (1) are consistent with the ALARA principle and decommissioning process (2) do not conflict with the requirements specifically stated in the license or impair the licensee's ability to meet all applicable NRC requirements (3) do not result in a degradation of safety of the environmental commitments addressed in the NRC-approved DP or RPP or have a significant adverse effect on the quality of work, the remediation objective, or health and safety, and (4) are consistent with the conclusions of actions analyzed in the July 29,1999, EA (ML092680912) and the August 20, 1999, SER (ML092680911). The NRC staff reviewed recent inspection reports for the Cimarron facility (s ML18060A168, ML18060A410, ML18156A478, ML18352B257, ML20233B018, and ML20233A507). The NRC staff found nothing in these reports regarding the ALARA committee that represented a significant change to the NRC-approved DP or RPP.

However, a review of the requirements of LC 26 and LC 27 identified a conflict between these two LCs, as LC 26 ties the licensee to a specific version of the RPP, whereas LC 27 allows

changes to the RPP as long as the change does not conflict with the criteria discussed previously in this section. The 1999 SER and EA tied to the license in LC 27 commit the licensee to using environmental air sampling and thermoluminescent dosimeters to monitor releases of particulate radioactive materials and direct gamma radiation, respectively. The staff compared Revision 5 to the RPP, submitted as Appendix M to the DP, Rev. 3 (ML22286A230), and revisions tied down in LC 26 and the 1999 EA and SER tied down in LC 27. It conducted this review to verify that the modifications made to the RPP did not require a license amendment. Based on this review, the NRC staff determined that changes made to the environmental program were appropriate for the site as it moved through the various stages of decommissioning and, therefore, were acceptable and appropriate changes to the environmental monitoring program. As part of the review and approval of this DP, edits will be made to the license to eliminate this potential conflict; specifically, LC 26 and condition 2.c. in LC 27.e. will be removed from the radioactive material license.

Evaluation and Findings

The NRC staff reviewed the information in the DP, Rev. 3, and the RPP, according to NUREG-1757, Volume 1, Revision 2, Section 17.3.1.6. Based on this review, the NRC staff has determined that the licensee has provided sufficient information on the methods that will be used to control or prevent the spread of contamination at the site during the groundwater remediation process to conclude that the program to control the spread of contamination will comply with 10 CFR 20.1501; 10 CFR 20.1702; 10 CFR 20.1906 (b) (d), and (f); and 10 CFR 20.2103

.

9.2 Effluent Monitoring Regulatory Requirements

NUREG-1757, Volume 1, Revision 2 (ML063000243), identifies 10 CFR 20.1301 (a) and (d); 10 CFR 20.1302 (a) and (b); 10 CFR 20.1501; 10 CFR 20.2001 (a); 10 CFR 20.2003 (a); 10 CFR 20.2103 (b); 10 CFR 20.2107 (a); 10 CFR 20.2202 (a); 10 CFR 20.2203 (a); and 10 CFR 70.59, “Effluent monitoring reporting requirements,” as the regulatory requirements applicable to the NRC staff’s review of the effluent monitoring and control program.

Staff Review and Analysis

The current version of the RPP, provided as Appendix M to the DP, Rev. 3 (ML22286A230), indicates that the licensee will perform environmental monitoring at various locations to monitor the migration of licensed material from former (now decommissioned) sources through environmental media. While not specifically stated in the RPP, it is expected, based on past practices at the site, that the licensee will use the flexibilities provided in LC 27 (e) to modify the effluent monitoring and control program as the site transitions through the stages of groundwater remediation. Changes to the program under LC 27 (e) must be documented, and it is anticipated that these documents will be reviewed as part of the routine annual site inspections.

Final surveys have demonstrated that buildings and soils have been decommissioned. Licensed material exceeds decommissioning criteria in groundwater in three areas: BA1, WUA, and WAA. In Section 15.1 of the RPP, the licensee committed to maintaining an environmental monitoring program in these three areas until superseded by a groundwater remediation work plan.

Effluent from the groundwater treatment process will be monitored to demonstrate that the concentrations of uranium comply with ODEQ discharge permit limits and underground injection permits. Monitoring will be performed in accordance with permit requirements and the sampling and analysis plan. The sampling and analysis plan establishes procedures for the collection, evaluation, and analysis of samples. The DP, Rev. 3, committed the licensee to having a radiation protection procedure that will address how background and baseline concentrations of radionuclides in effluents are established through appropriate sampling and analysis. The procedure will include the following information:

- a description of known or expected concentrations of radionuclides in effluents
- a description of the physical and chemical characteristics of radionuclides in effluents
- a summary or diagram of all effluent locations
- justification that samples are representative of actual releases
- a summary of the sample collection and analysis procedures, including the minimum detectable concentrations of radionuclides
- a summary of sample collection frequencies
- a description of effluent release monitoring recording and reporting procedures

The DP, Rev. 3, indicated that the licensee does not consider leaks or unintended releases of effluent from the tanks to constitute a contamination control concern. Direct radiation from groundwater processing operations is monitored in the vicinity of the WATF and BARF, as discussed in Section 15.3 of DP, Rev. 3 (ML22284A150).

Evaluation and Findings.

The NRC staff reviewed the information in DP, Rev. 3, and the RPP for the Cimarron facility according to Section 17.4 of NUREG-1757, Volume 1, Revision 2 (ML063000243). Based on this review, the NRC staff has determined that the licensee has provided sufficient information on the environmental monitoring to be conducted during the groundwater remediation process to conclude that the program to monitor for potential releases of radioactive material as the result of operating the groundwater remediation equipment will comply with 10 CFR 20.1301 (a) and (d), 10 CFR 20.1302 (a) and (b), 10 CFR 20.1501, 10 CFR 20.2001 (a), 10 CFR 20.2003 (a), 10 CFR 20.2103 (b), 10 CFR 20.2107 (a), 10 CFR 20.2202 (a), 10 CFR 20.2203 (a), and 10 CFR 70.59.

10. Radioactive Waste Management Program

Regulatory Requirements

Section 17.5 of NUREG-1757, Volume 1, Revision 2 (ML063000243), identified 10 CFR Part 20 as the requirement related to radioactive waste. The NRC staff determined that specific sections of the requirements of Subpart K, “Waste Disposal” (10 CFR 20.2001; 10 CFR 20.2002, “Method for obtaining approval of proposed disposal procedures”; 10 CFR 20.2006, “Transfer for disposal and manifests”; 10 CFR 20.2007, “Compliance with environmental and health protection regulations”; and 10 CFR 20.2008, “Disposal of certain byproduct material”), are

applicable to the radioactive waste management program for this site. Regulations in 10 CFR 20.2003, “Disposal by release into sanitary sewerage”; 10 CFR 20.2004, “Treatment or disposal by incineration”; and 10 CFR 20.2005, “Disposal of specific wastes [as nonradioactive],” do not apply to the licensee’s radioactive waste program, as wastes that cannot be treated or decontaminated to levels allowing release without restriction will be shipped off site as LLRW. Regulations in 10 CFR Part 20, Appendix G, “Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests,” are applicable to the licensee’s DP.

Regulatory Acceptance Criteria

The staff reviewed the information provided by the licensee to verify the following information:

- controls that will be used to minimize releases of radioactive material to the environment
- action levels and description of actions to be taken if a limit is exceeded
- description of the leak detection systems for ponds, lagoons, and tanks
- procedure(s) that will be in place to ensure releases are controlled and maintained to meet the requirements of 10 CFR Part 20
- summary of estimates for public dose from effluents
- description of the method that will be used to determine public dose

Staff Review and Analysis

10.1 Solid Radioactive Waste

In Section 13.1 of the DP, Rev. 3 (ML22284A150), the licensee indicated that two categories of solid radioactive waste are expected to be generated by the groundwater treatment processes: (1) spent anion resin and (2) contaminated materials, equipment, and other waste generated during the construction, use, maintenance, surveillance, repair, or decommissioning of the systems.

Resin Waste

Each resin vessel is expected to hold approximately 750 kg of resin, and no resin vessel is expected to accumulate greater than 450 g of U-235. Spent resin will be blended with a non-fissile material (inorganic absorbent) at a ratio of 1 g of U-235to 2 kg of absorbent, using a ribbon blender to create a uniform distribution of SNM in the mixture. The blended waste will then be packaged in 55-gallon drums or other suitable containers for storage and, ultimately, shipment off site as Class A, fissile exempt LLRW. Drums will be sampled to determine homogeneity of the SNM across the mixture. Appendix N to the DP, Rev. 3, contains an analysis of the potential for criticality during transportation and disposal. The analysis indicates criticality during storage or transportation is unlikely. Resin wastes will be stored four drums to a pallet (strapped together) in the WATF until sufficient inventory has accumulated to make a full consignment, at which point the resin waste drums will be shipped to Waste Control Specialists (Texas) or Energy Solutions (Utah) for disposal.

Other Waste Generated during Groundwater Treatment Processes

Other sections of the DP, Rev. 3 (ML22284A150), and this SER discuss the surveys that will be performed for materials, equipment, and soils that are removed from the systems or excavated during the groundwater treatment processes during construction, operations, or decommissioning. After surveys are performed, any soil, personal protective equipment, materials, or equipment that cannot be released for unrestricted use or disposal will be drummed, stored, and shipped off site as LLRW. This includes two drums that are currently on-site and stored in the CERT office building. These waste drums will also be stored on pallets in the WATF. The combined waste (e.g., soils, materials, equipment) is not expected to make up more than 15 percent of the total waste volume generated during the construction, operations, and decommissioning of the groundwater treatment system.

10.2 Liquid Radioactive Waste

The licensee stated, in Section 13.2 of the DP, Rev. 3, that no liquid radioactive waste will be generated during groundwater treatment efforts on-site, as the concentrations of radioactive materials in all liquid effluent will be below the NRC effluent limits listed in 10 CFR Part 20, Appendix B, “Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage.” Effluent from groundwater treatment will either be injected into impacted areas in accordance with Oklahoma’s underground injection control program or discharged to the Cimarron River in accordance with an OPDES permit.

10.3 Mixed Waste

In DP Section 13.3, the licensee indicated that, since there are no hazardous constituents in the groundwater, and pH adjustment (for uranium treatment) will not result in the generation of hazardous waste, no mixed waste will be generated during the groundwater treatment processes.

Evaluation and Findings

The NRC staff determined that the licensee described the planned disposition of waste at the Cimarron facility in sufficient detail to allow the staff to evaluate the potential safety issues associated with waste processing, packaging, transportation, and disposal. Therefore, the NRC staff concluded that the licensee’s described waste management program is sufficient to provide reasonable assurance that the licensee will address the requirements of 10 CFR 20.2001, 10 CFR 20.2002, 10 CFR 20.2006, 10 CFR 20.2007, and 10 CFR 20,2008, as applicable to the radioactive waste management program for this site.

11. Quality Assurance Program

Regulatory Requirements

10 CFR 70.22 (f) and 10 CFR 70.38 (g) (4) (ii)

Regulatory Requirements Guidance

NUREG-1757, Volume 1, Revision 2 (ML063000243); specifically, Section 17.6

NRC Regulatory Guide 4.15, Revision 2, "Quality Assurance for Radiological Monitoring Programs (Inception Through Normal Operations to License Termination)—Effluent Streams and the Environment," issued July 2007 (ML071790506)

Licensee Quality Assurance Program

The quality assurance project plan establishes a quality assurance program meeting the applicable requirements of the following:

- NUREG-1757, Vol.1, Rev.2 (ML063000243)
- NRC Regulatory Guide 4.15 (ML071790506)

Evaluation and Findings

The NRC staff has reviewed the quality assurance program for the Cimarron site according to Section 17.6 of NUREG-1757, Volume 1, Revision 2 (ML063000243). Additionally, the licensee's program commits to using NRC Regulatory Guide 4.15 (ML071790506).

Based on this review, as well as on discussions of the quality assurance program in SER chapter 6 and chapter 12, the NRC staff finds that the licensee's commitments to its quality assurance program are of sufficient quality to allow the agency to determine that the planned decommissioning activities can be conducted in accordance with its Quality Assurance program and will meet the guidance in NUREG-1757,Vol. 1, Rev.2, and the NRC Regulatory Guide 4.15. In addition to Annual Inspections, the NRC will continue attending the monthly status meetings with the licensees to confirm that the QA program is implemented as written and is effective and the licensee will address deficiencies if they are identified during the design, construction, operation, and termination of the groundwater treatment activities.

12. Facility Radiation Surveys

Regulatory Requirements

10 CFR 20.1402, “Radiological criteria for unrestricted use”;10 CFR 20.1403, “Criteria for license termination under restricted conditions”;10 CFR 20.1501, and 10 CFR 70.38, “Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas”

Staff Review and Analysis

12.1 Release Criteria

Regulatory Acceptance Criteria

LC 27 of SNM-928 stipulates the criteria for unrestricted release for all impacted media at the site:

- Unrestricted release criteria for surface and subsurface soils are 10 pCi/g for natural thorium and natural uranium, 30 pCi/g for enriched uranium, and 35 pCi/g for depleted uranium.

- Unrestricted release criteria for groundwater are 180 pCi/L of total uranium.

12.2 Characterization Surveys

In Section 3.3 of the DP, Rev. 3 (ML22284A150), the licensee provided information on both surface and subsurface soil and residual material, such as concrete slabs used for erosion control, that have been demonstrated to comply with the NRC release for unrestricted use criteria in all subareas. The licensee maintained that further characterization of surface and subsurface soil is no longer needed. Concrete rubble in areas F, G, and J has been surveyed and approved for unrestricted release by the NRC. Impoundments and lagoons were formerly located in subareas H, L, M, and O. These were excavated, and the residual soils were surveyed for release. The NRC has released all subareas except for F, G, and N from SNM-928. No additional characterization surveys are planned.

12.3 Remedial Action Support Surveys

During groundwater remediation activities, five types of in-process surveys will be performed at the site:

(1) Groundwater sampling and offsite laboratory analysis will be performed to monitor progress in reducing the concentration of uranium in groundwater and to demonstrate compliance with the NRC criterion once it has been reached.

(2) Influent and effluent sampling and offsite laboratory analysis will be performed to monitor the estimated quantity of uranium retained in the IX resin beds.

(3) Packages of spent resin and potentially contaminated material will be surveyed before shipment for disposal.

(4) Surveys will be performed to release materials and equipment from radiologically restricted areas.

(5) Routine surveys of unrestricted areas will be performed to identify any areas that may become contaminated, or to demonstrate that unrestricted areas are not impacted above unrestricted release criteria.

12.4 Final Status Survey Design

Under LC 27.c., the licensee is committed to conducting an FSS in accordance with the requirements of NUREG/CR-5849 (ML090640319). In Section 15.4 of the DP, Rev. 3 (ML22284A150), the licensee described the FSSP that it intends to submit to the NRC within the first year of post-remediation.

The licensee intends to remove all processing equipment from the site, leaving only the WATF, the outside slab around the WATF, and the slab for the BARF, and transfer these slabs and the WATF to a future owner of the site. To accomplish this, the licensee has made four decisions regarding the FSSP:

(1) Surveys already conducted by the licensee, the NRC, or NRC contractors have already demonstrated that the site meets the NRC criterion for free release. Therefore, only the areas that have the potential to be contaminated as a result of groundwater treatment activities would require surveys to verify that NRC criteria are met.

(2) Unaffected areas that were part of a routine periodic survey program to identify contamination, such as breakrooms, bathrooms, conference rooms, and offices, are not required to be surveyed to demonstrate NRC criteria were met, as the periodic data should support their release.

(3) Affected areas can be released based on exposure rate measurement and direct and removeable surface contamination surveys.

(4) Some areas do not require a survey, as they did not contact contaminated materials. These include land surfaces, monitoring wells, extraction trenches, injection trenches, injections wells and piping, utilities, and instrument control cables.

The licensee identified the following areas defined in NUREG/CR-5849 (ML090640319) as affected areas:

- concrete foundations for influent tanks and pumps
- floor and bottom 2 m of east, south, and west walls of the IX and spend resin area
- floor and bottom 2 m of east and south walls of the LLRW storage area
- instrument room

12.5 Final Status Survey Report

After submitting the FSSP to NRC, the licensee will perform surveys and prepare a report summarizing the survey results. The report will be submitted to both agencies and will inform

the activities necessary to support license termination in accordance with the requirements of NUREG/CR-5849 (ML090640319).

Evaluation and Findings

The FSSP will document how the licensee will show, at a future date and time, that it has met the objectives of the active groundwater remediation system (i.e., the groundwater release criteria in LC 27.b. of its license of 180 pCi/L total uranium), that operations are complete, and that the licensee has accomplished the decommissioning of the remaining licensed Cimarron facility licensed controlled areas. A more detailed review of the FSSP is not appropriate at this stage because the FSSP will be informed by activities and information gained during the groundwater remediation phase of the decontamination and decommissioning plan, and it will be updated at the completion of the groundwater remediation phase. Based on the licensee's commitments to develop the FSSP in a phased manner that ensures the license termination will be performed in accordance with the requirements of NUREG/CR-5849, the staff finds this sufficient at this decommissioning phase related to the groundwater remediations activities.

13. Financial Assurance

13.1 Regulatory Evaluation

With respect to the NRC's decommissioning planning and financial assurance requirements, 10 CFR 70.25 (e) (1) states, in part, the following:

> Each decommissioning funding plan must be submitted for review and approval and must contain (i) A detailed cost estimate…; (ii) Identification of and justification for using the key assumptions contained in the DCE; (iii) A description of the method of assuring funds for decommissioning… (iv) A certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning; and (v) A signed original or, if permitted, a copy, of the financial instrument obtained to satisfy the requirements of paragraph (f)….

Further, 10 CFR 70.25 (e) (1) (i) states the cost estimate must contain the following:

> A detailed cost estimate for decommissioning, in an amount reflecting: (A) The cost of an independent contractor to perform all decommissioning activities; (B) The cost of meeting the 10 CFR 20.1402 criteria for unrestricted use, provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of 10 CFR 20.1403, the cost estimate may be based on meeting the 10 CFR 20.1403 criteria; (C) The volume of onsite subsurface material containing residual radioactivity that will require remediation; and (D) An adequate contingency factor.

13.2 NRC Guidance

With respect to Section 4.1 of NUREG-1757, Volume 3, Revision 1 "Financial Assurance, Recordkeeping, and Timeliness," issued February 2012 (ML12048A683), the purpose of the review is to ensure that the licensee or responsible party has developed a cost estimate for decommissioning the facility based on documented and reasonable assumptions and that the

estimated cost is sufficient to allow an independent third party to assume responsibility for decommissioning the facility if the licensee or responsible party is unable to complete the decommissioning. In addition, if the licensee or responsible party intends to request license termination under restricted conditions, the cost estimate must be sufficient to allow an independent third party to assume responsibility for all necessary control and maintenance activities at the site.

With respect to Section 4.3 of NUREG-1757, Volume 3, Revision 1 (ML12048A683), the purpose of the review is to ensure that sufficient funds will be available to carry out all required decommissioning activities before license termination and, if the license is being terminated under restricted conditions, to enable an independent third party to assume and carry out responsibilities for any necessary control and maintenance of the site.

13.3 Decommissioning Funding Plan

By letter dated October 7, 2022 (ML22284A145), EPM submitted the DP, Rev. 3, that included a cost estimate to complete decommissioning the site. The cash flow analysis conducted by EPM determined that there were insufficient funds to complete decommissioning and terminate the license. By letter dated April 18, 2023 (ML23109A143), EPM requested a fee exemption from the NRC to preserve funds for decommissioning the site. By letter dated June 23, 2023 (ML23151A681), the NRC granted the fee exemption. As a result, EPM revised the cash flow analysis for DP, Rev. 3, by letter dated April 24, 2024 (ML24116A171). By letter dated May 31, 2024 (ML24156A067), EPM submitted a revised cash flow analysis to correct the Total Annual Costs in table 16-5a.

According to the licensee, the updated DCE presented in the DP, Rev. 3, assumes that the 2022 cost estimates for work proposed in the DP, Rev. 3 (with escalation), are still appropriate. The updated DCE assumed a return on the invested funds of approximately 1 percent per annum and a rate of cost escalation of 3 percent per annum. Since 2017, the return on the invested funds averaged approximately 1.9 percent, including in 2021, when the return was only 0.2 percent. Consequently, the use of a 1 percent return through the duration of the project is a conservative assumption. The submitted cash flow analysis did not contain any contingency factor for the costs of the project.

The total funding available for decommissioning activities consists of the funds in the Federal Environmental Cost Account, the State Environmental Cost Account, and the Standby Trust Account. The value of each of these accounts as of December 31, 2023, was as follows:

- Federal Environmental Cost Account $55,430,195
- State Environmental Cost Account $13,225,465
- Standby Trust Account $ 3,717,817
- Total $72,373,477

According to the licensee, the duration of groundwater remediation is projected to mid-2038. Attachment 1 indicates that there should be several million dollars available at that time, which would provide funding for some post-remediation work. EPM believes that optimization of remediation operations can reduce the time required for remediation, providing additional funding for the post-remediation activities presented in the DP, Rev. 3.

13.4. NRC Staff Analysis

The staff analyzed the cash flow and conducted a sensitivity analysis using the rate of return on the invested funds, the escalation of costs, and the contingency. Using the conservative baseline in the licensee's submission of 1 percent rate of return and 3 percent cost escalation as a starting point, with a 10 percent contingency, the staff concluded the decommissioning trust fund (DTF) would be exhausted by 2037. The staff varied the rate of return from 0.5 percent to 2 percent, varied the cost escalation from 2 percent to 4 percent, and varied the contingency from 10 percent to 25 percent. Using the same baseline with a 2 percent rate of return, a 4 percent cost escalation, and a 10 percent contingency, the DTF would be depleted in 2037. Below are possible outcomes of DTF levels with varied rates of return on the invested funds, the escalation of costs, and the contingency:

- With a 0.5 percent rate of return, 2 percent cost escalation, and a varied 10–25 percent contingency, the staff concluded DTF earnings would fall short between 2035 and 2037.

- With a 1 percent rate of return, 3 percent cost escalation, and a varied 10–25 percent contingency, the staff concluded DTF earnings would also fall short between 2035 and 2037.

- With a 2 percent rate of return, 4 percent cost escalation, and a varied 10–25 percent contingency, the staff concluded DTF earnings would fall short in 2037.

13.5 NRC Staff Conclusion

The staff concluded that, if the costs presented in EPM's submittal do not increase any significant amount or cost savings are realized during the groundwater remediation period, there is reasonable assurance that there will be sufficient funds to complete the decommissioning of the site and that there will be funds available for some post-remediation work. Any significant cost increases or unforeseen circumstances could be a factor in maintaining sufficient funds to complete decommissioning. The licensee and the staff should closely monitor funds on an annual basis to help ensure sufficient funds are available. The NRC will, as has been the case since the Trust was established, review the annual scope of work and budget and requests for additional funding, and monitor the budget as it relates to the effectiveness of the groundwater remediation efforts.

14. Material Control and Accounting

14.1 Purpose of Review

The purpose of this review was to determine whether the EPM material control and accounting (MC&A) practices are adequate to detect and protect against the loss, theft, or diversion of SNM that the licensee possesses, stores, and uses at its facility, and to comply with the applicable regulatory requirements in 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material."

14.2 Staff Review and Analysis

By letter dated October 7, 2022, the licensee submitted its DP package for SNM-928. It included MC&A in Section 11.10, which then referred to Section 11.2 of the RPP (ML22286A230). By email dated January 13, 2023 (ML24207A156), the NRC submitted to the licensee a request for clarification of the MC&A program as described in Section 11.2 of the RPP. On February 3, 2023 (ML23034A168), the licensee submitted supplemental information addressing the MC&A issues needing clarification.

14.3. Regulatory Requirements

The following discussion identifies each of the applicable MC&A requirements and summarizes the NRC staff's evaluation as to whether the information provided by EPM in the license application letter and the supplemental material meets the requirement.

14.3.1 Reports of Loss or Theft or Attempted Theft (10 CFR 74.11)

The requirement in 10 CFR 74.11, "Reports of loss or theft or attempted theft or unauthorized production of special nuclear material," states the following:

> Each licensee who possesses 1 gram or more of contained uranium-235, uranium-233, or plutonium shall notify the NRC Operations Center within 1 hour of discovery of any loss or theft or other unlawful diversion of special nuclear material which the licensee is licensed to possess, or any incident in which an attempt has been made to commit a theft or unlawful diversion of special nuclear material.

In the clarification letter for addressing 10 CFR Part 74 MC&A requirements, the licensee discussed 10 CFR 74.11 on reporting loss, theft, or diversion of SNM. The licensee stated that the NRC Operations Center will be notified, as required by 10 CFR 74.11, and that instructions regarding the requirement are provided in a site procedure on reports and notifications. The NRC staff reviewed the information provided by the licensee and based on the review, has determined that the licensee's MC&A measures include adequate procedures to ensure that the NRC is notified in a timely manner in the event of a loss, theft, or diversion of SNM, or attempted theft or diversion of SNM. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.11.

14.3.2 Material Status Reports (10 CFR 74.13)

The requirement in 10 CFR 74.13, "Material status reports," states that each licensee possessing SNM "in a quantity totaling one gram or more of contained uranium-235, uranium-233, or plutonium shall complete and submit, in computer-readable format Material Balance Reports concerning special nuclear material that the licensee has received, produced, possessed, transferred, consumed, disposed, or lost." The physical inventory listing report must be submitted with each material balance report. The reports shall be prepared in accordance with NUREG/BR-0007, Revision 8, "Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C)," issued August 2020 (ML20240A181).

In the MC&A clarification letter, the licensee addresses material status reports. The licensee states that it will submit electronic copies of the physical inventory listing and the material balance report, as required by 10 CFR 74.13, and provide the reports to the Nuclear Material Management and Safeguards System, as required.

The NRC reviewed the licensee's description of preparing and submitting material status reports. The licensee stated that it will submit material status reports at the required frequency and in accordance with 10 CFR 74.13. Based on the review, the NRC staff determined that the licensee's MC&A measures include adequate procedures to ensure that material balances and physical inventory listings are reported as required. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.13.

14.3.3 Nuclear Material Transaction Reports (10 CFR 74.15)

The requirement in 10 CFR 74.15, "Nuclear material transaction reports," states the following:

> Each licensee who transfers or receives special nuclear material in a quantity of one gram or more of contained uranium-235, uranium-233, or plutonium shall complete in computer-readable format a Nuclear Material Transaction Report. In addition, each licensee who adjusts the inventory in any manner, other than for transfers and receipts, shall submit a Nuclear Material Transaction Report, in computer-readable format, to coincide with the submission of the Material Balance report.

These reports shall be completed in accordance with NUREG/BR-0006, Revision 9, "Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M)," issued August 2020 (ML20240A155). Each licensee that transfers SNM shall submit a nuclear material transaction report no later than the close of business the next working day. Each licensee that receives SNM shall submit a nuclear material transaction report within 10 days after the material is received.

In the MC&A clarification letter, the licensee stated that it will submit electronic copies of the nuclear material transaction reports, as required by 10 CFR 74.15, and that the reports will be submitted to the Nuclear Material Management and Safeguards System, as required.

The NRC reviewed the licensee's description of preparing and submitting material transaction reports. The licensee stated that the reports will be submitted at the required frequency and in accordance with 10 CFR 74.15. Based on the review, the NRC staff determined that the licensee's MC&A measures include adequate procedures to ensure that nuclear material transaction reports are submitted, as required. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.15.

14.3.4 Recordkeeping (10 CFR 74.19 (a))

The requirement in 10 CFR 74.19 (a) states that a licensee is to keep records showing the receipt, inventory (including location and unique identity), acquisition, transfer, and disposal of all SNM in its possession regardless of its origin or method of acquisition. Each record relating to material control or material accounting must be maintained and retained for the period specified by the appropriate regulation or LC. Each record of receipt, acquisition, or physical inventory of SNM must be retained as long as the licensee retains possession of the material

and for 3 years following transfer or disposal of the material. Each record of transfer of SNM to other persons must be retained by the licensee that transferred the material until the Commission terminates the license authorizing the licensee's possession of the material.

In the MC&A clarification letter, the licensee addressed recordkeeping. The licensee stated it will keep records showing the receipt, inventory (including location and unique identity), acquisition, transfer, and disposal of all SNM in its possession regardless of its origin or method of acquisition. The licensee stated that each record relating to material control or material accounting will be maintained and retained for the period specified by the appropriate regulation.

The NRC staff reviewed the licensee's description of MC&A records and recordkeeping. The licensee stated that records are generated and maintained for all material under license and that records will be maintained for the period required by 10 CFR 74.19 (a). Based on the review, the NRC staff determined that the licensee's MC&A measures include adequate procedures to ensure MC&A records are completed and maintained. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.19 (a).

14.3.5 Written MC&A Procedures (10 CFR 74.19 (b))

The requirement in 10 CFR 74.19 (b) states, "Each licensee authorized to possess special nuclear material in a quantity exceeding one effective kilogram at any one time shall establish, maintain, and follow written material control and accounting procedures that are sufficient to enable the licensee to account for the SNM in its possession under license." The licensee shall retain these procedures until the Commission terminates the license and retain any superseded portion of the procedures for 3 years after the portion is superseded.

In Section 11.2.2 of the RPP, the licensee addressed written MC&A procedures. The licensee stated in the clarification letter that procedures will be maintained until license termination, as required by 10 CFR 74.19 (b).

The NRC staff reviewed the licensee's description of MC&A procedures provided in the RPP and the clarification letter. Based on the review, the NRC staff determined that the licensee's measures include adequate written MC&A procedures to ensure that the license can account for all SNM in its possession. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.19 (b).

14.3.6 Physical Inventory (10 CFR 74.19 (c))

The requirement in 10 CFR 74.19 (c) states that certain licensees that are authorized to possess SNM in a quantity greater than 350 g of contained U-235, U-233, or plutonium are to conduct a physical inventory of all SNM in its possession under license at intervals not to exceed 12 months. The licensee shall retain the results of these physical inventories in records until the Commission terminates the license authorizing the possession of the material.

In the MC&A clarification letter, the licensee stated that a physical inventory of SNM is conducted at intervals not to exceed 12 months, as required, and that inventory records shall be retained until license termination.

The NRC staff reviewed the licensee's description of physical inventory. The licensee affirmed that an inventory will be performed at intervals not to exceed 12 months, and that inventory records will be retained, as required by 10 CFR 74.19 (c). Based on the review, the NRC staff determined that the licensee's MC&A measures include adequate procedures to ensure physical inventories of its SNM are completed at the required frequency. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.19 (c).

14.4. NRC Evaluation and Findings of the Licensee's Material Control and Accounting Program

Based on the review of the DP MC&A program and clarification responses, the NRC staff finds that the MC&A practices as described provide assurance that the licensee will satisfy the applicable requirements found in 10 CFR 74.11; 10 CFR 74.13; 10 CFR 74.15; and 10 CFR 74.19, "Recordkeeping," during the license term. Therefore, the NRC staff finds that the licensee's MC&A practices are acceptable.

15. Proposed Revisions to the Conditions in the License

The NRC transferred SNM-928, along with the Cimarron site, from the Cimarron Corporation to CERT on February 14, 2011, and issued the current License Amendment 21, dated February 14, 2011 (ML110270373) (NRC, 2011). As received, the amendment request notes several LCs referencing documents (tie-downs) that are no longer relevant to decommissioning the site. Buildings, equipment, and soils have been decommissioned to comply with unrestricted release criteria stipulated in the license, and tie-downs that govern those aspects of decommissioning are no longer needed. LCs should continue to list those documents that pertain to the completion of decommissioning activities. In Sections 6.0 and 6.1 of the DP, Rev. 3 (ML22284A150), the licensee requested that the LCs be updated. This Section proposes revisions to LCs that align more closely with current conditions and plans for the site.

In addition to incorporating the revised DP, Rev. 3, into the license, CERT requests several other revisions to SNM-928. The license amendment would authorize the possession of technetium-99 (Tc-99) as a contaminant in groundwater. SNM-928 does not stipulate unrestricted release criteria for Tc-99. However, Tc-99 exists in the groundwater as a contaminant from the residual Tc-99 in the UF6 cylinders used at the facility. The addition of Tc-99 to the license would allow the licensee to possess and dispose of any contaminated material because treatment of the groundwater may result in concentration of the Tc-99 in the IX media above acceptable concentration limits. Any waste stream containing detectable Tc-99 would have to be disposed of as LLRW.

The license amendment also requests that the license distinguish between the possession limit for "in-process" U-235 and U-235 in packaged waste that complies with fissile exemption criteria. This distinction will clarify the requirements for each type of material that is possessed to avoid confusion during the future operation of the groundwater treatment facility.

Additionally, the license amendment would clarify the authorized place of use to include subsurface areas where the groundwater exceeds the NRC criterion, and areas where such licensed material will be transported or managed. Clarifying the authorized place of use to include areas previously released from the license, in which groundwater exceeding the NRC criterion is present in the subsurface and areas where such licensed material will be transported or managed, will clearly define the authorized places of use requiring radiological controls and surveillance during the life of the treatment facility. This will also determine the areas needing

characterization in future FSSs to eventually terminate the license at the end of the groundwater treatment process

.

Finally, as requested, this license amendment would eliminate references to documents referring to previous decommissioning activities of facilities and soil that are no longer relevant to ongoing decommissioning activities. Eliminating references to such documents will eliminate confusion in identifying program requirements that are relevant to the operation of the groundwater treatment facility and not preexisting and released facilities.

15.1 License Conditions 6–8—Possession Limit Current (Amendment 21) Condition

6.	Byproduct, Source, and/or Special Nuclear Material:	7.	Chemical and/or Physical Form:	8.	Maximum Amount that Licensee May Possess at Any One Time Under This License:
A.	Uranium enriched to ≤ 5.0 wt. percent in U-235	A.	Any compound	A.	1,200 grams of contained U-235
B.	Uranium enriched to > 5.0 wt. percent in U-235	B.	Any compound	B.	*100 grams of contained U-235
C.	Natural and depleted uranium	C.	Any compound	C.	2,000 kilograms of uranium source Material
D.	Thorium source material	D.	Any compound	D.	6,000 kilograms of Thorium

* If during the decontamination of the facilities and equipment at the Cimarron Plant, uranium solutions or compounds are generated that have a U-235 isotopic content greater than 5.0 wt. %, prompt action shall be taken to degrade these materials to below 5.0 wt. % U-235.

15.1.1 License's Request for Change to License Condition 8 (B)

The licensee addressed its request to amend the possession limits of its current license in Section 6.2 of the DP, Rev. 3 (ML22284A150). In the current license, License Amendment 21, dated February 14, 2011 (ML110270373), LC 8 (A) authorizes the licensee to possess up to 1,200 grams of "Uranium enriched to ≤ 5.0 wt. % in U-235." License Condition 8 (B) authorizes the licensee to possess up to 100 g of "Uranium enriched to > 5.0 wt. % in U-235." An asterisk in LC 8 (B) refers to a note stating, "If during the decontamination of the facilities and equipment at the Cimarron Plant, uranium solutions or compounds are generated that have a U-235 isotopic content greater than 5.0 wt. %, prompt action shall be taken to degrade these materials to below 5.0 wt. % U-235." EPM does not believe it is necessary to retain the provision to down-blend greater than 5 percent enriched material because uranium in groundwater does not exceed 5 percent enrichment.

Another issue related to the note in LC 8 refers to the decontamination of equipment of facilities and equipment. This provision was made to address the decontamination of material and equipment used in the uranium fuel processing operations, which was completed decades ago. Decontamination of equipment to be performed during the remaining decommissioning activities consists of washing or pressure washing equipment with water to remove soil so that release surveys can be performed. This applies, for example, to excavating equipment, drilling equipment tools such as augers and drill pipes, shovels, and downhole sampling equipment. The licensee contends that, because environmental media do not contain uranium exceeding 5 percent enrichment, decontamination cannot produce material exceeding 5 percent enrichment. Thus, the licensee requests that both the license possession limit stipulated in LC 8. B and the note be removed from LC 8.

15.1.2 NRC Evaluation and Finding for Request to Change License Condition 8 (B)

The NRC has reviewed this request to change LC 8. B. and agrees with the licensee's conclusion that, since environmental media do not contain uranium exceeding 5 percent enrichment, decontamination cannot produce material exceeding 5 percent enrichment. Therefore, the license possession limit stipulated in LC 8.B. and the note will be removed from LC 8.

SNM packaged for transportation meets the fissile exempt definition in 10 CFR 71.15, "Exemption from classification as fissile material," if it meets any one of the criteria listed in 10 CFR 71.15 (a)– (f). Appendix H (ML22285A189) to the DP, Rev. 3, justifies the issuance of a new possession limit in SNM-928 that applies to packaged waste that meets the requirements for transportation as "fissile exempt" material in 10 CFR 71.15. According to the licensee, the license should retain the 1,200 g possession limit for uranium present in groundwater remediation systems but should authorize the possession of additional uranium in packaged waste that has been demonstrated to comply with fissile exemption criteria.

15.1.3 Licensee's Request to Add License Condition 8 (E)

Tc-99 is present in groundwater in some western remediation areas (see Section 3.5.3 of the DP, Rev. 3, ML22284A150). The IX resin used to treat groundwater for uranium is expected to capture some, if not all, the Tc-99. The maximum concentration of Tc-99 in groundwater to be treated (see figure 8-3 of the DP, Rev. 3, ML22285A091) is estimated to be 1.26 nanograms per liter (ng/L). The WA treatment system will receive a maximum of 125 gpm of groundwater from the western remediation areas, and resin vessels will be changed out approximately every 120 days.

If the IX resin were to capture 1.26 ng/L of Tc-99 throughout a 120-day period in which 125 gpm of water were treated, a total mass of approximately 0.3 g of Tc-99 would accumulate in the resin. Drums containing the spent resin/absorbent mixture will be stored in the onsite storage area until a full shipment (approximately 40 drums) has accumulated. Each resin vessel will generate at least eight drums of resin/absorbent mixture, so three resin exchanges from the WA treatment system, plus three resin exchanges from the BA1 treatment system will constitute more than a full shipment. If all the resin from three exchanges from the WA treatment system were awaiting shipment in storage, and the lead vessel in the WA treatment system also contained 0.3 g of Tc-99, there would be a total of less than 2 g of Tc-99 on-site. If a small

quantity of Tc-99 were still present in lag and polishing vessels, a Tc-99 mass possession limit of 5 g would be more than sufficient.

The specific activity of Tc-99 is 1.71E+10 pCi/g, or 17,100 µCi/g. The quantity of Tc-99 that would require licensing stipulated in 10 CFR Part 20, Appendix C, “Quantities of Licensed Material Requiring Labeling,” is 100 µCi. To dispose of this resin, licensed disposal facilities will prove that the licensee is authorized to possess such a quantity of Tc-99. The licensee has requested authorization in the license to possess Tc-99 to dispose of the resin/absorbent mixture.

15.1.4 NRC Evaluation and Finding of Request to Add License Condition 8.E.

The NRC agrees that, because Tc-99 is not technically a byproduct material but is present as a contaminant in the SNM, a separate license for byproduct material is not needed. Specifically listing Tc-99 as a contaminant in the waste stream in SNM-928 will authorize the licensee to possess, transport, and dispose of the waste generated during groundwater treatment. Consequently, a possession limit of 5 g of Tc-99 as a contaminant in the waste stream is granted.

The licensee requested and the NRC agrees that License Conditions 6–8 may be amended to read as follows:

6.	Byproduct, Source, and/or Special Nuclear Material:	7.	Chemical and/or Physical Form:	8.	Maximum Amount that Licensee May Possess at Any One Time Under This License:
A.	Uranium enriched to ≤ 5.0 wt. % in U-235	A.	Any compound	A.	1,200 grams of contained U-235 (Note 1)
B.	Natural and depleted uranium source material	B.	Any compound	B.	2,000 kilograms of uranium
C.	Thorium source material	D.	Any compound	D.	6,000 kilograms of thorium
D.	Uranium enriched to ≤ 5.0 wt. % in U-235	D.	Any compound as packaged waste in containers that meet the transportation requirements in 10 CFR 71.15	D.	(Notes 1 and 2)
E.	Technetium-99	E.	Any compound as a contaminant in special nuclear material	E.	5 grams

Note 1: The total mass of U-235 possessed under Conditions 8A and 8E shall be limited to less than 0.5 effective kilogram of special nuclear material of low strategic significance. The requirements of 10 CFR 74.31 for nuclear material control and accounting are therefore not applicable.

Note 2: Special nuclear material packaged for transportation that meets the fissile exempt definition in 10 CFR 71.15 (c) or (d) may be handled, stored, and transported for disposal without nuclear criticality safety controls, nuclear criticality monitoring systems, or mass-based limits and is exempt from special nuclear material security (physical protection) requirements of 10 CFR Part 73.

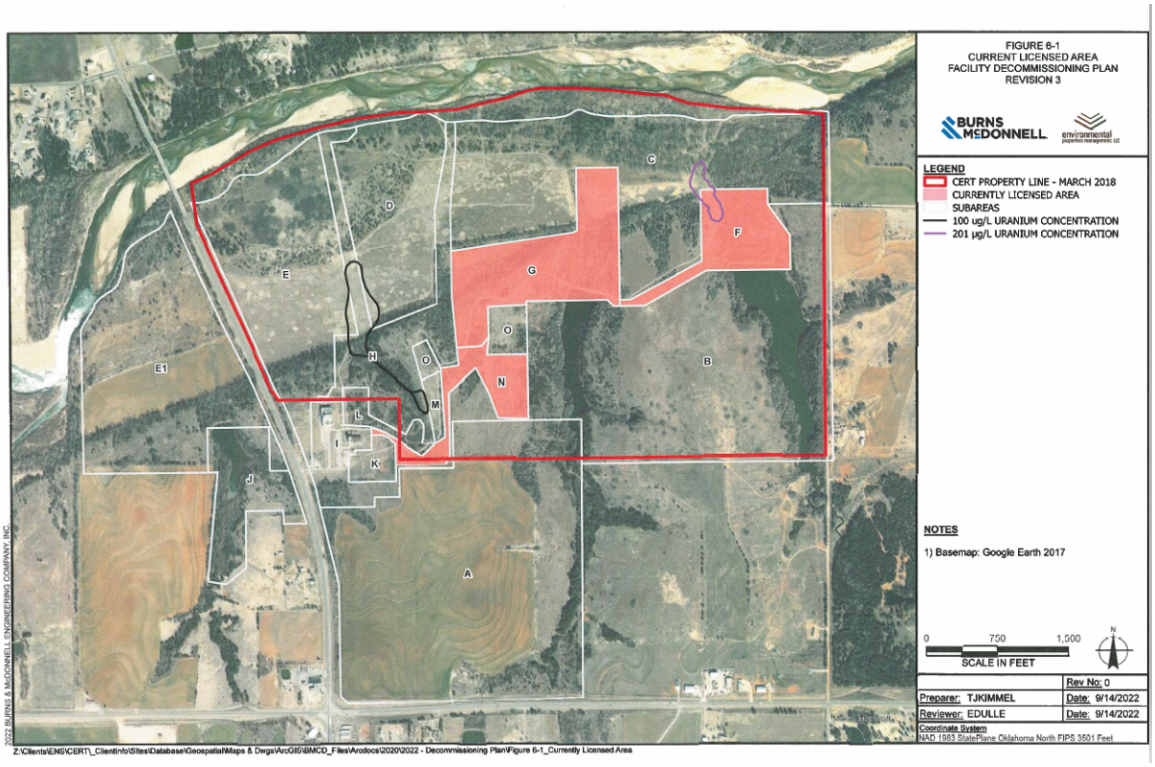
15.2 License Condition 9—Authorized Place of Use

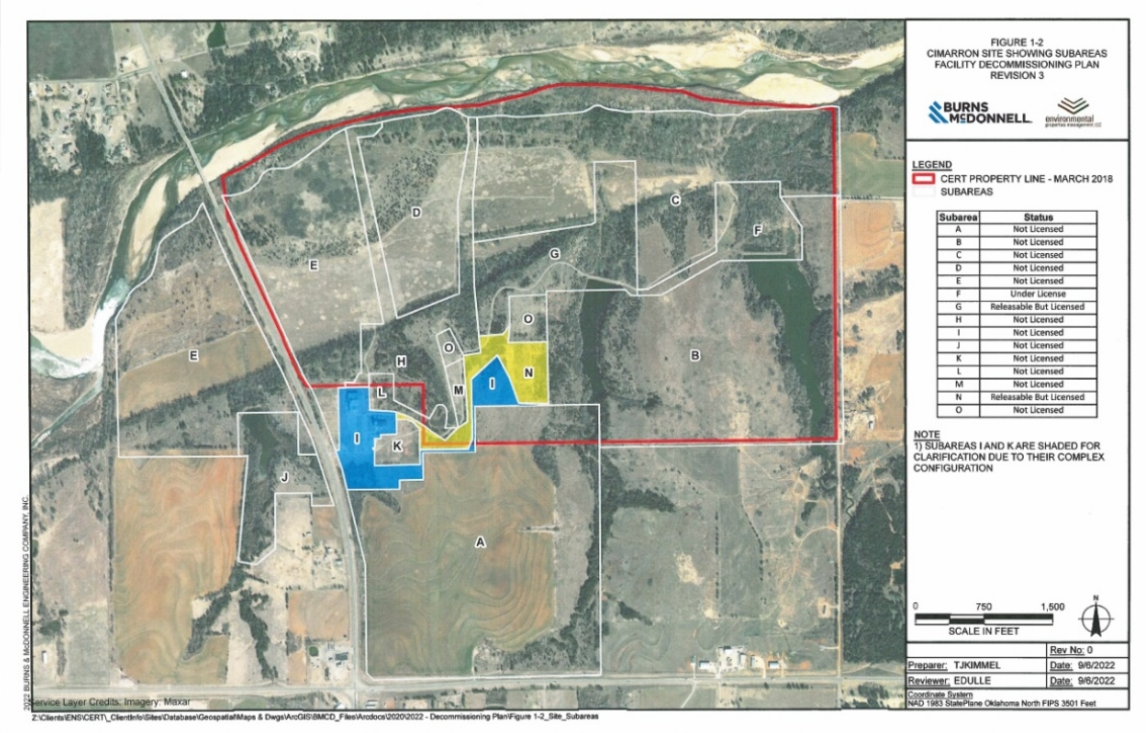
LC 9 describes the current licensed area:

> **9. Authorized Place of Use:**
>
> The licensee's Cimarron Uranium Plant, located 1/2-mile North of Highway 33 and Highway 74 junction near Crescent, Oklahoma

15.2.1 Licensee's Request for Change to Condition 9

Of the original site of more than 800 ac, only 52 ac remain under license. Figure 6-1 from the DP, Rev. 3, Figures 1-5 (ML22285A100), shows how the entire former Cimarron site was divided into 16 subareas (as shown in Figure 1-2 (ML22285A091)). It also shows the CERT property boundary as surveyed in 2018; the property line to the north varies as the Cimarron River moves northward across its floodplain.





Subareas A through E, H through M, and O have been released for unrestricted use. LCs 25, 28, 29, and 30 all state that these portions of the Cimarron site have been released for unrestricted use and that they are "…no longer licensed by NRC." FSSs and confirmatory surveys have provided verification that subareas G and N are releasable for unrestricted use, but the NRC has determined that these areas should not be released until groundwater remediation is complete (ML110280485). The shaded area on figure 6-4 is that portion of the former Cimarron site that remains licensed, as shown on the sitewide licensed area map (figure 6-4) (ML24192A319).

The purple areas in figure 6-1 show that uranium concentrations in groundwater exceed the NRC criteria in small portions of subareas C, D, E, F, H, and M. Of these, only subareas F, G, and N remain under license, although not specifically identified in LC 9. The areas currently defined as being regulated are discussed in Order Transferring License No. SNM-928 for the Cimarron site, dated August 14, 2011 (ML110280485). Specifically, areas currently covered by the license are defined in a paragraph on page 2 of the order:

> Final status surveys and confirmatory surveys have confirmed that Subareas G and N are releasable for unrestricted use, but NRC has determined that these areas should not be released until groundwater remediation is complete. Because groundwater exceeds license criteria in Subarea F, this area cannot be released for unrestricted use until groundwater remediation is complete.

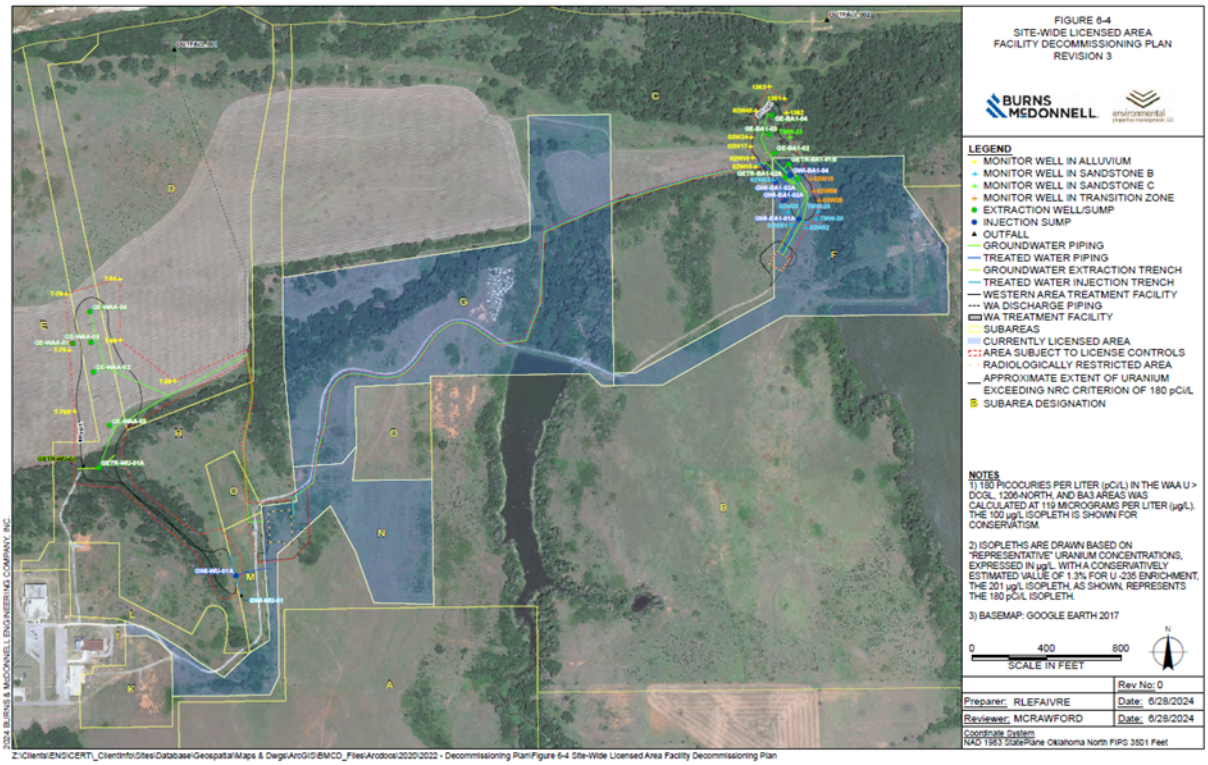
This means that subareas G, N, and F define the currently licensed areas. Figure 6-4 identifies these three areas, versus the areas no longer under license. Figure 6-4 was submitted as Attachment 3 to EPM's July 3, 2024, comments on the draft Environmental Assessment (ML24185A228).

The licensee contends that NRC regulations and Regulatory Guides do not define “unrestricted use,” but NUREG-1757, Vol.1, Rev. 2, does refer to “unrestricted use areas,” and 10 CFR 20.1003 defines an unrestricted area as “…an area, access to which is neither limited nor controlled by the licensee.” While there is no reason to implement controls in accordance with the provisions of the license (herein referred to as “licensee controls”) in areas that the NRC has confirmed are releasable for unrestricted use, areas where uranium exceeds the NRC criteria for groundwater should be subject to licensee controls; access to these areas should be limited.

Thus, according to the licensee, the designation of subareas more than 30 years old to define property now only documents the justification for the past release of property and is no longer useful for defining those portions of the CERT property that should be subject to licensee controls. Maintaining the location of the site (i.e., the licensee’s property, located approximately 0.5 mi north of the junction of Oklahoma State Highway 33 and Highway 74) is appropriate to define the “Authorized Place of Use.” However, the definition of those areas that remain under licensee controls should be incorporated into the license. Consequently, EPM proposed that the NRC stipulate the areas that remain under license in LC 9. This will provide the framework for future compliance inspections, as most of the property satisfies the criteria for “unrestricted use areas,” while a portion should continue to be subject to licensee controls.

15.2.2 NRC Evaluation and Finding of Request for Revision of License Condition 9

The NRC’s focus in the past in identifying areas that could be released from the license control and areas that have been maintained under the license has been to control areas of the site that might become recontaminated by other activities. The previous subareas were useful for identifying and tracking areas that required decommissioning and decontamination and FSSs performed while surface decommissioning activities were taking place. These activities have been completed and no longer provide a useful delineation of the NRC-licensed areas. The remainder of the property that will be impacted during the groundwater remediation process and that currently contains groundwater exceeding the release criteria, including BA1, can be identified in Figure 6-4 which was submitted as Attachment 3 to EPM’s July 3, 2024, comments on the draft Environmental Assessment (ML24185A228). Therefore, the NRC has determined that the areas subjected to licensee controls be identified as those in figure 6-4. Although figure 6-4 below is an accurate depiction of the site, because of the limited details available in the paper format of this document, the reader is referred to the larger format document to view the details.



License condition 9 will be revised to read

9. Authorized Place of Use:

The licensee's Cimarron Uranium Plant, located 1/2 mile North of Highway 33 and Highway 74 junction near Crescent, Oklahoma, with areas defined by the map in Figure 6-4, which was submitted as Attachment 3 to EPM's July 3, 2024, comments on the draft Environmental Assessment (ML24185A228).

15.3 License Condition 10—Final Survey and Onsite Disposal

LC 10, as currently written in Amendment 21 (ML110270373), contains the following list:

> For use in accordance with statements, representations, and conditions contained in letters dated April 12, 1995, July 5, 1995, April 25, 1996, August 28, 1996, and November 20, 1996; letters dated November 19, 1985, March 3, 1986, and November 2, 1989; letter dated June 24, 1992; letters dated September 4, 1987, February 25, 1993, April 19, 1994, May 31, 1994, July 20, 1994, September 21, 1994, and November 3, 1994; letters dated December 16, 1994, and June 5, 1995; letter dated January 23, 1996; letters dated August 9, 1995, and November 13, 1995; letters dated November 15, 1994, September 20, 1996, January 2, 1997, and May 16, 1997; letter dated May 6, 1997; letters dated August 22, 1990, and September 14, 1990; letters dated April 25, 1996, and June 10, 1996; and letters dated July 25, 1995, January 28, 1997, February 10, 1998, December 5, 1997, June 26, 1998, July 2, 1998, February 15, 2000, February 20, 2001 April 17, 2002, and May 10, 2002.

15.3.1 Licensee's Request for Change to License Condition 10

Section 6.4 of the licensee's DP, Rev. 3 (ML22284A150), addresses each of the letters, describing each one and justifying its deletion from LC 10 as follows:

> License Condition 10 lists 39 documents (there are 40 citations, but one date is listed twice). These documents primarily address final status surveys and the burial of soil in the on-site disposal cell.
>
> Other documents referenced in License Condition 10 include license amendment requests related to the authorization to possess specific quantities of radioactive material (this has since been incorporated into License Condition 8), the Radiation Safety Officer, and responses to NRC comments related to groundwater assessment and remediation. This section briefly describes each document listed in License Condition 10 and provides justification to delete License Condition 10 from the license.
>
> November 19, 1985—This letter from Kerr-McGee Corporation (ML21103A313) requested an amendment to the license to authorize possession of up to 6,000 kgs of thorium, which would allow the excavation, packaging, and shipment of thorium from the Cushing site (which has been buried at the Cimarron Site) for disposal at a licensed facility. License amendment No. 3, issued in April 1986, revised Item 8 (D) to authorize possession of 6,000 kg of thorium. This authorization is still present in Item 8 (D) of the current license. The reference to this document is no longer needed.
>
> March 3, 1986—This letter (ML20203P607) from Sequoyah Fuels Corporation (predecessor to Cimarron Corporation) requested an amendment to the license to increase the authorized quantity of < 5 wt. % U-235 from 1,200 grams to 6,000 grams, to provide latitude for the licensee to accumulate sufficient material on the Site to load several trucks with contaminated material for transportation to a licensed disposal facility. License amendment No. 4, issued in April 1986,

revised Item 8 (A) to authorize possession of 6,000 grams of < 5 wt. % U-235. However, this authorization is again limited to 1,200 grams of < 5 wt. % in Item 6 (A) of the current license. License amendments No. 5 through 9 only addressed changes to later license conditions, and the authorized amount is not listed in those amendments. It appears that when license amendment No. 10 was issued on November 4, 1994, NRC reverted the authorized quantity of < 5 wt. % U-235 back to the previous 1,200 grams. The reference to this document is no longer needed.

September 4, 1987—This letter from Sequoyah Fuels Corporation (ML21103A315) requested an amendment to the license to authorize the stockpiling of material designated as "Option 2 material" in the 1981 SECY 81-576, Disposal or Onsite Storage of Residual Thorium or Uranium (Either as Natural Ores or Without Daughters Present) From Past Operations (USNRC, 1981) (hereafter referred to as "Option 2 material") so that other areas could be decommissioned for release while on-site burial of this material was under consideration. License amendment No. 10, issued in November 1994, added this letter as a tie-down to Condition 10 to authorize the stockpiling of Option 2 material. Disposal of Option 2 material is complete, and authorization to create soil stockpiles is no longer needed. The reference to this document is no longer needed.

November 2, 1989—This submittal from Cimarron Corporation (ML21103A316) included results of the final release surveys of the MOFF facility. There is no reason for this document to be included in SNM-928; the operation and decommissioning of this facility was subject to NRC License SNM-1174, and SNM-1174 was terminated in 1993. Regardless, Subarea I, in which the MOFF plant is located, was released for unrestricted use in License Amendment No. 17, issued April 9, 2001. The reference to this document is no longer needed.

August 22, 1990, and September 14, 1990—The August 1990 letter (ML092610951) from Cimarron Corporation stated that the MOFF facility had been decommissioned, that decommissioning of the uranium plant was nearly complete, and that all major exhaust systems had been removed. Consequently, there were no longer effluents to monitor, and Cimarron planned to discontinue filing effluent monitoring reports as had been required per 10 CFR 70.59. In the September 14, 1990, letter (ML21103A318), the NRC stated, "Since the reports are required for licensees authorized possession or use of SNM for processing and fuel fabrication and your license authorizes possession or use of SNM subsequent to decontamination and decommissioning only, we have no objection to your discontinuation of the effluent release reports." Effluent release reports have not been submitted for over twenty years, and these tie-downs are no longer needed. The references to these documents are no longer needed.

June 24, 1992—This letter from Cimarron Corporation (ML21103A320) requested information from the NRC, maintaining that NRC was causing "unnecessary delay and additional expense in decommissioning the Cimarron facilities because of indecision and non-responsiveness of the Commission." It is not clear why this letter is referenced in Condition 10. The reference to this document is no longer needed.

February 25, 1993—This letter from Kerr-McGee Corporation (ML21103A322) responded to the NRC's request for additional information dated January 8, 1993. This letter addressed subsidence, wind and water erosion, deed notice and location markers, all associated with the proposed on-site burial cell. It also contained a commitment to submit a radiological characterization report and complete the decommissioning of the Site. On-site disposal of Option 2 material was approved by NRC in license amendment No. 10, issued November 4, 1994. Decommissioning of soil and burial in the on-site disposal cell is complete. The deed notice was filed, and the corner markers (cairns) were installed. The post-closure monitoring of the cell for subsidence and/or erosion associated with the on-site disposal cell is complete. The radiological characterization report was submitted in 1994. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. The required 5-year post-closure monitoring period expired in 2006 (16 years ago). There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

April 19, 1994—This letter from Kerr-McGee Corporation (ML21103A323) requested NRC approval of a procedure entitled, "Onsite Disposal Plan". This procedure defined the responsibilities of various personnel, the characterization, transportation, and disposal of Option 2 material in the cell, the determination of total activity in the filled cell, the construction of run-on and run-off controls and the final cover, and the record of disposal. On-site disposal of Option 2 material was approved by NRC in license amendment No. 10, issued November 4, 1994. Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

May 31, 1994—This letter from Kerr-McGee Corporation (ML21103A327) responded to the NRC's request for additional information dated April 19, 1994. The response addressed the final survey of Option 2 material in the on-site disposal cell, determination of the average concentration of material in the cell, Regulatory Guide 1.86 criteria, acceptance of a 100 pCi/g Option 2 limit for soil to be placed in the on-site disposal cell, hot spot averaging, the final survey of excavations, and the final survey of the disposal cell cap using the 1992 NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Determination* (Berger, D., 1992). Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

July 20, 1994—This letter from Kerr-McGee Corporation (ML092660429) responded to the NRC's request for additional information dated July 18, 1994. It addressed how soil samples would be collected for the determination of the distribution coefficient (K_d) value for soil in the on-site disposal cell. Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

September 21, 1994—This letter from Cimarron Corporation (ML092660380) responded to the NRC's request for additional information dated August 12, 1994. It addressed hot spot averaging of soil in the on-site disposal cell, the analysis of quality control samples, NUREG/CR-5849 calculations, and calibration of the on-site soil counter, all associated with the placement of Option 2 material in the on-site disposal cell. Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

November 3, 1994—This letter from Cimarron Corporation (ML21103A334) responded to an NRC question raised during a teleconference conducted November 1, 1994. It addressed exposure to workers placing soil in the on-site disposal cell. Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. There is no reason to maintain this tie-down in the license. The reference to this document is no longer needed.

November 15, 1994—This letter from Cimarron Corporation (ML092660378) requested a license amendment to eliminate tie-downs related to Appendix A of a 1976 license renewal request, and Annex A of a 1982 license renewal request. Both Appendix A and Annex A were previous versions of the Radiation Protection Plan. None of the referenced documents are relevant to the current license, Decommissioning Plan, or Radiation Protection Plan. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

December 16, 1994—This letter from Cimarron Corporation (ML21103A336) requested a license amendment to designate Karen Morgan RSO. Ms. Morgan has not been RSO for the Cimarron Site since 2007. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

April 12, 1995—This letter from Cimarron Corporation (ML21103A343) responded to the NRC's request for additional information dated March 29, 1995. It addressed the analysis of samples from a hot spot averaging used in the South Uranium Yard. Decommissioning and disposal of soils in the South Uranium Yard, which is part of Subarea K, is complete. Subarea K was released for unrestricted use in license amendment No. 18, issued May 28, 2002. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

June 5, 1995—This letter from Cimarron Corporation (ML21103A354) provided a resume for Karen Morgan to justify her designation as RSO. Ms. Morgan has not been RSO for the Cimarron Site since 2007. License Condition 27 (e) (3) of the current license (Amendment No. 21) states, "The Radiation Safety Officer shall be named in the licensee's Radiation Protection Plan", hence, neither the June 5, 1995, tie-down, nor a more up-to-date equivalent, need to be referenced in the license. The reference to this document is no longer needed.

July 5, 1995—This letter from Cimarron Corporation (ML21103A369) provided a response to an NRC telephone inquiry on hot spot averaging in the South Uranium Yard. Decommissioning and disposal of soils in the South Uranium Yard, which is part of Subarea K, is complete. Subarea K was released for unrestricted use in license amendment No. 18, issued May 28, 2002. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

July 25, 1995—This document is the *Final Status Survey Plan for Phase II Areas* (Chase Environmental Group, 1995B (ML20202A434). Subarea F is a Phase II area and is the only area in which the NRC has not yet formally agreed that soils are releasable for unrestricted use. In August 2005, Cimarron Corporation submitted a final status survey plan in accordance with this final status survey plan and supplemented it with subsurface soil data in November 2007. In March 2013, ORAU published the analytical results for confirmatory subsurface samples selected by NRC. All results were less than one-third the license criteria for unrestricted release. That final status survey plan is no longer relevant to the unrestricted release of Subarea F. The reference to this document is no longer needed.

August 9, 1995, and November 13, 1995—The August 9 document is the *Final Status Survey Report, Phase I Areas* (ML21158A013). The November 13 letter (ML21258A249) responds to September 5, 1995, NRC comments on the final status survey report. All five of the Phase I areas (Subareas A through E) were released for unrestricted use in license amendment No. 13, issued April 23, 1996. Groundwater containing uranium exceeding NRC Criteria for unrestricted release, as well as uranium and nitrate exceeding State Criteria, is present in portions of Subareas C, D, and E. The remediation of groundwater in these areas is addressed in this Plan, submitted as part of this license amendment request. Portions of Subareas C, D, and E will be drawn back under the license; the relicensing of those areas that should be licensed are being addressed in a separate license amendment request. The final status survey of soils described in Phase I areas is not relevant to the groundwater remediation plan proposed herein. Consequently, these submittals are no longer relevant to the license. The references to these documents are no longer needed.

January 23, 1996—This letter from Cimarron Corporation (ML092670504) requested a license amendment to recognize an organization change. The organizational change reported in this submittal is no longer relevant, and the license was transferred to a new licensee in February 2011. License amendment No. 21,(ML110270373), sets forth the organizational requirements for the Trust, which are addressed in the Radiation Protection Program. This tie-down does not reflect the current licensee's organization and is no longer relevant to the license. The reference to this document is no longer needed.

April 25, 1996 (Listed twice) and June 10, 1996—The April 25 letter from Cimarron Corporation (ML092670410) proposed an Option 2 material disposal procedure change from stockpiling to direct transportation to the on-site disposal cell. The June 10 letter from the NRC (ML092670281) approved this procedural change. Decommissioning of soil and closure of the on-site disposal cell is complete The NRC has documented that Subarea N, which contains the on-site

disposal cell, is releasable for unrestricted use. These tie-downs established requirements for work that has already been completed and are not relevant to current site conditions. The references to these documents are no longer needed.

August 28, 1996—This letter from Cimarron Corporation (ML092670405) described hot spot averaging procedures which were being used in the evaluation of material in stockpiles and the onsite disposal cell and clarified that hot spot averaging was not performed in the five wastewater pond areas. Decommissioning of soil and closure of the on-site disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. This tie-down was established to control work that has already been completed and is no longer relevant to current site conditions. The reference to this document is no longer needed.

September 20, 1996—This letter from Cimarron Corporation (ML092670400) responded to an August 1996 NRC request for additional information and revised the November 15, 1994, license amendment request. Cimarron Corporation was seeking to eliminate tie-downs related to Appendix A of a 1976 license renewal request, and Annex A of a 1982 license renewal request. During the ensuing two years, additional sections of the license were determined to need revision. A new RPP was submitted in this license amendment request, which was to represent a new “Annex A” to the Decommissioning Plan for Cimarron Corporation’s Former Nuclear Fuel Fabrication Facility (Chase Environmental Group, 1995A, ML20202A437). That RPP has been superseded several times, and other documents referenced in this submittal are no longer relevant to the license. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

November 20, 1996—This letter from Cimarron Corporation (ML092660285) proposed to perform a lung fluid solubility test to determine the biological solubility of uranium in site soils. The intent of this proposal was to determine if the Option 2 limit for soil for on-site disposal should be between the 100 pCi/g and the 250 pCi/g limits for totally soluble uranium and totally insoluble uranium, respectively. The issue is now moot since decommissioning of soil and closure of the onsite disposal cell is complete. The NRC has documented that Subarea N, which contains the on-site disposal cell, is releasable for unrestricted use. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

January 2, 1997—This letter from Cimarron Corporation (ML21113A241) responded to the NRC’s December 2, 1996, comments on Annex A, the RPP submitted in the September 20, 1996, license amendment request. The RPP has been superseded numerous times since this submittal, and the 1996 RPP is no longer relevant to the license. The reference to this document is no longer needed.

January 28, 1997—This letter from Cimarron Corporation (ML092680270) responded to the NRC’s October 31, 1996, comments on Final Status Survey Plan for Phase II Areas (Chase Environmental Group, Inc., 1995B). Subarea F, which is the only area in which NRC has not yet formally agreed that soils are

releasable for unrestricted use, is a Phase II area. Cimarron Corporation submitted a final status survey plan in accordance with this final status survey plan, in August 2005, and supplemented it with subsurface soil data in November 2007. In March 2013, ORAU published the analytical results for confirmatory subsurface samples selected by the NRC. All results were less than one-third the license criteria for unrestricted release. That final status survey plan is no longer relevant to the unrestricted release of Subarea F. The reference to this document is no longer needed.

May 6, 1997—This letter from Cimarron Corporation (ML092610946) responded to the NRC's February 25, 1997, comments on the 1995 decommissioning plan. This response addressed volumetric characterization of concrete in drainage and spillways, the State's classification of groundwater, and volumetric averaging at Uranium Ponds 1 and 2. The first two issues were addressed in subsequent decommissioning efforts. The two areas containing Uranium Ponds 1 and 2, the two Subarea O parcels, were released for unrestricted use in Amendment No. 16, issued April 17, 2000. Both NRC and DEQ approved criteria for groundwater under an unrestricted use scenario in 1999. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

May 16, 1997—This letter from Cimarron Corporation (ML092660227) responded to the NRC's March 5, 1997, comments on the RPP. The RPP has been superseded numerous times since this submittal, and the 1996 RPP is no longer relevant to the license. The reference to this document is no longer needed.

December 5, 1997—This letter from Cimarron Corporation (ML092680324) responded to the NRC's October 3, 1997, Comments on the *Final Status Survey Plan for Phase III Areas* (Chase Environmental Group, Inc., 1997). Final Status Survey Reports (FSSRs) for all Phase III areas have been submitted and approved by NRC. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

February 10, 1998—This letter from Cimarron Corporation (ML092610654) was the letter of submittal for the June 24, 1997, *Final Status Survey Plan for Phase III Areas* (Chase Environmental Group, Inc., 1997). FSSRs for all Phase III areas have been submitted and approved by the NRC. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

June 26, 1998—This letter from Cimarron Corporation (ML092610650) responded to the NRC's February 9, 1998, comments on the June 24, 1997, *Final Status Survey Plan for Phase III Areas* (Chase Environmental Group, Inc., 1997 (ML20202A560). FSSRs for all Phase III areas have been submitted and approved by NRC. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

July 2, 1998—This letter from Cimarron Corporation (ML092610647) responded to the NRC's July 1, 1998, conference call comments regarding the soil counter used to prepare the *Final Status Survey Report, Phase II Subarea J* (Cimarron Corporation, 1997). With the exception of Subarea F, the NRC has formally

agreed that soils in all Phase II areas are releasable for unrestricted use. A July 1, 1998, letter also addressed a similar soil counter comment on the Phase III Final Status Survey Plan. FSSRs for all Phase III areas have since been submitted and approved by NRC. The soil counter used for final status survey samples was demobilized from the Site prior to 2010. This tie-down regarding the traceability of the soil counter is no longer relevant to the license. The reference to this document is no longer needed.

February 15, 2000—This document was the *Final Status Survey Report, Subarea K* (ML20213C529)). Subarea K was released for unrestricted use in license amendment No. 18, issued May 28, 2002. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

February 20, 2001—This letter from Cimarron Corporation (ML010590080) responded to the NRC's January 9, 2001, comments on the *Final Status Survey Report, Subarea K* (Cimarron Corporation, 1997). Subarea K was released for unrestricted use in license amendment No.18, issued May 28, 2002. This submittal is no longer relevant to the license. The reference to this document is no longer needed.

April 17, 2002—This letter from Cimarron Corporation (ML021090498) proposed a decommissioning schedule based on information available at that time. That schedule is no longer relevant to the license. The reference to this document is no longer needed.

May 10, 2002—This letter from Cimarron Corporation (ML021360011) revised the decommissioning schedule, revising the assumptions behind the April 17, 2002, schedule. That document is no longer relevant to the license. The reference to this document is no longer needed.

In summary, none of the 39 documents listed in License Condition 10 are still relevant to the licensing and decommissioning of the Cimarron Site. EPM requests that License Condition 10 be removed from the license.

15.3.2 NRC Evaluation and Finding of Request to Delete Citations in License Condition 10

The NRC agrees that the citations under LC 10 are outdated and can cause conflict with actions taken by the licensee under LC 27.e. Therefore, the NRC agrees to delete the citations listed in LC 10.

License Condition 10 will now read:

For use in accordance with statements, representations, and conditions contained in letters dated, October 7, 2022

15.4 License Condition 23—Onsite Disposal

As currently written in Amendment 21 (ML110270373), LC 23 states the following:

> 23. The licensee is authorized to bury up to 14,000 cubic meters (m^3) (500,000 cubic feet) of soil contaminated with low-enriched uranium, in the 1981 Branch Technical Position (BTP) Option 2 concentration range, in the location described in the licensee's October 9, 1989, submittal to the NRC. The BTP Option 2 concentration range is up to 100 pCi/g for soluble uranium and up to 250 pCi/g for insoluble uranium.
>
> a. The licensee shall periodically monitor the disposal area for subsidence, erosion, and status of the vegetative cover for at least 5 years, and promptly repair any problems noted. Any additional measures necessary to prevent recurrence of the problems noted shall be undertaken.
>
> b. Notification shall be placed on the land title to declare that uranium -contaminated soil has been buried on the site and to record the volume, average uranium concentration, and exact location of the buried soil. This notification is not to be considered a restriction on the sale or future use of the site. Furthermore, cairns (permanent markers) placed at the corners of the disposal cell shall be maintained.
>
> c. Licensee shall maintain and implement procedures and engineering controls, to the extent practicable, to achieve occupational doses and doses to members of the public that are ALARA.

15.4.1 Licensee's Request for Change to License Condition 23

As described in Section 6.5 of the DP, Rev. 3 (ML22284A150), LC 23 authorized the licensee to bury up to 500,000 ft^3 of soil contaminated with low-enriched uranium in the location described in an October 9, 1989, submittal to the NRC. Approximately 452,000 ft^3 of such soil was buried in what has been designated BA4. That portion of the former Subarea N (on which BA4 is located) has been released for unrestricted use, so this authorization is no longer needed.

EPM requests that this license condition be deleted.

15.4.2 NRC Evaluation and Finding of Request to Delete License Condition 23

The NRC agrees that LC 23 is unnecessary. BA4 has already been sealed and found to be releasable for unrestricted use. The revision to LC 9, approved under SER Section 15.2, will adequately identify the licensee's authorized places of use.

The NRC will revise the LC 23 as follows:

> 23. Deleted

15.5 License Condition 26—Radiation Protection Program

As currently written in Amendment 21 (ML110270373), LC 26 reads as follows:

> The Licensee shall conduct a radiation protection program in accordance with Annex A, A Radiation Protection Plan, dated September 20, 1996, and supplements dated January 2, 1997, May 16, 1997, June 30, 1997, January 23, 1998, June 29, 1998, October 26, 1998, and December 11, 1998.

15.5.1 Licensee's Request for Change to License Condition 26

As described in Section 6.6 of the DP, Rev. 3 (ML22284A150), LC 26 requires the licensee to implement a version of the RPP that was submitted as Annex A to the 1996 site DP. This LC also lists a specific set of clarifications and revisions to the 1996 Annex A dated September 20, 1996; January 2, 1997; May 16, 1997; June 30, 1997; January 23, 1998; June 29, 1998; October 26, 1998, and December 11, 1998. The RPP has been revised on an annual basis, resulting in 15 subsequent revisions since the last submittal referenced in this LC. By the time the NRC issued Amendment 15 on August 20, 1999 (ML092680913) (NRC, 1999), the RPP consisted of the 1996 submittal as amended by NRC approval of changes submitted in the eight subsequent documents listed in LC 26. Amendment provided for subsequent revision of the DP and RPP without NRC approval, provided conditions specified in LC 27 (e) are met. The RPP has been revised nearly every year, and annual reports of all changes made under LC 27 (e) have been submitted to the NRC, usually with complete copies of the then-current RPP.

The NRC transferred SNM-928 to CERT on February 14, 2011. The RPP was revised significantly to reflect changes in the licensee and the licensee's organization. The RPP has since been revised to reflect changing conditions and programs at the site; all revisions have been approved as provided for by LC 27(e).

EPM requests that LC 26 be amended to reference the RPP, Revision 5, with revisions dated July 30, 1998, made to address RAIs and revisions made in accordance with LC 27(e).

15.5.2 NRC Evaluation and Finding of Request to Delete License Condition 26

The NRC agrees that LC 26 is unnecessary since the granting of LC 27(e) in Amendment 15 (ML092680913), and this has caused conflicting interpretations of the regulatory requirements that are best captured in the RPP (ML22286A230). Therefore, the NRC revised the text of LC 26 as follows:

The licensee shall conduct a radiation protection program in accordance with the Radiation Protection Plan, Revision 5, with revisions made to address RAIs and/or revisions made in accordance with License Condition 27(e).

15.6 License Condition 27—Site Decommissioning

15.6.1 License Condition 27(a)

As currently written in Amendment 21 (ML110270373), LC 27(a) states the following:

> a. The licensee is authorized to remediate the Licensee facility in accordance with the Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility at Crescent, Oklahoma, dated April 19, 1995, with supplemental correspondence dated September 10, 1996, May 6, 1997, August 26, 1997, March 10, 1998, March 12, 1998, June 15,1998, October 6, 1998, and March 4, 1999.

15.6.1.1 Licensee's Request for Change to License Condition 27 (a)

As indicated in Section 6.7.1 of the DP, Rev. 3 (ML22284A150), this LC authorizes the licensee to remediate the site in accordance with the April 1995 site DP, as supplemented by eight subsequent documents. Numerous additional submittals address subsequent commitments and work to decommission the site; specifically, the characterization and remediation of site groundwater. EPM believes this LC should be amended to incorporate the characterization work that justifies the redefinition of the licensed area. The amended LC should also incorporate the groundwater remediation plan submitted in this license amendment request to provide for the completion of decommissioning activities needed to achieve unrestricted release of the site and termination of the license. This section addresses each of the documents referenced in LC 27(a) and explains why each should be deleted from or retained in the license, as follows:

> April 19, 1995—This submittal was the *Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility* (Chase Environmental Group, Inc., 1995A (ML20202A437)). This document provided for the decommissioning of buildings, materials, and soil sitewide. It did not address groundwater remediation. This decommissioning plan was approved by the NRC under the Site Decommissioning Management Plan (SDMP). In a letter dated June 8, 2004 (ML041560310), the NRC advised the Cimarron Corporation that the SDMP was being eliminated, stating, "Although your facility will no longer be referred to as an "SDMP site," the NRC staff will continue to manage the decommissioning of your site in the same manner, using the same criteria that have been applied in the past." In a letter dated November 10, 2005 (ML053140316), the NRC stated that "Cimarron may continue decommissioning under the SDMP". That letter went on to say, "Cimarron must apply for and obtain a license amendment to change its approved method of groundwater remediation from MNA to excavation or pump and treat." *Facility Decommissioning Plan—Rev 3*, submitted in this license amendment request satisfies this requirement. Although this document is no longer relevant to the ongoing decommissioning of the Cimarron Site, the licensee contends the

document should be retained in License Condition 27.a., because it provides the basis for the decommissioning activities that have been completed.

September 10, 1996—This letter from Cimarron Corporation (ML092670402) responded to NRC's July 11, 1996, comments on the April 1995 *Final Status Survey Plan for Phase II Areas* (Chase Environmental Group, Inc., 1995B). NRC's comments primarily addressed the decommissioning and final status survey of areas which were subsequently released for unrestricted use. Except for groundwater, which has received substantial characterization since that time, and for which a remediation plan is submitted herein, all the work addressed in this submittal has been completed. This submittal is no longer relevant to the license. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

May 6, 1997—This letter from Cimarron Corporation (ML092610946) responded to NRC's February 25, 1997, comments on Cimarron's September 10, 1996 (ML092670402) response letter. NRC's comments addressed volumetric averaging, final survey of paved areas, groundwater classification, and the characterization of concrete. Except for groundwater, which has received substantial characterization since that time, and for which a remediation plan is submitted herein, all the work addressed in this submittal has been completed. This submittal is no longer relevant to the license. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

August 26, 1997—This letter from Cimarron Corporation (ML092610943) responded to NRC's July 1, 1997, comments on issues related to Cimarron's September 10, 1996 (ML092670402) response letter. NRC's comments addressed volumetric averaging in Uranium Ponds #1 and #2 and the characterization of concrete. All the work addressed in this submittal has been completed. This submittal is no longer relevant to the license. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

March 10, 1998—This submittal was *Final Status Survey Report for Concrete Rubble in Sub-Area F* (ML20043F213)). This report presented the results of surveys of concrete rubble (primarily floor slabs and footers) which came from demolished buildings in Subarea K. NRC performed a confirmatory survey of the concrete rubble in Subarea F in June 2012, and in a letter dated September 7, 2012, NRC released the rubble for unrestricted use. If the license is amended as requested in Section 6.3 of this D-P, the licensee contends reference to this document could be deleted.

March 12, 1998—This submittal was *Final Status Survey Report for Phase III Subarea O, Uranium Waste Ponds #1 and #2 (Subsurface)* (ML20206K825). The two Subareas identified as Subarea O were released for unrestricted use in license amendment No. 16, issued April 17, 2000. This submittal is no longer relevant to the license. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

June 15, 1998—This letter from Cimarron Corporation responded to NRC's May 20, 1998, comments on *Final Status Survey Report for Concrete Rubble in Sub-Area F* (Chase Environmental Group, 1998A (ML092610651)). If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

October 6, 1998—This letter from Cimarron Corporation (ML092710481) responded to NRC's September 10, 1998, comments on residential inhalation dose from concrete rubble in Subarea F. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

March 4, 1999—This letter from Cimarron Corporation (ML21111A336) responded to NRC's January 19, 1999, comments on *Decommissioning Plan Ground Water Evaluation Report* (Chase Environmental Group, 1998B), in which Cimarron stated that groundwater in Well 1315 (in Subarea F) exceeded the criteria for uranium. At that time, Cimarron personnel did not believe that groundwater exceeding release criteria extended beyond Well 1315, much less beyond the boundary of Subarea F. NRC required additional characterization of groundwater in Subareas F and C. Since that time, substantial characterization of groundwater, not only in Subareas F and C, but sitewide, has been performed, culminating in the submittal of *Conceptual Site Model (Revision—01)* (ENSR, 2006A). Consequently, Cimarron's response to NRC comments on the 1998 groundwater evaluation report are no longer relevant to the continued decommissioning of the Site. If the license is amended as requested in Section 6.3 of this DP, the licensee contends reference to this document could be deleted.

In summary, EPM requests that License Condition 27(a) be amended to reference the 1995 Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility and this Plan, with revisions made in accordance with responses to RAIs and/or revisions made in accordance with License Condition 27(e).

15.6.1.2 NRC Evaluation and Finding Regarding Request to Change License Condition 27.a.

The NRC has reviewed the licensee's request and agrees that the letter dated April 19, 1995, should be retained in LC 27 (a), and agrees that the letters dated September 10, 1996; May 6, 1997; August 26, 1997; March 10, 1998; March 12, 1998; June 15, 1998; October 6, 1998; and March 4, 1999, should be deleted from LC 27 (a).

Accordingly, in Amendment 22, the NRC will revise LC 27.a. to read as follows:

a. The licensee is authorized to remediate the Licensee facility in accordance with the letter dated April 19, 1995, and the Facility Decommissioning Plan—Revision 3, October 17, 2022, with revisions made in accordance with responses to RAIs and/or revisions made in accordance with License Condition 27.e.

15.6.2 License Condition 27.b.

As currently written in Amendment 21 (ML110270373), LC 27.b. states the following:

> b. The release criteria for groundwater at the Cimarron site is 6.7 Bq/l (180 pCi/l) total uranium. NRC will not terminate Radioactive Material License SNM-928 until the licensee demonstrates that the total uranium concentrations in all post-remediation monitoring wells have been below the groundwater release criteria for eight consecutive quarterly samples (the past 2 years). The Licensee will retain control of the property licensed under NRC Radioactive Material License SNM-928 until the groundwater release criteria are met. The Oklahoma Department of Environmental Quality may require continued groundwater monitoring of nonradioactive components under its authority.

15.6.2.1 Licensee's Request for Change to License Condition 27.b.

As described in Section 6.7.2 of the DP, Rev. 3 (ML22284A150), the licensee described its request for revision to LC 27.b. as follows:

> In October 1999, License amendment No. 15 established (in License Condition 27.b.) the radiological release criterion for uranium in groundwater and established a monitoring requirement to demonstrate that groundwater complies with the criterion. License Condition 27. b. states, "NRC will not terminate Radioactive Material License SNM-928 until Cimarron demonstrates that the total uranium concentrations in all wells have been below the groundwater release criteria for eight consecutive quarterly samples (the past 2 years)." It was then believed that uranium exceeded the license release criterion in only a very limited area, and that natural attenuation would reduce the concentration of uranium in groundwater to less than the release criterion within a few years. There were 50 monitor wells on-site; 25 of them have since been plugged and abandoned.
>
> Since that time, groundwater assessment has shown that groundwater exceeds license release criteria in several areas of the site, and that natural attenuation processes alone will not reduce groundwater concentrations to less than release criteria for decades. A total of 298 monitor wells have been installed on-site; 212 monitor wells are still present at the site. Many of these have never yielded groundwater exceeding the release criterion for uranium.
>
> The requirement to collect and analyze groundwater samples from ***all post-remediation wells*** for eight quarters is to demonstrate the compliance with the site DCGL. Section 8.8 of this plan specifies a post-remediation monitoring program which will demonstrate that uranium and Tc-99 concentrations in groundwater comply with unrestricted release criteria. Approval of this decommissioning plan therefore constitutes specification of post-remediation groundwater monitoring requirements.
>
> In the DP. Rev. 3, EPM requested that License Condition 27.b. be amended to read, "The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99." NRC will not terminate

Radioactive Material License SNM-928 until the licensee demonstrates that the total uranium concentrations in all post-remediation monitoring wells have been below the groundwater release criteria for eight consecutive calendar quarters.

However, in a letter dated July 12, 2023, (ML23193A843), EPM submitted *Revision of License Amendment Requests in Section 6 of Decommissioning Plan – Rev 3*. In that letter, EPM explained that Section 6.7.2 of the D-Plan did not adequately address the difference between uranium and Tc-99 requirements for post-remediation monitoring (and NRC release determination). The July 12 letter requested that License Condition 27(b) be amended to read,

"The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99." NRC will not terminate Radioactive Material License SNM-928 until the following requirements are met:

A) The concentration of uranium in the post-remediation monitor wells listed for uranium analysis in Table 8.8 of Facility Decommissioning Plan – Rev 3 remains below 180 pCi/L for eight consecutive calendar quarters.

B) The concentration of Tc-99 in the post-remediation monitor wells listed for Tc-99 analysis in Table 8.8 of Facility Decommissioning Plan – Rev 3 remains below 3,790 pCi/L for four consecutive calendar quarters."

EPM requests that License Condition 27.b. be amended to read, "The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99." NRC will not terminate Radioactive Material License SNM-928 until the licensee demonstrates that the total uranium concentrations in all post-remediation monitoring wells have been below the groundwater release criteria for eight consecutive calendar quarters.

However, in a letter dated July 12, 2023, (ML23193A843), the licensee submitted *Revision of License Amendment Requests in Section 6 of Decommissioning Plan – Rev 3*. In that letter, licensee explained that Section 6.7.2 of the D-Plan did not adequately address the difference between uranium and Tc-99 requirements for post-remediation monitoring (and NRC release determination). The July 12 letter requested that License Condition 27(b) be amended to read,

"The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99." NRC will not terminate Radioactive Material License SNM-928 until the following requirements are met:

A) The concentration of uranium in the post-remediation monitor wells listed for uranium analysis in Table 8.8 of Facility Decommissioning Plan – Rev 3 remains below 180 pCi/L for eight consecutive calendar quarters.

B) The concentration of Tc-99 in the post-remediation monitor wells listed for Tc-99 analysis in Table 8.8 of Facility Decommissioning Plan – Rev 3 remains below 3,790 pCi/L for four consecutive calendar quarters."

Additionally,since Table 8-8 was revised in the licensee's letter, December 8, 2023 "Response to October 2, 2023, Request for Additional Information in responding to NRC RAIs related to the SER. Therefore, the reference is to Table 8-8 in Condition 27 (b), is no longer appropriate and should be replaced by, Table 8-8 – Rev 1 of the December 8, 2023 (ML23346A262)"Response to October 2, 2023, Request for Additional Information".

Therefore, in summary, the licensee would like to have License Condition 27(b) be amended to read,

> b. *The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99. NRC will not terminate Radioactive Material License SNM-928 until the following requirements are met:*
>
> > i. *The concentration of uranium in the post-remediation monitor wells listed for uranium analysis, in Table 8-8 – Rev 1, of the letter dated December 8, 2023 (ML23346A262), remains below 180 pCi/L for eight consecutive calendar quarters.*
> >
> > ii. *The concentration of Tc-99 in the post-remediation monitor wells listed for Tc-99 analysis in Table 8-8 – Rev 1, of the letter dated December 8, 2023 (ML23346A262) remains below 3,790 pCi/L for four consecutive calendar quarters."*

15.6.2.2 NRC Evaluation and Finding Regarding Revision to License Condition 27.b.

The NRC agrees that these subareas have been released from the license and the activities described in LC 27.b. are no longer relevant to the remaining decommissioning activities.

Accordingly, in Amendment 22, the NRC will revise LC 27.b. to read as follows:

> c. *The release criteria for groundwater at the Cimarron Site is 6.7 Bq/L (180 pCi/L) for total uranium and 3,790 pCi/L for Tc-99. NRC will not terminate Radioactive Material License SNM-928 until the following requirements are met:*
>
> > i. *The concentration of uranium in the post-remediation monitor wells listed for uranium analysis in Table 8-8 – Rev 1 of the letter dated December 8, 2023 (ML23346A262) remains below 180 pCi/L for eight consecutive calendar quarters.*
> >
> > ii. *The concentration of Tc-99 in the post-remediation monitor wells listed for Tc-99 analysis in Table 8-8 – Rev 1 of the December 8, 2023 (ML23346A262) remains below 3,790 pCi/L for four consecutive calendar quarters."*

15.6.3 License Condition 27.c.

As currently written in Amendment 21 (ML110270373), LC 27.c. states the following:

b. The Licensee shall use the unrestricted use criteria listed in the August 1987A Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Materials for surfaces of buildings and equipment, and the October 23, 1981, BTP Disposal or Onsite Storage of Thorium or Uranium from Past Operations, for soils or soil-like materials.

Specific values are as follows:

Surfaces of buildings and equipment—

5,000 dpm alpha/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);

5,000 dpm beta-gamma/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);

15,000 dpm alpha/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);

15,000 dpm beta-gamma/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);

1,000 dpm alpha/100 cm^2 (15.5 in^2), removable

1,000 dpm beta-gamma/100 cm^2 (15.5 in^2), removable

Soils—

Natural uranium	0.37 Bq/g (10 pCi/g) total uranium
Enriched uranium	1.1 Bq/g (30 pCi/g) total uranium
Depleted uranium	1.3 Bq/g (35 pCi/g) total uranium
Natural thorium	0.37 Bq/g (10 pCi/g) total thorium

Exposure rates are as follows:

Surfaces of buildings and equipment—

1.3 pCi/kg (5μR/hr) above background at 1 m (3.3 ft)

Soils—

2.6 pCi/kg (10μR/hr) average above background at 1 m (3.3 ft)
5.2 pCi/kg (20 μR/hr) maximum above background at 1 m (3.3 ft)

Soils and soil-like material with concentration exceeding the 1981 BTP Option 1 limits, but less than the Option 2 limits may be disposed in the onsite disposal cell in accordance with License Condition 23.

The licensee shall conduct a final survey and sampling program to ensure that residual contamination meets the unrestricted use criteria in this license. Buildings, equipment, and outdoor areas shall be surveyed in accordance with NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Radioactivity levels shall not exceed the averaging criteria in NUREG/CR-5849. Soils and soil-like materials with elevated activities exceeding the unrestricted use criteria shall be investigated to determine compliance with the averaging criteria in NUREG/CR-5849. These criteria address averaging concentrations over any 100 m^2 (1070 ft^2) area and use the $(100/A)^2$ elevated area method.

For areas surveyed prior to the issuance of NUREG/CR-5849, in the applicable final survey report, the licensee shall describe the survey methods used and provide the applicable references.

For Waste Ponds 1 and 2 in Phase III Subarea O, the licensee may use the "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soils" (reference NRC letter dated February 25, 1997) for volumetric concentration averaging of enriched uranium in soils.

For concrete rubble located in Phase II and Phase III subareas, the licensee may use the concentration averaging for concrete rubble as described in submittals dated March 10, 1998, June 15, 1998, and October 6, 1998.

Material that exceeds the above averaging criteria shall be removed and shipped off site to a licensed low-level radioactive waste disposal site.

15.6.3.1 Licensee's Requests for Change to License Condition 27.c.

As described in Section 6.7.3 of the DP, Rev. 3 (ML22284A150), the licensee described its request as follows:

License Condition 27.c, includes the following paragraphs:

For Waste Ponds 1 and 2 in Phase III Subarea O, the licensee may use the "Method for Surveying and Averaging Concentrations of Thorium in Contaminated Subsurface Soils" (reference NRC letter dated February 25, 1997 (ML092610876)) for volumetric concentration averaging of enriched uranium in soils. For concrete rubble located in Phase II and Phase III subareas, the licensee may use the concentration averaging for concrete rubble as described in submittals dated March 10, 1998, June 15, 1998, and October 6, 1998.

Material that exceeds the above averaging criteria shall be removed and shipped off site to a licensed low level radioactive waste disposal site.

These references are no longer relevant to remaining decommissioning activities. EPM requests that the license be amended to delete these paragraphs from License Condition 27.c.

The two areas containing Waste Ponds 1 and 2 (the two Subarea O parcels) were released for unrestricted use in Amendment No. 16, issued April 17, 2000. Concrete slabs were placed in Phase II Subareas F, G, and J; the concrete floor of the former Uranium processing facility remained in Phase III Subarea K. A confirmatory survey of the concrete rubble (slabs) in Subarea G was documented in NRC Inspection Report 70-925/98-02. Confirmatory surveys of the concrete rubble (slabs) in Subarea F were documented in NRC Inspection Reports 70-925/9-8-02 and 70-925/12-01. Subareas J and K were released from the license in Amendments 16 and 19, respectively.

15.6.3.2 NRC Evaluation of Request to Change License Condition 27.c.

The NRC agrees that these subareas have been released from the license and the activities described in LC 27.c. are no longer relevant to the remaining decommissioning activities.

Accordingly, in Amendment 22, the NRC will revise LC 27.c. to read as follows:

The Licensee shall use the unrestricted use criteria listed in the August 1987 A Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Materials for surfaces of buildings and equipment, and the October 23, 1981, BTP Disposal or Onsite Storage of Thorium or Uranium from Past Operations, for soils or soil-like materials.

Specific values are as follows:

Surfaces of buildings and equipment—

5,000 dpm alpha/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);

5,000 dpm beta-gamma/100 cm^2 (15.5 in^2), averaged over 1 m^2 (10.8 ft^2);

15,000 dpm alpha/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);

15,000 dpm beta-gamma/100 cm^2 (15.5 in^2), maximum over 1 m^2 (10.8 ft^2);

1,000 dpm alpha/100 cm^2 (15.5 in^2), removable

1,000 dpm beta-gamma/100 cm^2 (15.5 in^2), removable

Soils—

Natural uranium	0.37 Bq/g (10 pCi/g) total uranium
Enriched uranium	1.1 Bq/g (30 pCi/g) total uranium
Depleted uranium	1.3 Bq/g (35 pCi/g) total uranium
Natural thorium	0.37 Bq/g (10 pCi/g) total thorium

Exposure rates are as follows:

Surfaces of buildings and equipment—

1.3 pCi/kg (5 μR/hr) above background at 1 m (3.3 ft)

Soils—

2.6 pCi/kg (10 μR/hr) average above background at 1 m (3.3 ft)
5.2 pCi/kg (20 μR/hr) maximum above background at 1 m (3.3 ft)

Soils and soil-like material with concentration exceeding the 1981 BTP Option 1 limits, but less than the Option 2 limits may be disposed in the onsite disposal cell in accordance with License Condition 23.

The licensee shall conduct a final survey and sampling program to ensure that residual contamination meets the unrestricted use criteria in this license. Buildings, equipment, and outdoor areas shall be surveyed in accordance with NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Radioactivity levels shall not exceed the averaging criteria in NUREG/CR-5849. Soils and soil-like materials with elevated activities exceeding the unrestricted use criteria shall be investigated to determine compliance with the averaging criteria in NUREG/CR-5849. These criteria address averaging concentrations over any 100 m^2 (1070 ft^2) area and use the $(100/A)^2$ elevated area method.

For areas surveyed prior to the issuance of NUREG/CR-5849, in the applicable final survey report, the licensee shall describe the survey methods used and provide the applicable references.

15.6.4 License Condition 27.d.

As currently written in Amendment 21 (ML110270373), LC 27.d. reads as follows:

> Access gates to the Cimarron facility shall be locked and secured when no personnel are onsite and fences and locks will be maintained.

15.6.4.1 Licensee's Request to Change License Condition 27.d.

This LC is no longer necessary. NRC regulations require that access to restricted areas be limited to individuals who have received the appropriate training. EPM will control access to all areas within which operations, offices, and radioactive material storage areas are located. Additional controls will be implemented for any areas that will be designated as restricted areas.

EPM requests that LC 27.d. be deleted from the license.

15.6.4.2 NRC Evaluation and Finding Regarding Revision to License Condition 27.d.

The NRC agrees with the licensee that controlling access to the site through the requirements defined in LC 27.d. (i.e., through the use of locks and fences) is prescriptive and no longer necessary, and that through EPM, the licensee will be required to control access to all areas

within which operations, offices, and radioactive material storage areas are located. Additional controls will be implemented for any areas that will be designated as restricted areas.

Accordingly, in Amendment 22, the NRC will revise LC 27.d. to read as follows:

c. Deleted

16. New License Conditions Related to Construction, Operation, and Monitoring of Groundwater Remediation System

16.1 Regulatory Requirements

Pursuant to 10 CFR 70.38 (g)(4)(ii), the plan must include a description of planned decommissioning activities.

16.2 Request for Additional Information

In an RAI dated October 2, 2023 (ML23251A211), the NRC requested that the licensee provide additional information that would address the requirement for a description of planned decommissioning activities, such as any reporting of remedial system construction, startup, operations and maintenance, or sampling and monitoring results to the NRC during site remediation that could not be identified in the DP, Rev. 3 (ML22284A150).

Periodic reporting to the NRC of remedial progress, including reports summarizing remedial system operational parameters (e.g., system run time, individual well and trench flow rates, influent and effluent concentrations, total treatment volumes, resin status) with tables and figures, including static and dynamic groundwater flow maps and uranium groundwater plume maps for each remediation area, are generally included as part of the DP and requested at 6 months and 1 year following startup, with annual reports requested thereafter. The first report generally includes a summary of the system startup activities, and any pertinent information related to system functionality.

16.3 Response from Licensee

In its response in Section 6 of a letter dated December 8, 2023 (ML23346A262), the licensee agreed to the reporting requirements described below.

16.3.1 Construction Reporting

The licensee will submit a quarterly construction progress report during construction. It should include the following major activities:

- mobilization and installation of stormwater controls;
- installation of groundwater extraction, treated water injection, and discharge components;
- construction of the WATF and BA1 Remediation Facility; and

- installation of groundwater treatment and resin processing systems and all ancillary equipment (e.g., influent and effluent tanks, injection skids, utilities and piping).

In addition, these reports will include the following:

- a summary of permits obtained to date and an update on the status of the OPDES discharge permit;
- a summary of work completed to date as compared with the baseline construction schedule;
- issues encountered and corresponding changes, if any;
- a summary of the results of radiological surveys performed;
- anticipated impacts to construction cost.

16.3.2 Startup of Remediation and Groundwater Treatment

A system startup report will be prepared and submitted to the NRC within 6 months following startup and commissioning activities. The system startup report will include the following:

- static (prior to system startup) groundwater elevation data and potentiometric surface maps;
- baseline (prior to system startup) in-process monitor well groundwater sampling results;
- daily, weekly, and monthly groundwater elevation data, and potentiometric surface maps based on groundwater elevation data collected during the third month of system operations;
- treatment process water sampling results for the first 3months of system operations;
- groundwater sampling results for the groundwater monitoring event conducted during the third month of system operations;
- a description of the operation of groundwater extraction systems, treatment systems, discharge and injection systems, facilities, etc.;
- a summary of data collected from system operations components such as overall system run time, individual well and trench extraction/injection flow rates, influent and effluent water concentrations, total treatment volumes, resin usage and status, etc. for the first 3 months of system operations; and
- a summary of the results of radiological surveys.

16.3.3 Groundwater Remediation

Remediation progress reports will be submitted at 6 months and 1 year following system startup and annually thereafter. Remediation progress reports will generally include the following:

- summary of activities performed during the reporting period;
- groundwater sampling activities, results, and analysis (including depictions of groundwater potentiometric surface maps, groundwater uranium concentration maps, groundwater concentration trend charts, etc.);
- remediation system operational summary (including system operational times; individual and cumulative groundwater recovery, treatment, and injection rates/volumes; water treatment media usage, inventory, and treatment efficiency; influent/effluent water concentration data and trends; etc.);
- treatment material control (resin usage, inventory, and deliveries, pretreatment chemical usage, inventory, and deliveries, etc.);
- waste material management and control (spent resin inventory, quantities/frequencies of waste shipments, waste uranium and Tc-99 concentration data, etc.)
- contingency measures implemented (as applicable);
- evaluation of progress towards decommissioning;
- summary of planned activities for the subsequent reporting period

16.4 License Condition 31

The NRC agrees with the LC proposed commitments as described above in letter dated December 8, 2023 (ML23346A262). Accordingly, in Amendment 22, the NRC will add LC 31 to read as follows:

31. Reporting

a. The licensee will submit a quarterly construction progress report during construction. It needs to include the following major activities:

i. Mobilization and installation of stormwater controls.
ii. Installation of groundwater extraction, treated water injection, and discharge components, including the trench and extraction well geologic and construction logs;
iii. Construction of the Western Area Treatment Facility and Burial Area 1 Remediation Facility;
iv. Installation of groundwater treatment and resin processing systems and all ancillary equipment (e.g., influent and effluent tanks, injection skids, utilities and piping);
v. A summary of permits obtained to date and an update on the status of the OPDES discharge permit;
vi. A summary of work completed to date as compared with the baseline construction schedule;
vii. Issues encountered and corresponding changes, if any;
viii. A summary of the results of radiological surveys performed; and

ix. Anticipated impacts to construction cost.

b. Startup of Remediation and Groundwater Treatment

The licensee will prepare and submit a System Startup Report to the NRC within 6 months following startup and commissioning activities. The system startup report will include the following:

i. Static (prior to system startup) groundwater elevation data and potentiometric surface maps;

ii. Baseline (prior to system startup) in-process monitor well groundwater sampling results;

iii. Daily, weekly, and monthly groundwater elevation data, and potentiometric surface maps based on groundwater elevation data collected during the startup of remedial system operations (at the end of the first day, one week, two weeks, one month, and at the end of three months);

iv. Treatment process water sampling results for the first three months of system operations;

v. Groundwater sampling results for the groundwater monitoring events conducted during the third month of system operations;

vi. A description of the operation of groundwater extraction systems, treatment systems, discharge and injection systems, facilities, etc.;

vii. A summary of data collected from system operations components such as overall system run time, individual well and trench extraction/injection flow rates, influent and effluent water concentrations, total volumes of groundwater treated in WA and BA1, resin usage and status, etc. for the first three months of system operations; and

viii. A summary of the results of radiological surveys.

c. Groundwater Remediation

The licensee will prepare and submit a Remediation Progress Report to the NRC 1 year following system startup and annually thereafter. Remediation Progress Reports will generally include the following:

i. Summary of activities performed during the reporting period;

ii. Groundwater sampling activities, results, and analysis (including depictions of groundwater potentiometric surface maps (quarterly),

groundwater uranium concentration maps (quarterly), groundwater concentration trend charts, etc.);

iii. Remediation system operational summary (including system operational times; individual and cumulative groundwater recovery, treatment, and injection rates/volumes; water treatment media usage, inventory, and treatment efficiency; influent/effluent water concentration data and trends; etc.);

iv. Treatment material control (resin usage, inventory, and deliveries, pretreatment chemical usage, inventory, and deliveries, etc.);

v. Waste material management and control (spent resin inventory, quantities/frequencies of waste shipments, waste uranium and Tc-99 concentration data, etc.); and

vi. Contingency measures implemented (as applicable).

vii. The remediation schedule provided in the DP (Figure 9-4, ML22284A145) is estimated based on the groundwater flow projection and uranium partitioning coefficient and other input parameters. If it is determined that decommissioning cannot be completed as outlined in the DP, Rev.3 approved by Amendment 22, dated December 20, 2024), the licensee will provide an updated schedule to the NRC and the ODEQ.

17. New License Condition from Environmental Assessment Related to Protecting cultural resources

As described in Section 2 of the Environmental Assessment (EA) ADAMS Accession Number (ML24334A062), for the Proposed Approval of a Decommissioning Plan for Groundwater Treatment at the Cimarron Site in Logan County, Oklahoma and as shown on figure 3-14 of the EA all proposed ground disturbance would occur in areas away from the identified historic resources. To ensure the protection of any unknown resources that EPM may encounter during excavation and other ground-disturbing activities, and consistent with SHPO recommendations to preserve the visual quality of the resources associated with the former fuel fabrication facility, the following condition is added to the license:

Condition 32 Protection of Cultural Resources

a. If archaeological artifacts are discovered during ground-disturbing activities, EPM must cease all work within 15 m (50 ft) of the discovery and secure the location against further disturbance. EPM must notify the NRC, SHPO, and OAS of the discovery before the close of business the next working day after the discovery. If human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered, EPM must cease all activities within 15 m (50 ft) of the discovery and secure the location. EPM must notify the NRC, SHPO, and OAS within one working day.

b. Upon completion of the groundwater remediation project, and except for the permanent WATF building and associated utilities and ancillary equipment, the site must be

returned to pre-construction condition. For example, for any monitoring wells not required to remain in place by the Oklahoma DEQ, concrete pads must be removed, filled, and revegetated. This is to ensure that the project has no lasting visual effect on the NRHP-eligible properties.

18. Conclusion

Based upon the NRC's review and its findings in this SER, specifically, the NRC approves of Revision 3 of the DP, which provides further details regarding the active groundwater remediation plans that specifically target areas for groundwater remediation where the concentration of uranium in groundwater exceeds the NRC criterion for unrestricted release, as specified in the license. The groundwater remedy supported by site-specific field and laboratory studies addresses the uranium groundwater contamination in the areas identified at the site through active groundwater extraction, injection, and treatment with IX to reduce uranium levels in the groundwater. System performance monitoring programs and evaluation procedures are specified to ensure the achievement of remedial objectives. The proposed remedy prevents further migration of uranium-impacted groundwater from the site, thereby reducing the risk to public health and the environment. The proposed remediation techniques are well established with numerous examples of successful implementation on similar site remediation projects. The NRC anticipates that the uranium-contaminated groundwater in most of the areas can be successfully remediated within the timeframe proposed in the DP, Rev. 3. Smaller, more limited areas of uranium-contaminated groundwater, such as the BA1 transition zone, may potentially require additional time for remediation due to complex hydrogeologic conditions and slower groundwater recovery. In addition to incorporating the DP, Rev. 3, as discussed in this SER, the NRC approves the licensee's requests for other revisions to SNM-928:

- Based upon the NRC conclusions about criticality safety and radiation safety in SER chapter 8 and MC&A in SER chapter 14, the request to amend the license will allow the licensee to distinguish between the possession limit for "in-process" U-235 and U-235 in packaged waste that complies with fissile exemption criteria. Distinguishing between the possession limit for "in-process" U-235 and U-235 in packaged waste that complies with fissile exemption criteria will clarify the requirements for each type of material that is possessed to avoid confusion in the future during operation of the groundwater treatment facility.

- Based upon the NRC conclusions in SER chapter 15, the license amendment will authorize the possession of Tc-99 as a contaminant in groundwater. SNM-928 does not stipulate unrestricted release criteria for Tc-99.

- Based upon NRC conclusions in SER Sections 15.1,15.2,15.3, 15.4, 15.5, and 15.6, the NRC approves the licensee's request to amend the license to clarify the authorized place of use to include subsurface areas where the groundwater exceeds the NRC criterion and areas where such licensed material will be transported or managed.

- Based upon NRC conclusions in SER Section 15.1, the NRC approves the license's request to eliminate references to documents on previous decommissioning activities of facilities and soil that are no longer relevant to ongoing decommissioning activities. Eliminating references to documents relevant to previously existing decommissioning activities of facilities and soil that are no longer relevant to ongoing decommissioning activities will eliminate confusion in identifying program requirements that are relevant to

the operation of the groundwater treatment facility and not preexisting and released facilities.

The NRC agrees that clarifying the authorized place of use to include areas previously released from the license, in which groundwater exceeding the NRC criterion is present in the subsurface and areas where such licensed material will be transported or managed, will clearly define the authorized places of use requiring radiological controls and surveillance during the life of the treatment facility (ML24192A319). This will also inform the areas needing characterization in future FSSs to eventually terminate the license at the end of the groundwater treatment process. As such License Condition 9 will be revised to refer to the map figure 6-4 of the DP, Rev. 3 (ML24192A319).

Additionally, the NRC, based upon the discussion in SER chapter 16, adds requirements under LC 31, pursuant to 10 CFR 70.38 (g)(4)(ii), to include requirements for the DP, Rev. 3, to include a description of planned decommissioning activities.

Finally, based upon the discussion in Section 2 of the Environmental Assessment (EA) and as shown on figure 3-14 of the EA, all proposed ground disturbance would occur in areas away from the identified historic resources. To ensure the protection of any unknown resources that EPM may encounter during excavation and other ground-disturbing activities, and consistent with State Historic Preservation Office (SHPO) recommendations to preserve the visual quality of the resources associated with the former fuel fabrication facility, the NRC is adding two new requirements under License Condition 32.

19. References not available in ADAMS

Adams, G.P. and D.L. Bergman, 1995. “Geohydrology of alluvium and terrace deposits of the Cimarron River from Freedom to Guthrie, Oklahoma,” Water-Resources Investigations Report 95-4066, 1995. https://doi.org/10.3133/wri954066

Carr, J.E. and M.V. Marcher, 1977. *Preliminary Appraisal of the Garber-Wellington Aquifer, Southern Logan and Northern Oklahoma Counties,* USGS OFR 77-278.

FEMA, 2021A. Flood Map Service Center. National Flood Hazard Layer. https://msc.fema.gov/portal/searchAddressQuery=100_N.Highway_74_Guthrie_OK/ Accessed October 11, 2021.

Oklahoma Geological Survey, 2017. “Potential Threat of Injection Induced Seismic Activity & Selected Associated Hydraulic Fracturing Tort Litigation,” Statement, March 1, 2017.

Tortorelli and McCabe, 2001. Tortorelli, Robert L., and Lan P. McCabe, “Flood Frequency Estimates and Documented and Potential Extreme Peak Discharges in Oklahoma,” U.S. Geological Survey, Water ..Resources Investigations Report 2001-4152, 2001, https://doi.org/10.3133/wri20014152.

Shleien, et al., 1998. Shleien, B., Slaback, L., Birky, B., Editors, *Handbook of Health Physics and Radiological Health*, Williams & Wilkins, 1998.

U.S. Environmental Protection Agency (EPA), 1994. “Methods for Monitoring Pump-And-Treat Performance,” EPA/600/R-94/123, Robert S. Kerr Environmental Research Laboratory, June 1994.

EPA, 2009. “Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance,” EPA/530-R-09-007, Program Implementation and Information Division, Office of Resource Conservation and Recovery, March 2009.

Wood, P.R., and Burton, L.C., 1968. *Ground-Water Resources of Cleveland and Oklahoma Counties, Oklahoma,* Oklahoma Geological Survey Circular 71.