To: Mr. James Smith, USNRC

From: Steve Dwyer, Dwyer Engineering, LLC

Date: 7-8-20

Re: UNC Response to USNRC's June 26, 2020 Clarification Request on the November 18, 2019 Supplemental Submittal to the Application for Amendment of USNRC Source Material License SUA-1475 for the United Nuclear Corporation Mill Site, McKinley County, New Mexico

Message:

The United Nuclear Corporation and the General Electric Company (UNC/GE) submitted a supplemental submittal to the Application for Amendment of *USNRC Source Material License SUA-1475 for the United Nuclear Corporation Mill Site* on November 18, 2019 for the USNRC's review to support use of the jetty excavation soils as cover material. Included with the submittal were the 2018 Northeast Church Rock Jetty Investigation Report that was finalized after the application was submitted, along with revised Appendices A (General Design Information), G (Mine Waste Repository Design), and H (Borrow Areas), and revised drawing Sections 07 and 09. A revised Appendix Y (Consolidation and Groundwater Evaluation Report) was not included with the submittal.

During a conference call with NRC on June 26, 2020, NRC requested that UNC provide clarification on the consolidation modeling scenarios evaluated for Appendix Y and how the scenarios would be impacted by effects of using the soil excavated from the jetty as borrow material for the Repository cover system and increasing the ET Cover thickness from 4 to 4.5-ft. This memo, provided on behalf of UNC/GE, addresses NRC's clarification request.

Appendix Y includes a lengthy and detailed set of analyses that evaluate consolidation of multiple profiles across the footprint of the proposed Repository after placement of the mine spoils. The profiles were developed from the material property and geotechnical parameters collected from borings installed at various locations within the tailings impoundments across the footprint of the proposed repository. The profiles evaluated a total repository thickness ranging from 28.6-ft (Profile B2, Appendix Y, Figure 8) to 68.2-ft (Profile B10, Appendix Y, Figure 10) based on the estimated volume of mine spoils that includes a 30% contingency. The 0.5-ft additional cover thickness is less than the thickness provided by the 30% contingency, with the exception of Profile B11 where only 9 inches of mine spoils will be placed under the ET cover.

Four profiles were evaluated including Profiles B10 and B8 in the Borrow Pit 1 and profile B11 in Borrow Pit 2 which showed the highest degree of saturation due to consolidation after construction of the repository. Appendix Y presents a typical cross section designated as Profile B2 - this profile is representative of most of the Repository footprint. The analysis shows that Profiles B2 and B11 never reach saturation within the profile after consolidation. Profiles B8 and B10 (both in Borrow Pit 1) did see some saturation in the fine-grained tailings. Borrow Pit 1 is the area with the deepest layer of fine-grained tailings and previous modeling showed it had the highest degree of saturation of all the profiles that were evaluated.

Profile B8 was considered to be the worst-case profile because the fine-grained tailings layers were the only layers in any of the profiles calculated to reach full saturation (100% degree of saturation) after placement of the mine spoils and ET Cover. The initial weighted average for these fine-grained tailings layers was 93.7%. This was an increase in saturation of 6.3% based on 0.65-ft of total settlement in the fine-grained tailings.

Profile B10 was close to full saturation (98.5%) after placement of the mine spoils and ET Cover. The upper fine-grained tailings layer was at about 95% saturation while the remaining underlying fine-grained layers were at 100% saturation. The initial weighted average of the B10 fine-grained tailings layers was 91.4%. This was an increase in saturation of 7.1% based on 0.93-ft of total settlement in the fine-grained tailings. The following table provides a summary of related details for these two profiles.

Summary of Profiles B8 and B10 Initial Conditions (Measured) and Model Results									
Area	Boring	Top of Layer (ft)	Bottom of layer (ft)	Material Description	Initial saturation - layer of interest	Initial Weighted Average	Final Saturation - layer of interest	Final Weighted Average	Total Settlement in wet tailings (greater than 90% saturation)
BORROW PIT 1	TI-B10	37.1	44.6	Coarse/Fine Tailings	87.7%		95.0%		
	TI-B10	44.6	45.6	Fine Tailings	83.5%		100.0%		
	TI-B10	45.6	47.6	Fine Tailings	93.5%		100.0%		
	TI-B10	47.6	51.6	Fine Tailings	92.3%		100.0%		
	TI-B10	51.6	52.6	Coarse Tailings	61.8%		100.0%		
	TI-B10	52.6	55.1	Fine Tailings	95.2%		100.0%		
	TI-B10	55.1	55.6	Fine Tailings	83.8%		100.0%		
	TI-B10	55.6	56.6	Coarse/Fine Tailings	93.8%		100.0%		
	TI-B10	56.6	60.6	Fine Tailings	100.0%		100.0%		
	TI-B10	60.6	62.6	Fine Tailings	98.8%		100.0%		
Profile B10						91.4%		98.5%	0.93 ft
BORROW PIT 1	TI-B8	35.2	39.7	Fine Tailings	96.9%		100.0%		
	TI-B8	39.7	43.7	Fine Tailings	92.0%		100.0%		
	TI-B8	43.7	44.2	Coarse Tailings	46.0%		100.0%		
	TI-B8	44.2	44.7	Coarse Tailings	51.2%		100.0%		
	TI-B8	44.7	50.2	Fine Tailings	100.2%		100.0%		
	TI-B8	50.2	50.7	Coarse/Fine Tailings	90.5%		100.0%		
	TI-B8	50.7	53.2	Coarse/Fine Tailings	94.9%		100.0%		
	TI-B8	53.2	53.7	Fine Tailings	96.2%		100.0%		
Profile B8						93.7%		100%	0.65 ft

The depth of ET Cover and mine spoils, depth of tailings, and initial degree of saturation in the fine-grained tailings all are sensitive to the respective final degree of saturation. A key assumption in the computation of the final degree of saturation is that the amount of initial water within the fine-grained tailings is the same before as after the placement of the mine spoils and ET cover. Thus, the saturation increase is due to the water spread through a thinner layer after settlement. Another key assumption is that water squeezed out of a thinner layer (excess water after 100% saturation is achieved) within the overall fine-grained tailings profile moves into the adjacent unsaturated layer increasing the water in this adjacent layer and thus increasing its degree of saturation.

Preliminary results from evaluating a 6-inch increase in the final cover and overall repository thickness indicates that the small increase in consolidation will not significantly increase the degree of saturation of the tailings. However, since the B8 profile was at full saturation, a small amount of water will likely move up into the overlying coarse tailings layer adjacent to the fine-grained tailings. This coarse layer will remain below full saturation as its initial degree of saturation is only 53.7%. Should the analysis be performed, the consolidation would be computed on this layer to determine the degree of saturation after consolidation and the layer's initial matric potential would be adjusted accordingly before the groundwater analyses are performed. It is not expected to have any significant change on the groundwater since the bottom layer of the fine-grained tailings layer is controlling the rate of drainage though it.