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December 24, 1992

Dr. John W. Bartlett, Director  
Office of Civilian Radioactive  
Waste Management, RW-1  
U.S. Department of Energy  
1000 Independence Ave. S.W.  
Washington, DC 20585

Dear Dr. Bartlett:

The State of Nevada has reviewed the DOE Study Plan "Water Resource Assessment of Yucca Mountain, Nevada" (Study Plan 8.3.1.9.2.2, Revision 0) and is providing its comments in this letter and attachment. The State's comments address the adequacy, completeness, and technical accuracy of the Study Plan to meet the Department's objective in site characterization.

The purpose of a water resource assessment of Yucca Mountain and vicinity will be to obtain information on the value of the water resources in the study area to assess the potential for future exploitation of the resource and the effect of exploitation on the mined geologic disposal system. The overall objectives of the study are to assess the current and projected supply and demand situation for ground water in the study area, and estimate the value of the ground-water resource.

Two general comments on this Study Plan are provided as follows:

1. The State questions whether the water resource assessment can provide meaningful information relative to meeting the purpose and objectives of the study. At best, the assessment can provide only a very qualified estimate of possible future demand for the resource: Given the scope, level of detail, and the time frame of the study, it is not evident that any real information will be generated appropriate for satisfying regulatory requirements.

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2. The plan defines two study areas, one an "economic study area" which covers the three county area, and a second "hydrographic study area" restricted to the three sub-basins surrounding Yucca Mountain. The entire discussion, which provides a lesson in marginal price theory, emphasizes the current water use within only part of the Alkali Flat sub-basin which is primarily agricultural. There is almost a total lack of recognition that in the future, the period which is to be considered, the marginal agriculture will likely disappear and other demands will be placed on the resource. In order to even make a very basic estimate of what those demands could be, the scope of the study needs to be greatly expanded to include Las Vegas area demands and possible future supplies.
  
3. The Study Plan claims that the only resource expected to have potential for future exploitation is groundwater. This conclusion while consistent with the Department's position as articulated in the Environmental Assessment, the Site Characterization Plan, and the Early Site Suitability Evaluation, is not supported by facts. There are no data, analyses, or interpretations known to the State which scientifically conclude that there is no potential for future exploitation of mineral resources, hydrocarbon resources, or geothermal resources. Most of the data available to date suggest the opposite. Such conclusionary statements by the DOE prior to any study should be removed from the Study Plan, or supported by published scientific literature.

Should you have questions, this Office is available to meet with the Department to discuss the State's comments at any time.

Sincerely,



Robert R. Loux  
Executive Director

CAJ:RRL:jem

Attachment

cc: Carl Gertz, YMPO  
✓ Joe Youngblood, NRC  
Dade Moeller, NRC-ACNW  
John Cantlon, NWTRB  
Dwayne Weigel, GAO  
Steve Kraft, EEI

## ATTACHMENT

### State of Nevada comments on DOE Study Plan 8.3.1.9.2.2. "Water Resource Assessment of Yucca Mountain, Nevada"

1. Section 1.1 (Page 1-8) indicates that the "study area is composed of two elements: 1) the hydrographic study area where the potentially affected water supply is located, and 2) the economic study area from which water demands may develop." The two "study areas" defined and shown in Figures 1-1 and 1-3 do not totally cover the areas which could influence groundwater levels in the "hydrographic study area" since our lack of understanding of the interconnection between the deep "carbonate system" in southern Nevada and the valley fill volcanic aquifer systems is incomplete. To forecast demand on any part of the system, it is necessary that there be an understanding of the total system and its interconnections. Future demand for water near Yucca Mountain may well be a result of the availability, or lack thereof, of water from other parts of the system.
2. Reference to Section 1.2 (Page 1-7 to 1-10). In evaluation of the ground water resources of the valley fill and carbonate aquifers near Yucca Mountain it must be recognized that nowhere in developed regions and particularly nowhere in arid regions, is a major aquifer carrying potable water not utilized as a resource. Comparisons should be made to arid climate developments elsewhere in the United States and in the world, rather than present circumstances in Nevada. Consideration should be given to predicted population growth on a national scale, and consequent demands for fresh water supplies, rather than extrapolating from current conditions. The world including the United States is changing and the life of the repository easily spans the period of population doubling to eleven billion people and potable water supplies becoming more and more valuable. This is the "foreseeable future", as specified in 10CFR60.122(c)(17)(i). It can be said with confidence that the groundwater resources of this region will be developed or over-developed during the operational phase of the repository or a few decades later.

The argument of "institutional constraint" on groundwater resources exploitation is not valid for a future case of an urban community near Yucca Mountain seeking a source for municipal water supply. The current quest by the Las Vegas Valley Water District (LVVWD) for additional ground-water supplies from neighboring counties to the north seems relevant.

Also, in considering the risk of unintentional human intrusion the assumption is made that instructions and authority may have changed entirely, so for this condition institutional

constraints on water resources development cannot be considered a controlling factor. If climatic change is a factor, then surely institutional change must also be a factor.

The two aquifers at the site (the tuff aquifer and the carbonate aquifer) and the alluvial aquifer adjacent to the site must be considered as one ground-water reservoir, and together comprise a Class 1 Aquifer and Special Source of water as specified by the U.S. Environmental Protection Agency.

3. Reference to page 1-7. To address Issue 1.3, it is proposed that the study include "the economic feasibility of developing the lower carbonate aquifer." In order to do this, a study well beyond the scope of this document is required since the potential demand for further development of water resources near the repository is a function of economic and physical ability to develop additional water supplies in an area much larger than the flow system depicted in Figure 1.1. Such a hydrographic study of the carbonate aquifer would likely include a region encompassing eastern and southern Nevada. For example, the LVVWD is actively looking at potential water resources in some 28 separate basins in southern and central Nevada. If a number of these basins prove infeasible for one reason or another, then increased pressure for development of the "carbonate aquifer" or other less extensive aquifers in the Amargosa River drainage will be felt.

In addition, the level of knowledge concerning the "deep carbonate aquifer" and its ability to yield water throughout southern Nevada is still quite limited and therefore any economic analysis would be subject to large uncertainties.

4. Reference to page 1-9. Under Issue 1.8, how does the assessment of "current markets" fit into an "assessment of the potential consequences of exploration activities . . . during the post-closure period"?
5. The first sentence of Section 2.0 states: The analytical methods incorporated in this study will be used to estimate the future value of the water resources within the study area." Does this mean that the study is limited to the future value of water resources within the "economic study area" or within the "hydrographic study area"? The future value must be determined considering regional demands, not just projected local demands.
6. On Page 2-3 it is stated that the definition of perennial yield also applies to the carbonate aquifer. In theory this is true, however, in reality, the concept of perennial yield cannot be applied to an aquifer system which is so poorly

understood. The recharge, extent, interconnection, and even flow direction are not known with any precision to make a "perennial yield" determination for this particular aquifer system.

7. Section 2.1.1.2 (Pages 2-6 to 2-13) addresses the economic supply of ground-water. The entire discussion in this section is primarily applicable to water resource economics for agriculture of fairly low value crops or large-water-use industrial projects. For most municipal and industrial uses, the pumping costs are really only a minor part of any budget and of minor importance. Demand for water in southern Nevada will be only slightly influenced by the cost of production, other economic influences will be much more significant.
8. Section 2.1.2 (Pages 2-13 to 2-18) indicates that the purpose and scope of the ground-water valuations to be conducted in this study are derived from 10 CFR 60. 122(c) and 10 CFR 960. 4-2-8-1. The section goes on to indicate that 10 CFR 960. 4-2-8-1 (a) requires specific consideration be given to water suitable for crop irrigation or human consumption without treatment. More correctly, 10 CFR 960. 4-2-8-1(a) requires that as a qualifying condition to siting a repository that the "site shall be located such that - considering permanent markers and records and reasonable projections of value, scarcity, and technology - the natural resources, including ground-water suitable for crop irrigation or human consumption without treatment present at or near the site will not be likely to give rise to interference activities that would lead to radionuclide releases greater than those allowable under the requirements specified in 960.4-1." There are no specific consideration requirements.
9. In paragraph two on page 2-14 the value of water in this study is considered only for agricultural and industrial purposes, yet the discussion in paragraph three discusses the value of water for domestic use. This inconsistency should be corrected or clarified. It should be noted that according to the discussion, domestic use has a higher value than agricultural or industrial use.
10. The discussion in Section 2.1.3 (Pages 2-18 to 2-23) emphasizes the agricultural sector which is a very minor part of the total southern Nevada economy. It is more correct to simply assume that the low value agriculture will disappear through existing market mechanisms and that water will be transferred to more economic uses in the future?
11. The discussion on Pages 2-25 to 2-27 is based on the existing economy and water use, however, the requirements are to estimate demand and use into the future, i.e., the post-closure period. Any data related to current water use within

the hydrographic area will have little relevance during that period.

12. On Page 2/27 the following statement is made: "Municipal water value will be estimated using demand curves derived from local data, if available within the economic study area, or from studies of communities in similar arid regions of the United States." Attempt to use local disparate demand data, say a mix of one large community such as Las Vegas and other small communities such as Beatty, Pahrump, etc., will yield little value. Also, using transfer data from other arid regions may be futile since it has been demonstrated time and again that water flows to money in these regions and that demand is a function of the area's economic engine, not the true availability of the resource.
13. In Section 2.2, the key constraint is correctly identified in the discussion, i.e., "the uncertainty inherent in making long-term predictions." There appears to be great uncertainty when attempting to estimate growth and resultant water demand in southern Nevada. The parametric approach suggested using a range of supply and demand scenarios and determining the sensitivities of the results is the only practical approach.
14. On Page 3.1 in Section 3.1 Ground-water Supply, there is a disconnect between the "economic" and "hydrographic" study area since the demand for water from the hydrographic area may very well be a function of the availability of water from other areas to supply the economic area.
15. On Page 3-2, how is the "carbonate aquifer" going to be evaluated with respect to either quantity or quality given our current level of understanding?
16. On Pages 3-3 through 3-9, the entire discussion is based on the current primary water user in the hydrographic area, that of relatively low value agriculture in Amargosa Valley. However, agriculture such as currently exists will likely have little influence on future water demand and the value of water. The future value will certainly be determined by alternative uses of the water, either municipal or industrial within the hydrographic area or for export to other demand areas such as Las Vegas Valley.
17. In Section 3.3 on Page 3-12, there is a clear acknowledgment of the uncertainty in long-term predictions of use and value of water, and the need for ". . . a range of supply and demand scenarios . . ." is stated. However, the most critical and sensitive scenario is not identified nor discussed relative to its impact on site suitability or regulations.

18. On Page 3-14 is the only mention of other areas having a future desire to use the water currently being used for agriculture in the hydrographic study area. There is still no discussion with respect to the real economic power house (Las Vegas) in the economic area and its potential influence on water demands. The assumption that the "wider region" has an institutional constraint of 14,400 persons has no basis in fact. Future impacts on the demand and value of potable ground-water in productive aquifers must be addressed in a realistic and comprehensive manner.
19. At the bottom of Page 3-14, the following statement is made: "These investigations will produce, for this period, population forecasts for the study areas (hydrographic and economic), which may produce a demand for water supplies located in the hydrographic study area." There still appears to be a dichotomy when defining study areas. The discussions focus primarily on the study defined hydrographic and economic areas however, all the economic driving forces for demand and value mechanisms will likely be from the Las Vegas area.
20. Reference to Table 4.1 on Pages 4-2 and 4-3.
  - (1) The study is unlikely to provide some of the results listed in Table 4-1. Specifically, the time-phased projections of rates and locations of groundwater withdrawals will be a guess at best given the high level of uncertainties inherent in the study as described. Also, the economic feasibility of development of the lower carbonate aquifer will be severely limited since the collective "we" have only a superficial understanding of this system, and the study as planned will not materially add to our understanding of the lower carbonate aquifer.
  - (2) Another contentious issue which is not well addressed by the Study Plan is whether only costs and values of ground water in a major aquifer, as related to present-day society and economics, provides a realistic picture of the value that society will place on the resource during the lifetime of the repository. For example environmental protection constraints are weakly addressed in the Study Plan, but may be of major importance to society in the future.
21. Reference to Table 5.1 on page 5-1. The use of the Hills method in itself is acceptable, but the method assumes a quasi-steady state for the change in ground-water levels for any change in pumping rate, and this could require years for each change. No consideration is given to this restraint on the use of the method.

22. Reference to Figure 5-1 on Page 5-2. The five and one-half month study period and the limitations as described in the plan will yield only a very general estimate of the potential changes to and likelihood of increased water resource use for the hydrographic study area. A more reasonable time frame for such a study would be to change the time scale on Figure 5-1 Schedule from months to years. Many years of study will be required to simply understand the hydrology of the lower carbonate aquifer.