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May 18, 2018

ATTN: Document Control Desk
Ms. Andrea Kock, Deputy Director
Division of Decommissioning, Uranium Recovery, and Waste Programs
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Mailstop T8-F05
Rockville, MD 20852-2738

Subject: License Amendment Request for Conditions 30.A, 30.C, 35.A(3), and 35.B(1)
Source Materials License SUA-1475, United Nuclear Corporation Church Rock Mill
Groundwater Corrective Action Program

Dear Ms. Kock:

United Nuclear Corporation made the original request on 22 October 2015. It was subsequently amended on 8 December 2016 and again on 13 February 2017. This request withdraws all three communications, and replaces them with this comprehensive resubmission that addresses all the requests, amended requests and corrections in a single request.

Existing Conditions

30. The licensee shall maintain a compliance monitoring program containing the following:

A. Sample wells GW-1-3; EPA Wells 2, 4, 5, 7, 13, 14, 23, 25 and 28, and wells 420, 504-B, 509-D, 515-A, 517, 604, 613, 614, 624, 627, 632, 708, 711, 717, 719, 801, 802, 803, 808 and TWQ-142, on a quarterly frequency for chloride, ammonia, nitrate, sulfate, manganese, calcium, magnesium, sodium, bicarbonate, potassium, field-pH, TDS and water level, arsenic, beryllium, cadmium, chloroform, lead, lead-210, nickel, combined radium-226 and radium-228, selenium, thorium-230, uranium, gross alpha and vanadium. Wells EPA 8, 9, TWQ-143, 402, 412, 424, 446, 501A, 502A, 504A, 505A, 701, 702, 706, 707, 710, 712, 713, 714, 805, and 807, shall be monitored for water level on a quarterly basis.

Notwithstanding the above, the licensee is only required to sample EPA wells after receipt of written authorization by the land owner to enter that area for the purpose of sampling groundwater from those specified wells. The licensee shall make every reasonable effort to obtain such authorization. If authorization is not obtained, the licensee shall inform the NRC, promptly.

NM5501

B. Comply with the following groundwater protection standards at point of compliance Wells GW-1, GW-2, GW-3, 632, EPA-23, EPA-28, and 509-D I the Southwest Alluvium; 614, 604, EPA-4, EPA-5, and EPA-7 in Zone 1; and 517, 613, 708, and 711 in Zone 3:

Southwest Alluvium: arsenic= 0.05 mg/L, beryllium= 0.05 mg/L, cadmium= 0.025 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha= 15.0 pCi/L, lead=-0. 7 mg/L, lead-210 = 5.9 pCi/L, nickel = 0.078 mg/L, radium-226 and 228 = 8.2 pCi/L, selenium = 0.07 mg/L, thorium-230 = 4.5 pCi/L, uranium = 0.3-pCi/L, and vanadium = 0.1 mg/L.

Zone 1: arsenic= 0.05 mg/L, beryllium= 0.05 mg/L, cadmium= 0.01 mg/L, total trihalomethanes =0.08 mg/L, gross alpha= 15.0 pCi/L, lead= 0.05 mg/L, lead-21 0 = 4.7 pCi/L, nickel= 0.07 mg/L, radium-226 and 228 = 12.1 pCi/L, selenium = 0.01 mg/L, thorium-230 = 1.6 pCi/L, uranium= 0.238 pCi/L, and vanadium = 0.1 mg/L.

Zone 3: arsenic= 0.757 mg/L, beryllium= 0.05 mg/L, cadmium = 0.09 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha= 39.7 pCi/L, lead= 0.08 mg/L, lead-21 0 = 5.7 pCi/L, nickel= 0.569 mg/L, radium-226 and 228 = 35.2 pCi/L, selenium= 0.01 mg/L, thorium-230 = 17 pCi/L, uranium=-0.359 pCi/L, and vanadium = 0.1 mg/L.

30.C. (2nd paragraph). Implement a corrective action program in Zone 3 to achieve ground water standards in License Condition 30.B. Ground water pumping in Zone 3 will cease temporarily to determine ground water concentration trends for future remedial action, as determined by the NRC. A Post-Pumping Evaluation Report must be submitted to the NRC by December 1, 2001. This report must use tables, graphs, and iso-contour maps to illustrate ground water quality trends. If necessary, as determined by the NRC, a Post-Pumping Evaluation Report must be submitted to the NRC by June 1, 2002. If NRC standards are still exceeded on June 1,2002, the licensee must submit either a modified active corrective action plan, an application for alternate concentration limits (ACLs) or an alternative to the specific requirements of 10 CFR Part 40, Appendix A, in accordance with 84.c of the Atomic Energy Act (AEA) by August 1, 2002.

30.C (3rd paragraph). Implement a corrective action program in the Southwest Alluvium in accordance with "Amendment 2, Reclamation Plan, License No. SUA-1475" submitted by letter dated March 29, 1989, to achieve the groundwater standards in License Condition 30.B. Groundwater pumping in the alluvium will cease temporarily to determine groundwater concentration trends for future remedial action for a period of 12 to 18 months, as determined by the NRC. A Post-Pumping Evaluation Report must be submitted to the NRC by December 1, 2001. This report must use tables, graphs, and iso-contour maps to illustrate groundwater quality trends. If necessary, as determined by the NRC, a Post-Pumping Evaluation Report must be submitted to the NRC by June 1, 2002. If NRC standards are still exceeded on June 1, 2002, the licensee must submit either a modified active corrective action plan, an application for alternate concentration limits (ACLs) or an alternative to the specific requirements of 10 CFR Part 40, Appendix A in accordance with 84.c of the Atomic Energy Act (AEA) by August 1, 2002.

30.C. (4th paragraph). No corrective action program component, meeting the abandonment criteria stated in the March 29, 1989, submittal, shall be decommissioned without obtaining prior NRC approval. Additional wells must be installed in Zone 3 and the Southwest Alluvium to determine the extent of ground water contamination. Once these wells have been installed, they will be sampled in accordance with the ground water monitoring program in License Condition 30. A.

35.A(3) Placement of final radon barrier designed and constructed to limit radon emissions to an average flux of no more than 20 $pCi/m^2/s$ above background – December 31, 2019.

35.B. Reclamation, to ensure required longevity of the covered tailings and ground water protection, shall be completed as expeditiously as is reasonably achievable, in accordance with the following target dates for completion.

(1) Placement of erosion protection as part of reclamation to comply with Criterion 6 of Appendix A of 10 CFR Part 40 – December 31, 2019.

Justification

Editorial and Typographical Revisions

UNC discovered that license amendment no. 37 (and subsequent amendments) failed to replace the analysis of "chloroform" with "total trihalomethanes" in Condition 30.A when it replaced the groundwater protection standard for chloroform with one for trihalomethanes in Condition 30.B. This proposed amendment request corrects this oversight.

Condition 30.B. needs to be corrected for some of the groundwater protection standards that have been revised to be the 95% UPL for background as per license amendment no. 52. Some corrections to units of measure are also noted.

Zone 1 Revisions

The June 14, 1990 and July 1, 1991 amendment requests no longer represent the conditions by which Zone 1 is being remediated. Neither is well EPA-7 being used as a seepage collection well. In a July 30, 1999 correspondence, NRC agreed that the last few seepage collection wells had met the well decommissioning criteria, and directed that they be shut off. A license amendment is needed to incorporate the current state of the corrective action program.

In 1999, pumping was recognized to provide no further benefits. Zone 1 behaved as an "effectively dewatered strata" because of the declining saturated thicknesses; however, the groundwater protection standards in condition 30.B. had not been fully achieved in the residual Zone 1 saturation. EPA and NRC acknowledged the physical limitations to meeting Site standards in the ROD (EPA, 1998), and in the evaluation of natural background water quality (NRC, August 14, 1996).

Data from the past sixteen years of post-shutdown monitoring indicates a gradual improvement in water from the Zone 1 Point-of-Compliance (POC) wells. There are few instances where the standards have not been consistently achieved:

- The concentration of non-hazardous, EPA-regulated constituents (sulfate, manganese and total dissolved solids (TDS)) associated with tailings seepage in the POC wells are less than or equivalent to background concentrations. The post shut-down monitoring data affirms the NRC staff's position (NRC, August 14, 1996) that sulfate, manganese, and TDS should not be used as a basis to implement corrective action.
- The licensed, non-radiological analytes associated with the tailings seepage are stable to improving in the POC wells. In the offsite POC wells (well EPA-4, 5, and7), concentrations of all licensed analytes are consistently below groundwater protection standards with a single exception of two analytes in one well (cobalt and nickel exceeded the GWPS in well EPA-07 in 2 of the last 8 measurements). In the onsite POC wells (604 and 614) there are similarly isolated instances of a couple of licensed analytes that do not meet the groundwater protection standard. In POC well 614, trihalomethane concentrations have trended downwards irrespective of groundwater recovery operations. Similarly, the two remaining licensed analytes (cobalt and

nickel) that exceeds the groundwater protection standard in well 604 has trended down in the absence of groundwater recovery.

- The licensed, radiological analytes meet groundwater protection standards in all onsite and offsite POC wells.

The proposed amendment text therefore relies upon continued monitoring to protect public health and safety as the corrective action program in Zone 1 using the monitoring and compliance requirements put forth in Conditions 30. A & B. UNC intends to continue working with the NRC, EPA and other stakeholders toward achieving a final, protective resolution to the few outstanding groundwater protection standard compliance issues.

Zone 3 Revisions

UNC's proposed amendment reflects the progress and current operations of the corrective action system in Zone 3 that were made in the course of performing the actions contemplated in license Amendment no. 31. Post-pumping evaluations have been reported in the annual review reports.

The corrective action program in Zone 3 underwent significant evaluation and evolution since the pumping was temporarily ceased over a decade ago. Notably, UNC conducted pilot programs involving:

- hydraulic fracturing pilot tests during 2003 to improve well yields (MACTEC, December 23, 2003, *Final Report-Hydraulic Fracturing Pilot Test Results and Preliminary Full Scale Design, United Nuclear Church Rock Facility, Gallup, New Mexico*). The full scale recommendations were executed in 2004 and 2005, and are documented in a June 2, 2006 report by MACTEC.

- an alkalinity stabilization program to neutralize the acidic uranium mill tailings seepage. These efforts have been documented in several reports and correspondence (most notably ARCADIS, June 2007 *(In-Situ Alkalinity Stabilization Pilot Study Report)*; Chester Engineers, May 17, 2010 (*Remedial Design Report)*; and Chester Engineers, August 30, 2010, (*Hydrogeological Analysis of Injection Testing of Zone 3, Well IW-A, July 2010*); and also annual summaries reported in the Annual Reports that are required under Condition 30.C. At present, the alkalinity stabilization program has been discontinued by mutual agreement of UNC and NRC due to adverse effects on uranium concentrations in Zone 3 (letter from Roy Blickwedel, GE to Yolande Norman, NRC, dated 12 October 2012).

Pumping continues at select recovery wells; however, the beneficial effects of hydraulic fracturing have diminished over time, and the recovery well yields are all less than the decommissioning criteria. UNC submitted a license amendment request for ACLs on December 15, 2008 ,and the NRC, by letter dated April 27, 2009, postponed the request until EPA's Site Wide Supplemental Feasibility Study has been completed. UNC therefore proposes to revise the second paragraph of Condition 30.C. to appropriately acknowledge current conditions, and because December 31, 2018 is established as the date to complete corrective actions in Condition 35. B. (2).

Southwest Alluvium Revisions

The corrective action program contained in the current license should be formally discontinued because the groundwater quality at all POC wells have remained at or within the standards set in the license for non-hazardous constituents for at least the past 2 years. Prior to July 2015, uranium in well GW-3exceeded the GWPS; however, that can be explained on the basis that the well was not providing representative samples. Since July 2015, Well GW-3 no longer produces enough water according to the low-flow sampling standard operating procedure (SOP). Water levels in the well are beneath the 2-foot minimum specified in the SOP. Samples must be collected on a second day to acquire the volume needed for sampling. It is believed that this well has become isolated from the Southwest Alluvial flow

system and is not representative of groundwater quality. Additional support for this belief is that there is no there monitoring well in the Southwest Alluvial monitoring program that exceeds the uranium GWPS or is trending up in concentration between GW-3 and the tailings impoundment (*Annual Review Report-2014,Groundwater Corrective Action, Church Rock Site, Church Rock, New Mexico*, Chester Engineers, January 2015).

The proposed amendment text therefore strikes reference to implementing a corrective action program in the Southwest Alluvium, and continues the monitoring and compliance requirements put forth in Conditions 30. A & B. for the POC wells only. It is further proposed that well GW-3 be omitted as a POC well and that the monitoring program in the Southwest Alluvium be reduced to include the remaining 5 POC wells.

Sampling at Well GW-2 was discontinued as of the October 2015 quarterly round because it became situated too close to the arroyo embankment for the sampling team to safely access the well for sampling. The arroyo has gradually widened over time such that both wells are located too close to a steep, deep drop-off into Pipeline Arroyo. The arroyo embankment is not stable, and UNC anticipates that the wells will eventually collapse into the channel. UNC proposes to seal the wells to a level that is 5 feet above the screened interval using bentonite placed manually into the wells. Locating heavy equipment this close to the embankment is no longer considered safe.

The remaining 5 POC wells in the Southwest Alluvium are sufficient to demonstrate on-going compliance with the Groundwater Protection Standards. In particular, wells GW-1 and EPA-28 are located close to the downgradient boundary of the Section 2 tailings disposal area as were wells GW-2 and GW-3.

Monitoring Well Installation

UNC proposes to delete the two sentences in the fourth paragraph of Condition 30.C. that require the installation and sampling of additional wells in Zone 3 and the Southwest Alluvium because the work has been completed. Well NBL-1 was constructed in Zone 3 in 2001 and SBL-1 was completed in the Southwest Alluvium in 2004. Both wells serve the intended purpose to define the limits of seepage-impacted water migration, and have been routinely monitored on a quarterly basis since their installation. Well NBL-1 is now unsaturated, and has been replaced by newer well NBL-2. Condition 30.A. has been amended to include the new wells in the quarterly sampling program.

Placement of Final Radon Barrier and Erosion Protection

In an *Action Memorandum* dated September 29, 2011, and subsequent *Record of Decision*, dated March 29, 2013, EPA decided to add approximately 800,000 cubic yards of mine spoil from the nearby NECR Mine to the tailings impoundment at the Church Rock Mill. A 3-year extension to the planned placement of the final radon barrier and erosion protection is justified based on currently projected, best-case, timeframes for completing the repository design and environmental review (MWH, *Design Work Plan Northeast Church Rock Mine Site Removal Action*, July 27, 2015). The earliest date for submission of the license amendment request is August 29, 2017. Based upon the complexity and involvement of multiple stakeholders, securing the amendment will require at least one year, likely longer, to complete the public involvement and license amendment phase. Construction of the repository has been estimated to take 4 years; and therefore, the date for final radon barrier and erosion controls should be set no sooner than December 31, 2022. Depending on the actual rate of progress made toward gaining regulatory approvals for the remedial action, the date to complete final radon barrier and erosion protection may require further extension.

Condition 35.D. requires that any license amendment request to change the target dates address added risk to public health, safety, and the environment. There is no added risk to public health, safety, or the environment because:

- there are no current or foreseeable users of seepage-impacted groundwater as documented in the most recent Annual Land Use Report (UNC, March 17, 2015).
- UNC will maintain a minimum of 0.5 feet of water in the evaporation ponds as an interim radon barrier until the ponds are closed. Because groundwater remedial pumping operations no longer provide sufficient water to accomplish this, the mill well will be used as necessary to augment the water in the evaporation ponds. The proposed license amendment includes language to require this activity until final closure is performed.
- access to the tailings area is restricted as it has been for the preceding 20+ years of corrective action operations.

PROPOSED AMENDMENT TEXT

30. The licensee shall maintain a compliance monitoring program containing the following:

A. Sample wells GW-1**, ~~GW-2-3~~**; EPA Wells **~~2, 4, 5, 7,~~ 13, 14,** 23, ~~25~~ and 28**~~,~~**; and wells 420, 504-B, 509-D, 515-A, 517, 604, 613, 614, **~~624, 627,~~** 632, 708, 711, 717, 719, **~~801, 802, 803, 808, and~~** TWQ-142, **NBL-2 and SBL-1** on a quarterly frequency for chloride, ammonia, nitrate, sulfate, manganese, calcium, magnesium, sodium, bicarbonate, potassium, field-pH, TDS**, and** water level, arsenic, beryllium, cadmium, **total trihalomethanes**, lead, lead-210, nickel, combined radium-226 and radium-228, selenium, thorium-230, uranium, gross alpha and vanadium. Wells EPA 8, 9, TWQ-143, 402, 412, 424, 446, 501A, 502A, 504A, 505A, 701, 702, 706, 707, 710, 712, 713, 7143, 805, and 807, shall be monitored for water level on a quarterly basis.

Notwithstanding the above, the licensee is only required to sample EPA wells after receipt of written authorization by the land owner to enter that area for the purpose of sampling groundwater from those specified wells. The licensee shall make every reasonable effort to obtain such authorization. If authorization is not obtained, the licensee shall inform the NRC, promptly.

B. Comply with the following groundwater protection standards at point of compliance Wells GW-1, **~~GW-2,~~ ~~GW-3,~~** 632, EPA-23, EPA-28, and 509-D in the Southwest Alluvium; 614, 604, EPA-4, EPA-5, and EPA-7 in Zone 1; and 517, 613, 708, and 711 in Zone 3:

Southwest Alluvium: arsenic= 0.05 mg/L, beryllium= 0.05 mg/L, cadmium= 0.025 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha= 15.0 pCi/L, lead= **~~0.7 mg/L~~ 0.07 mg/L**, lead-210 = 5.9 pCi/L, nickel = 0.078 mg/L, radium-226 and 228 = 8.2 pCi/L, selenium = 0.07 mg/L, thorium-230 = 4.5 pCi/L, uranium = 0.3 **~~pCi/L~~ mg/L**, and vanadium = 0.1 mg/L.

Zone 1: arsenic= 0.05 mg/L, beryllium= 0.05 mg/L, cadmium= 0.01 mg/L, total trihalomethanes =0.08 mg/L, gross alpha= 15.0 pCi/L, lead= 0.05 mg/L, lead-21 0 = 4.7 pCi/L, nickel= 0.07 mg/L, radium-226 and 228 = 12.1 pCi/L, selenium = 0.01 mg/L, thorium-230 = 1.6 pCi/L, uranium= 0.238 **~~pCi/L~~ mg/L**, and vanadium = 0.1 mg/L.

Zone 3: arsenic= 0.757 mg/L, beryllium= 0.05 mg/L, cadmium = 0.09 mg/L, total trihalomethanes = 0.08 mg/L, gross alpha= 39.7 pCi/L, lead= 0.08 mg/L, lead-21 0 = 5.7 pCi/L, nickel= 0.569 mg/L, radium-226 and 228 = 35.2 pCi/L, selenium= 0.01 mg/L, thorium-230 = 17 pCi/L, uranium= **~~0.359~~ 0.395 ~~pCi/L~~ mg/L**, and vanadium = 0.1 mg/L.**~~C.~~**

30.C. (1st paragraph). Implement a corrective action program in Zone 1 ~~in accordance with the June 14, 1990, and July 1, 1991, amendment requests, with the addition of EPA-7 as a seepage collection well~~ to achieve the groundwater standards in License Condition 30.B.

30.C. (2nd paragraph). Implement a corrective action program in Zone 3 to achieve ground water standards in License Condition 30.B. Ground water pumping in Zone 3 will ~~cease temporarily~~ **continue as practicable**, to determine ground water concentration trends for future remedial action, as determined by the NRC. ~~A Post-Pumping Evaluation Report must be submitted to the NRC by December 1, 2001. This report must use tables, graphs, and iso-contour maps to illustrate ground water quality trends. If necessary, as determined by the NRC, a Post-Pumping Evaluation Report must be submitted to the NRC by June 1, 2002. If NRC standards are still exceeded on June 1,2002, the licensee must submit either a modified active corrective action plan, an application for alternate concentration limits (ACLs) or an alternative to the specific requirements of 10 CFR Part 40, Appendix A, in accordance with 84.c of the Atomic Energy Act (AEA) by August 1, 2002.~~

30.C (3rd paragraph). ~~Implement a corrective action program in the Southwest Alluvium in accordance with "Amendment 2, Reclamation Plan, License No. SUA-1475" submitted by letter dated March 29, 1989, to achieve the groundwater standards in License Condition 30.B. Groundwater pumping in the alluvium will cease temporarily to determine groundwater concentration trends for future remedial action for a period of 12 to 18 months, as determined by the NRC. A Post-Pumping Evaluation Report must be submitted to the NRC by December 1, 2001. This report must use tables, graphs, and iso-contour maps to illustrate groundwater quality trends. If necessary, as determined by the NRC, a Post-Pumping Evaluation Report must be submitted to the NRC by June 1, 2002. If NRC standards are still exceeded on June 1, 2002, The licensee must submit either a modified active corrective action plan, an application for alternate concentration limits (ACLs) or an alternative to the specific requirements of 10 CFR Part 40, Appendix A in accordance with 84.c of the Atomic Energy Act (AEA) by August 1, 2002.~~

30.C. (4th paragraph). No corrective action program component, meeting the abandonment criteria stated in the March 29, 1989, submittal, shall be decommissioned without obtaining prior NRC approval. ~~Additional wells must be installed in Zone 3 and the Southwest Alluvium to determine the extent of ground water contamination. Once these wells have been installed, they will be sampled in accordance with the ground water monitoring program in License Condition 30. A.~~

35.A(3) Placement of final radon barrier designed and constructed to limit radon emissions to an average flux of no more than 20 pCi/m^2/s above background – December 31, 20~~19~~**22**.

35.B. Reclamation, to ensure required longevity of the covered tailings and ground water protection, shall be completed as expeditiously as is reasonably achievable, in accordance with the following target dates for completion.

(1) Placement of erosion protection as part of reclamation to comply with Criterion 6 of Appendix A of 10 CFR Part 40 – December 31, 20~~19~~**22**. **Water from the mill well will be used to augment groundwater remedy operations to maintain a minimum 0.5-feet of water over the base of each evaporation pond until the final radon barrier is constructed.**

As of September 1997 United Nuclear Corporation became a wholly-owned, indirect subsidiary of General Electric Company. GE Global Operations has been retained through a separate administrative

services agreement to assist United Nuclear both technically and administratively with environmental issues at the Church Rock site. Please contact me if you have any questions.

Sincerely,

Roy Blickwedel

Roy Blickwedel
Senior Project Manager – Remediation
GE Global Operations - EHS

cc: Jim Smith, NRC (via E-mail)
Rob Evans, NRC Region IV (via E-mail)
Ricky Spitz (via E-mail)