STATE OF CALIFORNIA – THE RESOURCES AGENCY

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November 21, 2005

EPA Docket Center (EPA/DC)
Air and Radiation Docket
Environmental Protection Agency
EPA West, Mail Code 6102T
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Attention Docket ID No. OAR-2005-0083

To Whom It May Concern:

Attached are our comments on the proposed U.S. Environmental Protection Agency's (EPA) radiation protection standard for the proposed Yucca Mountain nuclear waste repository. These comments are in response to EPA's Federal Register Notice (Federal Register, Vol. 70, No. 161, Monday, August 22, 2005). The California agencies contributing to the preparation and review of these comments include the California Energy Commission, the California Environmental Protection Agency, the Lahontan Regional Water Quality Control Board, the Department of Water Resources, and the Department of Conservation. Also, attached are the written comments provided to us by the California Regional Water Quality Control Board – Lahontan Region.

The most significant potential impacts in California from the proposed Yucca Mountain high-level waste repository are transportation impacts from spent fuel transport to the repository and potential ground water impacts in the Death Valley region, including potential impacts on public health, wildlife, natural habitat, and public parks. Our comments on the proposed EPA radiation protection standard focus on potential ground water impacts in California.

We conclude that, as required by law, EPA's proposed standard for Yucca Mountain should be consistent with the National Academy of Sciences' (NAS) findings and recommendations as presented in the NAS report Technical Bases for Yucca Mountain Standards (1995). The proposed standard should also comply with the "intergenerational equity" principle, described in the NAS report, that we should not impose burdens or higher risks on future generations that are not currently acceptable.

EPA's proposed new standard proposes a two-tiered standard that sets a more stringent standard (15 millirems per year) for the first 10,000 years, and then, when maximum radiation exposure from the repository is expected to occur, relaxes the standard to 350 millirems per year. EPA does not explain how this two-tiered standard is consistent with this widely accepted "intergenerational equity" principle, particularly since the 350-millirems-per-year standard greatly exceeds the acceptable radiation dose limit (10 to 30 millirems per year) described in the NAS report which is based upon a general consensus in the scientific community for the exposure limit allocated to high-level waste disposal.

We recommend that the new EPA radiation protection standard should fall within this recommended exposure range limit of 10-30 millirems per year and should remain in effect in perpetuity with no time limit. We further recommend that, if the repository is licensed, a ground water monitoring program should be developed to evaluate potential impacts in California. In addition, a ground water contamination mitigation, clean-up and decontamination plan should be developed prior to beginning waste emplacement in the repository.

If you have any questions, please contact Barbara Byron at 916-654-4976.

Sincerely,

JAMES D. BOYD
Commissioner and State Liaison Officer to the
Nuclear Regulatory Commission

Attachments:

1. California's Comments on EPA's Proposed Yucca Mountain Standard
2. Lahontan Regional Water Quality Control Board's Comments on EPA's Proposed Yucca Mountain Standard

Attachment 1

STATE OF CALIFORNIA'S COMMENTS ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S PROPOSED REVISED RADIATION PROTECTION STANDARD FOR THE YUCCA MOUNTAIN NUCLEAR WASTE REPOSITORY

November 2005

Background

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for setting radiation protection standards to protect public health and the environment from the proposed underground high-level radioactive waste repository at Yucca Mountain, Nevada. It has been longstanding U.S. policy to dispose of these wastes underground in a mined geologic repository.

The U.S. Department of Energy (DOE) is responsible for developing and eventually operating a high-level waste repository. The U.S. Nuclear Regulatory Commission (NRC) and EPA are responsible for regulating the high-level waste disposal program to ensure adequate protection of public health.

In 1985, EPA issued its first generic standards for managing, storing and disposing of radioactive wastes, including high-level wastes. These standards were intended to apply to any storage or disposal facility including Yucca Mountain. The standards were challenged, litigated, and ultimately reissued in December 1993 (40 CFR 191). Before EPA reissued the standard in 1993, Congress passed the Energy Policy Act (1992) which mandated a separate process for setting a standard specifically for the proposed repository at Yucca Mountain. The Act directed EPA to contract with the National Academy of Sciences (NAS) to provide the scientific basis for the standard for the Yucca Mountain Site and required the standards that EPA promulgated to be based upon and consistent with NAS' findings and recommendations on the standards.

In 1995, NAS released their report Technical Basis for Yucca Mountain Standards. The NAS report concluded that the peak risks from the repository might occur tens to hundreds of thousands of years or even farther into the future. The NAS recommended standards that would apply to the time of maximum risk and stated that there is no "scientific basis for limiting the time period of the individual-risk standard to 10,000 years or any other value."

EPA issued proposed standards for Yucca Mountain in 2001 (40 CFR Part 197) including a standard of 15 millirems per year for the first 10,000 years, after which there would be no standard. These standards included four sets of standards against which compliance would be assessed: a storage standard for when waste is received and handled at the site and emplaced in the repository and three separate waste disposal standards applying to releases of radionuclides from the disposal system after final closure. These three separate disposal standards were an individual protection standard, a human intrusion standard, and a ground water protection standard.

The EPA 2001 proposed standards were challenged by the State of Nevada, the Natural Resources Defense Council, and the Nuclear Energy Institute. In a ruling by the U.S. Court of Appeals for the District of Columbia District in July 2004, the Court concluded that "the 10,000-year compliance period selected by EPA violates the Energy Policy Act of 1992 because it is not 'based upon and consistent with' the findings and recommendations of the National Academy of Sciences. " The Court ruled that EPA had not justified its decision to apply compliance standards only to the first 10,000 years after disposal.

In August, 2005, EPA issued its revised proposed Yucca Mountain radiation protection standard (70 Fed. Reg. 49014, August 22, 2005). The standard is designed to protect the closest residents to the repository (residents currently located at Lathrop Wells, Nevada) to a level of risk within the range considered acceptable for all other cancer-causing pollutants. The new standard proposed by EPA in 2005 is nearly identical to the previous standard adopted in 2001. The old rule established a 15-millirems-per-year individual protection standard for the first 10,000 years, and no limit thereafter. The new standard establishes the same 15 millirems-per-year standard for the first 10,000 years, and a much higher standard of 350 millirems per year thereafter. The old rule included no groundwater protection standard after 10,000 years and that remains the same for the new rule.

EPA will not consider comments on the separate ground water standard. EPA concluded that the Court's ruling regarding the 10,000-year compliance period does not apply to the separate groundwater protection standard and that public health protection is provided by the individual-protection standard that accounts for radionuclide transport and exposure through all pathways (air, water and soil).

The proposed repository is located above an important ground water aquifer that is currently being used for drinking, irrigation and dairy cattle. The ground water standard that EPA originally adopted in 2001 requires that DOE meet a standard equivalent to the radionuclide "Maximum Contaminant Levels" established for drinking water. The ground water standard is designed to protect the aquifer beneath Yucca Mountain as both a resource for current users and potential future users in the vicinity of the repository and at greater distances.

In the current repository design, the radioactive materials would be placed about 1,000 feet beneath the land surface and about 1,000 feet above the closest ground water. The repository is currently designed to hold 70,000 metric tons of waste, 90 percent of which would be spent fuel from commercial nuclear power plants and 10 percent of which would be from high-level radioactive waste from federal defense programs.

Potential Impacts in California

The most significant potential impacts in California from the proposed Yucca Mountain high-level waste repository are: transportation impacts from spent fuel transport to the repository and potential ground water impacts in the Death Valley region, including potential impacts on public health, wildlife, natural habitat, and public parks. Ground water contamination and the potential migration of radionuclide contaminants in groundwater to sensitive receptors (for example, people, wildlife, and habitat) in California are major concerns.

Inyo County's representative reported (at the October 20, 2005 EPA hearing) on the results of studies jointly sponsored by Inyo, Nye and Esmeralda Counties on the possible hydrologic connectivity between the Lower Carbonate Aquifer that underlies Yucca Mountain and surface water discharges in Death Valley National Park in California. These studies indicate that the Lower Carbonate Aquifer is a source of surface waters in Death Valley National Park. These studies also indicate that the Lower Carbonate Aquifer may extend to the communities of Death Valley Junction, Shoshone and Tecopa-- all of which rely exclusively on ground water. The long term potential ground water contamination is the primary pathway for exposure of Inyo County residents to radioactive contamination from the Yucca site.

Comments on the Proposed Standards

1. **EPA's radiation protection standard should be consistent with the NAS findings and recommendations. A radiation exposure limit should be set within the recommended range of 10 to 30 millirems per year , e.g., 15 millirems per year as recommended by EPA, with no reference to a time limit on the standard.**

Congress in 1992 instructed EPA to prepare a standard based upon and consistent with National Academies of Sciences' (NAS) recommendations. In 1995, the NAS Committee said they "see no valid justification for a 10,000 year compliance cut-off and recommended that compliance with the standard be measured at the time of the peak risk, whenever that occurs. NAS said there is no "scientific basis for limiting the time period of the individual-risk standard to 10,000 years or any other value."

The maximum release of radioactive contaminants to the environment, based on DOE models, is predicted to occur in the tens to hundreds of thousands of years (i.e., well beyond 10,000 years). It makes no sense to establish a more stringent standard for the period up to 10,000 years, only to relax this standard (i.e., increase it to 350 millirems per year as EPA proposes) in the following years when maximum releases from the repository to the environment are expected to occur. If the 15-millirems-per-year standard is acceptable for the first 10,000

years, why not extend this standard beyond 10,000 years when the peak dose is expected to occur?

The NAS 1995 report referred to the principle of "intergenerational equity", which states that the risks to future generations should be no greater than the risks that would be accepted today. We recommend that EPA adopt this principle of "intergenerational equity" by establishing a radiation protection standard that applies uniformly over time and subsequent generations, i.e., would not increase from15 to 350 millirems per year after 10,000 years, as EPA proposes in their revised standards. EPA in its prior 2001 standard explained the "fundamental principle of intergenerational equity" by stating that "we should not knowingly impose burdens on future generations we ourselves are not willing to assume." 66 Fed. Reg. at 32107. EPA does not explain how the proposed rule, which imposes higher risks on future generations by raising the limit from15 millirems per year to 350 millirems per year, is consistent with this principle.

The NAS study in 1995 noted that a general consensus exists among national and international bodies on a framework for protecting the public health. This consensus opinion provides for a total radiation dose limit of 100 millirems per year from all anthropogenic sources other than medical exposures. The NAS study further concluded that a general consensus also appears to exist among national authorities in various countries to accept and use the principle of apportioning this total radiation dose limit among the respective anthropogenic sources of exposure, typically allocating to high-level waste disposal a range of 10 to 30 millirems per year. Therefore, an acceptable limit for the repository should be in the range of 10-30 millirems per year, such as the 15-millirems-per-year standard proposed by EPA for the first 10,000 years of the repository operation, and this standard should remain in effect in perpetuity with no reference to a time limit.

Radioactive waste and its hazards persist for extraordinarily long time spans. The NAS recommended that the radiation protection standard should be designed to protect public health and the environment when risks posed by leaks from the repository are greatest, which they concluded might occur tens of thousands to even hundreds of thousands of years in the future after the repository is sealed. For example, iodine-129, one of the radionuclides of concern in the high-level waste to be buried in the repository, has a half-life of 17 million years. Neptunium-237, another radionuclide in high-level waste, has a half-life of over 2 million years. Again, the more restrictive radiation protection standard, i.e., 15 milirems per year, should remain in effect beyond the 10,000 year period and should not be limited to any specific time frame.

2. **If the repository is licensed, a ground water monitoring program should be established to check the flow of potentially contaminated waters from the repository into California.**

If the repository is licensed, the State of California, Nevada, and affected local authorities should develop, in partnership with DOE and EPA, an early warning ground water monitoring system to detect potential ground water contamination in California. This monitoring system should be in place and operational prior to the commencement of waste storage activities at Yucca Mountain. An array of monitoring wells should be established to monitor whether the repository is in compliance with standards and to provide early warning of potential ground water contamination in California. These monitoring wells should include wells located at the periphery of the site extending into the Lower Carbonate Aquifer.

Potential radionuclide contamination in ground water might be attenuated to safe levels prior to harming the public and the environment. However, this assumption is highly dependent on the modeling scenarios and parameters used by DOE. For example, the potential exists for highly radioactive material to reach Franklin Lake Playa within the regulatory timeframe according to some of DOE's own modeling scenarios.

Given the extraordinarily long time span required for the waste to be contained in order to protect public health and the environment, a long-term ground water monitoring program should be established for tracking and evaluating ground water flow and contaminant transport into California and potential impacts. This is particularly important, given the considerable persistent scientific uncertainty regarding water infiltration pathways and rates at the Yucca Mountain site and ground water flow pathways and rates, e.g., the unresolved chlorine-36 studies.

A change in the ground water flow regime could result in ground water passing through geologic formations that do not have the attenuation capabilities that might be anticipated in other areas. In addition, flow direction could change due to new water storage, ground water pumping, climate change, or other currently unknown factors. These factors could result in a change in ground water flow to a more westerly direction, which could have a more direct effect on California ground water radionuclide levels than are currently anticipated. Therefore, a ground water monitoring program, including an array of wells to monitor ground water flow, should be established to evaluate ground water flow and provide for early detection of any potential radionuclide contamination.

3. **The EPA and DOE, in partnership with California, Nevada, and affected local governments, should develop and have in place prior to waste emplacement, a ground water containment, clean-up and decontamination plan in the event contamination levels exceed radiation protection standards.**

If the repository is licensed, a ground water containment, clean-up and decontamination plan should be required before waste emplacement can begin. DOE and EPA should develop a plan and program for ground water contamination remediation in the event of leakage from the repository to the environment. In conjunction with the monitoring system described in No. 2 above, DOE and EPA, and affected state and local governments including the State of California and Inyo County, should develop a ground water clean-up, treatment, and containment plan in the event ground water contamination exceeds federal and state drinking water standards. This plan should be developed and agreed upon before waste is emplaced in the repository to prevent potentially contaminated ground water from reaching irrigation, drinking and wildlife water resources in California.

4. **Potential future ground water banks in California should be identified in the vicinity of the Yucca Mountain Project and the potential impacts from repository operation on these ground water banks should be evaluated.**

California relies heavily on ground water banking projects to meet future water supply needs. Potential future ground water banks in California should be identified in the vicinity of the Yucca Mountain Project and potential impacts evaluated. These ground water banking projects could potentially affect groun water flow at the Yucca Mountain Site, and potentially be impacted by leakage from the Yucca Mountain repository. Studies should be conducted to assess anticipated radionuclide levels that could occur in California ground water.

5. **EPA should explain how their ground water protection standard (2001) relates to the revised proposed individual protection standard even though the likely pathway from the repository to the maximally exposed individual is by way of ground water transport. The proposed standards should be revised so that the time frame for the ground water protection standard is the same as the individual protection standard (at least 1 million years).**

The primary pathway for release of radionuclides from the disposal facility, after closure, is via ground water transport of radionuclides into the environment. Clearly, the ground water standard is the main driver for protecting public health and the environment especially when peak doses to the environment are expected to occur, i.e., after 10,000 years. The period for assessing compliance with the ground water standard should be consistent with the compliance period

for the individual protection standard. However, EPA proposes that the ground water standard extend only to 10,000 years, while the individual protection standard would cover 1 million years. There is no scientific basis for placing a time limit on protective standards for ground water.

The Federal Register notice for the proposed standards (FR, August 22, 2005) states that the ground water protection standards were a subject of the Court decision, were upheld, and are not a subject of "today's" proposal. (p. 49022) Additionally, it is stated "... we are not proposing to modify the ground-water protection standards, either by extending the period of compliance or in any other respect. We are not requesting, and will not consider, comments regarding any aspect of the ground-water protection standards." (p. 49024) EPA states that they "do not believe the Court's ruling regarding the 10,000-year compliance period applies to the ground-water protection standards, which have the same compliance period." (p. 49024)

However, since the individual protection standard includes the ground water pathway, the compliance period for both standards (individual protection standard and ground water standard) should be the same and should include the time period when maximum risk to the public and environment will occur. EPA should revise the proposed standards so that the separate ground water standard extends at least to 1 million years, in order to be consistent with the individual protection standard, and includes the period of maximum risk to the public and environment. The effect of this change would be to adopt a more scientifically acceptable and consistent standard to protect public health and the environment.

ATTACHMENT 2

California Regional Water Quality Control Board
Lahontan Region

Alan C. Lloyd Ph.D.
Agency Secretary

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Arnold Schwarzenegger
Governor

INTERNAL MEMORANDUM

TO: James D. Boyd, Commissioner
California Energy Commission

FROM: Greg Cash
LAHONTAN REGIONAL WATER QUALITY CONTROL BOARD

DATE: November 18, 2005

SUBJECT: **COMMENTS ON THE ENVIRONMENTAL PROTECTION AGENCY'S (EPA's) PROPOSED PUBLIC HEALTH AND ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR YUCCA MOUNTAIN, NEVADA; PROPOSED RULE**

Introduction

The California Regional Water Quality Control Board Lahontan Region (Board) staff received and reviewed the Proposed Public Health and Environmental Radiation Protection Standards for High-Level radioactive waste disposal facility at Yucca Mountain. The EPA is proposing to revise certain public health and safety standards for protection of health from radioactive materials stored or disposed of in the potential repository at Yucca Mountain.

The proposed standard incorporates "multiple compliance criteria applicable at different times for protection of individuals and in circumstances involving human intrusion into the repository." It also proposed to include several supporting provisions affecting the Department of Energy's (DOE's) performance projections.

Board staff had previously provided comments regarding groundwater quality issues on October 19, 2001 (see attachment), and these comments are still applicable to this project.

Following are Board staff comments on the proposed standard.

Board staff Comments

1. Section I.bb., Page 49020 - The proposed rule is for a compliance period for groundwater at 10,000 years. The rule did not require that DOE meet a specific radioactive dose limit after 10,000 years. The rule indicates that the 10,000-year period is within the period of geologic stability. The Yucca Mountain site is in an area of numerous faults, that have had activity as recently at June of 1992 (5.6 magnitude earthquake, 12 miles southeast of the project site). The rule does not explain how the 10,000-year time frame is "within the period of geologic stability." Board staff is concerned that the

rule terminates at the end of the 10,000-time period, and does not set any standard on the release of radiation beyond the time frame. The rule basically sets a time period to protect water quality, and after that time period the proposed rule does not provide beneficial use protection. What problems will arise by setting the standard for a 10,000 –year time frame, i.e., what will happen after 10,000 years?

2. Section I.c., Page 49021 - The proposed rule indicates that the primary means for demonstrating compliance with the standards is the use of computer modeling to project the performance of the disposal system under the range of expected conditions. The rule also states that the model involves extrapolations that involve inherent uncertainties. Board staff is concerned that using a model with "inherent certainties" could lead to erroneous results, thus not really identifying the "real" performance of the disposal system. Additionally, the "range of expected conditions" is not specified in the rule. Board staff would like to see an explanation of what the expected conditions were for the proposed model (i.e. does it include all potential geological conditions – earthquakes, volcanism, etc.).

3. Section II.A.1., Page 49023 - The proposed rule indicates that "Assumptions regarding the possible uses of ground water are quite speculative and have been avoided to the extent possible in the setting of the standards." Board staff is concerned that the possible uses of groundwater have not been addressed in the proposed rule. In a Regional Board letter to the California Energy Commission (dated January 10, 2000 – see Attachment), Board staff indicated that groundwater appears to move through the saturated zone from Yucca Mountain to the accessible environment (i.e. surface springs near the Death Valley region - 20-30 km away) in less than the 10,000-year regulatory compliance period. Regional Board staff comments on this issue have not been addressed.

4. Section II.B., Page 49027 – The proposed rule states that "...the projections of the disposal system's long-term performance cannot be confirmed. Not only is the projected performance of the disposal system not subject to confirmation, the natural conditions in and around the repository site will vary over time and these changes are also not subject to confirmation, making their use in performance assessments equally questionable over the long-term." If the long-term performance of the disposal system cannot be confirmed, then how is the proposed project going to properly monitor the facility for potential discharges?

Conclusion

Thank you for the opportunity to comment. Board staff requests that our comments be incorporated into the proposed project.

If you have any questions regarding this matter, please telephone me at (760) 241-7366 or Hisam A. Baqai, Supervising Engineer at (760) 241-7325.

Attachments: October 19, 2001 Comments on Yucca Mountain
January 10, 2000 RWQCB Comments on Yucca Mountain

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file: Yucca Mtn general

COMMENTS BY THE STATE OF CALIFORNIA ON THE POSSIBLE SITE RECOMMENDATION FOR YUCCA MOUNTAIN

October 19, 2001

Summary

There is insufficient analyses and information upon which to base a decision on the suitability of the Yucca Mountain Site for a high-level waste repository. Until the Department of Energy (DOE) provides the necessary analyses on potential groundwater and potential transportation impacts in California, DOE lacks the necessary legal and technical basis upon which to make a preliminary suitability determination on this site.

Need for Addressing States' Concerns

Since 1985, California has provided comments on various proceedings and documents for the proposed Yucca Mountain Project, including comments and testimony on the Draft EIS as well as the public scoping meetings held in 1985. Thirteen California agencies participated in the review of the Draft EIS. Our written comments were prepared through a cooperative interagency effort, coordinated by the California Energy Commission, including participation by the California Departments of Conservation, Emergency Services, Energy Commission, Fish and Game, Health Services, Highway Patrol, Parks and Recreation, Public Utilities Commission, Toxic Substances Control, Transportation, Water Resources Control Board, Water Resources, and the Lahontan Regional Water Quality Control Board. However, despite good faith efforts by these agencies to identify issues of concern to California, DOE has not responded to the large majority of these concerns and requests for additional analyses. As of today, DOE has made little or no progress in addressing the issues and priorities voiced by California and other western states, in particular, to develop a meaningful analysis of the potential transportation impacts from the proposed repository. The analyses and information provided in support of the Yucca Mountain project fail to provide the legal and scientific foundation to support a recommendation by the Secretary of Energy to the President that Yucca Mountain is a suitable site for the proposed geologic repository for the permanent disposal of the nation's spent nuclear fuel and high-level radioactive waste.

A complete and adequate EIS must present a comprehensive review of the proposal upon which well-informed decisions can be made. The whole of a proposed action must be considered in any proposed project. Piece-mealing a project into smaller parts has the effect of avoiding full disclosure of the environmental impacts and nullifies public involvement. To date, DOE has not provided full disclosure of the potential impacts in California from the proposed project, since it has not adequately analyzed potential transportation and potential groundwater impacts in California.

DOE has not adequately considered the project alternatives. The only alternatives examined by DOE have been two variations of the "no action" scenario: (1) the waste should remain in dry storage at the present sites for 10,000 years with "institutional controls" for the full 10,000 years (extremely costly) or (2) institutional controls for just 100 years, after which there would be no controls assumed to protect health and safety (unacceptable, because of disastrous potential consequences from radionuclide leakage into the environment). Neither of these are realistic alternatives.

There has been inadequate public notice of hearings. By failing to identify the preferred mix of shipment mode (rail vs. truck) or to identify rail and truck routes in California and the potentially impacted communities, these impacted communities have no means of evaluating the relevance of the proposed action.

Need for Additional Transportation Analyses

DOE has failed to carry out its promise made in 1986 that it would conduct comprehensive assessments of potential shipment routes to be used in transporting spent fuel and high level radioactive waste to a potential repository. DOE stated that, "Route-specific analyses and an evaluation of the impacts on host States and States along transportation corridors will be included in the environmental impact statement." California and other states have requested that the EIS provide route-specific analyses and a careful evaluation of the impacts on states along shipment corridors. DOE has not provided route-specific analyses and, therefore, has not provided a meaningful evaluation of the impact on states along transportation corridors or mitigating measures. Instead, DOE simply stated in the Draft EIS that route selection for shipments would comply with applicable federal regulations.

In our comments on the Draft EIS, we noted that if a Draft EIS is "so inadequate as to preclude meaningful analysis", DOE must "prepare and circulate a revised draft of the appropriate portion." We continue to believe that transportation issues, including the routes, logistics and risks, are so significant that they merit a separate Draft EIS. However, DOE has yet to provide this needed analysis or to provide a comprehensive transportation plan, as requested. In the May 2001, Supplement to the Draft EIS, DOE said, "DOE will address all aspects of the Proposed Action, such as the transportation of spent nuclear fuel and high-level radioactive waste and the No-Action Alternative, in the Final EIS" (SEIA, 1-3). It is our understanding that this Final EIS will be issued with the Site Recommendation to the President. As a result, the public will have no opportunity to review and comment on the promised transportation analysis in the Final EIS before the Secretary submits his recommendation to the President. Moreover, the Secretary will not have the benefits of the comments from corridor states and the public on transportation impacts prior to making a recommendation to the President.

Transportation impacts from the proposed Yucca Mountain Project are the major component of the project that will affect the most people across the US, since the shipments will travel cross-country on the nation's highways and railways. The Proposed Action involves transporting 70,000 metric tons of radioactive waste from 77 individual sites to the repository. DOE has noted that the safety record for the transportation of spent nuclear fuel has been relatively good. However, the numbers of shipments planned for the Yucca Mountain Project would be unprecedented and would be several orders of magnitude greater than the numbers of shipments that have been transported in the past. Total annual shipments of these wastes are projected to increase within the next decade from the current 15 to 25 rail shipments per year nationwide to Yucca Mountain to between 400 to 600 shipments per year. The State of Nevada estimates that the potential number of truck shipments to Yucca Mountain through California is about 74,000 truck shipments of which about three-fourths could traverse southern California under DOE's mostly truck scenario.

Because of California's proximity to Nevada, coupled with the desire to avoid shipments over Hoover Dam and through Las Vegas, DOE may transport a significant portion of these shipments from eastern states through California into Nevada. The number of shipments through California could average five truck shipments every day for 39 years. Under a "mixed truck and rail scenario", California could have an average of two truck shipments per day and 4-5 rail shipments per week for 39 years. Under a "best case" scenario assuming larger rail shipping containers and therefore fewer shipments, California could have more than 26,000 truck shipments and 9,800 rail shipments through our state over this period. Likely routes in California would impact Sacramento, Los Angeles, San Luis Obispo, Santa Barbara, San Bernardino, Fresno, Bakersfield, Barstow and smaller communities. These communities and others along major shipment corridors need to know the extent to which they will be impacted by these shipments, and those communities need to receive adequate resources, equipment, and training to provide for the uneventful transport of these materials.

DOE has not responded to longstanding western states' priorities and public officials' requests to develop a comprehensive transportation program for shipments to the proposed repository. Since 1985, California and other Western States acting through the Western Governors' Association (WGA) and Western Interstate Energy Board (WIEB) have repeatedly urged DOE to develop a comprehensive transportation

program and analysis for spent fuel shipments to the repository. This program would include: (1) full-scale shipping cask testing, (2) mode and route analysis, (3) implementation of a program to provide financial and technical assistance to states and tribes under Section 180 (c) of the NWPA, (4) recognition of the potential negative impact from privatizing key transportation public policy decision-making responsibilities, (5) using the WIPP program as a model in radioactive waste transportation planning, and (6) an assessment of terrorism risks and concerns. In addition, Western Governors adopted a policy resolution in 1999 (WGA Resolution 99-014) calling for DOE to develop a comprehensive transportation program for these shipments and develop adequate criteria and methods for selecting routes and evaluating shipment modes. In spite of these repeated requests, DOE's progress in all of these areas, as reflected in documents in support of the Yucca Mountain Project, has been slow. DOE has, for the most part, not responded to states' requests and concerns. DOE has yet to provide an adequate analysis of the transportation risks and has not provided sufficient detail to evaluate potential impacts. For example, there is no description of the transportation of spent fuel through California, no identification of routes and transport modes, no evaluation of route-specific populations and environmental consequences, and no mitigation proposals offered for these impacts.

Events since 1984, especially the increasing lethality of terrorist attacks in the US, such as the attacks on the World Trade Center and Pentagon and the bombing in Oklahoma City, support the need for a new, more comprehensive assessment of the risk of terrorist attacks and sabotage against repository shipments. We may now assume that a terrorist's objective may be solely to breach the integrity of the cask and release radiation wherever it can be done, rather than, for example, to hijack a shipment. Changes in spent nuclear fuel shipping cask designs and the capabilities of terrorists to attack and destroy targets, make it essential that these risks to spent fuel shipments be reevaluated. DOE should reexamine the risk of terrorism and sabotage against spent fuel and high-level waste shipments to determine the adequacy of the current physical protection requirements under 10 CFR 73 and reevaluate potential risks to the public from shipments to the repository. This analysis must be part of the environmental impact statement.

California's Routing Concerns

California transportation agencies have expressed their concern over the possibility that DOE may decide to route through California a major portion of the shipments to Yucca Mountain repository using roads not designed for heavy truck traffic that are extremely remote from emergency response personnel. This concern was heightened by DOE's recent decision to reroute through southern California thousands of low-level radioactive waste shipments from eastern states to the Nevada Test Site. The route selected through California is a longer, less direct route than alternative routes, that then backtracks into Nevada. The route in question originated as a wagon train road to Death Valley and was not engineered for heavy truck traffic. During certain times of the year, this route is the primary access route and evacuation route for the approximately 1.25 million visitors annually to the Death Valley National Park. The lack of emergency response capability along possible routes in California for these shipments and the isolated nature and current configuration of some of these roadways would make compliance with 180(c) requirements extremely costly to complete. DOE has not provided estimates of the resources needed to meet its obligations under 180 (c). DOE must identify the roadways and emergency response improvements and associated costs necessary to protect the public and resources along shipment corridors.

In 1998, the majority of states wrote in a consensus letter to DOE, "the multiplicity of available routes, coupled with the scarcity of resources for training state and local personnel, makes it imperative that the Department adopt a more coordinated approach to selecting the routes for these shipments." The states also recommended that DOE develop a routing policy that would make the federal government, not the carrier, responsible for selecting routes to allow the most efficient use of emergency response resources by limiting the number of routes. Again, DOE has failed to respond to these requests.

Need for an Analysis of Transportation Impacts from Fuel Blending

DOE has proposed transporting to the proposed repository during the first two decades of repository operation, more highly radioactive fuel, than had been anticipated. By shipping the "hotter" or more radioactive younger fuel (not aged), the temperature of the surrounding drift can be raised. However, current transportation impact analyses are based on the concept of shipping the oldest, and less radioactive fuels first, allowing the younger fuel stored at the reactor sites to "age" or gradually lose radioactivity through radionuclide decay. A long-accepted, underlying premise for geologic disposal, as proposed in the 1980 Generic EIS, has been the concept of shipping "oldest fuel first." DOE's recent proposal for fuel blending, coupled with the desire of many utilities to ship the "youngest" fuel out of their pools to a Federal facility at the earliest opportunity, could result in large amounts of 5-10 year cooled fuel being shipped to the repository at the beginning of operations.

The Draft EIS transportation risk analysis assumes an average SNF "age" of 26 years. Shipment of "younger" SNF would result in considerably higher routine and accident radiological risks during handling, transport, and storage, increased risks that have not been addressed in the SEIS.

Fuel blending requirements for "hotter" spent nuclear fuel could result in a much greater reliance upon truck, as opposed to rail, for transporting spent fuel to the repository during the first two decades of repository operations. Current rail transport casks are designed to ship spent nuclear fuel older than 10 years. Fuel blending requirements for hotter spent fuel could result in truck transportation becoming the predominant or even sole mode for transporting spent fuel to the repository. Truck casks can carry fuel as young as 5 years out of reactor. Moreover, if the goal is to maximize the "flexibility of operations" at the fuel blending facility by maintaining a diverse inventory of spent nuclear fuel, reliance on truck transport would be further encouraged because of quicker loading, unloading, and overall turn-around times for truck casks. As a result, fuel blending could dramatically increase the numbers of truck, versus rail, shipments of spent fuel, which, in turn, could increase the number of shipments. Fuel blending could eliminate the previous goal of delivering large, multiple-purpose canisters, sealed and ready for emplacement, which would curtail or eliminate the economic advantage of shipping large canisters by rail.

Need for Additional Groundwater Impact Analyses

California's Inyo and San Bernardino Counties contain major portions of the aquifers through which radionuclides leaking from Yucca Mountain are predicted to travel. The Amargosa River system that may transport these same materials via surface water is also in these counties. Inyo County is within 17 miles from the Yucca Mountain site. Inyo County has noted that hydrogeologic studies conducted by Inyo County and Nye and Esmeralda Counties in Nevada point to the existence of a continuous aquifer running from beneath Yucca Mountain south to Tecopa, Shoshone and Death Valley Junction. These studies indicate that water flowing beneath Yucca Mountain flows southeast to become surface water flowing into Death Valley that is used for commercial, domestic, farming, and to support natural habitats.

California water quality agencies have concluded that DOE needs to perform a more complete evaluation of the potential pathways for radionuclides reaching regional groundwater supplies in eastern California, such as the Death Valley region. We note that DOE has made progress in addressing comments by California water quality agencies. For example, an additional monitoring well was completed in the carbonate aquifer and several monitoring wells in the alluvial aquifer were completed. In addition, pumping tests were conducted within the alluvial aquifer down-gradient and up-gradient of the site. However, better data and more realistic models continue to be needed to evaluate groundwater flow and radionuclide migration toward California aquifers before a determination can be made on the suitability of the proposed Yucca Mountain site.

To adequately characterize the hydrologic conditions of the Yucca Mountain flow and transport model, the hydrogeological evaluation of the site needs: (1) better evaluation of the relationship between the perched water and the volcanic aquifer north of the site, to help determine the model boundary conditions. One monitoring well is not sufficient to determine water level for the up-gradient model

boundary; (2) more accurate determination of the transient zone between the volcanic and alluvial systems to improve estimates of flow-time and concentration of radionuclides released from the repository; (3) increased certainty regarding groundwater flow beneath the site; (4) coordination and integration of modeling efforts with the US Geological Survey regional modeling effort that encompasses the area from south of Yucca Mountain to Death Valley; (5) studies to determine if groundwater flowing under Yucca Mountain discharges into Death Valley, Alkali Flat, or Ash Meadows; and (6) studies to determine whether the carbonate and volcanic groundwater systems are independent. More scientific attention needs to be given the hydrogeologic characterization of the carbonate aquifer in the vicinity of Yucca Mountain. The existing characterization, based on data from two wells, is insufficient to provide reliable interpretation of important hydrogeologic parameters such as hydraulic gradient and groundwater flow direction. In addition, DOE needs to describe how it will monitor or detect migration of radionuclides from the repository.

In spite of some progress that DOE has made in its hydrogeologic investigation, the level of uncertainty regarding potential groundwater impacts in California remains too high to support a reasonable decision on the suitability of the Yucca Mountain Site. Key uncertainties include the rate of corrosion of waste packages, the release of radionuclides into the environment, and the impacts on California from the potential migration of radionuclides from any leaks from the proposed repository.

Need for Additional Analysis of Impacts on Wildlife, Habitat and Public Parks in California

California's State Park System contains 265 part units encompassing 1.4 million acres of land within which the State is responsible for preserving the State's extraordinary biological resources and diversity. Nearly half of these State park units, including State Parks, State Historic Parks, State Beaches and State Recreational Areas, are located along potential spent fuel shipment routes in California. In addition, the Death Valley National Park, visited by 1.25 million tourists each year, is located adjacent to potential routes in California. DOE needs to evaluate the potential groundwater and transportation impacts on the Death Valley National Park and measures to mitigate these impacts.

Responses to DOE's Suggested Topics for Public Comment

California received a letter that DOE sent to stakeholders interested in the Yucca Mountain project. The letter contained suggested topics and questions regarding the proposed repository. We offer the following response to these questions.

A. Please provide your views concerning whether the Yucca Mountain Preliminary Site Suitability Evaluation (PSSE) and other scientific documents produced by the Department provide an adequate basis for finding that the Yucca Mountain site is suitable for development of a repository. If you believe that certain aspects of the PSSE are inadequate, please detail the basis for this belief and indicate how the documentation might be made adequate with respect to these aspects.

The documents provided by DOE to date, including the PSSE, do not provide the scientific basis and technical analyses necessary to support a site suitability determination. The Department 's analyses of the impacts of transporting spent fuel and high-level radioactive waste to the proposed repository and its analysis of potential groundwater impacts in California are inadequate, insufficient and do not address concerns raised by California and Western states since 1985. Without these analyses, the Secretary will not have sufficient information or basis on which to make a finding regarding the suitability of the Yucca Mountain site. Although DOE stated in 1986 that it would address in the EIS the anticipated impacts on corridor states of transporting spent fuel and high-level wastes, would provide route-specific analyses, and would include an evaluation of impacts on host states and states along transportation corridors, these analyses have not been completed. In the Supplement to the Draft EIS, DOE said it would address all aspects of the Proposed Action, such as the transportation of spent fuel and high-level waste and the no-Action Alternative, in the Final EIS. DOE plans to issue the Final EIS at the same time as the Secretary submits his recommendation to the President. This would preclude the public and affected states from

having an opportunity to review and comment on this transportation analysis before the recommendation is made to the President.

B. If the Secretary determines that the scientific analysis indicates that the Yucca Mountain site is likely to meet the applicable radiation protection standards established by the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission, do you believe that the Secretary should proceed to recommend the site to the President at this time? If not, please explain.

Inyo County contends that the EPA's radiation protection standards for the proposed repository are unacceptable, since they would allow for the contamination of those aquifers that support human populations and federally protected natural habitat in both the Armargosa Valley and Death Valley National Park. California would reject any proposal/design for the repository that could result in a release of radionuclides from the repository that, in turn, could result in groundwater contamination in California exceeding the EPA's radiation protection standards for groundwater or the California Department of Health Services' Maximum Contaminant Level for radionuclides.

C. Are there reasons that you believe should prevent the President from concluding that the Yucca Mountain site is qualified for the preparation and submission of a construction license application to the Nuclear Regulatory Commission?

Until DOE adequately addresses California's groundwater issues and uncertainties and until DOE addresses the transportation issues that have been identified by host and corridor states and until route-specific analyses of impacts are completed, there is insufficient information to respond to this question.

D. If you believe that the Secretary should not proceed with a recommendation to develop a repository at Yucca Mountain, what mechanisms should be utilized to meet the Department's legal obligation to begin accepting spent nuclear fuel and high level radioactive waste?

The Secretary should not make a recommendation regarding the suitability of the site until the necessary analyses have been completed. There is not sufficient information available upon which to base this decision. The suitability of the Yucca Mountain site is still in question until the necessary route-specific transportation analyses and scientific studies needed to evaluate potential groundwater impacts in California have been completed.

Specific comments on the Preliminary Site Suitability Evaluation that were prepared by the California Water Quality Control Board are attached.

California Regional Water Quality Control Board
Lahontan Region

Winston H. Hickox
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Gray Davis
Governor

January 10, 2000

Commissioner Robert A. Laurie
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Dear Mr. Laurie:

SUITABILITY OF THE YUCCA MOUNTAIN, NEVADA SITE FOR THE LOCATION OF A HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY

The Lahontan Regional Water Quality Control Board staff appreciates the opportunity to review the Draft *Environmental Impact Statement for a Geologic Repository for the Disposal of High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DEIS). Regional Board staff comments generally are limited to the sections in Chapter 3, *Affected Environment*, and Chapter 4, *Environmental Consequences of Repository Construction, Operation and Monitoring, and Closure* that may have an effect on ground water quality down gradient of the site.

General Comments

There are many places in the text where qualitative terms such as "relatively little," "a small portion," or "relatively few" are used. These terms are virtually meaningless to a review. If the items described are important enough to discuss in the DEIS at least an estimate of the volumes, percentages, or whatever should be included in the text.

Based on the expectation of site-specific, health-based standards for radioactive releases from the repository, the Department of Energy (DoE) is proposing a repository system that is designed to fail, leak radionuclides into the environment, and hope that man-made barriers and the natural environment can dilute the radionuclide concentrations below these health-based limits before reaching the biosphere. However, based on the limited amount of data available, ground water appears to move through the saturated zone from Yucca Mountain to the accessible environment (20-30 km away) in less than the 10,000-year regulatory compliance period.

The DEIS summarizes extensive modeling efforts, based on very limited hard data, showing that the 25 millirem/year at 20 kilometers distance from the repository can be achieved. Rather than characterizing Yucca Mountain in terms of its suitability to contain the waste for the prescribed time period, DoE has spent most of their time and energy on the engineering aspects of site

development and waste placement. Significant uncertainties remain about the long-term performance of each proposed barrier and additional studies are needed to prove that containment can be achieved for the statutory 10,000-year compliance period

More data and, therefore better more realistic models are needed to demonstrate whether radionuclide travel times through the unsaturated zone are sufficiently long to allow the unsaturated zone to serve as a substantive natural component of the repository barrier design.

Specific Comments

§3.1.4.1.2 DoE correctly notes that precipitation is not uniform either spatially or temporarily at the site; e.g., most recharge occurs during the winter months. However, DoE never provides an estimate of the volume of water flux through the mountain nor is enough data available to determine what part of the mountain will be affected by the so-called "fast paths" through the mountain. DoE need to provide information on the water flux through Yucca Mountain and the most probable areas affected by the "fast paths" in the unsaturated zone.

Page 3-35, Table 3-10. The total dissolved solids values listed in the Table only range from 45 to 122 mg/L. However, the bicarbonate values alone are listed as ranging from 32 to 340 mg/L. Given the data presented in the table, TDS values should range from 51.5 to 516 mg/L. This discrepancy in the data table needs correction.

§3.1.4.2.1, Page 3-39, 4th paragraph. The DEIS states that "the primary ground water discharge points for this [Alkali Flat-Furnace Creek Ranch] sub-basin is Alkali Flat (Franklin Lake Playa) as indicated by the potentiometric surface of the ground water and hydrochemical data. A *small portion* (emphasis added) could move toward discharge points in the Furnace Creek area of Death Valley."

It is not clear, based on previous studies (some of which are not referenced in the DEIS) whether a flow path exists between the volcanic aquifer below Yucca Mountain and the springs emanating from the carbonate aquifer on the east side of Death Valley. What evidence is there to support this assertion and what quantity does DoE consider a "small portion?"

§3.1.4.2.2. It is significant that the character of the pore water from the rock matrix is chemically distinct from water found in fractures. It is also significant that water in the perched zones does not appear to receive a large contribution from the rock matrix; indicating all significant flow, both in terms of volume and velocity, is via fracture flow through the mountain. DoE should estimate at what level of precipitation (infiltration) fracture flow becomes the dominant flow path.

Table 3-14. Calling the basal vitrophyre and the Tram Tuff confining units seems to be little more than wishful thinking. Apparent hydraulic conductivities up to 40m/yr. in the Tram tuff are

not that much different than the underlying carbonate aquifer ("described as a "a regionally extensive aquifer system through which large amounts of ground water flow") displaying a permeability of 69 m/yr. Water percolating through the mountain will take the path of least resistance; therefore, the higher permeability value for the Tram Tuff is probably more indicative of its "typical" permeability.

§3.1.4.2.2, Page 3-52. DoE states that "the actual and relative amounts of inflow [into the volcanic aquifers below Yucca Mountain] from each (of the four potential) sources are not known." This is an essential piece of information necessary for any effective modeling of ground water flow from beneath the mountain and toward Franklin Playa. Any model lacking this information would not provide a meaningful or reliable characterization of ground water flow.

§3.1.4.2.2, Page 3-56. The data from Well JF-2a are troublesome. Why would this well exhibit a 27cm increase in elevation when all the other wells in the area exhibit 3- to 9-cm decreases? This apparent contradiction is glossed over in the text and not discussed except to relate the well locations to the proximity of Fortymile Wash. If wells JF-12, JF-13, and JF-3 were not pumped would their static levels also increase? By not providing an explanation of these static water levels, DoE indicates that the hydrogeology below and directly downgradient of Yucca Mountain is poorly understood. More data is necessary to both understand the down gradient hydrogeology and as input to more meaningful ground water modeling.

§4.1.3.2 There is some discussion here that water percolating into the repository drifts [if any] would be pumped to the surface. What is the maximum volume of water expected to percolate into the drifts?

§4.1.3.2, Page 4-22, 4th Paragraph states that 480 to 1,300 liters per year of cleaning solvents (described as "a relatively small quantity") would be used at the facility. DoE should redistill and reuse as much of these solvents as possible. A release of that magnitude reaching ground water could contaminate between 77,000 to 210,000 acre-feet of water to concentrations above the drinking water standard.

Page 5-10, last paragraph. DoE states that water "would drip into the repository but only in a *relative few* (emphasis added) places." What percentage of the repository does DoE estimate will be affected by dripping water?

It is amazing that, in a project that is to completely characterize the subsurface in and around Yucca Mountain, there has been no high-resolution geophysical surveys conducted to further delineate the geologic structures below Yucca Mountain that may enhance (of hinder) ground water flow. We recommend that such surveys be conducted as a very cost-effective way of gathering useful subsurface geologic information.

In summary, the hydrogeologic and geochemical characterization of Yucca Mountain and vicinity is not complete. Major uncertainties remain about the "fast paths" through the mountain and the flow paths from the underlying volcanic and carbonate aquifers to the alluvial aquifer in Amargosa Valley and possibly on to Death Valley. It is also unclear what effect the Ghost Dance fault (and other faults) east of the proposed facility could have on ground water flow. Currently, the ground water modeling performed on these flow paths, based on little or no information, is little more than conjecture.

Therefore, as it now stands, the DEIS is deficient, does not contain enough information to determine whether the site is suitable for a high-level radioactive waste repository, and does not contain enough definitive information to make a recommendation to the President. The DEIS should be revised to address these deficiencies before the project can proceed.

Should you have any questions regarding these comments, please telephone the undersigned at (760) 241-7384.

Sincerely,

Tim E. Post, RG, CHG
Associate Engineering Geologist
Lahontan Regional Water Quality Control Board