



STATE OF WASHINGTON

DEPARTMENT OF HEALTH
DIVISION OF RADIATION PROTECTION

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July 10, 2000

Mr. Paul H. Lohaus, Director
Office of State and Tribal Programs
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Lohaus:

This letter is in response to your May 19, 2000 letter and attachment, *NRC Comments on the Termination Finding of the Western Nuclear, Inc.'s Sherwood Uranium Mill License Submitted by the Washington Department of Health*. On May 24, 2000, the department met at the WNI site with NRC, DOE, and company representatives, to discuss the 20 questions in your letter and also to tour the reclaimed millsite. As a result of subsequent discussions, all parties agreed that a follow-up meeting at the millsite should be held to address the issue of whether or not the reclaimed tailings disposal area should be considered a dam, and that the meeting should also include the Federal Energy Regulatory Commission (FERC). The meeting was held on June 21, 2000, and included a review of technical documents and a tour of the tailings disposal area. The department felt that both meetings were very valuable and gave our staff a better understanding of the reasoning behind your 20 questions.

I requested WNI to prepare its own responses to your 20 questions, and to include all relevant reference material that had previously been submitted to the department in support of the reclamation. WNI's response was addressed to me and is enclosed, along with the reference material in two ringbinders. This letter contains the department's response. Also enclosed is a ringbinder of the department's reference material, consisting primarily of internal memos and correspondence among the department, NRC, and WNI.

GEO-TECHNICAL STABILITY

Question 1: Please provide further information and justification to confirm that the formation of sand boils was considered, and that resulting damage could be accommodated by the design.

Question 2: Please provide additional information and documentation to confirm that the embankment stability under saturated conditions was considered.

Question 3: Please provide additional information and documentation to confirm that an appropriate PGA, including amplification, if necessary, was considered in the stability and liquefaction analyses.

Rec'd STP 7/10/2000

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Question 4: Please provide additional information and documentation to support your conclusion regarding the potential for recharge of the tailings. If there is potential regarding the potential for ponding water to infiltrate and recharge the tailings, please provide additional information and documentation to confirm that an increased likelihood of liquefaction of a wet embankment was considered.

Response: The department has required WNI to consider "sand boils", embankment stability under all expected conditions, appropriate PGA including amplification, and potential for recharge (infiltration). As you are aware, WNI's Sherwood millsite has several site-specific features that influenced the design. The intact liner and neutralized tailings, as well as the natural environment (climate, topography, and natural soils and geologic formations) are the fundamental conditions influencing design. Department reviews determined that saturated tailings are preferred from a pore fluid water quality perspective. The thick cover design was preferred, over the conventional clay barrier design, due concern for bio-intrusion from expected prolific deep-rooted vegetation, principally ponderosa pine forest. Although liquefaction of tailings is possible, the thick cover design is expected to mitigate "sand boils" and provide geo-technical stability.

WNI conducted a comprehensive local and regional geologic evaluation, which was submitted to the department as part of the closure plan review, and is included in Appendix A of Volume 1 of the two enclosed ringbinders from WNI. A separate report that focuses on seismicity of the region was prepared by R.L. Volpe and Associates and is included in Appendix B of Volume 1. Both reports show that a conservative earthquake design event was used in the original study, and that the reclaimed tailings would not be impacted. Please also see the department's data in Appendix A, Geotechnical Stability, in the department's enclosed ringbinder.

NATIONAL DAM SAFETY ACT

Question 5: Please provide additional information and documentation to confirm whether this dam will be classified as a dam under the Federal Guidelines for Dam Safety and the National Dam Safety Program Act.

Response: The departments of Health and Ecology (through its Dam Safety Office) share regulatory responsibilities over the WNI Sherwood millsite. In addition to the dual regulatory roles of the agencies, the department has on several occasions requested technical assistance from professional engineers at the Dam Safety Office with regard to overall stability issues (structural stability, dam safety, hydrology, and other geo-technical issues) at the millsite.

Please see comments and appended materials from WNI's responses. In addition, see attachments in Appendix B of the department's enclosed ringbinder, for correspondence from the Dam Safety Office related to both your question on applicability and authority of dam safety issues, and on geo-technical reviews as technical assistance to the department.

ROCK DURABILITY AND LONGEVITY

Question 6: Please provide additional information and discussion of rock durability test results that support WDOH's final approval of the quarry for riprap source.

Question 7: Please provide additional information and justification of the representativeness of the 3 samples on which durability estimates were based. Based on field photos, the samples tested do not appear to be representative of the rocks used and could have led to underestimation of rock durability.

Question 8: Please provide additional information and justification of the acceptability of the rock that has already been placed to function for the performance period of 1,000 years and at least 200 years, given that some areas have degraded. The objective is to get more realistic basis for projected performance of the rocks than can be gotten from more pristine samples from quarry walls.

Question 9: Please provide further information and analyses that demonstrate that large areas of non-quartz monzonite rock or poor-quality quartz monzonite rock have been placed in the rock cover, particularly in the diversion channel.

Response: The department required WNI to perform rock durability testing for rock source qualification, and for rock production quality assurance. These test protocols were pre-planned to be consistent with NRC guidance. The rock durability tests clearly demonstrated that all the rock meets or exceeds the NRC's requirements. Construction was performed with oversight of a contract licensed engineer, a contract geo-technical test and measurement company, a WNI corporate auditor, and department inspection. Department of Ecology, Dam Safety Office staff also reviewed, approved, and inspected reclamation construction.

In 1999, the department performed its final inspection prior to license termination and found some areas of concern. Each of these areas was either corrected, or WNI was required to provide the department with written justification for not making corrections.

In 1994, WNI conducted an initial evaluation of the availability of rock sources, which indicated that the onsite basalt rock was acceptable for use, and that the quartz monzonite material was marginally acceptable. This information is included in Appendix F of Volume 1 of WNI's enclosed ringbinders. Follow-up testing of another quartz monzonite source showed that its rock would be acceptable; this information is included in WNI's Appendix G.

Additionally, WNI evaluated the diversion channel performance, following the establishment of vegetation, and found that at that time, rock would not be necessary for the stability of the channel. This evaluation can be found in Appendix I of WNI's Volume 1.

The department has included inspection reports and notes taken during construction that bear upon the question of quality assurance diligence and pedigree of samples used to qualify the rock quarry. This information can be found in Appendix C of the department's ringbinder.

GEOLOGIC AND GEOMORPHIC STABILITY

Question 10: Please provide additional information on this subject sufficient to understand the subsequent brief discussion of site stability.

Question 11: Please provide additional information and discussion of WDOH's findings on its review of the key reference materials relevant to site stability analysis.

Question 12: Please provide additional information and discussion related to specific local bedrock features, especially discontinuities such as faults and fractures, for consideration in seismotectonic hazard analyses.

Question 13: Please provide additional information and discussion of WDOH's findings related to its review of key references and the geologic map of Coulee Dam Vicinity (Waggoner report, 1990, Ref. 4). The TER points out a large discordance in the structural trends at the site. Waggoner indicates north-south; Shepherd Miller, Inc. (Reclamation Plan, 1994, Ref. 5), indicates east-west. Please provide further discussion and clarification of the significance of this discordance in WDOH's determination that all applicable standards and regulations have been met.

Question 14: Please provide additional information, technical discussion and/or summaries of operative surface processes, including but not limited to mass movements, stream erosion/deposition potential at the site that supports a finding that there are not potential processes which would lead to impoundment instability.

Question 15: Please provide additional information and discussion of WDOH's evaluation of earthquake sources (such as capable faults) and earthquake hazards for the site. The information should include discussion of seismic design basis (maximum credible earthquake or reasonable alternative basis) for the engineering structures and WDOH's evaluation of liquefaction potential.

Response: The department believes that the geological and geomorphic stability issues were resolved during the WNI siting process. A Final Environmental Impact Statement was issued in 1978 that included this information. The closure plan submitted to the department in December 1994 also included much of this background information. WNI's enclosed response (Appendix A of Volume 1) includes some of their background data provided during the department's closure plan review and approval. The department's Technical Evaluation Review (TER) and

Completion Review Report (CRR), which were previously submitted to you, include much of this information. In addition, Appendix B of the department's enclosed ringbinder may include reference material from the Dam Safety Office that addresses these questions.

GROUNDWATER IMPACTS

Question 16: Please provide documentation demonstrating that the review and acceptance, if appropriate, of licensee submitted information pertaining to the impacts of groundwater caused by potential releases of liquids from the disposal cell, given credible failure scenarios of the engineering design components of the disposal cell. This information should not be limited to synthetic liner failure and over-topping from water buildup, but include any other credible scenario that could cause release of liquids.

Response: The department has reviewed groundwater impacts during closure plan review, plans and specifications review, and during annual groundwater reports. WNI has also prepared several other groundwater reviews over the years, which considered all credible failure scenarios. In WNI's *Groundwater Technical Integration Report*, a complete description of the groundwater conditions and the modeled predictions of future groundwater concentrations, can be found in Appendix J of Volume 2 of WNI's enclosed ringbinders.

SOIL CLEANUP AND VERIFICATION

Question 17: Please provide discussion of results of confirmatory soil samples and radiation surveys (including highest, lowest and average values, and data comparisons between WNI and WDOH's results) that indicate that the subject site has been cleaned up to the State standards (including uranium and thorium limits) for both surface and subsurface soil.

Response: The department had two primary responsibilities in its verification of WNI's soil cleanup. The first was to review and approve the soil cleanup plan, to ensure compliance with all applicable standards. The second was to independently confirm the accuracy of WNI's data, through our own surveys and soil samples. The verification sampling included approximately 100 split samples and approximately 100 integrated grid surveys. Finally, the department randomly selected 40 grids for further, verification surveying. The results of our split samples can be found in Appendix K of Volume 2 of WNI's ringbinders, and confirm that all areas have been cleaned up to applicable limits. Additionally, Appendix D of the department's ringbinder contains the department's verification plans and results.

DECOMMISSIONING OF MILLSITE STRUCTURES

Question 18: Please provide information on the cleanup criteria used for remaining structures, if any, to demonstrate compliance with the State's equivalent of 10 CFR 40.42(k)(2).

Response: The millsite facility was decommissioned by demolition and disposal in the tailings impoundment. A water tank and pump house are the only remaining structures. These facilities support the existing truck shop that is not part of the millsite and is beyond the department's authority. All millsite cleanup was performed under a Mill Decommissioning Plan approved by the department. WNI submitted a construction completion report that was reviewed and approved by the department, which WNI has included in Appendix L of Volume 2.

GAMMA RADIATION AND COVER SOIL RADIOACTIVITY

Question 19: Please provide information and discussion of the evaluation of the sites compliance with the State's equivalent of 10 CRF 40, Appendix A, Criteria 6(2) and (5), concerning the overall gamma radiation level and radioactivity content of the cover material.

Response: Mill tailings have been covered with a thick soil cover at least 12.6 feet in thickness. The soil for the cover came from an area adjacent to the mill tailings area, that had been previously surveyed and found to contain no contamination. The results of soil surveys for the cover material can be found in Appendix K of Volume 2 of WNI's ringbinders, and in Appendix G of the department's ringbinder.

Following cover construction, the department requested that WNI perform an analysis of expected gamma radiation through the thick soils cover. WNI's analysis showed that there would be an attenuation fraction of approximately 3×10^{-12} .

REMEDIAL ACTIONS (1999)

Question 20: Please provide additional information to support your basis that WNI's remedial work was performed according to the approved plans and specifications.

Response: In 1999, the department performed its final review of the millsite post-reclamation monitoring and stabilization performance, and found some areas of concern. Each of these areas was either corrected, or WNI was required to provide the department with written justification for not making corrections.

All re-constructed area were designed by WNI's contract engineer, performed by WNI personnel, and verified in completion reports by an independent geo-technical engineer. The Department of Ecology Dam Safety Office reviewed the designs. Department staff reviewed all documents and performed oversight inspection. WNI has provided supporting information in Appendix N of Volume 2; additional information can be found in Appendix F of the department's ringbinder.

ROCK DURABILITY AND LONGEVITY (ADDED)

Question 21: Please provide information that standing water and/or freeze/thaw effects on weathering of rock (riprap) have been considered during WDOH review of rock durability and longevity in relation to millsite performance in meeting 10 CFR 40 Appendix A criteria (Paraphrased). (This question was added during the May 24, 2000 meeting in Spokane, WA)

Response: This question relates to rock durability under conditions of standing water or freeze-thaw. Both conditions are expected at the WNI millsite. The NRC guidance for qualification of rock has a purpose of providing long-term reliability under expected adverse conditions. The standing water and freeze-thaw conditions are to be expected and must therefore be a part of the basis for the NRC guidance. Therefore, these conditions are not expected to adversely affect the long-term performance of rock.

In addition, the WNI millsite is expected to re-vegetate over a shorter time-frame than required by design. This vegetation is expected to perform (or enhance) erosion protection, in addition to the use of rock for erosion protection. Vegetation will resist the surface water flow rates, thus producing less shear stress on the soil. Therefore, after a period of tens of years for re-vegetation, the rock may become unnecessary or only required at a smaller rock size to provide site performance requirements.

I have included additional documents in Appendices H and I that do not relate specifically to any of your questions, but may provide information on the department's approval process for the WNI reclamation.

If you have questions or need additional information, please contact me at (360) 236-3241, or John Blacklaw at (360) 236-3243.

Sincerely,


Gary Robertson, Head
Waste Management Section

GLR:krf

Enclosures:

WNI Responses (2 ringbinders)
WDOH Responses (1 ringbinder)