May 12, 1995

0383

Ronald A Milner, Director
Office of Program Management and Integration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington D.C. 20585

SUBJECT: HOLD ON TUNNEL BORING MACHINE OPERATION TO PRECLUDE POTENTIAL LOSS OF DATA RELEVANT TO STATE OF NEVADA PNEUMATIC PATHWAY CONCERN

Dear Mr. Milner:

In a letter dated March 31, 1995, (Reference 3, Enclosure A) the U.S. Department of Energy (DOE) responded to the October 6, 1994, U.S. Nuclear Regulatory Commission request (Reference 10, Enclosure A) for additional information on the State of Nevada Pneumatic Pathway Concern. A team of NRC and Center for Nuclear Waste Regulatory Analysis staff has considered information from the DOE and the State of Nevada to determine if the NRC has an "objection" level concern that Exploratory Study Facility construction might compromise the ability to collect "pneumatic pathway" data. It is the staff's decision that an "objection" level concern does not exist and that it is up to the DOE to determine when to release the hold point at the geologic contact between the Tiva Canyon welded and the Paintbrush non-welded units. A detailed explanation of this decision is contained in Enclosure A. It is anticipated that the NRC will continue to review and comment on characterization activities relevant to the description of pneumatic pathways.

If you have any questions on this letter, please feel free to contact me or William Ford of my staff. I can be reached at (301) 415-7437 and Mr. Ford can be reached at (301) 415-6630.

Sincerely,

/S/

John T. Greeves, Director
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

1700611

Enclosure: As stated

cc: see attached list

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HOLD ON TUNNEL BORING MACHINE OPERATION TO PRECLUDE POTENTIAL LOSS ON DATA RELEVANT TO STATE OF NEVADA PNEUMATIC PATHWAY CONCERN

The U.S. Department of Energy (DOE) responded to U.S. Nuclear Regulatory Commission requests for additional information on the State of Nevada Pneumatic Pathway Concern in a letter dated March 31, 1995, (Reference 3). A team of NRC and Center for Nuclear Waste Regulatory Analysis staff has considered information contained in this and other documents to determine if the NRC has an "objection" level concern with respect to the possibility that Exploratory Study Facility (ESF) construction might compromise the ability to collect "pneumatic pathway" data. It is the view of the NRC that an "objection" level concern does not exist and that it is up to the DOE to determine when to release the hold point at the geologic contact between the Tiva Canyon welded and the Paintbrush non-welded units. A detailed explanation of this position follows.

In reviewing the DOE characterization of Yucca Mountain as a potential high level waste repository; an NRC concern with the DOE characterization program that would prevent the DOE from starting work until the issue is satisfactorily resolved is defined as an "objection" (Reference 21). However, for a critical observation to be classified as an "objection" it must meet one of four criteria. The "pneumatic pathway" concern is related to the criterion that there are "potential significant and irreversible/unmitigable effects on characterization that would physically preclude obtaining information necessary for licensing." Furthermore, "*Objections are reserved primarily for concerns with activities, tests, and analysis which, if started, could cause significant and irreparable adverse effects on the site, the site characterization program, or the eventual usability of the data for licensing (programmatic fatal flaws).*" As a result "*Due to the irreparable nature of objections, NRC would recommend that DOE not start work until the objections are satisfactorily resolved.*"

In a letter dated January 25, 1994 (Reference 16), the State of Nevada requested that the NRC consider stating the "Pneumatic Pathway" concern as an "objection" to the DOE. The NRC responded in a letter dated March 31, 1994 (Reference 15), stating that at that time there was not sufficient technical information to support an objection. The NRC committed to aggressively investigate the issues raised in the State of Nevada's "pneumatic pathways" concern and to request further information from the DOE on: (1) the importance of this type of air pressure data to site description; (2) the potential for the ESF to impact the collection of air pressure and air chemistry data; and (3) the accelerated surface-based testing plans ability to collect air pressure and air chemistry data. The NRC requested data on these aspects of the issue in four communications sent on June 21, 1994, September 26, 1994, and October 13, 1994 (References 14, 13, 11, & 8). Furthermore, in the October 13, 1994, communication (Reference 8) the NRC requested identification of the point in the ESF north ramp construction where there is a potential to impact the site characterization capability of the

site. It was also requested that if DOE determines that there is no impact, it should provide justification.

The State of Nevada identified the "pneumatic pathways" issue, which has been actively followed and investigated by Nye County, Nevada, a member of the Affected Units of Local Government (References 18, 17, & 9). The State of Nevada has expressed why it feels the "pneumatic pathways" issue is important to site characterization in three formal communications to the NRC dated February 4, 1993, January 25, 1994, and January 10, 1995 (References 20, 16, & 6). From these communications and participation at the Scientific Roundtable on Yucca Mountain Pneumatic Continuity (References 18 & 17) and other informal communications, the NRC restated its understanding of the pneumatic pathways issue in three letters sent on March 31, 1994, June 21, 1994, and October 6, 1994 (References 15, 13, & 11).

From the January 10, 1995, communication (Reference 6) "*The State's concern is that early excavation of the ESF may preclude adequate characterization of pneumatic (air, gas, or vapor) pathways, and as such, may prevent the NRC from making a licensing finding on the issue of the fastest pathway for radionuclide release. Early tunnel excavation may compromise the collection of undisturbed data on how the bedded zones transmit barometric pressure changes, which are already known to vary above the PTn bedded unit. The best measure at the repository block scale for "tightness" of the bedded zones is soil gas pressure data in response to barometric pressure changes. Once the tunnel introduces atmospheric pressures and artificial ventilation pressures into the Topopah Spring's highly fractured welded tuff below the PTn Bedded tuff, there may be little or no opportunity to develop an undisturbed pneumatic database at the repository scale, or even on a more localized scale.*" It is further stated that "*The NRC should also be concerned that lifting the hold prematurely could adversely affect the collection of undisturbed gas geochemistry data.*"

The staff has identified three explanations why this data might be "necessary for licensing":

1. This data is necessary to determine the "fastest pathway for radionuclide release."

2. This data is necessary to evaluate gaseous radionuclide releases relative to the EPA high-level waste standard.

3. This data is necessary to model moisture distribution caused by repository heat, which in turn is necessary to reach a determination of radionuclide release via ground water, against the EPA high-level waste standard.

The DOE responded to requests for information in communications dated August 10, 1994, and March 31, 1995 (References 12 & 3). Open Item Question 1 of Site Characterization Progress Reports 6 & 7 expressed the NRC staff's interest in interference by the ESF on gas chemistry sampling (Reference 10). In a letter to Ronald A. Milner (DOE) from Margaret V. Federline (NRC) dated September 26, 1994, (Reference 11) the NRC closed this open item. As a result, the NRC's remaining concern was with the gas flow (air pressure) aspects of the State of Nevada's pneumatic pathway concern. Further, in a October 6, 1994 letter (Reference 10), the NRC recognized that the description of the accelerated testing plan demonstrated that the DOE has a plan to collect some pneumatic pressure data from units above, below, and in the Paintbrush nonwelded unit prior to the approach of the tunnel boring machine (TBM).

In the March 31, 1995, communication (Reference 3) the DOE explained:

1. How the "pneumatic pathways" concern will be addressed through a variety of site characterization activities.

2. The conceptual model of gas flow through Yucca Mountain.

3. How the site characterization program will guarantee that some large-scale gas data will be collected before it could be impacted by ESF construction.

4. The status of ongoing Yucca Mountain gas flow modeling and modeling to determine the extent of ESF effects on gas pressures in the mountain.

In this report it was concluded that "*Data sought from the pre-construction pneumatic pathways testing program are considered to be non-critical, but of high value to the characterization of Yucca Mountain.*" In addition, the program uses a variety of direct and indirect characterization methods other than undisturbed soil gas pressure data in response to barometric pressure changes, to characterize gas flow properties through Yucca Mountain. The testing program was developed based on a conceptual model of air flow through Yucca Mountain that identifies potential stratigraphic pneumatic barriers and structural pathways within the mountain. While the DOE does not consider pre-ESF data to be essential to site characterization, they do considered the data to be valuable to subsequent analyses of the repository site, and therefore controls on the construction/testing sequencing have been established.

Using site geologic, hydrologic, geochemical, and gas data collected at Yucca Mountain, the DOE has developed a conceptual model of moisture and gas flow within the unsaturated zone at Yucca Mountain. It is hypothesized that a two- or three-layer system exists, where the fractured and relatively permeable units are separated by lower-permeability, bedded units that act as barriers to pneumatic flow. It is not assumed that these zones are continuous over the entire Yucca Mountain area. "*Instead, it is postulated that the Drill Hole Wash, Bow Ridge, Ghost Dance, and Solitario Canyon faults, and several other sub-vertical structural features, act as gas-flow pathways that divide this*

two- or three-layer system into a series of flow cells. Each cell may have significantly different gas-transport characteristics, depending upon the spatial distribution of permeabilities in the bounding fault zones." More details of the DOE conceptual model are contained in Reference 3.

In conducting its review of the "pneumatic pathways" issue, the NRC staff has observed that data which can be used to characterize present and future air, gas, and vapor movement through Yucca Mountain will be collected through a number of site characterization activities. Activities supplying data that will be applied to the "pneumatic pathways" issue are described in the following study plans:

1. Study Plan 8.3.1.2.2.1, "Characterization of the Unsaturated-Zone Infiltration."

2. Study Plan 8.3.1.2.2.3, 'Characterization of the Percolation in the Unsaturated Zone-Surfaced-Based Study."

3. Study Plan 8.3.1.2.2.4, "Characterization of the Yucca Mountain Unsaturated Zone in the Exploratory Studies Facility."

4. Study Plan 8.3.1.2.2.6, "Characterization of the Yucca Mountain Unsaturated-Zone Gaseous Phase Movement."

5. Study Plan 8.3.1.2.2.9, "Site Unsaturated Zone Modeling and Synthesis."

The NRC staff have knowledge of the characterization activities described in these study plans as a result of NRC's ongoing review of the DOE program. We have confirmed with DOE that these study plans are being implemented under the program approach.

In these activities, data will be collected using holes drilled from the land surface and in the ESF. These activities will collect data on temperature, humidity, rock water content, gas flow rates and the air permeability of rock, fractures, and faults. These data will be collected at a variety of scales ranging from core, to rock volumes that are tested by single and multiple boreholes. This type of information can be used to derive quantitative information that is needed to model present and future gas flow and moisture redistribution through Yucca Mountain. In addition, characterization activities will collect air chemistry data which can be used to identify pathways, residence times, and mixing.

The NRC staff has also confirmed its earlier conclusion that the DOE has implemented a plan to collect some pneumatic pressure data from units above, below, and in the Paintbrush nonwelded unit prior to the approach of the tunnel boring machine (TBM). This plan is described in detail in the March 31, 1995, communication (Reference 3). Eight boreholes are identified from which soil gas pressure in response to barometric pressure changes from the land surface will be monitored. This is the recommended testing technique, which might be compromised by ESF construction. Data from four of the holes have already been collected (UZ-1, NRG-4, NRG-6, & NRG-7a), with

data from two holes to be collected this fiscal year (UZ-4 & UZ-5). Data from the remaining two holes (SD-12 & UZ-7a), which are located at the south end of the repository footprint, will be completed in fiscal year 1996. All of these boreholes will be monitored by the DOE with the exception of hole NRG-4, which will be monitored by Nye County as part of the cooperative study program. It is anticipated that data from all of these holes can be collected before it could be compromised by ESF construction. This is because testing experience to date has shown the equilibration time for air pressure monitoring is short and can be completed before the approach of the ESF (Reference 3). In the case of the southern holes, SD-12 and UZ-7a, the tunnel will not be developed in these areas until fiscal years 1996 to 1997 (Reference 3).

In addition to monitoring soil gas pressure data in response to barometric pressure changes from the land surface, some of the boreholes have been located to monitor effects from the ESF as it advances towards them. The DOE expects that "*The ESF will provide an advancing front of barometric pressure proximal to the ramp boreholes that is in phase with and only slightly less than atmospheric pressure (due to ventilation effects). The gas-pressure changes in these boreholes as a function of time and distance from the ESF will provide insight into the role and efficiency of existing fractures as pneumatic pathways within Yucca Mountain*" (Reference 3).

Numerical gas flow modeling has not yet been performed that can bound or predict the extent of ESF effects on subsurface air pressures. The 3-dimensional site-scale model has been modified to include the north ramp of the ESF and will be calibrated using meteorological records and barometric responses in instrumented boreholes (Reference 3). At this time, the "*...model has been calibrated against data from the relatively well-characterized local gas-flow system at UZ-6/UZ-6s*" and "*...over the next few months, it will be calibrated using meteorological records and associated barometric responses in the instrumented NRG boreholes*" (Reference 3). However, while numerical gas flow modeling has yet to be performed, much of the data to model gas and vapor flow will come from tests, which are not impacted by ESF construction.

The staff has the following observations on the importance to licensing of collecting soil gas pressure data in response to barometric pressure changes from the land surface (pneumatic pathway data). In reference to the statement that this data is necessary to the determination of the "fastest pathway for radionuclide release," the NRC staff desires to point out that the post-closure performance objectives of 10 CFR 60.113 do not specifically limit gaseous radionuclide or vapor movement travel times from a high-level waste repository. In NRC regulations, the words "fastest path" only apply to the groundwater travel time requirements of 10 CFR 60.113(a)(2) and 122(b)(7). However, as stated at the Scientific Roundtable on Yucca Mountain Pneumatic Continuity on January 26 and 27, 1994 (Reference 17), the NRC staff considers that the groundwater travel time requirements apply to water (water being a liquid) and are not applicable to gaseous radionuclide releases and vapor movement. Gaseous releases are covered in 10 CFR 60.122(c)(24), which was specifically added to the regulations when they were amended to include the development of a repository above the water table.

The contention that these data are necessary to an evaluation of repository performance regarding gaseous radionuclide release relative to the EPA high-level waste standard may not be correct, given the long time frames considered by the EPA standard and the relatively fast speeds with which gaseous releases could move through the mountain. The claim that these data are necessary to model moisture distribution caused by repository heat, which in turn is necessary to reach a determination of radionuclide release through ground water against the EPA high-level waste standard, does not appear to be correct. This is because, for both of these concerns, much of the data to model gas and vapor flow will come from tests, which are not impacted by ESF construction. Furthermore, a significant amount of the data to address these concerns will come from the ESF, so that delays in ESF construction could have significant impacts on pneumatic pathway characterization.

It is the conclusion of the NRC staff that:

1. The conceptual model of gas flow through Yucca Mountain is reasonable, given the present state of knowledge about the mountain.

2. The collection of undisturbed soil gas pressure data in response to barometric pressure changes from the land surface provides useful information to help characterize pneumatic pathways.

3. The DOE plans to collect soil gas pressure data in response to barometric pressure changes from the land surface, before it can be disturbed by ESF construction.

4. While the collection of undisturbed soil gas pressure data in response to barometric pressure changes from the land surface does provide useful information to help characterize pneumatic pathways, most of the information to characterize pneumatic pathways will come from tests, which are not impacted by ESF construction.

5. Should construction of the ESF preclude the collection of additional undisturbed soil gas pressure data in response to barometric pressure changes from the land surface, other characterization activities should be able to characterize pneumatic pathways.

6. The DOE plan to collect soil gas pressure data is designed so that interference effects by the ESF on gas pressures may provide additional information relevant to pneumatic pathways.

7. A significant amount of the data to characterize pneumatic pathways comes from the ESF. Therefore, delays in ESF construction could have significant impacts on pneumatic pathway characterization.

The NRC does not have an "objection" relative to the characterization of pneumatic pathways and ESF construction. This is because the NRC finds that:

1. The technique of collecting soil gas pressure data in response to barometric pressure changes from the land surface is not necessary to

license the site. This conclusion is based on the observation that modeling of gas flow through the mountain is heavily dependent on data from other tests which are not impacted by ESF construction.

2. The technique of collecting soil gas pressure data in response to barometric pressure changes from the land surface is mitigable and is not irreparable. Furthermore, ESF construction effects on this characterization technique will not physically preclude obtaining information necessary for licensing. This is because, some of this data will be collected before it can be impacted by the ESF, the characterization program will be looking to quantify the extent of any impact by the ESF, and pneumatic pathway data can be collected using other techniques that are not impacted by ESF construction.

In the DOE's November 14, 1994, response to Question 2 (Reference 7, page 6) of the NRC letter on "Concerns With Quality Assurance Program" (Reference 8) the DOE stated that "*There is no specific demarcation point associated with the excavation of the North Ramp beyond which the potential for impacts is expected to increase.*" However, "*In recognition of the State of Nevada's concerns over the potential penetration of the PTn-TCw contact prior to adequate pneumatic pathways data*" the DOE placed a "hold" on tunnel boring machine operations beyond this point until that data is collected. This document goes on to define this "data" as instrument arrays in holes NRG-7a and NRG-6 that will record pressure change responses to atmospheric changes above, within, and below the PTn unit, for several pressure fronts (Reference 7, DOE Response to Question 2, page 2). The DOE March 31, 1995, letter (Reference 3) provides the following additional information on "hold" criteria.

"*The TBM shall not excavate beyond the TCw/PTn (Tiva Canyon welded/Paintbrush Tuff non-welded) geologic contact until after collection of pneumatic data from monitored boreholes. This hold shall be rescinded when:*

* *Pneumatic data have been collected from isolated intervals in the Tiva Canyon welded unit (TCw), the Paintbrush non-welded unit (PTn), and the Topopah Spring welded unit (TSw).*

* *Data have been collected over a time period equivalent to early to later winter (this period is anticipated to be completed by late February).*

* *Data for several barometric pressure changes (weather fronts) have been gathered, or an alternative testing program that meets the above objectives is developed.*"

In this letter, the DOE also stated that "*The first of the pressure monitoring systems (in NRG-7a) was installed in late October and has been gathering data since the beginning of November 1994. A second system (in NRG-6) was installed in mid-November. These instrument arrays record pressure changes nominally at the surface and at depth (above, within, and below the PTn) in response to atmospheric pressure changes.*" "*The TBM is not scheduled to reach this unit until approximately July 1995.*"

In a letter dated May 4, 1995, (Reference 2) the DOE notified the NRC that on May 12, 1995, the DOE plans to lift the "hold." In this letter the DOE presented plots of the data it has collected for holes NRG-7a and NRG-6. The letter also described the methods of data collection and reiterated commitments to continue to implementing its plan to collect some pneumatic pressure data prior to the approach of the TBM (as described in the Reference 3 communication).

The NRC has also reviewed a May 4, 1995, communication from the State of Nevada (Reference 1) in which it is stated that the State of Nevada does not believe that the March 31, 1995 letter (Reference 3) addresses its concerns relative to pneumatic pathways. This letter also states that "*The DOE must commit prior to lifting any tunnel boring machine hold that it 1) conduct an analysis of the data collected, including whether the data are appropriate and sufficient for adequate pneumatic pathway modeling; 2) model pneumatic flow at a repository scale, not a drill site scale; and 3) define the approach and specific models and codes it intends to use to resolve the pneumatic pathways issue.*" It is further stated that "*The State's position is that clear and concise hold-point criteria must be established prior to the tunnel reaching the PTn unit, and that any decisions based on that criteria be reported and justified to the State prior to excavating through the PTn. The DOE must commit to share any and all pneumatic databases with the State, as well as other oversight parties. The data must be provided in sufficient time so that independent analysis of the adequacy of the databases for pneumatic model analysis can be accomplished before release of the TBM hold point.*"

However, for the reasons previously stated, it is the decision of the NRC that an "objection" level concern does not exist with respect to this issue. Therefore, the NRC is not requiring a "hold" and it is up to the DOE to decide when to release the hold point at the geologic contact between the Tiva Canyon welded and the Paintbrush non-welded units.

REFERENCES

1 Letter to Ronald A. Milner, Director, Office of Program Management and Integrations, DOE, from Robert R. Loux, Executive Director, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada, dated May 4, 1995.

2 Letter to Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, from Stephen J. Brocoum, Assistant Manager for Suitability and Licensing, DOE dated May 1, 1995.

3. Letter to Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, from Ronald A. Milner, Director, Office of Program Management and Integrations, DOE, dated March 31, 1995.

4. Letter to Ronald A. Milner, Director, Office of Program Management and Integrations, DOE, from Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, on "Results of Initial Staff Review of U.S. Department of Energy November 14, 1994, Quality Assurance Letter and Plan for Verification," dated March 9, 1995.

5. Letter to Robert R. Loux, Executive Director, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada from John H. Austin, Chief, Performance Assessment and Hydrology Branch, NRC, dated February 8, 1995.

6. Letter to Malcolm Knapp, Director, Division of Waste Management, NRC, from Robert R. Loux, Executive Director, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada, dated January 10, 1995.

7. Letter to Robert M. Bernero, Director, Office of Nuclear Material Safety and Safeguards, NRC, from Daniel A. Dreyfus, Director, Office of Civilian Radioactive Waste Management, DOE, dated November 14, 1994.

8. Letter to Daniel A. Dreyfus, Director, Office of Civilian Radioactive Waste Management, DOE, from Robert M. Bernero, Director, Office of Nuclear Material Safety and Safeguards, NRC, on "Concerns With Quality Assurance Program," dated October 13, 1994.

9. Letter to Margaret Federline, Chief, Performance Assessment and Hydrology Branch, NRC, from Les W. Bradshaw, Manager, Nuclear Waste Repository Project Office, Nye County, Nevada, on "NRC Staff Response to Pneumatic Pathways Concerns," dated October 11, 1994.

10. Letter to Ronald A. Milner, Acting Director, Office of Program Management and Integrations, DOE from Margaret Federline, Chief, Performance Assessment and Hydrology Branch, NRC, on "State of Nevada Concern on Pneumatic Pathways," dated October 6, 1994.

11. Letter to Ronald A. Milner, Acting Director, Office of Program Management and Integrations, DOE, from Margaret Federline, Chief, Performance Assessment and Hydrology Branch, NRC, on "Staff Evaluation of Open Item Response to Question 1 of Site Characterization Plan Progress Reports 6 & 7," dated September 26, 1994.

12. Letter to Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, from Stephan J. Brocoum, Assistant Manager for Suitability and Licensing, DOE, on "Accelerated Surface-Based Testing Plan for Ambient Pneumatic Conditions (SCPB: 8.3.1.2.2.3, 8.3.1.2.2.6, 8.3.1.2.2.7)," dated August 10, 1994.

13. Letter to Mr. Dwight E. Shelor, Associate Director, Systems and Compliance, DOE from Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, on "Staff Evaluation of Open Item Responses on Dewatering and Air Movement in the Experimental Studies Facility," dated June 21, 1994.

14. Letter to Dwight E. Shelor, Associate Director, Office of Systems and Compliance, DOE, from Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, on "State of Nevada Concern on Pneumatic Pathways," dated June 21, 1994.

15. Letter to Robert R. Loux, Executive Director, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada from B.J. Youngblood, Director, Division of High-Level Waste Management, NRC, dated March 31, 1994.

16. Letter to B.J. Youngblood, Director, Division of High-Level Waste Management, NRC, from Robert R. Loux, Executive Director, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada, dated January 25, 1994.

17. Summary of Proceedings, Scientific Roundtable on Yucca Mountain Pneumatic Continuity: Progressing from Conceptual Models of Gas Circulation in the Vadose Zone to Confident Characterization, Yucca Mountain Affected Units of Local Government, January 26 and 27, 1994.

18. Letter to B.J. Youngblood, Director, Division of High-Level Waste Management, NRC, from Les W. Bradshaw, Manager, Nuclear Waste Repository Project Office, Nye County, Nevada, on "Proposed Workshop on Characterization of Pneumatic Pathways at the Yucca Mountain Site," dated November 2, 1993.

19. Letter to Joseph J. Holonich, Chief, High-Level Waste and Uranium Recovery Projects Branch, NRC, from Dwight E. Shelor, Associate Director, Office of Systems and Compliance, DOE, dated August 20, 1993.

20. Letter to B.J. Youngblood, Director, Division of High-Level Waste Management, NRC, from Carl A. Johnson, Administrator of Technical Programs, Agency for Nuclear Projects Nuclear Waste Project Office, State of Nevada, dated February 4, 1993.

21. U.S. Nuclear Regulatory Commission, Review Plan For NRC Staff Review of DOE Study Plans, Revision 2, Division of High-Level Waste Management, March 10, 1993.