

August 12, 2015

Mr. Lawrence J. Corte
President and General Manager
Western Nuclear Incorporated
28011 Youngfield Street, Suite 340
Golden, CO 80401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING WESTERN
NUCLEAR INCORPORATED TECHNICAL MEMORANDUM ENTITLED
“ASSESSMENT OF RECENT GROUND WATER AND SURFACE WATER
CONDITIONS” FOR THE SPLIT ROCK SITE IN JEFFERY CITY, WYOMING
(Docket 040-01162)

Dear Mr. Corte:

I am writing in response to your letter dated May 11, 2015, in which you provided the U.S. Nuclear Regulatory Commission (NRC) staff with a technical memorandum entitled “Assessment of Recent Ground Water and Surface Water Conditions” dated May 22, 2015, that provided information about ground water and surface water at Western Nuclear Incorporated’s (WNI’s) Jeffery City, Wyoming site (Agencywide Document Access and Management System (ADAMS) Accession Number ML15162A364).

The NRC staff has completed its review of the letter and technical memorandum and has determined that additional information is necessary to complete our evaluation of the ground water conditions at WNI’s Jeffery City site. The additional information is summarized in the enclosure. This information will aid the NRC staff in concluding that the proposed long-term care boundary for the Jeffery City site is appropriate and provide a basis for the NRC and WNI staff to resolve other outstanding ground water issues at the Split Rock site prior to the transfer of the site to the U.S. Department of Energy for long-term care and maintenance.

After you have reviewed the enclosed request for additional information (RAI), we suggest that we convene a meeting between NRC and WNI staffs to discuss the RAI to ensure that there are no questions about the information the NRC staff will need to complete our review.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR 2.390) of the NRC’s “Agency Rules of Practice and Procedure,” a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC’s ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

L. Corte

- 2 -

If you have any questions, please contact me at 301-415-6749 or by e-mail at Dominick.Orlando@nrc.gov.

Sincerely,

/RA/

Dominick Orlando, Senior Project Manager
Materials Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Enclosure:
Request for Additional Information

Docket No. 040-01162
License No. SUA-56

L. Corte

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NAME	NOrlando	CHolston (DMiller for)	MMeyer	MNorato	NOrlando
DATE	8/11/15	8/12/15	8/12/15	8/12/15	8/12/15

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**U.S. Nuclear Regulatory Commission
Request for Additional Information
“Assessment of Recent Ground Water and Surface Water Conditions”
Western Nuclear Inc., Split Rock Uranium Mill Site,
Jeffrey City, Wyoming**

Description of the Deficiency

Western Nuclear Incorporated's (WNI's) May 2015 report entitled "Assessment of Recent Ground Water and Surface Water Conditions" (Agencywide Document Access and Management System (ADAMS) Accession Number ML15162A364) only compared the ground water elevations at upgradient and downgradient monitoring wells and the resulting hydraulic gradients during one sampling event after the calibration period in 2002. Specifically, WNI only evaluated the predicted and observed ground water elevation information developed during the 2013 sampling event. In addition, the May 2015 assessment did not include information regarding the predicted and observed concentrations of contaminants in the ground water at the site.

In order to adequately understand the ground water conditions at the Jeffrey City, Wyoming site, and to support WNI's conclusion that: (1) the approved long-term care boundary will provide the requisite reasonable assurance of long-term protection, and (2) that all necessary requirements for ground water have been met, all sampling information since the calibration period in 2002 for the Southwest Valley and in 1996 for the Northwest Valley should have been compared to the modeled predictions and included in the assessment. This information would then be used to assess the validity of the models used by WNI to predict the contaminant transport and to determine if the long-term care boundary is appropriate.

Discussion

The U.S. Nuclear Regulatory Commission's (NRC's) Technical Evaluation Report (TER) for the approval of license Amendment No. 99 for the Alternate Concentration Limits (ACLs) at the WNI Split Rock Mill Site required *"a ground water and surface water monitoring network to track ground water contamination and assess model predictions"* (ML062910216). However, a comparison of the observed ground water concentrations to the model's predicted concentrations for uranium and sulfate, following the end of the ground water flow and transport model calibration period in 2002 for the Southwest Valley and in 1996 for the Northwest Valley, has not been performed by WNI. Unlike model calibration, which adjusts the model input parameters to match the observed flow conditions, and ultimately, the observed constituent concentrations during the prescribed calibration period, successful model validation must be able to reasonably predict the observed concentrations without any adjustment.

Approval of the ACLs was predicated on the model's ability to reasonably predict the ground water flow conditions and transport of the approved ACL constituents. If the observed conditions after the model calibration period indicate that the future ground water conditions no longer support the proposed long-term care boundary, then the ground water model is unsupported and cannot be considered reliable for decision making.

Enclosure

During a presentation on June 10, 2015, WNI stated that the *“model was not designed nor intended to be used to validate future concentrations within [the] core of the plume”* (ML15216A039). However, a memorandum from Lou Miller to Larry Corte included as Attachment 3 to a February 16, 2004, letter to the NRC does not support this statement (ML040560079). The memorandum states, *“The new proposed wells will be able to monitor the plume as it matures. Data from the proposed wells could be used to evaluation [evaluate] the plume development with the modeled results.”*

Additionally, a letter to the NRC from Lou Miller dated April 12, 2005 (ML051050501), provided responses to comments from the State of Wyoming on March 12, 2004 (ML040830583), regarding unresolved ground water issues. Mr. Miller’s April 12, 2005, letter states that *“We [WNI] would like to take this opportunity to discuss some of the issues that were raised in an attempt to clarify the closure plan and to make the record clear that the proposed plan does protect public health and the environment and provides a strategy that provides protection that is as low as reasonably achievable (ALARA).”* One comment from the Wyoming State Engineer’s Office (WSEO) specifically addressed model validation. WSEO’s comment and WNI’s response is as follows:

WSEO Comment: *An adequate ground water sampling and analysis programs must be established to verify the accuracy of the modeled predictions, over time. The ground water sampling and analysis programs should also serve as a warning mechanism to protect ground water users such as those in the Red Mule Subdivision.*

Response: *WNI has proposed a modified ground water monitoring program, which will verify the accuracy of the model [emphasis added] as well as monitor immediately up-gradient from the Red Mule area. The ground water monitoring program that is used long-term by the DOE will be specified in the LTSP [Long Term Surveillance Plan].*

During the June 10, 2015, presentation, WNI provided the following additional rationale for why they believe validation of the ground water model is not appropriate:

- *Only 16 years of the 1,000 year model temporal domain has elapsed (1.6%).*
- *Model assumed a limited set of values for hydraulic conductivity (k) to approximate conditions documented to vary by 2 orders of magnitude over a few tens of meters.*
- *Model is expected to over-predict and under-predict head and concentration at different points in model domain (spatial and temporal).*
- *It is unlikely that model will precisely predict concentrations in any specific point.”*
- *To expect a model to always over-predict or match actual conditions for all points in the model spatial and temporal domain would require unprecedented and non-representative conservatism.*

The NRC staff disagrees with the rationale provided by WNI because:

- The years following model calibration should produce a relatively close fit between the predicted and observed conditions due to refinements made to sensitive parameters during calibration producing an increased level of model certainty.
- A model's predictive error is typically the result of limited historic data, uncertainty of future stresses, and insufficient characterization of the model parameters. The extensive historical record and characterization data used to develop the models would provide a high level of confidence and reliability in the model predictions following the calibration period and, therefore, should be capable of providing reasonable predictive results.
- The parameter values used in the model for the Southwest Valley were calibrated on a cell-by-cell basis, which seems to contradict the statement WNI made about the limited set of values used to approximate varying conditions. Specifically, the March 2003 supplemental ground water modeling report (ML030760338 and ML030760346) for the Southwest Valley states that *"Pilot points were then placed into this zone [zones in layer 2] with a spacing of 1,200 feet and PEST [A Parameter Estimation code] was allowed to estimate the hydraulic conductivity of every cell within the zone [emphasis added]."*
- The modeling performed for the October 29, 1999, submittal (Applicable to the Northwest Valley) was considered conservative and would tend to over predict concentration fate. The modeling is further described as *"The elements of the proposed alternative that employ conservative factors include the highly detailed characterization of geochemical conditions, which lends a high degree of confidence in the model predictions, the conservative over-estimates [emphasis added] of mass in the transport system, which tend to over predict potential future concentrations, the highly conservative transport parameters assumed in the modeling, which tend to over predict constituent fate, [emphasis added] the broad and durable and enforceable institutional controls included in the proposed alternative and the highly conservative assumptions used to estimate protective levels of constituents in ground water"* (ML003676129).

The NRC understands that models are approximations and, typically, predictions will over-predict and under-predict observed conditions. For this reason, the NRC staff believes that a precise prediction or an exact match of predicted-to-observed results is not reasonable and is not expected. However, the predictions should reasonably match the observed data and the magnitude of the predictive errors should be justified. This is necessary because the accuracy of a model's predictions provides confidence that the long-term predictions that are used as the basis for establishing the proposed long-term surveillance boundary are appropriate.

Basis for the Request

In their ACL request, WNI proposed four corrective action alternatives, which included: institutional controls with an alternate water supply (Alternative 1); hydraulic diversion with institutional controls (Alternative 2); focused pumping with institutional controls (Alternative 3); and perpetual containment with institutional controls (Alternative 4) (ML003672400).

The preferred alternative for WNI was Alternative 1. Alternative 1 proposed two additional options: (1) the selection and use of ACLs, and (2) an alternative to ACLs by exclusion of hazardous constituents through Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40, Appendix A, Criterion 5B(3). The alternative proposed by WNI would require the use of institutional controls at residential properties determined to be impacted by ground water contamination in the future. To accomplish this, an alternative to the requirements specific to institutional controls found in 10 CFR Part 40, Appendix A would be required.

License Amendment No. 99 approved WNI's use of ACLs, rather than the alternate option proposed to exclude all hazardous constituents. Therefore, the requirements of 10 CFR Part 40, Appendix A, including the requirements of 10 CFR Part 40, Appendix A, Criterion 5B(1) are applicable. Furthermore, verification of the ground water flow and contaminant transport modeling predictions were included in the basis for the approval of the ACLs in the NRC's TER.

The TER provided the NRC staff's technical basis for approval of license amendment No. 99. Verification of the model's predicted results will demonstrate to the NRC staff that the ground water flow conditions are behaving as expected and that the ACLs would result in residual downgradient contaminant concentrations that meet water quality standards at the POE or are consistent with NRC-approved background concentrations.

Formulation of the RAI

The accuracy of a model's predictions must be established to allow the NRC staff to state with confidence that the model produces reliable future predictions. The NRC staff expects that the predictions made by the WNI models will reasonably match the observed data and that the magnitudes of the predictive errors will be justified. In order for the NRC staff to have the necessary confidence in the model's future predictions, WNI will need to assess and validate the accuracy of the predictions made by the ground water flow and contaminant transport models for the Northwest Valley and Southwest Valley flow regimes.

Specifically, WNI will need to:

- Validate each of the ground water flow and contaminant transport models by comparing the predicted values to the observed values. The appropriate validation period is from 2002 through the most recent sampling event for the Southwest Valley and from 1996 through the most recent sampling event for the Northwest Valley;
- Identify the magnitude of the error between the predicted and observed ground water flow and contaminant transport values (i.e., the predictive error) and determine the accuracy of the modeled predictions. Justify that the predictive error does not invalidate the model's predictions; and
- If necessary (i.e., if the models are invalidated) re-calibrate and re-run the models to demonstrate that the observed conditions will produce a plume boundary that remains within the proposed long-term care boundary.

By these actions, WNI will verify that the proposed institutional control boundary and future long-term surveillance boundary are appropriately located and are protective of public health and safety prior to transfer of the site to the DOE. WNI's demonstration that the ground water flow and contaminant transport models have been successfully validated will allow the NRC staff to continue with the license termination process for the Jeffery City site.