UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 63-001
U.S. DEPARTMENT OF ENERGY	)	
	)	
(High-Level Waste Repository)	)	December 22, 2008
_____	)	

PETITION FOR LEAVE TO INTERVENE BY THE COUNTY OF INYO, CALIFORNIA ON AN APPLICATION BY THE U.S. DEPARTMENT OF ENERGY FOR AUTHORITY TO CONSTRUCT A GEOLOGIC HIGH-LEVEL WASTE REPOSITORY AT A GEOLOGIC REPOSITORY OPERATIONS AREA AT YUCCA MOUNTAIN, NEVADA

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I. IDENTIFICATION OF PETITIONER AND BASIS FOR STANDING

In response to the October 22, 2008 "*In the Matter of the U.S. Department of Energy (High Level Waste Repository); Notice of Hearing and Opportunity to Petition for Leave to Intervene on an Application for Authority to Construct a Geologic Repository at a Geologic Repository Operations Area at Yucca Mountain*." the County of Inyo, California ("County") petitions for leave to intervene in this proceeding. The County requests a formal adjudicatory hearing one each of the contentions presented in this Petition in accordance with section 189a(1)(A) of the Atomic Energy Act of 1954, as amended, section 114(d) of the Nuclear Water Policy Action of 1982, as amended, 5 U.S.C §§554-558, and 10 CFR 2, Subparts C, G and J.

The County is a political subdivision of the State of California and the County is an "affected unit of local government" as defined in section 2 of the Nuclear Waste Policy Act of 1982 as amended (42 U.S.C 10101).

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Pursuant to a clarification of its intent regarding 10 CFR §2.309(d) published in 73 Federal Register 63031, October 22, 2008, this Commission determined that an affected unit of

local government, need not address the standing requirements of 10 CFR 2.309(d) in a petition for leave to intervene. Accordingly, this Petition does not address such standing requirements. Also, in 73 Federal Register 63031, this Commission clarified that an affected unit of local government shall be considered a party to this proceeding if it files at least one admissible contention in accordance with 10 CFR 2.309. The County hereby submits 10 contentions and 2 joint contentions. The County respectfully requests that this Petition be granted.

II. JOINT CONTENTIONS

The County designates IC-(Joint) Safety _ and IC (Joint) Safety _ as Joint Contentions that are being submitted pursuant to 10 CFR 2.309(F)(3). These contentions are being jointly offered by Nye, Churchill, Esmeralda, Lander and Mineral Counties, Nevada, and Inyo County California. For each of these two joint contentions, Nye County, Nevada is the specific participant with authority to act with respect to each of the two joint contentions.

The County reserves the right to join the contentions of other parties within a reasonable period of time after the contentions are filed or admitted.

III. CONTENTIONS

The County of Inyo's contentions are presented below.

CONTENTION NO. 1

INY-SAFETY-1

FAILURE TO ADEQUATELY DESCRIBE AND ANALYZE THE FLOW PATH IN THE LOWER CARBONATE AQUIFER THROUGH WHICH CONTAMINANTS MAY MIGRATE AND ADVERSELY IMPACT AREAS WITHIN THE COUNTY OF INYO

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(i)]

The applicant (or "DOE") failed to include in the Yucca Mountain Repository License Application ("LA") and Safety Analysis Report ("SAR") a description and analysis of the flow path in the lower carbonate aquifer through which contaminants can migrate from the proposed repository site to the biosphere including to areas within the County of Inyo.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

The lower carbonate aquifer beneath the proposed repository site is a potential flow path for contaminants from the repository to migrate to the biosphere (including Devil's Hole, springs at Ash Meadows, groundwater wells in the Amargosa Valley in Nevada and the Franklin Lake Playa and major springs near Furnace Creek in Death Valley National Park in Inyo County.) 10 CFR 63.21(c)(12) requires that the SAR must assess the ability of the proposed geologic repository to limit releases of radionuclides into the accessible environment as required by 10 CFR 113(c). 10 CFR 63.21(c)(9) requires that investigations of features, events and processes of site that are expected to affect waste isolation must extend from the surface to a depth sufficient to determine principal pathways for radionuclide migration from the repository. The LA and the SAR do not adequately access the flow path in the lower carbonate aquifer to the accessible environment.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

See number 4 below.

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

This Commission may only authorize construction of a geologic repository operations area at Yucca Mountain if it determines "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(1). Further, this Commission must determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(2). In arriving at these determinations, this Commission must consider whether "DOE has described the proposed geologic repository as specified at §63.21." 10 CFR 31(a)(3)(i).

Guidance regarding the NRC staff evaluation of the adequacy of the LA's evaluation of flow paths in the unsaturated zone is provided in the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Acceptance Criterion 1 on page 2.2-84 provides in pertinent part that NRC should find that:

> (2) The description of the aspects of hydrology, geology, geochemistry, design features, physical phenomena, and couplings, that may affect flow paths in the saturated zone, is adequate.

The issue raised in this contention is material to the findings that must be made by the Commission because the determinations called for by 10 CFR 31(a)(1) and 10 31(a)(2) cannot be reasonably made in the absence of an adequate assessment in the LA and SAR of the risk of

contamination from the proposed repository reaching the biosphere through the lower carbonate aquifer.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Yucca Mountain is located in a subsection of the Death Valley regional groundwater flow system called the Alkali Flat-Furnace Creek groundwater basin and overlies a geologic feature known as the lower carbonate aquifer. The lower carbonate aquifer is characterized by thick sequences of carbonate rock. The rocks form a generally deep regional aquifer and allow interbasin transfer of groundwater in the Death Valley region (LA, Vol. 1, §5.2.2.2.1, page 5-45). The LA acknowledges that a regional lower carbonate aquifer is beneath the proposed repository in the saturated zone (LA, Vol. 1, §5.2.2, page 5-40). The regional lower carbonate aquifer hydraulically connects with and exerts control on the water table elevations in the overlying alluvial and volcanic rock aquifers throughout the groundwater basin (LA, § 5.2.2.2.2, page 5-46).

As stated in the LA, groundwater moves from Yucca Mountain toward Death Valley (LA, Vol. 1, §5.2.2.2.2, page 5-46) flowing in volcanic and alluvial aquifers to discharge naturally at Franklin Lake Playa, and possibility as spring discharge in Death Valley, and flows through the lower carbonate aquifer to discharge at Ash Meadows and Devils Hole (Final SEIS, §5.4, page 5-23). The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley." This conclusion is supported by recent research conducted by the County of Inyo. See, Bredehoeft, Fridrich and King, *Groundwater Flow Through the Funeral Mountains, Death Valley National Park, California*, Hydrodynamics Group, LLC, 12th IHLRWM, Las Vegas, NV, September 7-11,

2008 LSN No. CAL 000000030), and Bredehoeft and King, *The Potential for Contaminant Transport Through the Carbonate Aquifer Beneath Yucca Mountain*, *Nevada*, Hydrodynamics Group LLC, unpublished, (LSN No. 000000029).

The LA states that the lower carbonate aquifer beneath the proposed repository underlies the likely flow paths for water leaving the repository area (LA, Vol. 1, §5.2.2.3.2.1, page 5.54), and that "the saturated zone is a potential pathway for transport of radionuclides to the accessible environment" (LA, Vol. 1, §5.2.2.1, page 5.42). The Final SEIS on page 5-2 (§5) states that the principal exposure pathway through which radionuclides and hazardous and carcinogenic chemicals could reach human populations is groundwater. Although the saturated zone is a potential pathway for transport of radionuclides to the accessible environment, the LA does not assess migration of contaminants from the repository in the lower carbonate aquifer.

Instead, the LA concludes that in the vicinity of Yucca Mountain, there is an upward hydraulic gradient between the lower regional carbonate aquifer and the overlying volcanic aquifers. LA, Vol. 14, §2.3.9.2.4.2, page 2.3.9-55. (An upward hydraulic gradient means water moves from the carbonate aquifer into the overlying volcanic aquifer but does not move from the overlying volcanic aquifer into the lower carbonate aquifer.) The LA states that the upward gradient is important to the performance of the repository because it restricts groundwater flow and radionuclide transport pathways to overlying volcanic and alluvial aquifers and it prevents radionuclides from entering the lower carbonate aquifer. LA, Vol. 14, §2.3.9.2.4.2, pages 2.3.9-53 and 2.3.9-55. The LA concludes that on the basis of simulations of the Death Valley regional groundwater flow system under past and future climate scenarios, it is expected that the upward gradient will persist during future wetter climates.

The Final EIS, at page 5-23 (§5.4), acknowledges the upward gradient, and observes that *under current conditions*, contamination from Yucca Mountain is not likely to mix with carbonate aquifer waters and discharge to the surface a Ash Meadows or Devil's Hole. The Final SEIS further states that because there would be no contamination of the carbonate aquifer *under current conditions*, it is concluded that no human health impacts or impacts to endangered pupfish at Ash Meadows or Devil's Hole are expected. Final SEIS, page 5-23 (§5.4). (Italics added for emphasis.)

Although, the applicant assumes that under current conditions and during future wetter climates, the upper gradient will persist, the LA doesn't assess the possibility that a continuation of current levels of local groundwater pumping and/or additional regional groundwater pumping that is foreseeable in the future could reduce or eliminate the upward gradient. Should such groundwater pumping eliminate the upward gradient, contaminants from the repository could potentially enter the lower carbonate aquifer and migrate to the biosphere at Devil's Hole, Ash Meadows, Amargosa Valley and Death Valley. Moreover, recent scientific work done by the County of Inyo indicates that contaminants entering the carbonate aquifer from the repository could migrate to the springs in Death Valley National Park relatively quickly. These springs are the sole source of water for the more than 1.25 million annual visitors to Death Valley National Park.[1]

In a recent report done as part of the County of Inyo's assessment of the repository, Bredehoeft and King, "*The Potential For Contaminants Transport Through the Carbonate Aquifer Beneath Yucca Mountain Nevada,*" Hydrodynamics Group LLC, 2008, unpublished, (page 17) (LSN CAL 000000029) modeling calculations revealed that if contaminants from the

[1] Death Valley National Park Information Page, http://www.death.valley.natioal-park.com/info.htm

repository enter the lower carbonate aquifer near Yucca Mountain, the transit time to the biosphere of Death Valley may be less than 100 years. Further, in the same report at page 31, the authors found that when the Death Valley regional groundwater flow system hydrogeologic framework model ("USGS DVRGM") developed by the U.S. Geological Survey *was run for 1000 years at 1995 groundwater pumping levels*, the model predicted drawdown of 10 meters in the lower carbonate aquifer in the vicinity of Yucca Mountain (page 17) and more than 70 m of additional drawdown in the Amargosa Valley in the next several hundred years. The upward gradient in the carbonate aquifer may be affected by a continuation of groundwater pumping at current levels.

The USGS DVRGM was used by the applicant in the development of the site-scale hydrogeologic framework model (HFM2006) which in turn was used to develop the model used to simulate groundwater flow directions and flow rates of water from beneath the repository to the southern end of the controlled area boundary (LA, §2.3.9.2.2.2, page 2.3.9-16). The applicant's site scale model takes boundary conditions from the USGS DVRGM. Hydrodynamic Group's research has revealed that although the USGS DVRGM was calibrated to water levels observed in the mid 1990s, the model is capable of generating steady-state water levels that do not include the impacts of pumping on water levels. The applicant used the steady-state water levels (that essentially excluded the impacts of a continuation of existing pumping) as the boundary condition for their hydrogeologic Site Model. Consequently, neither the predicted drawdown in the Amargosa Valley, nor the drawdown in the lower carbonate aquifer in the vicinity of Yucca Mountain, was considered in the applicant's analyses of the potential impacts to upward gradient in the lower carbonate aquifer.

Both the LA and the Final SEIS acknowledge the possibility of a significant increase local and regional groundwater pumping in the future. For example, on page 8-46 (§8.4.2), the Final SEIS incorporates Chapter 5 of the Rail Alignment EIS. On page 5-37(§5.2.2.6), the Rail Alignment EIS describes potential groundwater development projects—including a massive groundwater extraction and importation project by the Southern Nevada Water Authority that is located over and within the regional carbonate aquifer. The Rail Alignment EIS states that "…cumulative water use for the projects described above could total more than 430 million cubic meters (350,000 acre-feet) per year." Some of this groundwater may be withdrawn from the lower carbonate aquifer or from areas recharging the lower carbonate aquifer.

Further, the Final SEIS reports, on page 3-85 (§3.1.11.1.1), that by 2050, annual water demand in the Pahrump area could be about 99 million cubic meters (80,000 acre-feet) per year, while the LA, Vol. 1, §5.2.2.6, page 5-56, provides projections that by 2050, the demand for water in Nye County will be 252,000 acre-feet per year-almost 2.5 times the 2000 demand-and that most of this increase will be in Pahrump and some of the increase will be in the Amargosa Valley. The Final SEIS reports, on page 3-85 (§3.1.11.1.1) that possible alternatives for meeting the projected future shortfalls include a managed overdraft of the basin by optimizing the locations of new wells, development of the carbonate aquifer that underlies the basin, importation of water from other basins, and conservation. Finally, neither the LA nor the Final SEIS mention a ruling of the Nevada State Engineer (Ruling 5465, January 4, 2005) (http://water.nv.gov/scans/rulings/5465r.pdf) which has already granted the Southern Nevada Water Authority the right to pump 8,905 acre-feet of groundwater from the Tikapoo and Three Lakes Valley hydrographic basins as part of its regional groundwater importation project. Significantly, in Ruling 5465, the State Engineer found that groundwater in Tikapoo and Three

Lakes Valleys eventually discharges through the lower carbonate aquifer at Ash Meadows and Death Valley.

Without question, increased local and regional groundwater pumping in the future is reasonably foreseeable, and as shown by the County's recent report, such groundwater pumping has the potential to impact the upward gradient in the lower carbonate aquifer. If the upward gradient is eliminated, it will no longer be a barrier to contaminants from the repository entering the lower carbonate aquifer and then potentially rapidly entering the biosphere.

As discussed in 10 CFR 63.303, there are three quantitative public health requirements for demonstrating postclosure compliance and safety: (1) the individual protection standard after permanent closure in the absence of human intrusion into the repository, (2) the individual protection standard for human intrusion, and (3) the separate standards for protection of groundwater. Under 10 CFR 63.342, the applicant undertook separate "performance assessments" for each of the quantitative standards. The performance assessments evaluated and screened relevant features, events and processes ("FEPs") that could affect attainment of the standards.

Proposed 10 CFR 63.342 requires that performance assessments demonstrate that there is a reasonable expectation that the "reasonably maximally exposed individual" ("RMEI") receives no more than a specified dose of radiation from releases during the first 10,000 years and, thereafter, after 10,000 years from the undisturbed Yucca Mountain disposal system. 10 CFR 63.2, as modified in proposed 10 CFR 63.2, provides that performance assessment means an analysis that:

(1) Identifies the features events, processes (except human intrusion) and sequences of events and processes (except human intrusion) that might affect the Yucca Mountain disposal system and their probabilities of occurring;

(2) Examines the effects of those features, events, processes and sequences of events and processes upon performance of the Yucca Mountain disposal system; and

(3) Estimates the dose incurred by the reasonably maximally exposed individual, including the associated uncertainties, as a result of releases caused by all significant features, events processes and sequences of events and processes, weighted by their probability of occurrence.

Under 10 CFR 63.342, with regard to assessments for human intrusion into the repository and the groundwater protection standards, the performance assessments for human intrusion and groundwater protection do not require consideration of "unlikely" FEPs (those with less than one chance in 10 of occurring within 10,000 years). On the other hand, the performance assessment for the individual protection standard requires consideration of both likely and unlikely FEPs and excludes only very unlikely features, events and processes (those with less than one chance in 10,000 of occurring in 10,000 years).

Because the likelihood of such groundwater pumping affecting the lower carbonate aquifer is not assessed in the LA or in the Final SEIS, one must assume that the applicant concluded that current groundwater pumping and reasonably foreseeable future local and/or regional groundwater pumping that could eliminate the upward gradient in lower carbonate aquifer qualified as an "unlikely" FEP (less that one chance in 10 of occurring within 10,000 years or less than one chance in 10,000 of occurring in 10,000 years). Such an assumption is not

in compliance with the performance assessment requirements of 10 CFR 63.342. 10 CFR 63.342 requires that the likelihood of groundwater reaching the biosphere through the lower carbonate aquifer and impacting human health or threatened species be evaluated--not assumed. In addressing its reason for not analyzing the potential elimination of the upward gradient in the lower carbonate aquifer, DOE explains in a response to comments on the Draft SEIS (Final SEIS, Vol. 3, p. CR-324, Response to Comment – RRR000091 / 0002):

> This water from beneath Yucca Mountain could contribute to Death Valley springs whether or not it reaches the carbonate aquifer in the area of Yucca Mountain. Without the upward gradient in the carbonate aquifer in the area of Yucca Mountain, it is likely that contaminant migration would be on a slightly different pathway. Although DOE modeling of groundwater flow and contaminant migration did not include a scenario that involved the elimination of the upward gradient in the carbonate aquifer, the modeling to evaluate the long-term postclosure performance of the repository is not inconsistent with that scenario.

While the Final SEIS discusses the time that it would take contaminants to travel through the unsaturated zone to reach the saturated zone beneath the repository, neither the LA, the SAR nor the Final SEIS contain an assessment of how long it may take contaminants from the repository to reach the lower carbonate aquifer once the contaminants reach the saturated zone. (With regard to the movement of plutonium, the Final SEIS, §3.1.4.2.2, page 3-51, reports that there is evidence of plutonium migration in the saturated zone of at least 1.3 kilometers (0.8 mile) in 28 years from the source of a below ground test at Pahute Mesa and that the plutonium movement may be due to colloidials—1.3 kilometers is more than the distance from the repository site to the lower carbonate aquifer.)

On pages 3-41 to 3-42 (§3.1.4.2.2), the Final SEIS reports that models were developed of groundwater movement in the unsaturated zone and that these models were used to assess the flow of water from the repository site to the saturated zone. After adjustment of the models to

simulate transportation of tracers, the most likely infiltration scenario estimated that ten percent of the tracer would move through the roughly 300 meters (800 feet) of the unsaturated zone to reach the saturated zone in about 300 years, but half would take longer than 8,000 years.

If based on the Final SEIS predictive models, one were to assume that 10 percent of contaminants reached the saturated zone in 300 years, and that thereafter, over an unknown amount of time (but perhaps as short as 28 years based upon the observation at Pahute Mesa), the contaminants traveled through the approximate 3,300 feet of the saturated zone to the lower carbonate aquifer, and if one were to assume that the upward gradient in the lower carbonate aquifer had been eliminated by groundwater pumping or by some other factor, upon reaching the lower carbonate aquifer, the contaminants could theoretically reach the biosphere in an additional 100 years. Under 10 CFR 63.342, if there is at least one chance in 10,000 that such a scenario could occur in 10,000 years, the performance assessment should have evaluated such a scenario; however the LA lacks such an assessment.

10 CFR 63.312 defines the RMEI and requires that the RMEI live above the highest concentration of radionuclides in the plume of contamination. The LA sites the RMEI south of the repository control area over the area where the highest concentration of radionuclides is expected in the plume of contamination outside of the controlled area (Final SEIS, §5.5, page 5-25). 10 CFR 63.312 specifies that the RMEI drinks 2 liters of water from wells at the RMEI location. The LA assumes that the wells will extract water from the aquifers overlying the lower carbonate aquifer.

As previously described, the LA contains no assessment of a scenario where the upward gradient in the lower carbonate aquifer is eliminated and the lower carbonate aquifer is contaminated by radionuclides. Under such a scenario, the only drinking water supply for the

more than 1.25 million visitors a year to Death Valley National Park could become contaminated with radionuclides. Moreover, under such a scenario, there is a potential that the highest concentration of radionuclides in the plume of contamination would be in the lower carbonate aquifer—not in the overlying aquifers as projected by the applicant. For those reasons, the LA should contain an assessment of whether the location of the RMEI should be relocated under a scenario where the lower carbonate aquifer is contaminated with radionuclides.

In conclusion, the LA, the SAR and Final SEIS do not comply with applicable laws and regulations requiring an adequate assessment of the potential flow path of radionuclides from the repository through the lower carbonate aquifer to the biosphere where the contaminants may affect human health and threatened species. In the absence of an adequate assessment in the LA and SAR of the risk of contamination from the proposed repository reaching the biosphere through the lower carbonate aquifer, this Commission cannot determine "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(1), nor can it determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(2). For those reasons, this Commission should find the LA inadequate.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's License Application it fails to provide a complete and adequate discussion of the nature and extent of the repository's impact on groundwater in the lower carbonate aquifer. The lower carbonate aquifer beneath the proposed repository site is a

potential flow path for contaminants from the repository to migrate to the biosphere (including Devil's Hole, springs at Ash Meadows, groundwater wells in the Amargosa Valley in Nevada and the Franklin Lake Playa and major springs near Furnace Creek in Death Valley National Park in Inyo County.) 10 CFR 63.21(c)(12) requires that the SAR must assess the ability of the proposed geologic repository to limit releases of radionuclides into the accessible environment as required by 10 CFR 113(c). 10 CFR 63.21(c)(9) requires that investigations of features, events and processes of site that are expected to affect waste isolation must extend from the surface to a depth sufficient to determine principal pathways for radionuclide migration from the repository. The LA and the SAR do not adequately assess the flow path in the lower carbonate aquifer to the accessible environment.

The specific portion of the LA that is being challenged includes LA, Vol. 14, §2.3.9.2.4.2, and in the Final EIS, Volume I, Chapter 5; the Final SEIS, Volume I, Chapter 3, § 3.1.4.2, Vol. I, section 5.4, and Vol. III, Chapter 1, subchapter 1.7.4.

CONTENTION NO. 2
INY-NEPA-1

FAILURE TO PROVIDE A COMPLETE AND ADEQUATE DISCUSSION OF THE NATURE AND EXTENT OF THE REPOSITORY'S DIRECT AND CUMULATIVE IMPACTS ON GROUNDWATER IN THE LOWER CARBONATE AQUIFER

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(I)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the direct and cumulative environmental impacts of the proposed repository on groundwater in the lower carbonate aquifer.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(F)(1)(II)]

The Final EIS and the Final SEIS are inadequate because neither document provides a complete and adequate discussion of the nature and extent of the repository's direct and cumulative impacts on groundwater in the lower carbonate aquifer. Because of these deficiencies, the documents are incomplete and inadequate pursuant to NEPA and NRC regulations at 10 CFR 51. As a result, the FEIS and Final SEIS cannot be adopted by the NRC.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

This contention raises an issue whether DOE has complied with NEPA, the Council on Environmental Quality (CEQ) regulations, and the NRC NEPA regulations; pursuant to 10 CFR

51.109(a)(2) and 63.31(c), and section II, paragraph 1 of the Notice of Hearing, this contention is within the scope of the hearing. (Also, see number 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository are practicable for adoption, this Commission must find that all requirements of NEPA have been satisfied. (*NEI v EPA*, 373 F.3d at 1314.) An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 CFR 51.109(c), which makes the NEPA documents not practicable for adoption.[2] The NEPA documents are inadequate and not practicable for adoption because they fail to assess the environmental impacts of the proposed Yucca Mountain Repository, namely they have not provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the lower carbonate aquifer in a manner that is consistent with NEPA, the CEQ guidelines and NRC guidance and applicable regulations. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Yucca Mountain is located in a subsection of the Death Valley regional groundwater flow system called the Alkali Flat-Furnace Creek groundwater basin and overlies a geologic feature known as the lower carbonate aquifer. The lower carbonate aquifer is characterized by thick sequences of carbonate rock. The rocks form a generally deep regional aquifer and allow interbasin transfer of groundwater in the Death Valley region (LA, Vol. 1, §5.2.2.2.1, page 5-45).

[2] Notice of Hearing Section IIIB, 73 Fed. Reg. 63031 October 22, 2008

The LA acknowledges that a regional lower carbonate aquifer is beneath the proposed repository in the saturated zone (LA, Vol. 1, §5.2.2, page 5-40). As components of the engineered barrier system within the repository, including waste containers, slowly corrode and lose their capability to contain their contents, the release of materials, both radioactive and non-radioactive, are the source of contaminants entering the groundwater in the vicinity of the repository.

Volume I, Chapter 5 of the Final EIS and Volume I, Chapter 5 of the Final SEIS discuss the potential environmental impacts of the proposed repository over the long term. The subject matter of these chapters concerns the potential repository impacts on groundwater and on human health through a groundwater pathway. DOE is obligated under NEPA to provide a complete evaluation and disclosure of the impacts from the proposed repository. 10 CFR 51.109(c)(2) provides that it is not practicable to adopt any environmental impact statement prepared by the Secretary of Energy in connection with a geologic repository proposed to be constructed if there is "[s]ignificant and substantial new information or new considerations [that would] render such environmental impact statement inadequate." The NEPA documents fail to completely and adequately characterize the cumulative impacts of the repository in combination with a continuation of current levels of groundwater pumping in the vicinity of the repository into the future. Recent research conducted for Inyo County which shows dramatic drawdown in both the volcanic-alluvial aquifer and the carbonate aquifer as a result of continuing current groundwater pumping levels into the future is a significant new consideration that renders the NEPA documents inadequate.

As noted in the NRC staff's Adoption report,[3] DOE's analysis of the post-closure behavior of the repository recognizes that the release of contaminants to groundwater can be

[3] U.S. Nuclear Regulatory Commission's Staff's Adoption Determination Report for the U.S. Department of Energy's Environmental Impact Statements for the Proposed Geologic Repository at Yucca Mountain, September 5, 2008. [NRC Staff Report]

expected over the long term.[4] The NRC staff concluded that this is a reasonably foreseeable outcome for the repository. Neither the Final EIS nor the Final SEIS provide an adequate analysis and discussion of the impacts to groundwater and of the cumulative amounts of radiological and non-radiological contaminants that may enter the groundwater over time, and specifically how these contaminants would behave in the lower carbonate aquifer and related environment. As the NRC staff noted, "the extent of contamination and accumulation in the aquifer of releases over multiple years is not fully considered."[5]

As defined in 40 CFR 1508.7, cumulative effects are those effects that result from incremental impacts of a proposed action when added to other past, present and reasonably foreseeable future actions, regardless of whether a federal or nonfederal agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that can take place over time. CEQ recommends that any action that causes cumulatively significant impacts be examined in an EIS (40 CFR 1508l25(a)(2). Further, the federal courts have required that an agency take a "hard look" at the cumulative effects of a project, *Oregon Natural Resources Council v. Marsh*, 52 F. 3d 1485 (9th Cir. 1995).

The NRC staff noted that the Final EIS and the Final SEIS "have not provided complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer."[6] They recommend that a supplemental analysis should include a description of the full extent of the volcanic-alluvial aquifer, particularly those parts that could become contaminated, and how water (and potential contaminants) can leave the flow system. The NRC staff noted that DOE's License Application (LA) describes potential groundwater flow farther to the south of Alkali Flats into the Southern Death Valley subregion of

[4] DOE, 2008b, Chapter 5
[5] NRC Staff Report, p. 3-10.
[6] NRC Staff Report, p. 3-10

the regional model domain, but this component of the groundwater flow system is not discussed in the Final EIS or in the Final SEIS. As is more fully explained below, the reasoning for a supplemental analysis into the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer is equally applicable to the need for supplemental analysis into the nature and extent of the repository's direct and cumulative impacts on groundwater in the lower carbonate aquifer, which is a potential pathway for transport of radionuclides and other contaminants to the accessible environment.

The Final SEIS acknowledges in §3.1.4.2.1, pages 3-29 – 3-38, and the LA acknowledges in Vol. 1, §5.2.2, page 5-40, that a regional lower carbonate aquifer is beneath the proposed repository in the saturated zone. The regional lower carbonate aquifer hydraulically connects with and exerts control on the water table elevations in the overlying alluvial and volcanic rock aquifers throughout the groundwater basin (LA, § 5.2.2.2.2, page 5-46).

The lower carbonate aquifer is a potential pathway for radioactive contaminants that may leak from the waste packages in the repository. As recognized in the Final SEIS on p. 3-32 there is evidence that the lower carbonate aquifer feeds the line of springs in the Ash Meadows area. Devil's Hole, a groundwater-filled cave in a fault zone in the vicinity of the proposed repository is supplied by the lower carbonate aquifer.[7] The Final SEIS acknowledges on page 3-35 that groundwater flows from the lower carbonate aquifer beneath Yucca Mountain "to discharge at Ash Meadows…" The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley" and that this conclusion is confirmed by research done by Inyo County which shows that the lower carbonate aquifer is a significant contributor to the springs in the Furnace Creek area of Death Valley and that this aquifer represents a potentially rapid pathway for contaminants to

[7] Final SEIS page 3-31

reach the springs and the biosphere.[8] These springs are the only source of water for the park workers and the more than 1.25 million annual visitors to the Death Valley National Park[9].

Although the saturated zone is a potential pathway for transport of radionuclides to the accessible environment, the LA does not address the migration of contaminants from the repository in the lower carbonate aquifer. Instead, the LA concludes that in the vicinity of Yucca Mountain, there is an upward hydraulic gradient between the lower regional carbonate aquifer and the overlying volcanic aquifers. LA, Vol. 14, §2.3.9.2.4.2, page 2.3.9-55. (An upward hydraulic gradient means water moves from the carbonate aquifer into the overlying volcanic aquifer but does not move from the overlying volcanic aquifer into the lower carbonate aquifer.) The LA states that the upward gradient is important to the performance of the repository because it restricts groundwater flow and radionuclide transport pathways to overlying volcanic and alluvial aquifers and it prevents radionuclides from entering the lower carbonate aquifer. LA, Vol. 14, §2.3.9.2.4.2, pages 2.3.9-53 and 2.3.9-55. The LA concludes that on the basis of simulations of the Death Valley regional groundwater flow system under past and future climate scenarios, it is expected that the upward gradient will persist during future wetter climates.

The Final SEIS, at page 5-23 (§5.4), acknowledges the upward gradient, and observes that *under current conditions*, contamination from Yucca Mountain is not likely to mix with carbonate aquifer waters and discharge to the surface at Ash Meadows or Devil's Hole. The Final SEIS further states that because there would be no contamination of the carbonate aquifer *under current conditions*, it is concluded that no human health impacts or impacts to endangered pupfish at Ash Meadows or Devil's Hole are expected. Final SEIS, page 5-23 (§5.4). (Italics added for emphasis.)

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[8] Final SEIS, p. 3-34
[9] Death Valley National Park Information Page, http://www.death.valley.natioal-park.com/info.htm

In a recent report done as part of the County of Inyo's assessment of the repository, Bredehoeft and King, "*The Potential For Contaminants Transport Through the Carbonate Aquifer Beneath Yucca Mountain Nevada*," Hydrodynamics Group LLC, 2008, unpublished, (page 18) (LSN CAL 000000029) modeling calculations revealed that if contaminants from the repository enter the lower carbonate aquifer near Yucca Mountain, the transit time to the biosphere of Death Valley may be less than 100 years. In the same report at page 31, the authors found that when the Death Valley regional groundwater flow system hydrogeologic framework model ("USGS DVRGM") developed by the U.S. Geological Survey *was run for 1000 years at 1995 groundwater pumping levels*, the model predicted drawdown of 10 meters in the lower carbonate aquifer in the vicinity of Yucca Mountain (page 17) and more than 70 meters of additional drawdown in the Amargosa Valley in the next several hundred years.

Although, the applicant assumes that under current conditions and during future wetter climates, the upper gradient will persist, neither the Final EIS nor the Final SEIS assess the potential cumulative impact resulting from a continuation of current levels of local groundwater pumping and/or additional regional groundwater pumping that is foreseeable in the future could have on the upward gradient in the lower carbonate aquifer. Should such groundwater pumping eliminate the upward gradient, contaminants from the repository could potentially enter the lower carbonate aquifer and migrate to the biosphere at Devil's Hole, Ash Meadows, Death Valley and Amargosa Valley.

Both the LA and the Final SEIS acknowledge the possibility of a significant increase local and regional groundwater pumping in the future. For example, on page 8-46 (§8.4.2), the Final SEIS incorporates Chapter 5 of the Rail Alignment EIS. On page 5-37(§5.2.2.6), the Rail Alignment EIS describes potential groundwater development projects—including a massive

groundwater extraction and importation project by the Southern Nevada Water Authority that is located over and within the regional carbonate aquifer. The Rail Alignment EIS states that "…cumulative water use for the projects described above could total more than 430 million cubic meters (350,000 acre-feet) per year." Some of this groundwater may be withdrawn from the lower carbonate aquifer or from areas recharging the lower carbonate aquifer.

Further, the Final SEIS reports, on page 3-85 (§3.1.11.1.1), that by 2050, annual water demand in the Pahrump area could be about 99 million cubic meters (80,000 acre-feet) per year, while the LA, Vol. 1, §5.2.2.6, page 5-56, provides projections that by 2050, the demand for water in Nye County will be 252,000 acre-feet per year-almost 2.5 times the 2000 demand-and that most of this increase will be in Pahrump and some of the increase will be in the Amargosa Valley. The Final SEIS reports, on page 3-85 (§3.1.11.1.1) that possible alternatives for meeting the projected future shortfalls include a managed overdraft of the basin by optimizing the locations of new wells, development of the carbonate aquifer that underlies the basin, importation of water from other basins, and conservation. Finally, neither the LA nor the Final SEIS mention Ruling 5465 (January 4, 2005) (http://water.nv.gov/scans/rulings/5465r.pdf) of the Nevada State Engineer, which has already granted the Southern Nevada Water Authority the right to pump 8,905 acre-feet of groundwater from the Tikapoo and Three Lakes Valley hydrographic basins as part of its regional groundwater importation project. Significantly, in Ruling 5465, the State Engineer found that groundwater in Tikapoo and Three Lakes Valleys eventually discharges through the lower carbonate aquifer at Ash Meadows and Death Valley.

Increased local and regional groundwater pumping in the future is reasonably foreseeable, and as shown by the County's recent report, such groundwater pumping has the potential to impact the upward gradient in the lower carbonate aquifer. If the upward gradient is

eliminated, it will no longer be a barrier to contaminants from the repository entering the lower carbonate aquifer and then potentially rapidly entering the accessible environment.

In conclusion, neither the NEPA documents nor the LA comply with applicable laws, regulations, and standards requiring an adequate assessment of the potential flow path of radionuclides from the repository through the lower carbonate aquifer to the accessible environment where the contaminants may affect human health and threatened species. In the absence of an adequate assessment in these documents of the risk of contamination from the proposed repository reaching the accessible environment through the lower carbonate aquifer and an analysis of the repository's cumulative impact on the lower carbonate aquifer, this Commission cannot determine "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(1). Further, this Commission cannot determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(2). For those reasons, this Commission should find the NEPA documents fail to completely and adequately evaluate the nature and extent of the repository's cumulative impact on groundwater in the lower carbonate aquifer.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's 2008 Final SEIS and 2002 FEIS because neither has provided a complete and adequate discussion of the nature and extent of the repository's

cumulative impact on groundwater in the lower carbonate aquifer. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts on groundwater would be materially different. As a result, the Final EIS and Final SEIS cannot be adopted by the NRC.

The specific portion of the LA that is being challenged includes the Final EIS, Volume I, Chapter 5; and the Final SEIS, Volume I, Chapter 3, § 3.1.4.2, Vol. I, section 5.4, and Vol. III, Chapter 1, subchapter 1.7.4.

CONTENTION NO. 3

INY-SAFETY-2

FAILURE TO ADEQUATELY DESCRIBE AND ANALYZE THE IMPACT OF THE REPOSITORY IN COMBINATION WITH A CONTINUATION OF EXISTING LEVELS OF GROUNDWATER PUMPING ON THE POTENTIAL MIGRATION OF CONTAMINANTS FROM THE PROPOSED REPOSITORY

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(i)]

The applicant (or "DOE") failed to include in the Yucca Mountain Repository License Application ("LA") and Safety Analysis Report ("SAR") a description and analysis of the impact of a continuation of existing levels of groundwater pumping in the vicinity of the proposed repository on the flow path in the saturated zone through which contaminants can migrate from the proposed repository site to the biosphere including to areas within the County of Inyo.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

The saturated zone aquifer beneath the proposed repository site is a potential flow path for contaminants from the repository to migrate to the biosphere (including Devil's Hole, springs at Ash Meadows, groundwater wells in the Amargosa Valley in Nevada and the Franklin Lake Playa and major springs near Furnace Creek in Death Valley National Park in Inyo County.) 10 CFR 63.21(c)(12) requires that the SAR must assess the ability of the proposed geologic repository to limit releases of radionuclides into the accessible environment as required by 10 CFR 113(c). 10 CFR 63.21(c)(9) requires that investigations of features, events and processes of site that are expected to affect waste isolation must extend from the surface to a depth sufficient to determine principal pathways for radionuclide migration from the repository. The LA and the SAR do not adequately assess the impact of a continuation of existing levels of groundwater

pumping on the potential migration of contaminants from the proposed repository to the biosphere including areas within Inyo County.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

See number 4 below.

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

This Commission may only authorize construction of a geologic repository operations area at Yucca Mountain if it determines "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(1). Further, this Commission must determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(2). In arriving at these determinations, this Commission must consider whether "DOE has described the proposed geologic repository as specified at §63.21." 10 CFR 31(a)(3)(i).

Guidance regarding the NRC staff evaluation of the adequacy of the LA's evaluation of flow paths in the saturated zone is provided in the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Acceptance Criterion 1 on page 2.2-84 provides in pertinent part that NRC should find that:

> (3) The description of the aspects of hydrology, geology, geochemistry, design features, physical phenomena, and couplings, that may affect flow paths in the saturated zone, is adequate.

The issue raised in this contention is material to the findings that must be made by the Commission because the determinations called for by 10 CFR 31(a)(1) and 10 31(a)(2) cannot be reasonably made in the absence of an adequate assessment in the LA and SAR of the risk that a continuation of existing levels of groundwater pumping into the future will increase the potential for migration of contaminants from the proposed repository to the biosphere including areas within Inyo County.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Yucca Mountain is located in a subsection of the Death Valley regional groundwater flow system called the Alkali Flat-Furnace Creek groundwater basin and overlies a geologic feature known as the lower carbonate aquifer. The lower carbonate aquifer is characterized by thick sequences of carbonate rock. The rocks form a generally deep regional aquifer and allow interbasin transfer of groundwater in the Death Valley region (LA, Vol. 1, §5.2.2.2.1, page 5-45). The LA acknowledges that a regional lower carbonate aquifer is beneath the proposed repository in the saturated zone (LA, Vol. 1, §5.2.2, page 5-40). The regional lower carbonate aquifer hydraulically connects with and exerts control on the water table elevations in the overlying alluvial and volcanic rock aquifers throughout the groundwater basin (LA, § 5.2.2.2.2, page 5-46).

As stated in the LA, groundwater moves from Yucca Mountain toward Death Valley (LA, Vol. 1, §5.2.2.2.2, page 5-46) flowing in volcanic and alluvial aquifers to discharge naturally at Franklin Lake Playa, and possibility as spring discharge in Death Valley, and flows through the lower carbonate aquifer to discharge at Ash Meadows and Devil's Hole (Final SEIS, §5.4, page 5-23). The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer

beneath Yucca Mountain "is the primary source of spring discharge in Death Valley." This conclusion is supported by recent research conducted by the County of Inyo. See, Bredehoeft, Fridrich and King, *Groundwater Flow Through the Funeral Mountains, Death Valley National Park, California*, Hydrodynamics Group, LLC, 12th IHLRWM, Las Vegas, NV, September 7-11, 2008 LSN No. CAL 000000030), and Bredehoeft and King, *The Potential for Contaminant Transport Through the Carbonate Aquifer Beneath Yucca Mountain, Nevada*, Hydrodynamics Group LLC, unpublished, (LSN No. 000000029).

The LA states that the lower carbonate aquifer beneath the proposed repository underlies the likely flow paths for water leaving the repository area (LA, Vol. 1, §5.2.2.3.2.1, page 5.54), and that "the saturated zone is a potential pathway for transport of radionuclides to the accessible environment" (LA, Vol. 1, §5.2.2.1, page 5.42). The Final SEIS on page 5-2 (§5) states that the principal exposure pathway through which radionuclides and hazardous and carcinogenic chemicals could reach human populations is groundwater. Although the saturated zone is a potential pathway for transport of radionuclides to the accessible environment, the LA does not assess the potential impact of a continuation of existing levels of groundwater pumping from the saturated zone on the potential migration of contaminants from the repository through the aquifer.

The LA concludes that in the vicinity of Yucca Mountain, there is an upward hydraulic gradient between the lower regional carbonate aquifer and the overlying volcanic aquifers. LA, Vol. 14, §2.3.9.2.4.2, page 2.3.9-55. (An upward hydraulic gradient means water moves from the carbonate aquifer into the overlying volcanic aquifer but does not move from the overlying volcanic aquifer into the lower carbonate aquifer.) The LA states that the upward gradient is important to the performance of the repository because it restricts groundwater flow and

radionuclide transport pathways to overlying volcanic and alluvial aquifers and it prevents radionuclides from entering the lower carbonate aquifer. LA, Vol. 14, §2.3.9.2.4.2, pages 2.3.9-53 and 2.3.9-55. The LA concludes that on the basis of simulations of the Death Valley regional groundwater flow system under past and future climate scenarios, it is expected that the upward gradient will persist during future wetter climates.

The Final EIS, at page 5-23 (§5.4), acknowledges the upward gradient, and observes that *under current conditions*, contamination from Yucca Mountain is not likely to mix with carbonate aquifer waters and discharge to the surface a Ash Meadows or Devil's Hole. The Final SEIS further states that because there would be no contamination of the carbonate aquifer *under current conditions*, it is concluded that no human health impacts or impacts to endangered pupfish at Ash Meadows or Devil's Hole are expected. Final SEIS, page 5-23 (§5.4). (Italics added for emphasis.) The Final EIS does not include a continuation of current groundwater pumping levels into the future in its description of "current conditions."

In a recent report for the County of Inyo, Bredehoeft and King, *The Potential for Contaminant Transport Through the Carbonate Aquifer Beneath Yucca Mountain, Nevada*, Hydrodynamics Group LLC, unpublished, p. 17 (LSN No. 000000029), modeling calculations revealed that if contaminants from the repository enter the lower carbonate aquifer near Yucca Mountain, the transit time to the biosphere of Death Valley may be less than 100 years. Further, in the same report at page 17, the authors found that when the Death Valley regional groundwater flow system hydrogeologic framework model ("USGS DVRGM") developed by the U.S. Geological Survey *was run for 1000 years at 1995 groundwater pumping levels*, the model predicted drawdown of 10 meters in the lower carbonate aquifer in the vicinity of Yucca Mountain (page 17) and more than 70 meters of additional drawdown in the Amargosa Valley in

the next several hundred years. A continuation of current levels of groundwater pumping was not analyzed in the License Application or SAR.

The USGS DVRGM was used by the applicant in the development of the site-scale hydrogeologic framework model (HFM2006), which in turn was used to develop the model used to simulate groundwater flow directions and flow rates of water from beneath the repository to the southern end of the controlled area boundary (LA, §2.3.9.2.2.2, page 2.3.9-16). The applicant's site scale model takes boundary conditions from the USGS DVRGM. Hydrodynamic Group's research has revealed that although the USGS DVRGM was calibrated to water levels observed in the mid 1990s, the model is capable of generating steady-state water levels that do not include the impacts of pumping on water levels. The applicant used the steady-state water levels (that essentially excluded the impacts of a continuation of existing pumping) as the boundary condition for their hydrogeologic Site Model. Consequently, neither the predicted drawdown in the Amargosa Valley, nor the drawdown in the lower carbonate aquifer in the vicinity of Yucca Mountain, that would result from a continuation of current levels of groundwater pumping in the vicinity of the repository was considered in the applicant's analyses of the potential impacts to the saturated zone and to the upward gradient in the lower carbonate aquifer.

A continuation of current levels of groundwater pumping in the future is reasonably foreseeable, and as shown by the County's recent report, such groundwater pumping has the potential to cause drawdown in both the volcanic-alluvial aquifer and the lower carbonate aquifer and to potentially impact the upward gradient in the lower carbonate aquifer. If the upward gradient is eliminated, it will no longer be a barrier to contaminants from the repository entering the lower carbonate aquifer and then potentially rapidly entering the accessible environment.

Although, the applicant assumes that under current conditions and during future wetter climates, the upper gradient will persist, the LA doesn't assess the possibility that a continuation of current levels of local groundwater pumping and/or additional regional groundwater pumping that is foreseeable in the future could reduce or eliminate the upward gradient. Should such groundwater pumping eliminate the upward gradient, contaminants from the repository could potentially enter the saturated zone and migrate to the biosphere at Devil's Hole, Ash Meadows, Amargosa Valley and Death Valley. These springs are the sole source of water for the more than 1.25 million annual visitors to Death Valley National Park.[10]

In conclusion, the LA, the SAR and Final SEIS do not comply with applicable laws and regulations requiring an adequate assessment of the potential flow path of radionuclides from the repository through the saturated zone to the biosphere where the contaminants may affect human health and threatened species. In the absence of an adequate assessment in the LA and SAR of the risk of contamination from the proposed repository reaching the biosphere through the saturated zone, this Commission cannot determine "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(1), nor can it determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(2). For those reasons, this Commission should find the LA inadequate.

[10] Death Valley National Park Information Page, http://www.death.valley.natioal-park.com/info.htm

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

10 CFR 63.21(c)(12) requires that the SAR must assess the ability of the proposed geologic repository to limit releases of radionuclides into the accessible environment as required by 10 CFR 113(c). 10 CFR 63.21(c)(9) requires that investigations of features, events and processes of site that are expected to affect waste isolation must extend from the surface to a depth sufficient to determine principal pathways for radionuclide migration from the repository. The LA and the SAR do not adequately assess the impact of a continuation of existing levels of groundwater pumping on the potential migration of contaminants from the proposed repository to the biosphere including areas within Inyo County.

The specific portion of the LA that is being challenged includes LA, Vol. 14, §2.3.9.2.4.2, and in the Final EIS, Volume I, Chapter 5; the Final SEIS, Volume I, Chapter 3, § 3.1.4.2, Vol. I, section 5.4, and Vol. III, Chapter 1, subchapter 1.7.4.

CONTENTION NO. 4

INY-NEPA-2

FAILURE TO ADEQUATELY DESCRIBE AND ANALYZE THE CUMULATIVE IMPACT OF THE REPOSITORY IN COMBINATION WITH A CONTINUATION OF EXISTING LEVELS OF GROUNDWATER PUMPING ON THE POTENTIAL MIGRATION OF CONTAMINANTS FROM THE PROPOSED REPOSITORY

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(i)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the cumulative environmental impacts of a continuation of existing levels of groundwater pumping in the vicinity of the proposed repository on the flow path in the saturated zone through which contaminants can migrate from the proposed repository site to the biosphere including to areas within the County of Inyo.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

The saturated zone aquifer beneath the proposed repository site is a potential flow path for contaminants from the repository to migrate to the biosphere (including Devil's Hole, springs at Ash Meadows, groundwater wells in the Amargosa Valley in Nevada and the Franklin Lake Playa and major springs near Furnace Creek in Death Valley National Park in Inyo County.) The Final EIS and the Final SEIS are inadequate because neither document provides a complete and

adequate discussion of the nature and extent of the cumulative impacts of the repository in combination with a continuation of current levels of groundwater pumping on the flow path in the saturated zone through which contaminants can migrate from the proposed repository site to the biosphere including to areas within the County of Inyo.

Because of these deficiencies, the documents are incomplete and inadequate pursuant to NEPA and NRC regulations at 10 CFR 51. As a result, the FEIS and Final SEIS cannot be adopted by the NRC. 10 CFR 63.21(c)(12) requires that the SAR must assess the ability of the proposed geologic repository to limit releases of radionuclides into the accessible environment as required by 10 CFR 113(c). 10 CFR 63.21(c)(9) requires that investigations of features, events and processes of site that are expected to affect waste isolation must extend from the surface to a depth sufficient to determine principal pathways for radionuclide migration from the repository. The LA and the SAR do not adequately assess the impact of a continuation of existing levels of groundwater pumping on the potential migration of contaminants from the proposed repository to the biosphere including areas within Inyo County.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

See number 4 below.

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

This Commission may only authorize construction of a geologic repository operations area at Yucca Mountain if it determines "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(1). Further, this Commission must determine

"[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public." (10 CFR 31(a)(2). In arriving at these determinations, this Commission must consider whether "DOE has described the proposed geologic repository as specified at §63.21." 10 CFR 31(a)(3)(i).

Guidance regarding the NRC staff evaluation of the adequacy of the LA's evaluation of flow paths in the saturated zone is provided in the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Acceptance Criterion 1 on page 2.2-84 provides in pertinent part that NRC should find that:

> (4) The description of the aspects of hydrology, geology, geochemistry, design features, physical phenomena, and couplings, that may affect flow paths in the saturated zone, is adequate.

The issue raised in this contention is material to the findings that must be made by the Commission because the determinations called for by 10 CFR 31(a)(1) and 10 31(a)(2) cannot be reasonably made in the absence of an adequate assessment in the Final EIS and Final SEIS of the risk that the cumulative impact of the repository in combination with a continuation of existing levels of groundwater pumping into the future will increase the potential for migration of contaminants from the proposed repository to the biosphere including areas within Inyo County.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Yucca Mountain is located in a subsection of the Death Valley regional groundwater flow system called the Alkali Flat-Furnace Creek groundwater basin and overlies a geologic feature known as the lower carbonate aquifer. The lower carbonate aquifer is characterized by thick sequences of carbonate rock. The rocks form a generally deep regional aquifer and allow

interbasin transfer of groundwater in the Death Valley region (LA, Vol. 1, §5.2.2.2.1, page 5-45). The LA acknowledges that a regional lower carbonate aquifer is beneath the proposed repository in the saturated zone (LA, Vol. 1, §5.2.2, page 5-40). The regional lower carbonate aquifer hydraulically connects with and exerts control on the water table elevations in the overlying alluvial and volcanic rock aquifers throughout the groundwater basin (LA, § 5.2.2.2.2, page 5-46).

As stated in the LA, groundwater moves from Yucca Mountain toward Death Valley (LA, Vol. 1, §5.2.2.2.2, page 5-46) flowing in volcanic and alluvial aquifers to discharge naturally at Franklin Lake Playa, and possibility as spring discharge in Death Valley, and flows through the lower carbonate aquifer to discharge at Ash Meadows and Devil's Hole (Final SEIS, §5.4, page 5-23). The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley." This conclusion is supported by recent research conducted by the County of Inyo. See Bredehoeft, Fridrich and King, *Groundwater Flow Through the Funeral Mountains, Death Valley National Park, California*, Hydrodynamics Group, LLC, 12th IHLRWM, Las Vegas, NV, September 7-11, 2008 LSN No. CAL 000000030), and Bredehoeft and King, *The Potential for Contaminant Transport Through the Carbonate Aquifer Beneath Yucca Mountain, Nevada*, Hydrodynamics Group LLC, unpublished, (LSN No. 000000029).

The LA states that the lower carbonate aquifer beneath the proposed repository underlies the likely flow paths for water leaving the repository area (LA, Vol. 1, §5.2.2.3.2.1, page 5.54), and that "the saturated zone is a potential pathway for transport of radionuclides to the accessible environment" (LA, Vol. 1, §5.2.2.1, page 5.42). The Final SEIS on page 5-2 (§5) states that the principal exposure pathway through which radionuclides and hazardous and carcinogenic

chemicals could reach human populations is groundwater. Although the saturated zone is a potential pathway for transport of radionuclides to the accessible environment, the LA does not assess the potential impact of the reposition in combination with a continuation of existing levels of groundwater pumping from the saturated zone on the potential migration of contaminants from the repository through the aquifer.

The LA concludes that in the vicinity of Yucca Mountain, there is an upward hydraulic gradient between the lower regional carbonate aquifer and the overlying volcanic aquifers. LA, Vol. 14, §2.3.9.2.4.2, page 2.3.9-55. (An upward hydraulic gradient means water moves from the carbonate aquifer into the overlying volcanic aquifer but does not move from the overlying volcanic aquifer into the lower carbonate aquifer.) The LA states that the upward gradient is important to the performance of the repository because it restricts groundwater flow and radionuclide transport pathways to overlying volcanic and alluvial aquifers and it prevents radionuclides from entering the lower carbonate aquifer. LA, Vol. 14, §2.3.9.2.4.2, pages 2.3.9-53 and 2.3.9-55. The LA concludes that on the basis of simulations of the Death Valley regional groundwater flow system under past and future climate scenarios, it is expected that the upward gradient will persist during future wetter climates.

The Final EIS, at page 5-23 (§5.4), acknowledges the upward gradient, and observes that *under current conditions*, contamination from Yucca Mountain is not likely to mix with carbonate aquifer waters and discharge to the surface a Ash Meadows or Devil's Hole. The Final SEIS further states that because there would be no contamination of the carbonate aquifer *under current conditions*, it is concluded that no human health impacts or impacts to endangered pupfish at Ash Meadows or Devil's Hole are expected. Final SEIS, page 5-23 (§5.4). (Italics added for emphasis.)

Although, the applicant assumes that under current conditions and during future wetter climates, the upper gradient will persist, the LA doesn't assess the possibility that a continuation of current levels of local groundwater pumping and/or additional regional groundwater pumping that is foreseeable in the future could reduce or eliminate the upward gradient. Should such groundwater pumping eliminate the upward gradient, contaminants from the repository could potentially enter the saturated zone migrate to the biosphere at Devil's Hole, Ash Meadows, Amargosa Valley and Death Valley. Recent scientific work done by the County of Inyo indicates that contaminants entering the carbonate aquifer from the repository could migrate to the springs in Death Valley National Park relatively quickly. These springs are the sole source of water for the more than 1.25 million annual visitors to Death Valley National Park.[11]

In a recent report done as part of the County of Inyo's assessment of the repository, Bredehoeft and King, "*The Potential For Contaminants Transport Through the Carbonate Aquifer Beneath Yucca Mountain Nevada*," Hydrodynamics Group LLC, 2008, unpublished, (page 17) (LSN CAL 000000029), modeling calculations revealed that if contaminants from the repository enter the lower carbonate aquifer near Yucca Mountain, the transit time to the biosphere of Death Valley may be less than 100 years. Further, in the same report at page 31, the authors found that when the Death Valley regional groundwater flow system hydrogeologic framework model ("USGS DVRGM") developed by the U.S. Geological Survey *was run for 1000 years at 1995 groundwater pumping levels*, the model predicted drawdown of 10 meters in the lower carbonate aquifer in the vicinity of Yucca Mountain (page 32) and more than 70 meters of additional drawdown in the Amargosa Valley in the next several hundred years. A

[11] Death Valley National Park Information Page, http://www.death.valley.natioal-park.com/info.htm

continuation of current levels of groundwater pumping was not analyzed in the License Application or SAR.

The USGS DVRGM was used by the applicant in the development of the site-scale hydrogeologic framework model (HFM2006), which in turn was used to develop the model used to simulate groundwater flow directions and flow rates of water from beneath the repository to the southern end of the controlled area boundary (LA, §2.3.9.2.2.2, page 2.3.9-16). The applicant's site scale model takes boundary conditions from the USGS DVRGM. Hydrodynamic Group's research has revealed that although he USGS DVRGM was calibrated to water levels observed in the mid 1990s, the model is capable of generating steady-state water levels that do not include the impacts of pumping on water levels. The applicant used the steady-state water levels (that essentially excluded the impacts of a continuation of existing pumping) as the boundary condition for their hydrogeologic Site Model. Consequently, neither the predicted drawdown in the Amargosa Valley, nor the drawdown in the lower carbonate aquifer in the vicinity of Yucca Mountain that will result from a continuation of groundwater pumping at current levels in the vicinity of the repository, was considered in the applicant's analyses of the potential impacts to upward gradient in the lower carbonate aquifer. This deficiency is compounded because not only do the NEPA documents fail to assess a continuation of current groundwater pumping, but also, they fail to assess the potential impacts of reasonably foreseeable regional groundwater pumping.

Both the LA and the Final SEIS acknowledge the possibility of a significant increase local and regional groundwater pumping in the future. For example, on page 8-46 (§8.4.2), the Final SEIS incorporates Chapter 5 of the Rail Alignment EIS. On page 5-37(§5.2.2.6), the Rail Alignment EIS describes potential groundwater development projects—including a massive

groundwater extraction and importation project by the Southern Nevada Water Authority that is located over and within the regional carbonate aquifer. The Rail Alignment EIS states that "…cumulative water use for the projects described above could total more than 430 million cubic meters (350,000 acre-feet) per year." Some of this groundwater may be withdrawn from the lower carbonate aquifer or from areas recharging the lower carbonate aquifer.

Further, the Final SEIS reports, on page 3-85 (§3.1.11.1.1), that by 2050, annual water demand in the Pahrump area could be about 99 million cubic meters (80,000 acre-feet) per year, while the LA, Vol. 1, §5.2.2.6, page 5-56, provides projections that by 2050, the demand for water in Nye County will be 252,000 acre-feet per year-almost 2.5 times the 2000 demand-and that most of this increase will be in Pahrump and some of the increase will be in the Amargosa Valley. The Final SEIS reports, on page 3-85 (§3.1.11.1.1) that possible alternatives for meeting the projected future shortfalls include a managed overdraft of the basin by optimizing the locations of new wells, development of the carbonate aquifer that underlies the basin, importation of water from other basins, and conservation. Finally, neither the LA nor the Final SEIS mention a ruling of the Nevada State Engineer (Ruling 5465, January 4, 2005) (http://water.nv.gov/scans/rulings/5465r.pdf), which has already granted the Southern Nevada Water Authority the right to pump 8,905 acre-feet of groundwater from the Tikapoo and Three Lakes Valley hydrographic basins as part of its regional groundwater importation project. Significantly, in Ruling 5465, the State Engineer found that groundwater in Tikapoo and Three Lakes Valleys eventually discharges through the lower carbonate aquifer at Ash Meadows and Death Valley.

Without question, a continuation of current levels of groundwater pumping in the future is reasonably foreseeable, and an increase in regional groundwater pumping is certainly

foreseeable. As shown by the County's recent report, such groundwater pumping has the potential to cause drawdown in both the volcanic-alluvial aquifer and the lower carbonate aquifer and to potentially impact the upward gradient in the lower carbonate aquifer. If the upward gradient is eliminated, it will no longer be a barrier to contaminants from the repository entering the lower carbonate aquifer and then potentially rapidly entering the accessible environment.

In conclusion, neither the NEPA documents nor the LA comply with applicable laws, regulations, and standards requiring an adequate assessment of the potential flow path of radionuclides from the repository through the saturated zone to the accessible environment where the contaminants may affect human health and threatened species. In the absence of an adequate assessment of the cumulative impacts of the repository in combination with a continuation of current levels of groundwater pumping and a future increase in regional groundwater pumping on the saturated zone, this Commission cannot determine "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(1). Further, this Commission cannot determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(2). For those reasons, this Commission should find the NEPA documents fail to completely and adequately evaluate the nature and extent of the repository's cumulative impact on groundwater in the lower carbonate aquifer.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's 2008 Final SEIS and 2002 FEIS because neither has provided a complete and adequate discussion of the nature and extent of the cumulative impacts of the repository in combination with a continuation of current levels of groundwater pumping and a future increase in regional groundwater pumping on the saturated zone and of the potential for contaminants migration through the saturated zone. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts on groundwater and contaminants entry into the biosphere would be materially different. As a result, the Final EIS and Final SEIS cannot be adopted by the NRC.

The specific portion of the LA that is being challenged includes the Final EIS, Volume I, Chapter 5; and the Final SEIS, Volume I, Chapter 3, § 3.1.4.2, Vol. I, section 5.4, and Vol. III, Chapter 1, subchapter 1.7.4.

CONTENTION NO. 5
INY-NEPA-3

FAILURE TO PROVIDE A COMPLETE AND ADEQUATE DISCUSSION OF THE NATURE AND EXTENT OF THE REPOSITORY'S CUMULATIVE IMPACT ON GROUNDWATER IN THE VOCANIC-ALLUVIAL AQUIFER.

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(I)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the cumulative environmental impacts of the proposed repository on groundwater in the volcanic-alluvial aquifer.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

The Final EIS and the Final SEIS are inadequate because neither document has provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer. Because of these deficiencies, the documents are incomplete and inadequate pursuant to NEPA and NRC regulations at 10 CFR 51. As a result, the FEIS and Final SEIS cannot be adopted by the NRC.

Moreover, the NRC staff has concluded that the information provided in the Final EIS and in the Final SEIS do not adequately characterize how potential contaminants may affect

groundwater resources in the volcanic-alluvial aquifer, and has ordered supplementation by DOE to ensure the 2002 EIS and the Repository Supplemental EIS are adequate.[12] Absent supplementation that adequately evaluates these impacts, the FEIS and FSEIS cannot be adopted by the NRC.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

This contention raises an issue whether DOE has complied with NEPA, the Council on Environmental Quality (CEQ) regulations, and the NRC NEPA regulations; pursuant to 10 C.F.R. §§ 51.109(a)(2) and 63.31(c), and section II, paragraph 1 of the Notice of Hearing, this contention is within the scope of the hearing. (Also see number 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository are practicable for adoption, the NRC must find that all requirements of NEPA have been satisfied. (*NEI v EPA*, 373 F.3d at 1314). An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 C.F.R. 51.109(c), which makes the NEPA documents not practicable for adoption. (Notice of Hearing Section IIIB, 73 Fed. Reg. 63031 (October 22, 2008).) The NEPA documents are inadequate and not practicable for adoption because they fail to assess the environmental impacts of the proposed Yucca Mountain Repository, namely they have not provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-

[12] U.S. Nuclear Regulatory Commission's Staff's Adoption Determination Report for the U.S. Department of Energy's Environmental Impact Statements for the Proposed Geologic Repository at Yucca Mountain, September 5, 2008, p. 3-10 (NRC Staff Report)

alluvial aquifer in a manner that is consistent with NEPA, the CEQ guidelines and NRC guidance and applicable regulations. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Environmental impacts of the proposed repository over the long-term are considered in Volume I, Chapter 5 of the 2002 EIS and Volume I, Chapter 5 of the 2008 Final SEIS discuss the potential environmental impacts of the proposed repository over the long term. The subject matter of these chapters concerns the potential repository impacts on groundwater, and on human health through a groundwater pathway. As components of the engineered barrier system within the repository slowly corrode and lose their capability to contain their contents, the release of materials, both radioactive and non-radioactive, would then be the source of impacts on groundwater.

DOE is obligated under NEPA to provide a complete evaluation and disclosure of the impacts from the proposed repository. 10 CFR § 51.109(c)(2) provides that it is not practicable to adopt any environmental impact statement prepared by the Secretary of Energy in connection with a geologic repository proposed to be constructed if there is "[s]ignificant and substantial new information or new considerations [that would] render such environmental impact statement inadequate." The failure of the NEPA documents to completely and adequately characterize potential contaminant releases to groundwater including within the lower carbonate aquifer is a significant new consideration that renders the NEPA documents inadequate.

As noted by the NRC staff, potential contaminants have limited means of leaving the volcanic-alluvial aquifer (radioactive decay is a principal means for lowering the levels of many of the radiological contaminants).[13] The staff further notes that the NEPA documents characterize radionuclide impacts on groundwater by calculating doses and concentrations for an annual contaminant release captured by well withdrawal of a given volume of groundwater. This methodology assumes that the full amount of contaminants released each year is removed by groundwater withdrawal, to avoid possibly underestimating annual peak doses or radionuclide levels for regulatory compliance with 10 CFR 63. NRC staff further noted that because the annual flux of contaminants is assumed to be removed, the extent of contamination and accumulation in the aquifer of releases over multiple years is not fully considered. The NRC staff concluded that or both radiological and nonradiological contaminants, the NEPA documents do not characterize contamination in the aquifer if annual withdrawal did not occur. [14]

As noted by the NRC staff, the NEPA documents have not provided complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer and require a supplement be prepared that includes a description of the full extent of the volcanic-alluvial aquifer, particularly those parts that could become contaminated, and how water (and potential contaminants) could leave the flowsystem.[15] The staff noted that the DOE License Application describes potential groundwater flow farther to the south of Alkali Flats, into the Southern Death Valley subregion of the regional domain (DOE, 2008, General Information, Section 5.2.2.2). However, this component of the groundwater flow system is not discussed in the NEPA documents. The County agrees with the

[13] NRC Staff Report, p. 3-10.

[14] NRC Staff Report, p. 3-10.

[15] NRC Staff Report, p. 3-10

NRC staff's conclusions that the EISs have not provided complete and adequate discussion and evaluation of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer.

As defined in 40 CFR 1508.7, cumulative effects are those impacts that result from incremental impacts of a proposed action when added to other past, present and reasonably foreseeable future actions, regardless of whether a federal or nonfederal agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that can take place over time. CEQ recommends that action causing cumulatively significant impacts be examined in an EIS (40 CFR 1508l25(a)(2). The federal courts have required that an agency take a "hard look" at the cumulative effects of a project, *Oregon Natural Resources Council v. Marsh*, 52 F. 3d 1485 (9th Cir. 1995).

As noted in the NRC staff's Adoption report,[16] DOE's analysis of the postclosure behavior of the repository recognizes that the release of contaminants to groundwater can be expected over the long term[17] (DOE, 2008b, Chapter 5).The NRC staff further concluded that this is a reasonably foreseeable outcome for a repository. [18] The NEPA documents consider impacts to groundwater, but the analysis does not provide adequate discussion of the cumulative amounts of radiological and non-radiological contaminants that may enter the groundwater over time, and how these contaminants would behave in the aquifer and related environment.

The discussion of groundwater impacts in the EISs is not consistent with NRC regulations for completeness and adequacy of the discussion of environmental consequences of the proposed action [e.g., 10 CFR Part 51, Appendix A(7)]. The EISs consider impacts to groundwater, but the analysis does not provide adequate discussion of the cumulative amounts of

[16] NRC Staff Report, p. 3-10.
[17] NRC Staff Report, p. 3-10.
[18] NRC Staff Report, p. 3-10.

radiological and non-radiological contaminants that may enter the groundwater over time, and how these contaminants would behave in the aquifer and related environment. In this instance, the incomplete and inadequate characterization itself constitutes a significant consideration, irrespective of the magnitude of potential impacts.

In the Final EIS and Final SEIS, impacts on groundwater are discussed principally as those defined for regulatory compliance. However, 10 CFR § 51.71 and 10 CFR Part 51, Subpart A, Appendix A(7) indicate that compliance with regulatory requirements does not necessarily satisfy the need to consider the environmental impacts of the proposed action. Simply stated, the failure of DOE to completely and adequately characterize potential contaminant releases to groundwater within the volcanic-alluvial aquifer renders the NEPA documents inadequate, and further analysis is necessary and environmental statement supplementation is needed.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges the adequacy of the Final EIS and the Final SEIS because neither has provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the volcanic-alluvial aquifer. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts on groundwater would be materially different. As a result, the FEIS and FSEIS cannot be adopted by the NRC.

The specific portion of the LA that is being challenged is the Final EIS, Volume I, Chapter 5; and the Final SEIS Volume I, Chapter 6, subchapter 6.2.2.

CONTENTION NO. 6
INY-NEPA-4

FAILURE TO PROVIDE A COMPLETE AND ADEQUATE DISCUSSION OF THE NATURE AND EXTENT OF THE REPOSITORY'S CUMULATIVE IMPACT FROM SURFACE DISCHARGE OF GROUNDWATER

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(I)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the impacts to public health and safety and other cumulative environmental impacts the discharge of potentially contaminated groundwater to the surface.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(F)(1)(II)]

The Final EIS and the Final SEIS are inadequate because neither has provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact from the discharge of potentially contaminaed groundwater to the surface, and how such contaminated groundwater would impact the environment at the discharge sources within Inyo County

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

The Commission's regulations in 10 C.F.R. §§ 51.109(a)(2) and 63.31(c), and section II, paragraph 1 of the notice of hearing, provide that this issue is within the scope of the hearing. (Also see section 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository are practicable for adoption, the NRC must find that all requirements of NEPA have been satisfied. (*NEI v EPA* 373 F.3d at 1314). An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 C.F.R. 51.109(c), which makes the NEPA documents not practicable for adoption. (Notice of Hearing Section IIIB, 73 Fed. Reg. 63031 (October 22, 2008).) The NEPA documents are inadequate and not practicable for adoption because they fail to assess the public health and safety and other environmental impacts from the discharge of potentially contaminated groundwater to the surface. In fact, NRC staff have ordered supplementation by DOE to ensure the 2002 EIS and the Repository Supplemental EIS are adequate. Absent supplementation, the FEIS and Final SEIS cannot be adopted by the NRC. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

As stated in the License Application, groundwater moves from Yucca Mountain toward Death Valley (LA, Vol. 1, §5.2.2.2.2, page 5-46) flowing in volcanic and alluvial aquifers to discharge naturally at Franklin Lake Playa, and possibility as spring discharge in Death Valley, and flows through the lower carbonate aquifer to discharge at Ash Meadows and Devil's Hole (Final SEIS, §5.4, page 5-23). The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley."

Not only is contaminated groundwater surfacing within Inyo County a concern, but also, the flow paths for surface water within the Amargosa River Basin terminate in Death Valley National Park. Yucca Mountain is located within the Amargosa River Basin. (SEIS, Vol. 1, §3.1.4.1.1, p. 3-26.) Consequently, contaminants can reach Inyo County through underground or surface flow paths. In the Final EIS, DOE acknowledged that 69,500 people could be exposed to contaminated groundwater at Franklin Lake Playa during the next 10,000 years.[19]

The County of Inyo has identified potential impacts from contaminated groundwater in the Death Valley region from the repository. These include impacts on wildlife, habitat, and public parks. While, the Final SEIS focuses much of its analysis on the Alkali Flat-Furnace Creek groundwater basin of Death Valley, an area that DOE acknowledges is the area that the proposed repository "could affect the most" (Final SEIS, Volume I, Ch.3, p.3-31), NEPA requires that DOE provide a complete evaluation and disclosure of impacts from the proposed action. The Final EIS and Final SEIS both fail to assess the public health and safety and other

[19] Final EIS, Chapter 5, pages 5-24-25 (DOE-EIS-0250) 2002.

environmental impacts from the discharge of potentially contaminated groundwater to the surface.

Both the Final EIS and the Final SEIS acknowledge the likelihood of future discharges of contaminated groundwater to the surface. As noted in the NRC Staff Report, the NEPA documents indicate possible surface discharge at Franklin Playa, as the result of radionuclide migration through groundwater to surface discharge points (Final EIS, Section 5.9; Final SEIS, Sections 5.10 and 5-11.)[20] The discussion in these sections regarding potential impacts from potential groundwater discharges is limited to a statement that no detrimental radiological impacts on plants and animals from the migration of radioactive materials are expected.

The Final SEIS on p. 3-35 notes that DOE's evaluation of geochemical data indicates that the deep underflow of groundwater from the underlying carbonate aquifer that contributes to discharges in the Ash Meadows area is the primary source of the spring discharge in Death Valley (DIRS 177391-SNL 2007). DOE's responses to comments on the Final SEIS restate its conclusion that any potential impacts from surface discharges would be no greater than those of the RMEI (reasonably maximally exposed individual) represented by doses associated with groundwater withdrawal and use at the ~18-km (11-mi) location (DOE, 2008b, Volume III, response to Comment RRR000524/0030, page CR–497, and Comment RRR000690/0013, page CR–330, respectively). This reliance on the RMEI standard adopted by DOE has resulted in an inadequate analysis into the potential impacts from future discharges of contaminated groundwater within Inyo County.

The NRC staff noted that one of the major areas of potential impacts on the groundwater

[20] U.S. Nuclear Regulatory Commission Staff's Adoption Determination Report for the U.S. Department of Energy's Environmental Impact Statements for the Proposed Geologic Repository at Yucca Mountain, September 5, 2008, p. 3-9.

system that has been insufficiently characterized in the NEPA documents and requires supplementation is in the area of potential impacts from the discharge of potentially contaminated groundwater to the surface.[21] The NRC staff further concluded that the NEPA documents have not provided a complete and adequate discussion of the impacts on soils and surface materials from the processes involved in surface discharges of contaminated groundwater and recommended that a supplement be prepared that includes a description of the locations of potential discharge of contaminated groundwater for present and expected future wetter periods (for example, as discussed in DOE, 2008a, Safety Analysis Report, Section 2.3.1.2).[22]

The NRC Staff noted that spring deposits that provide evidence for past discharge of groundwater to the surface are common in the Yucca Mountain region, including fossil deposits that formed during past wetter climates.[23] The paleoclimate record indicates that future wetter periods are reasonably expected for the region (e.g., DOE, 2008a, Safety Analysis Report, Section 2.3.1.2). Future surface discharges during wetter periods may involve larger volume (higher flow rate) of water and contaminants, and different conditions for deposition and removal, compared to present conditions.

While DOE discounts the potential for contaminants to reach the lower carbonate aquifer, DOE's modeling demonstrates that contaminants from the repository could nevertheless find their way to the Death Valley springs even they did not reach the lower carbonate aquifer. (Repository SEIS Volume I, Chapter 3, p.3-24.) Additionally, the U.S. Geological Survey's regional hydrogeologic framework model concludes that the potential exists for the carbonate rocks beneath the Funeral Mountains to provide a pathway for flow from the alluvial aquifers

[21] NRC Staff Report, p. 3-10.
[22] NRC Staff Report, p. 3-12.
[23] NRC Staff Report , p. 3-11.

beneath the Amargosa Desert towards Death Valley. (DIRS 173179-Belcher 2004. P. 155)

The Final SEIS notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley." This conclusion is supported by recent research conducted by the County of Inyo. See, Bredehoeft, Fridrich and King, *Groundwater Flow Through the Funeral Mountains, Death Valley National Park, California*, Hydrodynamics Group, LLC, 12th IHLRWM, Las Vegas, NV, September 7-11, 2008 LSN No. CAL 000000030), and Bredehoeft and King, *The Potential for Contaminant Transport Through the Carbonate Aquifer Beneath Yucca Mountain, Nevada*, Hydrodynamics Group LLC, unpublished, (LSN No. 000000029).

The research conducted by Inyo County, as well as DOE's own analysis in the Final SEIS, demonstrates that groundwater discharged in the Death Valley National Park is mixed with groundwater sources from the Ash Meadows area and the Amargosa Desert. NEPA requires that the discharge points within Inyo County must be fully analyzed and evaluated in the NEPA documents. Inyo County agrees with the NRC staff conclusion that the NEPA documents have not provided a complete and adequate discussion of the impacts from surface discharges of contaminated groundwater.[24]

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges the Final EIS and the Final SEIS because neither has provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact from the discharge of potentially contaminated groundwater to the surface.

[24] NRC Staff Report, p. 3-10.

This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts from the discharge of potentially contaminated groundwater to the surface would be materially different. As a result, the Yucca Mountain FEIS and Repository SEIS cannot be adopted by the NRC.

The specific portion of the License Application that is being challenged is the Yucca Mountain FEIS, Volume I, Chapter 5; and the Final SEIS, Volume I, Chapter 3.

CONTENTION NO. 7

INY-NEPA-5

FAILURE TO PROVIDE A COMPLETE AND ADEQUATE DISCUSSION OF THE NATURE AND EXTENT OF THE NECESSARY MITIGATION AND REMEDIATION MEASURES FOR RADIONUCLIDES SURFACING AT ALKALI FLAT/FRANKLIN LAKE PLAYA

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(I)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the necessary mitigation and remediation measures that are necessary to protect the public health and safety and they do not adequately analyze other environmental impacts from radionuclides surfacing within Inyo County, California.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(F)(1)(II)]

The Final EIS and the Final SEIS are inadequate because neither has analyzed the necessary mitigation and remediation measures to protect the public health and safety and other environmental impacts from radionuclides traveling through the saturated zone and surfacing

within Inyo County. Rather, DOE defers mitigation and remediation planning to such time that "detection of any unusual conditions in groundwater" would assumedly occur. For these reasons, the Final EIS and the Final SEIS cannot be adopted by the NRC.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

This contention raises an issue whether DOE has complied with NEPA, the CEQ regulations, and the NRC NEPA regulations; pursuant to 10 C.F.R. § 51.109(a)(2), 10 C.F.R. § 63.31(c) and section II, paragraph 1 of the Notice of Hearing, this contention is within the scope of the hearing. (Also, see section 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository are practicable for adoption, the NRC must find that all requirements of NEPA have been satisfied. (*NEI v. EPA*, 373 F.3d at 1314.) An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 C.F.R. § 51.109(c), which makes the NEPA documents not practicable for adoption. (Notice of Hearing Section IIIB, 73 Fed. Reg. 63,031 (Oct. 22, 2008).) The NEPA documents are inadequate and not practicable for adoption because they fail to assess the environmental impacts of the proposed Yucca Mountain Repository, namely they have not analyzed the necessary mitigation and remediation measures to protect the public health and safety and other environmental impacts from radionuclides surfacing within Inyo County in a manner that is consistent with NEPA, the

Council on Environmental Quality (CEQ) guidelines and NRC guidance and applicable regulations. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

The discussion of mitigation and remediation measures to protect the public health and safety and other environmental impacts in the NEPA documents is not consistent with NRC regulations for completeness and adequacy of the discussion of environmental consequences of the proposed action [e.g., 10 CFR part 51, Appendix A(7)]. In this instance, the incomplete and inadequate characterization itself constitutes a significant consideration, irrespective of the magnitude of potential impacts.

DOE acknowledged in the Final EIS that groundwater from the volcanic aquifers under the repository comes to the surface at Franklin Lake Playa and Alkali Flat, near Death Valley Junction, in California. (Final EIS Volume I, Ch.3, p.3-41.) However, DOE does not offer any plan for remediation of those potentially contaminated sites. In Chapter 9, p. 9-8 and 9-9 DOE commits to conducting monitoring activities including monitoring groundwater quality, but no details are provided.

It is DOE's obligation to implement a mitigation and remediation plan for radionuclides transported by groundwater that could surface in Inyo County, for example, at Alkali Flat / Franklin Lake Playa, east of the community of Death Valley Junction. As stated in the License Application, groundwater moves from Yucca Mountain toward Death Valley (LA, Vol. 1, §5.2.2.2.2, page 5-46) flowing in volcanic and alluvial aquifers to discharge naturally at Franklin Lake Playa, and possibility as spring discharge in Death Valley, and flows through the lower

carbonate aquifer to discharge at Ash Meadows and Devil's Hole (Final SEIS, §5.4, page 5-23). The Final SEIS also notes on page 3.35 (§3.1.4.2.1) that the carbonate aquifer beneath Yucca Mountain "is the primary source of spring discharge in Death Valley."

Not only is contaminated groundwater surfacing within Inyo County a concern, but also, the flow paths for surface water within the Amargosa River Basin terminate in Death Valley National Park. Yucca Mountain is located within the Amargosa River Basin. (SEIS, Vol. 1, §3.1.4.1.1, p. 3-26.) Consequently, contaminants can reach Inyo County through underground or surface flow paths. In the Final EIS, DOE acknowledged that 69,500 people could be exposed to contaminated groundwater at Franklin Lake Playa during the next 10,000 years.[25]

DOE has suggested that it may defer its analysis of the necessary mitigation and remediation measures to protect the public health and safety and other environmental impacts until such time that there has been "detection of any unusual conditions in the groundwater."[26] DOE relies on 10 CFR § 63.161 to justify its deferral of its obligation to analyze the appropriate mitigation and remediation measures. That section provides:

> DOE shall develop and be prepared to implement a plan to cope with radiological accidents that may occur at the geologic repository operations area, at any time before permanent closure and decontamination or decontamination and dismantlement of surface facilities. The emergency plan must be based on the criteria of § 72.32(b) of this chapter.

It is DOE's position that they are not required to develop a plan for mitigation and remediation until after the facility has been licensed, rather than during the licensing phase. According to DOE, "[d]uring the active, preclosure phase of the project, DOE would be required by NRC regulations (10 CFR § 63.131) to develop and be prepared to implement an emergency plan to cope with radiological accidents that may occur at the

[25] Final EIS, Chapter 5, pages 5-24-25 (DOE-EIS-0250) 2002.

[26] Final SEIS, Vol. III, Comments—Response Document, 1.21.1 (84) Impacts Mitigation, p. CR-527.

repository operations area."[27] However, 10 CFR § 63.131 also requires that the emergency plan must be based on the criteria of § 72.32(b). That section provides:

> (b) Each application for an MRS that is licensed under this part and each application for an ISFSI that is licensed under this part and that may process and/or repackage spent fuel, must be accompanied by an Emergency Plan that includes the following information:
>
> (1) Facility description. A brief description of the licensee facility and area near the site.
>
> (2) Types of accidents. An identification of each type of radioactive materials accident.
>
> (3) Classification of accidents. A classification system for classifying accidents as "alerts" or "site area emergencies."
>
> (4) Detection of accidents. Identification of the means of detecting an accident condition.
>
> (5) Mitigation of consequences. A brief description of the means of mitigating the consequences of each type of accident, including those provided to protect workers on site, and a description of the program for maintaining the equipment.

In the NEPA documents, DOE asserts that it may defer its mitigation and remediation analysis until the active, preclosure phase, well after the license to construct the Yucca Mountain repository has been granted. While DOE may be correct that it may not be required to "implement an emergency plan to cope with radiological accidents that may occur at the geologic repository operations area at any time before permanent closure," § 72.32(b) requires that the LA include an emergency plan. Such an emergency plan cannot be developed absent an adequate analysis into the necessary mitigation and remediation measures to protect the public health and safety and other environmental impacts.

NRC's NEPA regulations in Part 51 and guidance in NUREG–1748 indicate that

[27] Final SEIS, Vol. III, Comments—Response Document, 1.21.1 (84) Impacts Mitigation, p. CR-527.

compliance with regulatory requirements does not necessarily satisfy the need to consider the environmental impacts of the proposed action. The regulations and guidance recognize that further analysis and discussion may be needed [e.g., 10 CFR § 51.71; 10 CFR part 51, Subpart A, Appendix A(7)].

While surface water is not expected to be impacted by repository operations within the mountain, there will be numerous surface facilities present that will store waste on a temporary basis. DOE must conduct specific analysis of impacts to these facilities in case of a flood event, as any hazardous materials or radioactive waste on the surface carried off by floodwaters would enter the Amargosa River drainage. If DOE waits until the facility is in the "active, preclosure phase" to develop a mitigation or remediation plan, such a plan would do nothing to protect the public health and safety and other environmental impacts in the event of a flood before such plans were developed. The NRC must require that the DOE conduct the necessary analysis into these potential impacts as a part of the NEPA documents and License Application.

Until DOE has submitted a mitigation and remediation plan for radionuclides that would surface within California at Alkali Flat / Franklin Lake Playa, the analysis in the NEPA documents with respect to public health and safety and other environmental impacts from surface renders the relevant portions of those environmental documents insufficient.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's 2008 Repository SEIS and 2002 Yucca Mountain FEIS because neither has analyzed and discussed the necessary mitigation and remediation measures to protect the public health and safety and other environmental impacts from

radionuclides transported in groundwater and surfacing in California, for example, at Alkali Flat/ Franklin Lake Playa. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts from the potentially contaminated surface water would be materially different. As a result, the Yucca Mountain FEIS and Repository SEIS cannot be adopted by the NRC.

The specific portion of the LA that is being challenged is Yucca Mountain FEIS, Volume I, Chapter 3, Chapter 5, and Chapter 9; and the Repository SEIS, Volume I, Chapter 3, and Volume III, Chapter 1.

CONTENTION NO. 8

INY-SAFETY-3

FAILURE TO ADEQUATELY DESCRIBE AND ANALYZE THE VOLCANIC FIELD IN THE GREENWATER RANGE IN AND ADJACENT TO DEATH VALLEY NATIONAL PARK

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(i)]

The applicant (or "DOE") failed to include in the Yucca Mountain Repository License Application ("LA") and Safety Analysis Report ("SAR") and description and analysis of the probability of igneous activity disrupting the site of the proposed repository. The applicant reports in the SAR in sections 2.2.2.2.3.1, 2.3.11.2.2 and related sections, that the probability of igneous activity disrupting a repository drift is 1.7 x 10-8 events/year. The *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") reports in section 3.1.3.1.3 (page 3-21) that the average probability of such activity is 1 chance in 6,300 that a volcanic dike could disrupt the repository during the first 10,000 years. These estimates underestimate the probability of igneous activity, likely by two or more orders of magnitude, because the applicant does not include the Death Valley volcanic field in the Greenwater Range as part of the area to be considered for hazard calculations.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

SAR Subsections 2.2.2.2, 2.2.2.2.3.1, 2.3.11.2.1.1, and 2.3.11.2.2.5 claim that the essential characteristics of the age and location of basaltic volcanism near Yucca Mountain were fundamentally understood when the "probabilistic volcanic hazard analysis" ("PVHA") was completed in 1996. (The PVHA described the estimated annual frequency of intersection of the repository by an igneous event.) The claim in the SAR ignores volcanic activity in the

Greenwater Range just 20 km south of buried basalt in Amargosa Valley and within approximately 50 kilometer (30 miles) of the proposed repository site. The volcanic rocks in the Greenwater Range have chemical, mineralogical and age similarities to those near Yucca Mountain and clearly represent the southern extension of the field of volcanoes about Yucca Mountain. This larger volcanic field, therefore, should be considered in any calculation of repository disruption by volcanic activity.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

This contention raises an issue whether DOE (or the "applicant") has complied with the NRC requirements applicable to Yucca Mountain, and falls within the scope of the hearing as specified in section II, paragraph 1 of the Notice of Hearing. (Also, see number 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

10 C.F.R. § 63.31(a)(2) states that the NRC may authorize issuance of a construction authorization for Yucca Mountain if it determines that there is reasonable assurance or expectation the materials described in the application can be disposed of without unreasonable risk to the health and safety of the public. In reaching this determination, 10 C.F.R. § 63.31(a)(3) requires the application to satisfy the requirements in 10 C.F.R. § 63.21, and the site and design to comply with Subpart E of 10 C.F.R. Part 63. 10 C.F.R. § 63.21(c)(9) requires an assessment to determine the degree to which features, events and processes of the site that are expected to materially affect compliance with Section 63.113 have been characterized, and paragraph (c)(15) requires adequate support for the models used to provide the information required in paragraph (c)(9). 10 C.F.R. § 63.114 (part of Subpart E) requires a performance assessment to be completed to evaluate the ability of the engineered barrier system along with

natural barriers to meet the performance objectives of Section 63.113, and this performance assessment must include consideration of the probability and consequences of events and processes identified under 10 C.F.R. § 63.21 (c)(9).

Further, Guidance regarding the NRC staff evaluation of the adequacy of the LA's evaluation of the probability for future volcanic events applicable to the repository is provided in the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Review Method 2, Probability Criteria, page 2.2-11 provides in pertinent part that NRC should:

> *Verify that probability estimates for future igneous events have considered past patterns of igneous events in the Yucca Mountain region. Evaluate the adequacy and sufficiency of the U.S. Department of Energy characterization and documentation of past igneous activity. This should include uncertainties about the distribution, timing and characteristics of past igneous activity. <u>Confirm that, at a minimum, documentation of past igneous activity, since about 12 million years ago, encompasses the area within about 50 kilometers (30 miles) of the proposed repository site. Give particular attention to the documentation of the locations, ages, volumes, geochemistry, and geologic settings of less than 6-million-year-old basaltic igneous features, such as cinder cones, lava flows, igneous dikes and sills.</u> Verify that the U.S. Department of Energy used geological and geophysical information relevant to past igneous activity contained in the literature.* (Underlining added for emphasis.)

This contention alleges non-compliance with these regulatory provisions and therefore raises a material issue within the scope of the licensing proceeding.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

DOE asserts that the size and shape of the volcanic field about Yucca Mountain is well known and that the hazard estimates made by experts that comprised the PVHA panel in 1996 are still valid. Even after considering buried volcanic centers discovered after 1996, DOE claims in SAR Subsection 2.2.2.2 at page 2.2-91 that "[t]he results also show that the effects of buried volcanic centers on the hazard estimate are modest (Section 2.3.11.2.2.6)**,** and the updated hazard estimate is robust and suitable for use in the license application and supporting TSPA calculations."

However, the Yucca Mountain volcanic field should be expanded to include the volcanoes of the Greenwater Range near Death Valley. Recent research by Eugene I. Smith, the County of Inyo's consultant on volcanism, supports this contention.

- First, volcanic activity in the Greenwater Range is associated with at least 17 volcanic centers and occurred after about 5 million years ago, contemporaneous with activity near Yucca Mountain. *See* "Geologic Map of California -- Death Valley Sheet, with Index and Stratigraphic Nomenclature" (01/01/1974), LSN# DN2001741565, solo page.
- Second, basalt from Death Valley is very similar in major and trace element chemistry to basalt from Crater Flat. Trace-elements usually better characterize volcanic rocks than do major elements and are considered as fingerprints that are commonly used to correlate volcanic rocks from area to area. For comparison purposes, volcanic rocks are usually normalized to a standard rock like average ocean island basalt. Plots of trace elements versus normalized concentration show

characteristic patterns that can be used to fingerprint and compare rocks from different volcanic fields. Comparing Death Valley and Crater Flat basalt on such a plot shows that they share a similar pattern. Especially characteristic is low Nb and high Rb, Th and U. See "Report of Research Activities in 2007 Prepared to Satisfy the Requirements of a Clark County Contract for Volcanic Hazard Assessment of the Proposed Nuclear Waste Repository at Yucca Mountain, Nevada" (07/08/2008), LSN# CLK000000071, at 10-13.

- Third, Strontium (Sr) and neodymium (Nd) isotopes for Greenwater Range basalts (see Asmerom, Y., Jacobsen, S.B., and Wernicke, B.P., "Variations in Magma Source Regions During Large Scale Continental Extension, Death Valley Region, Western United States," EARTH AND PLANETARY SCIENCE LETTERS, Vol. 125 (1994) at 235-254) are identical to isotopic analyses from Crater Flat. Basalts in both areas have low epsilon Nd values (between -9.95 and -12), and high 87Sr/86Sr (0.7069-0.7073). *See* CLK000000071, at 10-13.
- Fourth, basalts in both the Crater Flat and Death Valley areas are similar in mineralogy and contain olivine as the major phenocrysts phase. Plagioclase is rare and usually occurs as microlites in the matrix.

The close geographic proximity to Crater Flat, similar age of eruption, similar mineralogy and major element chemistry, distinctive trace element patterns and distributions, and identical isotopic ratios demonstrate that Death Valley basalt in the Greenwater Range is closely associated with Yucca Mountain basalt. Hazard assessment for Yucca Mountain should consider the Greenwater volcanoes near Death Valley as part of field of

volcanoes about Yucca Mountain. Indeed, the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Review Method 2, Probability Criteria, page 2.2-11, directs that NRC staff "[*C]onfirm that, at a minimum, documentation of past igneous activity, since about 12 million years ago, encompasses the area within about 50 kilometers (30 miles) of the proposed repository site. Give particular attention to the documentation of the locations, ages, volumes, geochemistry, and geologic settings of less than 6-million-year-old basaltic igneous features, such as cinder cones, lava flows, igneous dikes and sills.*" Such an analysis is not presented in the LA and the SAR; therefore, calculations of repository disruption that ignore the Death Valley field underestimate the probability of repository disruption by igneous activity.

In summary, SAR Subsections 2.2.2.2, 2.2.2.2.3.1, 2.3.11.2.1.1, 2.3.11.2.2.5 claim that the essential characteristics of the age and location of basaltic volcanism near Yucca Mountain were fundamentally understood when the PVHA was completed in 1996. This statement ignores volcanic activity in the Greenwater Range just 20 km south of buried basalt in Amargosa Valley. Volcanic rocks in the Greenwater Range have chemical, mineralogical and age similarities to those near Yucca Mountain and clearly represent the southern extension of the field of volcanoes about Yucca Mountain. This larger volcanic field, therefore, should be considered in any calculation of repository disruption by volcanic activity.

In conclusion, the LA and the SAR do not comply with applicable laws and regulations requiring an adequate assessment of the probability of volcanic intrusion into the proposed repository. In the absence of an adequate assessment in the LA and SAR of the such a risk this Commission cannot determine "[T]hat there is reasonable assurance that the types and amounts of radioactive material described in the application can be received and possessed in a geologic repository operations area of the design proposed without unreasonable risk to the health and

safety of the public" as required by 10 CFR 31(a)(1), nor can it determine "[T]hat there is a reasonable expectation that the materials can be disposed of without unreasonable risk to the health and safety of the public" as required by 10 CFR 31(a)(2). For those reasons, this Commission should find the LA inadequate.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges SAR Subsections 2.2.2.2, 2.2.2.2.3.1, 2.3.11.2.1.1, 2.3.11.2.2.5, which claim that the essential characteristics of the age and location of basaltic volcanism near Yucca Mountain were fundamentally understood when the PVHA was completed in 1996, ignoring volcanic activity in the Greenwater Range just 20 km south of buried basalt in Amargosa Valley and within approximately 50 kilometers (30 miles) of the proposed repository. Had this activity been considered, then SAR Subsections 2.2.2.2.3.1, 2.3.11.2.2 and related sections, which indicate that the probability of igneous activity disrupting a repository drift is 1.7 x 10-8 events/year, would have had to be revised, as they underestimate that probability, likely by two or more orders of magnitude.

The specific portion of the LA that is being challenged includes SAR Subsections 2.2.2.2, 2.2.2.2.3.1, 2.3.11.2.1.1, and 2.3.11.2.2.5, which claim that the essential characteristics of the age and location of basaltic volcanism near Yucca Mountain were fundamentally understood when the PVHA was completed in 1996, ignoring volcanic activity in the Greenwater Range just 20 km south of buried basalt in Amargosa Valley and within approximately 50 kilometers (30 miles) of the proposed repository.

CONTENTION NO. 9

INY-NEPA-6

FAILURE TO ADEQUATELY DESCRIBE AND ANALYZE THE DESCRIBE AND ANALYZE THE VOLCANIC FIELD IN THE GREENWATER RANGE IN AND ADJACENT TO DEATH VALLEY NATIONAL PARK THUS FAILING TO ASSESS THE POTENTIAL ENVIRONMENTAL IMPACTS RESULTING FROM IGNEOUS ACTIVITY THAT COULD DISRUPT THE RESPOSITORY

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(i)]

The applicant (or "DOE") failed to include in the Yucca Mountain Repository License Application ("LA"), Safety Analysis Report ("SAR"), *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") and *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") an adequate description and analysis of the probability of igneous activity disrupting the site of the proposed repository. This omission is the result of ignoring the Death Valley volcanic field in the Greenwater Range as part of the area to be considered for hazard calculations. As a result of this omission, the documents underestimate the probability of igneous activity, likely by two or more orders of magnitude; thus, neither the Final EIS nor the Final SEIS adequately describe the potential environmental impacts that may result from igneous activity disrupting the repository.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(f)(1)(ii)]

SAR Subsections 2.2.2.2, 2.2.2.2.3.1, 2.3.11.2.1.1, and 2.3.11.2.2.5 claim that the essential characteristics of the age and location of basaltic volcanism near Yucca Mountain were

fundamentally understood when the "probabilistic volcanic hazard analysis" ("PVHA") was completed in 1996. (The PVHA described the estimated annual frequency of intersection of the repository by an igneous event.) The claim in the SAR ignores volcanic activity in the Greenwater Range just 20 km south of buried basalt in Amargosa Valley and within approximately 50 kilometer (30 miles) of the proposed repository site.

The volcanic rocks in the Greenwater Range have chemical, mineralogical and age similarities to those near Yucca Mountain and clearly represent the southern extension of the field of volcanoes about Yucca Mountain. This larger volcanic field, therefore, should be considered in any calculation of repository disruption by volcanic activity. As a result of ignoring these volcanoes, the applicant underestimates the probability of igneous activity disrupting the repository, likely by two or more orders of magnitude. Thus, neither the Final EIS nor the Final SEIS adequately describe the potential cumulative environmental impacts that may result from igneous activity disrupting the repository and are inadequate pursuant to NEPA and NRC regulations at 10 CFR 51. As a result, the FEIS and Final SEIS cannot be adopted by the NRC.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

This contention raises an issue whether DOE has complied with NEPA, the Council on Environmental Quality (CEQ) regulations, and the NRC NEPA regulations; pursuant to 10 CFR 51.109(a)(2) and 63.31(c), and section II, paragraph 1 of the Notice of Hearing, this contention is within the scope of the hearing. (Also, see number 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository

are practicable for adoption, this Commission must find that all requirements of NEPA have been satisfied.[28] An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 CFR 51.109(c), which makes the NEPA documents not practicable for adoption.[29] The NEPA documents are inadequate and not practicable for adoption because they fail to assess the environmental impacts of the proposed Yucca Mountain Repository, namely they have not provided a complete and adequate discussion of the potential impact of igneous activity disrupting the repository and causing radionuclides to enter the biosphere in a manner that is consistent with NEPA, the CEQ guidelines and NRC guidance and applicable regulations. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

DOE asserts that the size and shape of the volcanic field about Yucca Mountain is well known and that the hazard estimates made by experts that comprised the PVHA panel in 1996 are still valid. Even after considering buried volcanic centers discovered after 1996, DOE claims in SAR Subsection 2.2.2.2 at page 2.2-91 that "[t]he results also show that the effects of buried volcanic centers on the hazard estimate are modest (Section 2.3.11.2.2.6)**,** and the updated hazard estimate is robust and suitable for use in the license application and supporting TSPA calculations."

The applicant reports in the SAR in sections 2.2.2.2.3.1, 2.3.11.2.2 and related sections, that the probability of igneous activity disrupting a repository drift is 1.7 x 10-8 events/year. The *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal*

[28] *NEI v EPA*, 373 F.3d at 1314
[29] Notice of Hearing Section IIIB, 73 Fed. Reg. 63031 October 22, 2008

of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada, June 2008, ("Final SEIS") reports in section 3.1.3.1.3 (page 3-21) that the average probability of such activity is 1 chance in 6,300 that a volcanic dike could disrupt the repository during the first 10,000 years. These estimates underestimate the probability of igneous activity, likely by two or more orders of magnitude, because the applicant does not include the volcanoes of the Greenwater Range. As shown by recent research described below which has been conducted by Eugene I. Smith, the County of Inyo's consultant on volcanism, the volcanic field about Yucca Mountain should be expanded to include the volcanoes of the Greenwater Range near Death Valley.

- First, volcanic activity in the Greenwater Range is associated with at least 17 volcanic centers and occurred after about 5 million years ago, contemporaneous with activity near Yucca Mountain. *See* "Geologic Map of California -- Death Valley Sheet, with Index and Stratigraphic Nomenclature" (01/01/1974), LSN# DN2001741565, solo page.
- Second, basalt from Death Valley is very similar in major and trace element chemistry to basalt from Crater Flat. Trace-elements usually better characterize volcanic rocks than do major elements and are considered as fingerprints that are commonly used to correlate volcanic rocks from area to area. For comparison purposes, volcanic rocks are usually normalized to a standard rock like average ocean island basalt. Plots of trace elements versus normalized concentration show characteristic patterns that can be used to fingerprint and compare rocks from different volcanic fields. Comparing Death Valley and Crater Flat basalt on such a plot shows that they share a similar pattern. Especially characteristic is low Nb

and high Rb, Th and U. See "Report of Research Activities in 2007 Prepared to Satisfy the Requirements of a Clark County Contract for Volcanic Hazard Assessment of the Proposed Nuclear Waste Repository at Yucca Mountain, Nevada" (07/08/2008), LSN# CLK000000071, at 10-13.

- Third, Strontium (Sr) and neodymium (Nd) isotopes for Greenwater Range basalts (see Asmerom, Y., Jacobsen, S.B., and Wernicke, B.P., "Variations in Magma Source Regions During Large Scale Continental Extension, Death Valley Region, Western United States," EARTH AND PLANETARY SCIENCE LETTERS, Vol. 125 (1994) at 235-254) are identical to isotopic analyses from Crater Flat. Basalts in both areas have low epsilon Nd values (between -9.95 and -12), and high 87Sr/86Sr (0.7069-0.7073). *See* CLK000000071, at 10-13.
- Fourth, basalts in both the Crater Flat and Death Valley areas are similar in mineralogy and contain olivine as the major phenocrysts phase. Plagioclase is rare and usually occurs as microlites in the matrix.

In summary, the close geographic proximity to Crater Flat, similar age of eruption, similar mineralogy and major element chemistry, distinctive trace element patterns and distributions, and identical isotopic ratios demonstrate that Death Valley basalt in the Greenwater Range is closely associated with Yucca Mountain basalt. Hazard assessment for Yucca Mountain should consider the Greenwater volcanoes near Death Valley as part of field of volcanoes about Yucca Mountain.

10 C.F.R. § 63.31(a)(2) states that the NRC may authorize issuance of a construction authorization for Yucca Mountain if it determines that there is reasonable assurance or expectation the materials described in the application can be disposed of without unreasonable

risk to the health and safety of the public. In reaching this determination, 10 C.F.R. § 63.31(a)(3) requires the application to satisfy the requirements in 10 C.F.R. § 63.21, and the site and design to comply with Subpart E of 10 C.F.R. Part 63. 10 C.F.R. § 63.21(c)(9) requires an assessment to determine the degree to which features, events and processes of the site that are expected to materially affect compliance with Section 63.113 have been characterized, and paragraph (c)(15) requires adequate support for the models used to provide the information required in paragraph (c)(9). 10 C.F.R. § 63.114 (part of Subpart E) requires a performance assessment to be completed to evaluate the ability of the engineered barrier system along with natural barriers to meet the performance objectives of Section 63.113, and this performance assessment must include consideration of the probability and consequences of events and processes identified under 10 C.F.R. § 63.21 (c)(9).

Further, Guidance regarding the NRC staff evaluation of the adequacy of the LA's evaluation of the probability for future volcanic events applicable to the repository is provided in the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Review Method 2, Probability Criteria, page 2.2-11 provides in pertinent part that NRC should:

> Verify that probability estimates for future igneous events have considered past patterns of igneous events in the Yucca Mountain region. Evaluate the adequacy and sufficiency of the U.S. Department of Energy characterization and documentation of past igneous activity. This should include uncertainties about the distribution, timing and characteristics of past igneous activity. <u>Confirm that, at a minimum, documentation of past igneous activity, since about 12 million years ago, encompasses the area within about 50 kilometers (30 miles) of the proposed repository site. Give particular attention to the documentation of the locations, ages, volumes, geochemistry, and geologic settings of less than 6-million-year-old basaltic igneous features, such as cinder cones, lava flows, igneous dikes and sills.</u> Verify that the U.S. Department of Energy used geological and geophysical information relevant to past igneous activity contained in the literature. (Underlining added for emphasis.)

Indeed, the NRC *Yucca Mountain Review Plan* (NUREG-1804, Revision 2). Review Method 2, Probability Criteria, page 2.2-11, directs that NRC staff "[*C]onfirm that, at a minimum, documentation of past igneous activity, since about 12 million years ago, encompasses the area within about 50 kilometers (30 miles) of the proposed repository site. Give particular attention to the documentation of the locations, ages, volumes, geochemistry, and geologic settings of less than 6-million-year-old basaltic igneous features, such as cinder cones, lava flows, igneous dikes and sills.*" Such an analysis is not presented in the LA, the SAR, the Final EIS on in the Final SEIS; therefore, calculations of repository disruption that ignore the Death Valley field underestimate the probability of repository disruption by igneous activity and the environmental document fail to adequately describe the cumulative impacts of resulting from igneous activity disrupting the repository and causing radionuclides to enter the biosphere.

DOE is fully obligated under NEPA to provide a complete evaluation and disclosure of the impacts from the proposed repository. 10 CFR 51.109(c)(2) provides that it is not practicable to adopt any environmental impact statement prepared by the Secretary of Energy in connection with a geologic repository proposed to be constructed if there is "[s]ignificant and substantial new information or new considerations [that would] render such environmental impact statement inadequate." The failure of the NEPA documents to completely and adequately characterize the volcanic hazard to the proposed repository is a significant new consideration that that was not available at the completion of the PVHA in 1996 that renders the NEPA documents inadequate. Because the characterization of the volcanic hazard is inadequate, the Final EIS and Final SEIS may significantly underestimate the likelihood of igneous activity intruding into the repository and, thus, the NEPA documents underestimate the potential environmental impacts of such an intrusion.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's 2008 Final SEIS and 2002 FEIS because neither has provided a complete and adequate discussion of the nature and extent of the repository's cumulative impact on groundwater in the lower carbonate aquifer. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of overall impacts on groundwater would be materially different. As a result, the Final EIS and Final SEIS cannot be adopted by the NRC.

The specific portion of the Final EIS that is being challenged is section 3.1.3.1, page 3-27, and "Potential for Volcanism at the Yucca Mountain Site." The specific portion of the Final SEIS that is being challenged is section 3.1.3.1.3, page 3-21, "Potential for Volcanism at the Yucca Mountain Site."

CONTENTION NO. 10
INY-NEPA-7

FAILURE TO ADDRESS SOCIOECONOMIC IMPACTS IN THE COUNTY OF INYO

1. STATEMENT OF LAW OR FACT RAISED OR CONTROVERTED [10 CFR 2.309(F)(1)(I)]

This Commission should not adopt DOE's *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County Nevada*, February 2002, ("Final EIS") or DOE's 2008 *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain , Nye County Nevada*, June 2008, ("Final SEIS") as is required by 10 CFR 51.109(c), because they are incomplete and inadequate pursuant to National Environmental Policy Act ("NEPA") and NRC regulations at 10 CFR 51, because those documents do not analyze the socio-economic impacts related cumulative environmental impacts in Inyo County that will potentially result from the proposed repository.

2. BASIS OF THIS CONTENTION [10 CFR 2.309(F)(1)(II)]

The Final EIS and the Final SEIS are inadequate because neither has provided a complete and adequate discussion of the nature and extent of the socio-economic impacts of the proposed repository's within Inyo County.

3. THE ISSUE RAISED IN THIS CONTENTION IS WITHIN THE SCOPE OF THE PROCEEDING [10 CFR 2.309(f)(1)(iii)]

The Commission's regulations in 10 C.F.R. §§ 51.109(a)(2) and 63.31(c), and section II, paragraph 1 of the notice of hearing, provide that this issue is within the scope of the hearing. (Also see section 4 below.)

4. THE ISSUE RAISED IN THIS CONTENTION IS MATERIAL TO THE FINDINGS THAT MUST BE MADE BY THIS COMMISSION TO SUPPORT THE ACTION INVOLVED IN THIS PROCEEDING [10 CFR 2.309(f)(1)(iv)]

Before it may determine that the NEPA documents for the Yucca Mountain repository are practicable for adoption, this Commission must find that all requirements of NEPA have been satisfied. (*NEI v EPA* 373 F.3d at 1314). An attack on DOE's NEPA documents based on substantial and significant new information is a new consideration under 10 C.F.R. 51.109(c), which makes the NEPA documents not practicable for adoption. (Notice of Hearing Section IIIB, 73 Fed. Reg. 63031 (October 22, 2008).) The NEPA documents are inadequate and not practicable for adoption because they fail to assess the socio-economic impacts and related cumulative environmental impacts of the proposed repository within Inyo County. Such new and necessary information should be included in the NEPA documents. This contention challenges compliance with NEPA and therefore raises a material issue.

5. STATEMENT OF ALLEGED FACTS AND EXPERT OPINIONS AND REFERENCES RELIED UPON IN SUPPORT OF THIS CONTENTION [10 CFR 2.309(f)(1)(v)]

Although the site of the proposed repository is approximately 15 miles from the Inyo County line (and from the boundary for Death Valley National Park) because DOE considers Inyo County outside the "region of influence" for socio-economic impacts analysis under NEPA, the Final EIS and the Final SEIS do not assess the potential socio-economic impacts of the proposed repository within Inyo County. See FEIS, §§3.1.7 to 3.1.7.5.4, pp. 3-63 to 3-74. In explaining this decision, DOE, in its response to comments on the Draft EIS, states that "[A]though Inyo County is nearby, historically, workers have not chosen to live in California while working at Yucca Mountain or the Nevada Test Site." Based upon that observation, DOE concluded that "[T]herefore, neither Inyo County nor Death Valley, are part of

the region of influence." (Final SEIS, Vol. 3, §1.7.7 Socioeconomics, Response to Comment 1.7.7 (4230), p. CR-360.)

As defined in 40 CFR 1508.7, cumulative effects are those effects that result from incremental impacts of a proposed action when added to other past, present and reasonably foreseeable future actions, regardless of whether a federal or nonfederal agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that can take place over time. CEQ recommends that any action the causes cumulatively significant impacts be examined in an EIS (40 CFR 1508l25(a)(2). Further, the federal courts have required that an agency take a "hard look" at the cumulative effects of a project, *Oregon Natural Resources Council v. Marsh*, 52 F. 3d 1485 (9th Cir. 1995).

In the Final EIS and in the Final SEIS, DOE analyzed socio-economic impacts to employment, housing, population, economic measures, Payments Equal to Taxes, and public services. While the DOE analyzed potential socio-economic impacts to Lincoln, Clark, and Nye Counties in both environmental documents, no socio-economic impact analysis was conducted for Inyo County. See FEIS, §§3.1.7 to 3.1.7.5.4, pp. 3-63 to 3-74.

As outlined below, there is a significant potential for socioeconomic impacts within Inyo County and Death Valley; therefore, the NEPA analyses should have taken a "hard look" at such cumulative impacts.

Impacts to tourism and local businesses

Beginning in the 1980's, tourism emerged as the dominant force behind economic growth and revenue in the region. Local tourist attractions are numerous, to include Death Valley

National Park, the China Date Ranch, Amargosa Opera House, natural hot springs and baths, bird watching, Ash Meadows National Wildlife Refuge, and Dumont Dunes Off-Highway Vehicle Recreation Area.

The County relies heavily on revenues generated by tourists visiting Death Valley National Park, with approximately 1.25 million annual visitors.[30] Without an attempt at meaningful analysis in the Final EIS, and the Final SEIS, the NEPA documents' impact assessment of socio-economic impacts in Inyo County is incomplete and entirely inadequate because it incorrectly defines the region of influence for the impacts created by the proposed action.

Transient Occupancy Taxes in the Region

The Inyo County transient occupancy tax (TOT) is a 12% excise tax on all overnight hotel rooms stays in Inyo County. TOT is a vital funding source from tourism for the County. Beginning in fiscal year 2003, through fiscal year 2007, 58%-64% of the total TOT revenue the County received was from hotels in the Death Valley region. The proposed action would have a significant impact on TOT collected in Southeast Inyo County, due to an anticipated decrease in tourist visits to the region.

Impacts to local services

The residents of Southeast Inyo County would feel a disproportionate burden from a shipping campaign, and repository construction and operation. Most residents cite the unique desert environment and quality of life as the primary factors to live in the area. These aspects would be negatively impacted, even with no short-term release of radioactive materials. A

[30] Death Valley National Park Information Page, http://www.death.valley.natioal-park.com/info.htm

comprehensive evacuation system would need to be implemented in case of a release of radioactive material. This would require substantial funding and cooperation between the DOE, the State of California, and Inyo County. Any evacuation plan would also have to incorporate the Death Valley Unified School District, in addition to tourists and employees at Death Valley National Park.

Moderate impacts to the Death Valley Unified School District, most notably busses transporting children to and from school, are expected from a shipping campaign due to the anticipated volume of truck transportation on County highways. Disruption of some local government services, such as road maintenance and emergency response to non-radiological incidents, could be expected even in an incident free shipping campaign. If radiological release occurs in the area, impacts to schools and disruption of local government services would be severe.

Devaluation of Real Property and Future Residential Growth

Devaluation of property along nuclear transportation shipping corridors is a contentious issue. The County believes that repository construction and operation and the transportation of nuclear materials along Inyo County's highways will lower both real and business property values. However, accurately predicting decreases is difficult. A reasonable and conservative estimate of a 2.5% to 5% decrease in property values could be expected for land situated along or near highway shipping routes. That projection would be significantly higher if there were any release of radioactive material in the area.

The construction and operation of Yucca Mountain, as well as the shipping campaign of nuclear material to the repository, would impact future residential growth, most probable in the

Chicago Valley and Charleston View areas in Inyo County. Again, impacts are difficult to assess given the uncertainties and timelines for the Yucca Mountain Project.

An EIS should succinctly describe the environment of the area affected by the proposed project. 40 CFR 1502.15. An EIS is required to discuss economic and social effects if these effects are interrelated with effects on the natural or physical environment. 40 CFR 1508.14. Given the proximity of proposed repository to Inyo County and to Death Valley National Park, and the potential for impacts on the natural and physical environment, the failure to discuss the potential socio-economic impacts of the proposed project within Inyo County and within Death Valley National Park are deficiencies in the NEPA documents. In conclusion, neither the NEPA documents nor the LA comply with applicable laws, regulations, and standards requiring an adequate assessment of the potential socio-economic impacts of the proposed project with Inyo County.

6. IDENTIFICATION OF DISPUTE INCLUDING REFERENCES TO LICENSE APPLICATION, ENVIRONMENTAL DOCUMENTS, AND THE SAFETY REPORT AND IDENTIFICATION OF FAILURES TO INCLUDE NECESSARY INFORMATION IN SUCH DOCUMENTS [10 CFR 2.309(f)(1)(vi)]

This contention challenges DOE's 2002 Final EIS and Final SEIS because neither has provided a complete and adequate discussion of the nature and extent of the repository's cumulative socio-economic impacts within the County of Inyo and within Death Valley National Park. This deficiency is significant and, if it were to be addressed in a satisfactory manner, the disclosure of the repository's overall socio-economic impacts would be materially different. As a result, the Yucca Mountain Final EIS and Final SEIS cannot be adopted by the NRC.

The specific portion of the License Application that is being challenged is the Yucca Mountain Final SEIS, FEIS, Vol. 1, §§3.1.7 to 3.1.7.5.4, pp. 3-63 to 3-74, and Vol. 3, §1.7.7 Socioeconomics, Response to Comment 1.7.7 (4230), p. CR-360.).

CONTENTION 11

INY-(JOINT) SAFETY-4

(NYE–(JOINT) SAFETY-5

FAILURE TO INCLUDE THE REQUIREMENTS OF THE NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS), DATED MARCH 1, 2004, AND RELATED DOCUMENTATION IN SECTION 5.7 EMERGENCY PLANNING OF THE YUCCA MOUNTAIN REPOSITORY SAFETY ANALYSIS REPORT (SAR).

1. Statement of issue of law or fact. [2.309(f)(1)(i)]

The applicant failed to include key interoperability and standardized procedure and terminology requirements of the National Incident Management System (NIMS), in the Emergency Planning required as part of the Safety Analysis Report [Yucca Mountain Repository License Application, General Information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR Section 5.7; SAR pp 5.7-1 to 5.7-55). LSN DEN001592183] to sufficiently ensure the ability of Nye County and other offsite agencies to properly plan and respond to onsite emergency actions. See requirements at 10 CFR 63.161 and 10 CFR 72.32(b).

2. Explanation of basis. [2.309(f)(1)(ii)]

The applicant is required by 10 CFR 61.161 and 10 CFR 72.32(b) to prepare an emergency plan which will provide for offsite notification and coordination, offsite assistance and participation in exercises, arrangements for providing information to the public, the training of offsite response personnel, and provisions for prompt communications among principal response organizations to offsite emergency personnel who would be responding onsite. The SAR addresses NRC directives and DOE requirements, but does not include the critical interoperability and communications requirements of the National Incident Management System (NIMS), dated March 1, 2004, that was promulgated subsequent to the NRC regulations cited above. NIMS has

been implemented for the federal government under Homeland Security Presidential Directive/HSPD-5, dated February 28, 2003; HSPD-7, dated December 17, 2003; and by HSPD-8, dated December 17, 2003. [Homeland Security Presidential Directive/HSPD-5 (February 28, 2003) LSN NYE000002223; HSPD-7(December 17, 2003).LSN NYE000002213; HSPD-8 (December 17, 2003) LSN NYE000002212.] Homeland Security National Preparedness Guidelines, dated September 2007, and the Homeland Security National Response Framework, dated January 2008, further describe how the various government agencies should work together. [Homeland Security National Preparedness Guidelines, dated September 2007, LSN NYE000002216; Homeland Security National Response Framework, dated January 2008, LSN NYE000002217.] NIMS and HSPD-5 are anticipated to be specifically included in the requirements of 10 CFR 73.32(b) as a subsequent, pertinent directive to ensure public safety and the full participation of Nye County in emergency planning and offsite assistance to Yucca Mountain. The absence of a specific reference to the new Federal requirements from the cited NRC regulations in no way alleviates DOE and NRC responsibility to ensure the implementation of such requirements.

3. Issue is within scope of proceeding. [2.309(f)(1)(iii)]

See response at 4.

4. Issue raised is material to finding NRC must make. [2.309(f)(1)(iv)]

a. The SAR contains no reference to the NIMS or Homeland Security Presidential Directive (HSPD)-5. The incorporation of NIMS is basic to ensuring the proper coordination and integration of Nye County and other offsite responder agencies in the emergency plan. “HSPD-5 requires all Federal departments and agencies to adopt the NIMS and to use it in their individual domestic incident management and emergency prevention, preparedness, response, recovery, and

mitigation programs and activities, as well as in support of all actions taken to assist State, local, or tribal entities." [National Incident Management System, Preface, Homeland Security, March 1, 2004]

b. The SAR must include:

- "Notification and coordination. A commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, …" [10 CFR 72.32(b)(8)]

- "Exercises. (i) Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies." [10 CFR 73.32(b)(12)]

- "Comments on Plan. The licensee shall allow the offsite response organizations expected to respond in case of an accident 60 days to comment on the initial submittal of the licensee's emergency plan before submitting it to NRC. Subsequent plan changes need not have the offsite comment period unless the plan changes affect the offsite response organizations." [10 CFR 72.32(b)(14)]

- "Offsite assistance. The applicant's emergency plans shall include the following:
    - a brief description of the arrangements made for requesting and effectively using offsite assistance on site and provisions that exist for using other organizations capable of augmenting the planned onsite response.
    - Provisions that exist for prompt communications among principal response organizations to offsite emergency personnel who would be responding onsite." [10 CFR 72.32(b)(15)]

- "Arrangements made for providing information to the public." [10 CFR 72.32(b)(16)]

c. Because the applicant failed to include NIMS or adopt the NIMS requirements, the NRC has no assurance of communications and equipment interoperability, or the integration of local government participation in effective emergency planning and the provision of emergency information to the public. Failure to include these principles encourages site personnel to act independently of surrounding governmental agencies, greatly increases the likelihood of miscommunication and misunderstanding, and limits the ability of offsite responders to be sure their equipment will fully integrate with onsite equipment. Additionally, because the applicant

intends to forward only those emergency plan changes deemed by the applicant to affect the offsite agency, it is very possible that important issues will be missed. The same holds true if the offsite agency does not coordinate changes to their plans.

5. Statement of alleged facts or opinions and references to be relied upon [2.309(f)(1)(v)]

a. While the DOE SAR addresses the NRC directives and DOE requirements as they are currently written, it does not include the requirements of the National Incident Management System (NIMS), dated March 1, 2004. NIMS has been implemented for the federal government under Homeland Security Presidential Directive/HSPD-5, dated February 28, 2003; HSPD-7, dated December 17, 2003; and by HSPD-8, dated December 17, 2003. [Homeland Security Presidential Directive/HSPD-5 (February 28, 2003) LSN NYE000002223; HSPD-7(December 17, 2003) LSN NYE000002213; HSPD-8 (December 17, 2003) LSN NYE000002212.] Homeland Security National Preparedness Guidelines, dated September 2007, and Homeland Security National Response Framework, dated January 2008, further identify how the various government agencies should work together. [Homeland Security National Preparedness Guidelines, dated September 2007, LSN NYE000002216; Homeland Security National Response Framework, dated January 2008, LSN NYE000002217.] In accordance with the above directives, specific information on Nye County participation in the planning effort should be submitted to NRC in a future SAR revision or supplement prior to the License Application update required by NRC before DOE can be granted a license to receive and possess radioactive material under 10 CFR 63. This information should include the following revisions as a minimum.

- "Notification and coordination. A commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, …" [10 CFR 72.32(b)(8)]

- "The communications system provides communication services for data, voice, and video transmissions throughout the repository, both the surface and the subsurface. The communications system permits reliable communications under anticipated circumstances during both normal and emergency conditions. The communication system supports safeguards and security, fire protection, employee safety and health, construction, operations, and emergency management." [Yucca Mountain Repository License Application, General information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR p. 5.7-12, Section 5.7.5.2.4.5). LSN DEN001592183]

- The preceding statement from the DOE License Application contains no reference to ensuring integrated or interoperable communications where offsite emergency responders are concerned. Interoperable communications are too critical to effective emergency response to merely assume they are in place. The same is true of Section 5.7.5.2.4.6 Emergency Communications (SAR p 5.7-12), in which there is no reference to communications with offsite emergency responders. Nye County believes that the inclusion of these specific NIMS concepts are required to ensure effective and efficient response capabilities are in place prior to an emergency.

    - "Effective communications, information management, and information and intelligence sharing are critical aspects of domestic incident management. Establishing and maintaining a common operating picture and ensuring accessibility and interoperability are principal goals of communications and information management." [National Incident Management System, page 54, Homeland Security, March 1, 2004]

- By including NIMS requirements, or at least a commitment to the requirements at this time, in the emergency plan, many of the assumed conditions will be specifically addressed. For example, the SAR Section 5.7.5.2.4.5 Communications, begins "The communications system provides communications services for data, voice, and video transmissions throughout the repository, …" Under this section all site communications are included – the unspoken assumption being that the site will be able to communicate with all surrounding offsite jurisdictions and any offsite responders. The same assumption that all communications will work appears in Section 5.7.5.2.4.6 Emergency Communications. Yet there is no assurance that all agencies involved will have interoperable communications – especially in an emergency situation. NIMS requires reviews for communications integration and interoperability and that steps be taken to ensure first responders can communicate with site personnel and networks.

- "Exercises. (i) Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies." [10 CFR 73.32(b)(12)]

- "Exercises will be conducted biennially, at a minimum, to test the adequacy and effectiveness of organizational command and control, implementing procedures,

notification and communication networks, emergency equipment, response organization performance, and the overall emergency preparedness program. Exercises are designed and conducted for maximum realism and attempt to duplicate the sense of stress inherent in an actual emergency situation.

- Exercises will be designed to test integrated response capabilities of the repository and offsite response agencies, the NRC, and the DOE headquarters organization. Offsite response organizations (including the NRC and DOE headquarters organization) shall be invited to participate in the biennial exercises; however, their participation is not required." [Yucca Mountain Repository License Application, General information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR p. 5.7-36). LSN DEN001592183]

- "Preparedness requires a unified approach. A major objective of preparedness efforts is to ensure mission integration and interoperability in response to emergent crises across functional and jurisdictional lines, as well as between public and private organizations." [National Incident Management System, page 30, Homeland Security, March 1, 2004] The inclusion of NIMS in the emergency plan will ensure that exercises are fully interoperable and utilize the same terminology and standard operating procedures for all responding agencies.

- "Comments on Plan. The licensee shall allow the offsite response organizations expected to respond in case of an accident 60 days to comment on the initial submittal of the licensee's emergency plan before submitting it to NRC. Subsequent plan changes need not have the offsite comment period unless the plan changes affect the offsite response organizations." [10 CFR 72.32(b)(14)]

    - "The Emergency Plan will be provided to offsite response organizations identified in the Emergency Plan for review prior to submittal to the NRC. The offsite response organizations will have 60 days to review and comment on the Emergency Plan. Offsite response organization comments, if provided, will be included with the Emergency Plan submitted to the NRC. Comments from offsite response organizations, as appropriate, will be dispositioned in subsequent revisions to the Emergency Plan. If subsequent revisions to the Emergency Plan affect the offsite response organizations, future revisions will also be provided to those organizations for review. The comment period for subsequent revisions to the Emergency Plan will be 60 days. Comments provided by offsite organizations during this period will again be included with the revised Emergency Plan submitted to the NRC." [Yucca Mountain Repository License Application, General information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR p. 5.7-41, Section 5.7.5.2.4.5). LSN DEN001592183]

b. The President, through the Department of Homeland Security, has required the implementation of NIMS by federal, state, local and tribal governments to avoid the inability

to work together efficiently and seamlessly demonstrated during 9/11 and Hurricane Katrina. Based upon that hard learned emergency response experience there is no assurance that this section, while meeting the specific requirements of 10 CFR 72.32(b)(14), takes into account the coordination of all changes to emergency plans (onsite or offsite) that may have a possible bearing on nearby agencies. For example, changes in the number of personnel or equipment at a fire station due to mission changes may not be seen as affecting another agency. But the change may require a response from another location and an associated delay in arrival time to assist the other agency. Or, if both agencies decided to reduce their stations in an area due to budget restrictions, the ability of each to assist the other will have been reduced in an overall view. All changes need to be coordinated.

c. As stated in NIMS "Preparedness is the responsibility of individual jurisdictions; this responsibility includes coordinating various preparedness activities among all appropriate agencies within a jurisdiction, as well as across jurisdictions and with private organizations. This coordination is effected by mechanisms that range from individuals to small committees to large standing organizations. These mechanisms are referred to in this document as "preparedness organizations," in that they serve as ongoing forums for coordinating preparedness activities in advance of an incident. Preparedness organizations represent a wide variety of committees, planning groups, and other organizations that meet regularly and coordinate with one another to ensure an appropriate focus on planning, training, equipping, and other preparedness requirements within a jurisdiction and/or across jurisdictions. The needs of the jurisdictions involved will dictate how frequently such organizations must conduct their business, as well as how they are structured. When preparedness activities

routinely need to be accomplished across jurisdictions, preparedness organizations should be multijurisdictional.. Preparedness organization at all jurisdictional levels should:

- •establish and coordinate emergency plans and protocols including public communications and awareness;
- •integrate and coordinate the activities of the jurisdictions and functions within their purview;
- •establish the standards, guidelines, and protocols necessary to promote interoperability among member jurisdictions and agencies;
- •adopt standards, guidelines, and protocols for providing resources to requesting organizations, including protocols for incident support organizations;
- •set priorities for resources and other requirements; and
- •ensure the establishment and maintenance of multiagency coordination mechanisms, including EOCs, mutual-aid agreements, incident information systems, nongovernmental organization and private-sector outreach, public awareness and information systems, and mechanisms to deal with information and operations security." [National Incident Management System, Preface, Homeland Security, March 1, 2004, Nye County RID #7569, Nye County LSN Assession No. nye_rid7569_01_00.pd, an NRC LSN Assession number will be provided when available.]

d. Furthermore, DOE unilaterally assigning Nye County 60 days to review emergency plans and changes does not comply with the spirit of the communications requirements of NIMS. The commitment in DOE's emergency plan should be to engage in communications with local government to ensure a fully integrated emergency plan and response system is in place, to the extent that the local community agrees to work cooperatively. In the case of Nye County, it is our desire to work cooperatively with DOE to ensure the safety of our citizens. This entails a common communications plan, not simply the opportunity for Nye County to review documents 60 days before DOE unilaterally implements its emergency plans.

- "Offsite assistance. The applicant's emergency plans shall include the following:
  - a brief description of the arrangements made for requesting and effectively using offsite assistance on site and provisions that exist for using other organizations capable of augmenting the planned onsite response.

- Provisions that exist for prompt communications among principal response organizations to offsite emergency personnel who would be responding onsite." [10 CFR 72.32(b)(15)]

- SAR Section 5.7.15.1 Planning Goals states: "To facilitate a coordinated and planned emergency response, provisions for advance arrangements with offsite organizations will be addressed in the Emergency Plan. These arrangements include:
    - •Identification of offsite response organizations that have agreed to provide support, as well as other support organizations capable of augmenting the planned onsite response
    - •Means for requesting offsite assistance
    - •Provisions for prompt communications among principal response organizations with offsite emergency personnel who would be responding
    - •Provisions for providing and maintaining emergency response facilities and equipment to support the emergency response
    - •The availability of adequate methods, systems, and equipment for assessing and monitoring actual or potential consequences of a radiological emergency
    - •Provisions for medical services for contaminated or injured individuals
    - •Arrangements for radiological emergency response training to be offered to offsite support organizations that may be called upon to assist in an onsite emergency
    - •Documentation of assistance agreements in the form of letters of agreement or memoranda of understanding." [Yucca Mountain Repository License Application, General information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR p. 5.7-42, Section 5.7.5.2.4.5). LSN DEN001592183]

- Provision for prompt communications does not ensure interoperable communications. Nor does the paragraph contain any reference to ensuring the equipment of the responding agencies is compatible with the onsite equipment. However, the following NIMS requirement exists for DOE and NRC.

- "Incident communications are facilitated through the development and use of a common communications plan and interoperable communications processes and architectures. This integrated approach links the operational and support units of the various agencies involved and is necessary to maintain communications connectivity and discipline and enable common situational awareness and interaction. Preparedness planning must address the equipment, systems, and protocols necessary to achieve integrated voice and data incident management communications." [National Incident Management System, page 18, Homeland Security, March 1, 2004]

- "Arrangements made for providing information to the public." [10 CFR 72.32(b)(16)]

- SAR Table 5.7-7 and Figure 5.7-1 contain no provision for a Nye County Representative within the Joint Information Center Staff to provide local liaison and insight for any information which will be released and which will affect the County and its residents. Nye County, as the Site Host for the repository, has a strong and practical interest in the impact that center pronouncements will have on county residents. [Yucca Mountain Repository License Application, General information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR p. 5.7-52, and p. 5.7-55). LSN DEN001592183]

- "Public Information Functions Must Be Coordinated and Integrated Across Jurisdictions and Across Functional Agencies; Among Federal, State, Local, and Tribal Partners; and with Private-Sector and Nongovernmental Organizations." [National Incident Management System, p. 36, Homeland Security, March 1, 2004]

e. In summary, the inclusion of NIMS in the emergency plan is not meant to denigrate the actions which have been taken to prepare this plan. It is intended to strengthen the plan by ensuring that all participants are working from the same integrated script (Standard Operating Procedures, terminology, etc.), with fully interoperable communications and equipment.

f. Nye County remains committed to a continued emergency management relationship with the Yucca Mountain Site, as is evidenced by the Memorandum of Understanding (MOU) between the US DOE/OCRWM and Nye County, Nevada signed by Edward F. Sproat, III, Director, DOE/OCRWM, on January 14, 2008, and by Joni Eastley, Chairman, Nye County Board of Commissioners, on February 5, 2008. [Memorandum of Understanding (MOU) between the US DOE/OCRWM and Nye County, Nevada signed by Edward F. Sproat, III, Director, DOE/OCRWM, on January 14, 2008, and by Joni Eastley, Chairman, Nye County Board of Commissioners, on February 5, 2008, LSN NYE000002221.] The MOU delineates communication and coordination for mutual assistance associated with DOE/OCRWM

activities and the commitment to participate in broader multi-agency emergency response and planning activities to include all governmental agencies active in Nye County.

6. References to portions of the application or environmental documents. [2.309(f)(1)(vi)]

Yucca Mountain Repository License Application, General Information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR Section 5.7; SAR pp 5.7-1 to 5.7-55). LSN DEN001592183

Homeland Security Presidential Directive/HSPD-5 (February 28, 2003) LSN NYE000002223.

Homeland Security Presidential Directive/HSPD-7(December 17, 2003) LSN NYE000002213.

Homeland Security Presidential Directive/HSPD-8 (December 17, 2003) LSN NYE000002212.

Homeland Security National Preparedness Guidelines, dated September 2007, LSN NYE000002216.

Homeland Security National Response Framework, dated January 2008, LSN NYE000002217.

National Incident Management System, Preface, Homeland Security, March 1, 2004, LSN NYE000002211.

Memorandum of Understanding (MOU) between the US DOE/OCRWM and Nye County, Nevada signed by Edward F. Sproat, III, Director, DOE/OCRWM, on January 14, 2008, and by Joni Eastley, Chairman, Nye County Board of Commissioners, on February 5, 2008, LSN NYE000002221.

10 CFR 63.161

10 CFR 72.32(b)

7. Statement Regarding Joint Ownership

Nye County is jointly sponsoring this Safety Contention with the Nevada Counties of Churchill, Esmeralda, Lander, and Mineral, and Inyo County, California. Nye County, Nevada is the specific participant with authority to act with respect to this contention.

CONTENTION 12

INY- (JOINT) SAFETY-5

(NYE-(JOINT) SAFETY-6)

THE LA LACKS ANY JUSTIFICATION OR BASIS FOR EXCLUDING POTENTIAL AIRCRAFT CRASHES AS A CATEGORY 2 EVENT SEQUENCE.

1. Statement of Issue of Law or Fact (2.309(f)(1)(i))

Contrary to the requirements of 10 CFR 63 to provide the technical basis for the inclusion or exclusion of specific human-induced hazards in the repository preclosure safety analysis, the Department of Energy (DOE) has merely assumed the U.S. Air Force (USAF) will restrict their activities in the repository vicinity. No basis or justification for that assumption is provided by DOE in its repository License Application (LA) or supporting documents.

2. Explanation of Basis 2.309(F)(1)(ii))

In its LA Safety Analysis Report (SAR), DOE takes credit for various flight restrictions on USAF operations in the vicinity of the proposed repository [SAR section 1.6.3.4.1, pages 1.6-21, -22, and -23 LSN DEN001592183]. In the same SAR section on page 1.6-22, DOE states, "The accident an alysis conducted assumed that such flight restrictions would occur." No further basis or justification of this critical assumption is discussed. In the same SAR section on page 1.6-23, DOE discusses its event sequence probability calculations (based in large part on the noted unsupported assumption) and states, "Consequently, the aircraft hazard to the surface facilities is screened out as an initiating event."

3. Issue is Within the Scope of the Proceeding (2.309(f)(1)(iv))

Determination of potential event sequences is a key step in DOE's repository preclosure safety analysis required by 10 CFR 63.112. Without understanding the potential event sequences and

their probability, neither NRC, nor other stakeholders can judge with reasonable assurance that the repository can be operated safely. The regulatory basis for this requirement is described in detail in the next section of this contention.

4. Issue Raised Is Material to Findings NRC Must Make (2.309(f)(1)(v))

a. 10 CFR 63.111 states the performance objectives for the repository through permanent closure. The relevant portions of that regulation states the following requirements:

> **Preclosure Performance Objectives**
>
> **§ 63.111 Performance objectives for the geologic repository operations area through permanent closure.**
>
> * * *
>
> *(b)* Numerical guides for design objectives.
>
> * * *
>
> (2) The geologic repository operations area must be designed so that, taking into consideration any single Category 2 event sequence and until permanent closure has been completed, no individual located on, or beyond, any point on the boundary of the site will receive, as a result of the single Category 2 event sequence, the more limiting of a TEDE of 0.05 Sv (5 rem), or . . .
>
> (c) *Preclosure safety analysis*. A preclosure safety analysis of the geologic repository operations area that meets the requirements specified at § 63.112 must be performed. This analysis must demonstrate that:
>
> (2) The design meets the requirements of § 63.111(b).
>
> * * *

b. Preclosure safety analysis is defined in 10 CFR 63.112. The relevant portions follow:

> **§ 63.112 Requirements for preclosure safety analysis of the geologic repository operations area.**
>
> The preclosure safety analysis of the geologic repository operations area must include:

(a) A general description of the structures, systems, components, equipment, and process activities at the geologic repository operations area;

(b) An identification and systematic analysis of naturally occurring and human-induced hazards at the geologic repository operations area, including a comprehensive identification of potential event sequences;

* * *

(d) The technical basis for either inclusion or exclusion of specific, naturally occurring and human-induced hazards in the safety analysis;

c. Further guidance regarding the identification and evaluation of potential event sequences is provided in the NRC Yucca Mountain Review Plan (NUREG-1804, Revision 2) on pages 2.1-25 and -26 as follows:

2.1.1.4 Identification of Event Sequences

Review Method 2 Categories 1 and 2 Event Sequences

Verify that the U.S. Department of Energy has properly considered the hazards and initiating events reviewed . . .

Acceptance Criterion 1 Adequate Technical Basis and Justification are Provided for the Methodology Used and Assumptions Made to Identify Preclosure Safety Analysis Event Sequences

(1) Methods selected for event sequence identification are appropriate, and are consistent with Agency [NRC] guidance or standard industry practices or are adequately justified.

(2) The methods selected are consistent with, and supported by, site-specific data; and

(3) Assumptions made in identifying event sequences are valid and reasonable.

The definition of event sequence in 10 CFR 63.2 is also relevant to this contention as follows.

§ 63.2 Definitions

Event sequence means a series of actions and/or occurrences within the natural and engineered components of a geologic repository operations area that could potentially lead to exposure of individuals to radiation. An event sequence includes one or more initiating events and associated combinations of repository system component failures, including those produced by the action or inaction of operating personnel. Those event sequences that are expected to occur one or

more times before permanent closure of the geologic repository operations area are referred to as Category 1 event sequences. Other event sequences that have at least one chance in 10,000 of occurring before permanent closure are referred to as Category 2 event sequences.

5. Statement of Alleged Facts or Opinions and References to be Relied On (2.309(f)(1)(vi))

a. DOE is required to perform a preclosure safety analysis of the geologic repository operations area that must include an identification and systematic analysis of naturally occurring and human-induced hazards at the geologic repository operations area, including a comprehensive identification of potential event sequences (10 CFR 63.112 (b)). Additionally, DOE must provide the data used to identify naturally occurring and human-induced hazards at the geologic repository operations area (10 CFR 63.112 (c)). It must further provide the technical basis for either the inclusion or exclusion of specific, naturally occurring and human-induced hazards in the safety analysis (10 CFR 63.112 (d)). This technical basis must be implemented by the determination of potential event sequences that result in release of and public exposure to radioactive contaminants that could occur during repository operations and determining the probability of such event sequences. If the event sequences are such that they could occur with a probability of at least one chance in 10,000 over the period of preclosure repository operations, DOE must prepare consequence calculations and compare those calculated consequences to prescribed standards in 10 CFR 63.111(b)(2).

b. Contrary to these requirements, DOE has failed to provide any justification or basis for its assumption that it can achieve a binding agreement with the USAF to prescribe flight restrictions on its operations in the vicinity of the repository. DOE merely makes the

unsupported assumption that, "The accident analysis conducted assumed that such flight restrictions would occur." Without the flight restrictions assumed by DOE, its calculation of aircraft crash event sequence probability would likely have significantly different results. Based on the assumption and its prominence in SAR section 1.6.4.3.1 and in Bectel SAIC Company (BSC) calculation, "Frequency Analysis of Aircraft Hazards for License Application," page 22 [BSC identifier 000-00C-WHS0-00200-000-00E and DOE LSN Participant Accession Number ALOA.20071023.0985], it is presumed that without the unjustified assumption that an aircraft crash into repository facilities would be much more probable and categorized as a category 2 event sequence per 10 CFR 63.2. The consequences of such an aircraft crash are unknown because DOE has not performed a consequence analysis using NRC regulated processes because of its claim that the probability of such an event sequence is below the regulatory probability threshold for category 2 event sequences.

c. Nye County believes that before NRC allows DOE to begin construction of the repository, it should require a binding agreement between DOE and the USAF mandating the flight restrictions assumed by DOE in its preclosure safety analysis. At a minimum, DOE should be required to provide justification and basis for its assumption showing that there is reasonable assurance, such as documentation from the USAF, that such an agreement with the USAF is forthcoming with a prescribed implementation date or milestone. NRC should also make ongoing flight restrictions as assumed in DOE's safety analysis a condition of any license it issues for DOE to receive and possess nuclear materials at the repository. Otherwise, it is unknown whether or not the USAF would implement such restrictions and DOE's safety analysis is without basis in regard to the aircraft crash event sequence

categorization. Such an indeterminate state is not adequate to show that repository workers and other Nye County residents in the vicinity of the repository will be safe.

6. References (including relevant LA sections)

Yucca Mountain Repository License Application, General Information and Safety Analysis Report. DOE/RW-0573 REV 0. 2008 (SAR Section 1.6.3.4.1, pp. 1.6-21, 6-22, and 6-23, Section 5.7; SAR pp 5.7-1 to 5.7-55). LSN DEN001592183

NRC "Yucca Mountain Review Plan," pp. 2.1-25 and -26 (NUREG-1804, Revision 2)
Bechtel SAIC Company calculation, "Frequency Analysis of Aircraft Hazards for License Application," page 22 (BSC identifier 000-00C-WHS0-00200-000-00E and DOE LSN Participant Accession Number ALA.20071023.0985)

10 CFR 63.2

10 CFR 63.111 (b), (c)

10 CFR 112 (a), (b), (d)

7. Statement Regarding Joint Ownership

Nye County is jointly sponsoring this Safety Contention with the Nevada Counties of Churchill, Esmeralda, Lander, and Mineral, and Inyo County, California. Nye County, Nevada is the specific participant with authority to act with respect to this contention.

IV

SUPPORTING ATTACHEMENTS

Attachment 1: Affidavit of John Bredehoeft
Attachment A to Affidavit of John Bredehoeft
Attachment B to Affidavit of John Bredehoeft

Attachment 2: Affidavit of Matthew Gaffney
Attachment A to Affidavit of Matthew Gaffney

Attachment 3: Affidavit of Eugene I. Smith
Attachment A to Affidavit of Matthew Gaffney

ATTACHMENT 1

AFFIDAVIT OF JOHN BREDEHOEFT

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 63-001
U.S. DEPARTMENT OF ENERGY	)	
	)	
(High-Level Waste Repository)	)	December 17, 2008
	)	

AFFIDAVIT OF JOHN BREDEHOEFT

I, John Bredehoeft, the undersigned affiant, do hereby make the following statements based upon my own knowledge, information, and belief.

1. My name is John Bredehoeft. I have a Ph.D. in Geology. I have 45 years of experience in hydrogeology, 32 years with the U.S. Geological Survey, in both management and research positions, and 15 years as a private consultant. I have taught as an adjunct professor, among other places at Stanford for 8 years, and I have published more than 100 papers in the refereed scientific literature. I am a member of the U.S. National Academy of Engineering. Since 1997, I have worked for the County of Inyo as a consultant evaluating the potential impacts the proposed Yucca Mountain Nuclear Waste Repository site on the regional groundwater system. My resume and bibliography are attached Attachment A & B.

2. I am currently a Principal of the Hydrodynamics Group, LLC, Sausalito, California. In my capacity as a consultant to the County of Inyo, I have extensively studied DOE's activities and analyses of the Yucca Mountain site and potential repository impacts and have reviewed the

findings of other government agencies and scientific panels as they relate to DOE's site suitability evaluations.

3. I am executing this Affidavit in support of the County of Inyo's Petition to for Leave to Intervene as a Party (Petition) in the above-captioned proceeding.

4. In order to offer an expert opinion for the County of Inyo in the instant proceedings, I have reviewed and am familiar with the portions of the following documents relevant to my expert opinion: the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High –Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F)(2002); *Final Supplemental Environmental Impact Statement Repository for the Disposal of Spent Nuclear Fuel and High –Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F-S1) (2008)*;* the Petition to Intervene of the County of Inyo, including the accompanying Contentions.

4. Contentions 1 through 4, each comprised of several paragraphs are contained in the Petition. I hereby adopt as my own opinions the statements contained within Paragraph 5 of Contentions 1 through 4 that are based upon research conducted by Hydrodynamics Group, LLC. Those four contentions are listed as INY-SAFETY-1, INY-NEPA-1, INY-SAFETY-2, and INY-NEPA-2.

Further, the affiant sayeth not.

John Bredehoeft

The above-named affiant personally appeared before me this 18th day of December, 2008, and executed this affidavit.

Notary Public

My Commission expires: April 12, 2010

MARTIN KONOPASKI
COMM. # 1656024
NOTARY PUBLIC - CALIFORNIA
MARIN COUNTY
MY COMM. EXP. APR. 12, 2010

ATTACHMENT A

TO

AFFIDAVIT OF JOHN BREDEHOEFT

The HYDRODYNAMICS Group

studies in mass and energy transport in the earth

JOHN D. BREDEHOEFT *PhD, NAE*

Contaminant Transport
Numerical Models of Groundwater Flow and Transport
Water Resources Development
Contaminant Clean-Up including Nuclear Waste Disposal

EDUCATION

1955 **BSE**	**GEOLOGICAL ENGINEERING**, Princeton University (Cum Laude)
1957 **MS**	**GEOLOGY**, University of Illinois
1962 **Ph.D.**	**GEOLOGY**, University of Illinois (minor in Civil Engineering—Soil Mechanics); Thesis: *The Hydrogeology of the Lower Humboldt River Basin, Nevada.*

EXPERIENCE

In 1995 John Bredehoeft established the consulting firm—The HydroDynamics Group. He devoted the previous 32 years to public service at the U.S. Geological Survey (USGS). His expertise is in water resources, especially groundwater; he has worked on many aspects of water related problems. During his years at the USGS, he held both scientific research and high-level management positions. In 1994, Bredehoeft retired as a senior research geologist from the Water Resources Division of the USGS.

While at the USGS Bredehoeft testified before U.S. Congress on such diverse topics as: the USGS study of the Potomac Estuary, National Policy on the geologic disposal of nuclear wastes, water in the western United States, the use of numerical models in management decisions. He was a member of the National Academy of Sciences/National Research Council (NAS/NRC) Committee on the Waste Isolation Pilot Plant (WIPP), and a member of the NAS/NRC Panel that reviewed groundwater concerns for the Yucca Mountain Nuclear Repository.

Bredehoeft was George Pinder's Ph.D. advisor at the University of Illinois in 1967-68. Together they 1) developed and published the first widely utilized numerical groundwater flow model (for which they received the Horton Award of the American Geophysical Union), and 2) the first widely used contaminant transport model (for which they received the Meinzer Award of the Geological Society of America). During his career in research Bredehoeft worked on a variety of other topics: 1) analytical methods for the field determination of aquifer parameters, 2) geophysical experiments for both the prediction and control of earthquakes. He spent two years at Resources for the Future (RFF) where he engaged in analytical studies of the economics of groundwater management. He engaged in experiments utilizing water wells as strain meters at Parkfield, CA, and in studies of the hydrodynamics of deep sedimentary basins. In recent years he has also worked on studies of contaminant movement and nuclear waste disposal.

In the tradition of the USGS, Bredehoeft held positions in both research and high-level management. For five years in the 1970s, he managed the USGS National Water Research Program. In the early 1980s, he was the Regional Hydrologist, Western Region, where he supervised the Survey's water activities in the eight western states—Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, and Washington.

Bredehoeft taught one year as a visiting professor at the University of Illinois; and was a consulting professor at Stanford for 8 years, and at the University of California—Santa Cruz, and San Francisco State University for several years. He served on numerous national advisory committees for the National Research Council, the National Science Foundation, and the Department of Energy.

He received numerous awards: member of the U.S. National Academy of Engineering; Editor of the scientific journal, ***Ground Water*** (1991-95); received both the Horton Medal of the American Geophysical Union (the highest award given to a hydrologist), the Penrose Medal of the Geological Society of America (the highest award given to a geologist), and made a life-member of the National Ground Water Association (their highest award).

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The HYDRODYNAMICS Group

studies in mass and energy transport in the earth

EXPERIENCE

1994 **Consultant/Principal**—The HYDRODYNAMICS Group, Sausalito, CA
1985-94 **Research Geologist**—U.S. Geological Survey (USGS), Menlo Park, CA (Supergrade)
1989-91 **Consulting Professor**—Applied Earth Sciences Department, Stanford University
1980-85 **Regional Hydrogeologist**—USGS, Region Manager (8 states west), Menlo Park, CA
1974-79 **Deputy Chief Hydrologist for Research**—USGS, Reston, VA
1968-70 **Resources for the Future**—USGS (cooperative studies), Washington DC
1967-68 **Visiting Associate Professor**—Geology Department, University of Illinois, IL
1962-67 **Research Geologist**—USGS, Water Resources Division, Arlington, Virginia
1961-62 **Groundwater Hydrologist**—Nevada Department of Conservation and Natural Resources and the Desert Research Institute, University of Nevada, Reno, NV
1957-59 **Exploration Geologist**—Humble Oil, Vernal, UT

BIBLIOGRAPHY

Bredehoeft is the author of more than 100 scientific papers in the referred scientific literature.

SCIENTIFIC COMMITTEES

1995-98 **Council International Exchange of Scholars (Fulbright Scholars)**—Advisory Board
1996-98 **Lawrence Livermore National laboratory**—Advisory Committee for Environmental Programs
1992-96 **Association of Ground Water Scientists and Engineers**, National Ground Water Association Board of Directors
1992-95 **Editor—*GROUND WATER***, Journal of the Association of Ground Water Scientists and Engineers, National Ground Water Association.
1984-94 **National Research Council**—Member, Committee on the Waste Isolation Pilot Plant (WIPP)
1990-93 **National Science Foundation**—Member, Advisory Committee for Earth Science
1990-92 **National Research Council**—Member, HYTEC Panel for the Yucca Mountain Nuclear Repository (Chair, Modeling Subcommittee)
1970-92 **numerous other Advisory Committees, including NAS/NRC, US-DOE, UNESCO, etc.**

SCIENTIFIC SOCIETIES

American Association of Petroleum Geologists
Geological Society of America
American Geophysical Union
Association of Ground Water Scientists and Engineers
Russian Academy of Natural Sciences
U.S. National Academy of Engineering

MEDALS and AWARDS

1969 **HORTON AWARD**—American Geophysical Union (G. F. Pinder & J.D. Bredehoeft)
1974 **INTERDISCIPLINARY AWARD**—U.S. Committee for Rock Mechanics (C.B. Raleigh, J. Healy, & J.D. Bredehoeft)
1975 **O.E. MEINZER AWARD**—-Geological Society of America (J.D. Bredehoeft & G.F. Pinder)
1978 **MERITORIOUS SERVICE AWARD**—Department of Interior
1981 **DISTINGUISHED SERVICE AWARD**—Department of Interior
1984 **BOGGESS AWARD**—American Water Resources Association (E.G. Reichard & J.D. Bredehoeft)
1991 **FOREIGN ASSOCIATE, RUSSIAN ACADEMY OF NATURAL SCIENCES**
1991 **M. KING HUBBERT AWARD**—National Ground Water Association
1994 **MEMBER, U.S. NATIONAL ACADEMY OF ENGINEERING**
1997 **HORTON MEDAL**—American Geophysical Union
1997 **PENROSE MEDAL**—Geological Society of America
1997 **LIFE MEMBER**—National Ground Water Association
1999 **LANGBEIN DISTINGUISHED LECTURER—**American Geophysical Union
2001 **HALBOUTY DISTINGUISH LECTURE in RESOURCES—**Geological Society of America
2003 **DISTINGUISHED SERVICE AWARD**—Hydrogeology Division, Geological Society of America
2004 **LIFETIME ACHIEVEMENT AWARD—**Ground Water Resources Association

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The HYDRODYNAMICS Group

studies in mass and energy transport in the earth

SIGNIFICANT PROJECTS--USGS:

Flow & Contaminant Transport Models
Economic Studies—Conjunction Ground and Surface Water Use
Earthquake Control—Rangeley, Colorado
Oil Shale—Hydrogeology of the Piceance Basin, Colorado
Water Wells as Strain Meters
Nuclear Waste—WIPP and Yucca Mountain
Hydrodynamics of Deep Sedimentary Basins

MAJOR CONSULTING PROJECTS—1995-08:

CONTAMINANT STUDIES

Clean-up Guadalupe Oil Field, California—California WQCB
TCE/PCE Contaminant Spill, California—U.S. Department of Justice
TCE/PCE Contaminant Spill, Phoenix, Arizona—U.S. EPA
MTBE Contamination, California
Hydrogeologic Impacts of Mining, Summitville, Colorado—Robert Freidland

NUCLEAR WASTE

Yucca Mountain Nuclear Repository—Oversight for Inyo County, California
Savannah River Site—Remediation of the F and H Area Disposal Ponds
Waste Isolation Pilot Plant (WIPP)—New Mexico Attorney General
Exploratory Drilling Deep Carbonate Aquifer—Amargosa Desert, CA—Inyo County
Contamination at Los Alamos National Laboratory—New Mexico Attorney General
West Valley, New York—Review of Draft EIS for site closure, NYSERDA

WATER SUPPLY

San Francisco Zoo –Zoo
Platte River Groundwater, Wyoming vs Nebraska—Wyoming Attorney General
Conjunctive Use, Santa Ynez River Basin—Santa Barbara County, California
Fall River Springs: Impact of Geothermal Development, California—Local Land Owners
Conjunctive Use: San Pedro Riparian Area, Arizona/Mexico—CEC
Groundwater in Mexico—World Bank
South Denver Metropolitan Area—Douglas County, Colorado
Cadiz Groundwater Storage and Supply, California—Environmental Coalition
SE-Nevada Carbonate Aquifer—Nevada Power Company
Walker Lake, Nevada—Environmental Coalition
Pine Cove Water District, California—District & Environmental Coalition
Conjunctive use, Gallatin River near Bozeman, Montana—Environmental Coalition
Spring Valley, NV proposed pumping by Southern Nevada Water Authority—Environmentalists

OTHER

Conrad Landslide, British Columbia—CN Rail
Powder River Basin; Coal-Bed Methane FEIS, WY & MT—Environmental Coalition
Feasibility of Gas Storage, Georgia (Country)—Georgian International Oil Company & USTDA
Mountain Spring in Yellowstone, Wyoming—Federal Highway Administration

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ATTACHMENT B

TO

AFFIDAVIT OF JOHN BREDEHOEFT

The HYDRODYNAMICS Group

studies in mass and energy transport in the earth

John D. Bredehoeft—Significant Papers

BREDEHOEFT, J.D., BLYTH, C.R., WHITE, W.A., and MAXEY, G.B., 1963, *A possible mechanism for the concentration of brines in subsurface formations:* American Association Petroleum Geologists Bulletin, v. 47, p. 257-269.

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ATTACHMENT 2

AFFIDAVIT OF MATTHEW GAFFNEY

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 63-001
U.S. DEPARTMENT OF ENERGY	)	
	)	
(High-Level Waste Repository)	)	December 19, 2008
	)	

AFFIDAVIT OF MATTHEW GAFFNEY

I, Matthew Gaffney, do hereby swear and affirm that the following matters are true and correct, based on my own personal knowledge and professional training:

1. I am currently employed by the California Department of Transportation as an Environmental Planner.

2. I was employed by the County of Inyo from March 2006 to June 2008 as the Project Coordinator for the Yucca Mountain Repository Assessment Office (RAO). As the Project Coordinator, I was responsible for the management of the RAO, which conducts oversight and independent analysis of the Yucca Mountain Project to assess potential impacts to Inyo County.

2. My professional training and experience are as follows: Three years of environmental planning experience.

3. In my capacity as the Project Coordinator, I have extensively studied the U.S. Department of Energy's (DOE) activities and analyses of the Yucca Mountain site and have reviewed the findings of other government agencies and scientific panels as they relate to DOE's site suitability evaluations. In this affidavit, on the basis of my personal knowledge and experience, I conclude as follows: The DOE has negelcted to conduct adequate impact analysis under the National Enviromental Policy Act and the License Application/Safety Evaulation Report to Inyo County and the State of California from the Yucca Moutain Project.

- The DOE's EIS and SEIS analysis are inadeuqate regrding the effects of facility on groundwater in volcanic alluvial acquifer.
- The DOE's EIS and SEIS analysis are inadeuqate regarding effects of facility on groundwater in lower carbonate acquifer.
- The DOE's EIS and SEIS analysis are inadeuqate regarding effects from discharge of potentially contaminated groundwater from lower carbonate acquifer in California.
- The DOE's EIS and SEIS analysis are inadeuqate regarding effects of groundwater pumping.

4. Attached hereto are comments previously prepared and reviewed by me and submitted to the Chairman of the Inyo County Board of Supervisors for signing and transmission to the DOE regarding the environmental analysis performed by DOE in the matter of the Yucca Mountain High-Level Waste Repository, which have been previously submitted to the DOE. I have read and considered these documents, and am familiar with their contents. I affirm that the statements contained are true and correct to the best of my professional knowledge, and hereby incorporate them into this affidavit.

Signed this 19th day of December, 2008

MATTHEW GAFFNEY

State of California }
County of Inyo }

Subscribed and sworn to (or affirmed) before me on this 19 day of December, 2008, by Matthew Gaffney proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature Jennifer Kitchens

JENNIFER KITCHENS
Commission # 1705491
Notary Public - California
Inyo County
My Comm. Expires Nov 17, 2010

ATTACHMENT A

TO

AFFIDAVIT OF MATTHEW GAFFNEY

BOARD OF SUPERVISORS
COUNTY OF INYO

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Assistant Clerk of the Board

December 18, 2007

Jane R. Summerson
M. Lee Bishop
Environmental Impact Statement Office
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
1551 Hillshire Drive
Las Vegas, NV 89134

Re: Inyo County's comments on draft Repository Supplemental Environmental Impact Statement and draft Nevada Rail Corridor/Alignment Environmental Impact Statement

Dear Ms. Summerson and Mr. Bishop,

The County of Inyo, State of California, is an Affected Unit of Local Government under the Nuclear Waste Policy Act of 1987, as amended. Inyo County has prepared its response to the U.S. Department of Energy's (DOE) draft Repository Supplemental Environmental Impact Statement and draft Nevada Rail Corridor/Alignment Environmental Impact Statement.

The County has identified several issues regarding both documents that should be addressed by the DOE in the course of developing both Final Environmental Impact Statements (EIS). A supplement to the comment letter has also been attached and offers technical details of Inyo County's groundwater studies program, its main findings, and specific recommendations for the Final Repository Environmental Impact Statement.

Failure to Define the Affected Environment Correctly - Inadequate analysis in the draft Repository Supplemental Environmental Impact Statement relating to groundwater impacts to the Lower Carbonate Aquifer

The draft Repository Supplemental EIS (draft SEIS) gives an adequate description of individual groundwater basins, recharge sources, water uses, and major subterranean geologic characteristics. The SEIS also gives a brief summary of Inyo County's groundwater studies program, mentioning that a primary focus of the County "has been the investigation of the source of water that discharges from the various springs on the east side of Death Valley and whether there is a hydraulic connection between those springs and the groundwater moving beneath Yucca Mountain." The County has amassed a body of strong scientific evidence through geochemical analysis that the Lower Carbonate Aquifer (LCA), which underlies the repository, has several discharge points on the western side of the Funeral Mountains in the Furnace Creek area of Death Valley National Park (Park). The County also recognizes, as does the draft SEIS, that groundwater discharged in the Park is mixed with other groundwater sources from the Ash Meadows area and the Amargosa Desert.

The draft SEIS makes mention of an independent study, conducted by the University of Nevada, Las Vegas, that substantiates this theory of carbonate flow discharging in to the Park. The brief section describing Inyo County's program also concludes that flow from volcanic aquifers does not discharge into the Park. While this statement is correct, it misinterprets the purpose of Inyo's program, which is to study whether the LCA, and not volcanic aquifers, discharge in to the Park. The DOE assumes that because the volcanic aquifers do not discharge in to the Park, that no impacts to the Park are anticipated. This is an erroneous statement, as Inyo County believes that the Park will be potentially affected by contaminated discharge from the LCA, and **not** the volcanic aquifers. It should also be noted that the DOE concedes that Inyo County, but not the Park, will be impacted from contaminants in the volcanic aquifers. Radionuclides in the volcanic aquifers will surface at Franklin Lake Playa and Alkali Flat, near Death Valley Junction, California. However, the DOE predicts this will happen after any applicable compliance period.

From Inyo County's perspective, the most glaring omission in the draft SEIS is that it contains no meaningful assessment of potential impacts to the LCA. The draft SEIS makes no predictions, based on water infiltration and waste package corrosion rates, or groundwater migration times, of the severity or timeframe for impacts to the LCA, or its discharges points in the Park. Accordingly, the draft SEIS contain no impact assessment for plant life, wildlife, wildlife habitat or drinking water supplies in the Park that could potentially be impacted by migrating radiouclides from the repository.

The 2002 Final Environmental Impact Statement for a Geologic Repository at Yucca Mountain, Nevada (2002 FEIS) frequently references ongoing studies relating to groundwater impacts, but the draft SEIS contains little new information on studies conducted by the DOE, the State of Nevada, or Nye and Inyo Counties. DOE concedes that Death Valley proper is the regional hydrological sink for surface and groundwater, yet Inyo County is scarcely mentioned in terms of groundwater impacts from the repository. The Yucca Mountain regional hydrographic map on page 3-33 (Figure 3.9) in the "Affected Environment" section conveniently omits California in terms of hydrographic areas, even though maps on pages 3-28 (figure 3-7) and 3-30 (Figure 3-8) clearly show Inyo County and Death Valley as part of Death Valley regional groundwater flow system, receiving flow from both the volcanic aquifers and the LCA.

Failure to Define the Affected Environment Correctly - Inadequate analysis in the draft Repository Supplemental Environmental Impact Statement relating to groundwater pumping in the region, its effects on repository compliance and groundwater migration from the repository

Currently, an upper gradient exists in the LCA, which causes LCA water to move upward in to the volcanic aquifers because of a steep down gradient found in the vicinity of Yucca Mountain. The DOE argues that the upper gradient will prevent migration of radionuclides from the repository to the LCA. While Inyo's scientific data supports this conclusion, the upper gradient is ephemeral and very fragile. The County believes that the upper gradient could be degraded by regional groundwater pumping, both from the LCA and volcanic aquifers. The DOE maintains that the future effects of groundwater pumping are highly speculative, and need not be considered in any NEPA analysis. Therefore, there is no analysis from groundwater pumping in the region, and no regulatory measures to maintain the upper gradient. Inyo County strongly disagrees with this assertion. At the very least, the County believes that the DOE should consider present pumping rates and its impact on the upper gradient and radionuclide migration. Any NEPA analysis of repository performance and radionuclide migration that does not take into account the effects of groundwater pumping is incomplete and completely inadequate.

Clean up or remediation plan for radionuclides surfacing at Alkali Flat/Franklin Lake Playa

The 2002 FEIS states that water from beneath Yucca Mountain surfaces at Alkali Flat and Franklin Lake Playa, and the 69,000 people could be exposed to contaminated groundwater. The County recognizes that NEPA does not require mitigation measures. However, the County believes it is the DOE's responsibility to implement a mitigation/remediation plan, and an evacuation plan should the repository suffer a catastrophic failure.

Inadequate analysis relating to socio-economic impacts to Inyo County

The DOE considers Inyo County outside the "region of influence" for socio-economic impacts analysis under NEPA. Inyo County strenuously disagrees with this assertion, as the repository is approximately 15 miles from the Inyo County line and the boundary for Death Valley National Park. The Park has approximately 700,000 visitors a year, many of whom are foreign tourists. The County relies heavily on tourism revenues from the Park, as well as other regional attractions, such as the China Date Ranch, the Amargosa River, bird watching, and local mineral baths. The County is concerned about reduced tourism revenues, as well as decreases in real and business properties, from repository operations and the transportation of nuclear materials through the County. Therefore, Inyo County should be considered within the “region of influence” for socio-economic impacts analysis because of it proximity to the site. Without meaningful analysis in the 2002 Final EIS, and now the draft SEIS, the DOE’s impact assessment of socio-economic impacts in Inyo County is incomplete and entirely inadequate because it fails to define the region of influence for the impacts created by the proposed action or due to reasonably foreseeable alternatives.

Inadequate analysis relating to reasonable alternatives to the Caliente Rail Corridor

The draft Rail EIS states that if the Caliente Rail Corridor is not completed, that the future course is “uncertain” with regards to transportation of nuclear materials to Yucca Mountain. Inyo County believes that if the Caliente Rail Corridor fails, truck transport will become the preferred method of transportation to the repository. Yet the draft Rail Corridor/Alignment EIS contains no analysis for a mostly truck shipping scenario, which should be considered a reasonable alternative, given the massive uncertainty surrounding the Caliente Rail Corridor. This will be the largest rail construction project in 80 years, and will cost $2.5-$3 billion dollars to complete the rail line. The Caliente Rail Corridor also faces several engineering challenges, as the route traverses seven north-south mountain ranges with steep grades, and numerous areas prone to flash flooding. The Caliente Rail Route will also impact grazing allotments by local ranchers, and require approximately 175 new groundwater wells to be drilled along the route to support construction. Given the uncertainty with cost, engineering challenges, and land-use conflicts, the prospects of the Caliente Rail Corridor being completed is highly questionable. Therefore, the DOE should be required to analyze a “mostly truck” shipping campaign as a reasonable alternative to the Caliente Rail Corridor.

Inadequate analysis of impacts relating to the movement of construction equipment and personnel on Highway 127 for the Caliente Rail Corridor

Finally, the draft Rail EIS gives no impact assessment of construction equipment and personnel traveling on Inyo County highways for construction of the portion of the Caliente Rail Corridor which parallels Nevada Highway 95, south from Tonopah, Nevada to the repository site. The County believes it is highly likely that the DOE will move construction equipment along California Highways 127 and 178 because of their close proximity to the Caliente Rail Corridor. This has the potential to increase the volume of traffic on these County highways and impact air quality, yet the draft Rail Alignment/Construction EIS makes no such prediction or assessment of potential impacts. The DOE should analyze the impacts of increased traffic volumes to Inyo County on Highways 127 and 178 in the Final Rail EIS.

Transportation, Aging, and Disposal Canister

The Transportation, Aging, and Disposal (TAD) canister is a multi-purpose canister designed to simplify the transport process and reduce exposure to highly radioactive spent fuel rods. The TAD utilizes one packaging system for spent fuel when it leaves the reactor site.

Use of the TAD canister system will significantly increase workers’ radiological exposure and the risks associated with handling bare spent fuel assemblies, and loading and welding canisters at reactor sites. There also are uncertainties regarding acceptance of the TAD canisters at the repository and the potential return of rejected TADS to originating sites. The Final SEIS should thoroughly assess the risks

and impacts to workers, surrounding communities, the environment, and populations in transit (highways, rail) at reactor sites from using the TAD system. In addition, the Final EIS should analyze how the TAD system will interface with the dry cask storage system at reactor sites as well as analyze its costs and financial arrangements for paying for the TAD system at reactor sites. All four California commercial reactor sites (Diablo Canyon, San Onofre, Rancho Seco, and Humboldt Bay) may have specific problems with the proposed TAD system. All commercial reactors in California are either planning to transfer or have transferred all or a portion of their spent fuel into dry cask storage. Finally, because TADs will be packaged by the individual utilities offsite and then shipped to Yucca Mountain, inspection of the TAD by the DOE before emplacement is critical to the repository's performance.

The Final EIS also should assess how the TAD system would work at decommissioned reactors where the spent fuel handling equipment and facilities have been removed and no longer remain onsite. All of the spent fuel at Rancho Seco, which is in the final stages of decommissioning, has been transferred into dry storage using multi-purpose canisters. The Final SEIS should evaluate how the TAD system would work at decommissioned reactors, where spent fuel handling equipment and facilities have been dismantled and removed from the site. The Final SEIS should identify who is responsible for building facilities to house spent handling operations and how would the costs, liability, and impacts associated with transferring spent fuel into TADs at reactor sites would be handled. About 10% of all spent fuel rods have broken due to gamma ray exposure during fission. These broken rods are not compatible with the TAD. Consequently, the Final EIS should identify and analyze how these broken rods will be shipped to the repository. Inyo County also remains concerned that the TAD will not be certified by the U.S. Nuclear Regulatory Commission before submission of the DOE's License Application. Given the massive uncertainty surrounding the TAD, the Final SEIS must evaluate alternatives if the TAD system does not prove to be suitable, due to its cost and/or risk.

Potential truck transportation of nuclear materials on California Highways 127 and 178

Inyo County remains very concerned about the potential for nuclear materials to be shipped to Yucca Mountain on California State Highways 127 and/or 178 given the uncertainties surrounding the Caliente Rail Corridor. While these alternative truck routes have not yet been designated, the Draft SEIS estimates that approximately 755 rail casks would be transported through California (8% of total shipments) and 857 truck casks (32% of total) if the Caliente Rail Corridor is constructed and used. It should be noted that the State of Nevada has estimated a potential for larger numbers of rail cask shipments to Yucca Mountain through California for both the Caliente Rail Corridor (as many as 4,400 casks or 45% of the total shipments). Under the terms of the standard contracts between the DOE and the utilities, 47% of the waste shipments in the first five years of the program will originate at sites without rail access. There will be a huge incentive for DOE to begin it's shipping campaign with truck shipments.

California Highways 127 and 178 began originally as wagon routes across the desert, and do not take into account the engineering demands that a prolonged truck shipping campaign of nuclear material will place on the roadways. These highways are inadequate for a truck shipping campaigns for many reasons:

1.Two-lane highway from San Bernardino County line to Nye County line
2. Limited passing lanes
3. Limited areas of highway shoulder
4. Few turnoffs
5. Flooding from the Amargosa River during spring run off or during other flood events

The first responder to any release of nuclear material in Southeast Inyo County is the Southern Inyo Fire Protection District (SIFPD). The SIFPD has a volunteer staff of approximately 10, with one full time paid employee who acts as Chief. Response times vary based on the location of an incident. In the past, the

SIFPD has received limited training to respond to a nuclear release through the DOE's Training Emergency Preparedness Program (TEPP). It is anticipated that the SIFPD would need numerous full-time, paid employees, in addition to its current volunteer staff, if a shipping campaign to Yucca Mountain is initiated. In addition, the SIFPD would need specialized equipment and detection devices, along with a rigorous training plan to adequately deal with a release of radionuclides in Southeast Inyo County.

The nearest major hospital facilities are in Las Vegas or Barstow, depending on the site of the incident. It is unclear whether these facilities are properly equipped or trained to handle persons who have been exposed to radioactive materials. Travel times to these facilities range from one and a half to three hours away from potential truck shipping routes in Inyo County. Currently, there is no regional communication network that could alert residents and visitors to a radioactive release.

The DOE maintains that these routes are currently not under consideration as truck transport routes. However, due to lingering uncertainties regarding the TAD canister, the Caliente Rail Corridor, and Clark County's steadfast opposition to nuclear shipments through Las Vegas, truck transport appears to be the most probable method of transporting nuclear materials to Yucca Mountain. This belief is further strengthened by the fact that the DOE currently uses State Highway 127 and 178 for low-level waste transport to and from the Nevada Test Site.

The County believes that Section 180 (c) of the Nuclear Waste Policy Act, which provides grants to affected states and tribes for response training, is ineffective both in funding and scope, to adequately train emergency responders to deal with a nuclear release. Modeling indicates that the State of California will only receive approximately $200,000 to distribute to the hundreds of local jurisdictions and first responder agencies.

Other Transportation Issues

The Draft SEIS does not consider "worst-case" accidents in its NEPA analysis because such combinations of factors were considered "not reasonably foreseeable." Yet, the Draft SEIS acknowledges that clean-up costs after a very severe transportation incident involving a repository shipment resulting in the release of radioactive material could range from $300,000 to $10 billion. The Final SEIS should evaluate the impacts from a credible worst-case transportation accident or terrorist attack, as well as other accidents scenarios caused by human error.

A National Academy of Sciences (NAS) study recommended that detailed surveys of transportation routes for spent fuel be done to identify potential hazards that could lead to or exacerbate extreme accidents involving very long duration, fully engulfing fires and that steps should be taken to avoid or mitigate such hazards. The Final SEIS should identify the shipping corridors and include route-specific analyses that identify potential hazards along shipment routes. The risk analyses should include the potential consequences of a severe accident or terrorist attack involving extreme, long duration fire conditions that exceed package performance requirements. The Final SEIS should also consider the impact of human error as well as the potential for unique local conditions to exacerbate the

consequences of accidents or terrorist attacks. Certain segments of possible routes in California could provide conditions in which an accident or terrorist attack could exceed the spent fuel packaging performance requirements. Two major highway accidents that occurred this year on California highways (one in the Bay Area and one in Santa Clarita tunnel fire) are being investigated to determine whether these accidents may have resulted in conditions, in particular fire temperatures and fire durations, which approached or exceeded packaging performance requirements. Similarly nearly half of the 16 historical severe accident scenarios that were examined in the NAS 2006 study on spent fuel transport safety occurred in California. The Final SEIS should examine credible accident scenarios that could exceed packaging performance standards.

In the draft Rail EIS, the DOE proposes to ship newer spent nuclear fuel first, contrary to the recommendation made by the NAS that the oldest spent fuel be shipped first to the repository. This recommendation was proposed because fuel that has aged fifty or more years contains significantly less amounts of Cesium-90 and Stonchium-137. These radioactive isotopes present the most substantial risk to workers who package the spent fuel for transport, and those involved in the actual transport of spent fuel. Inyo County recommends that the Final Rail EIS incorporate the NAS's recommendation of the oldest fuel being shipped first to Yucca Mountain.

No final U.S. Environmental Protection Agency compliance standard

The final U.S. Environmental Protection Agency (EPA) rule regarding acceptable radiation dose rates at the compliance point, located near Nevada Test Site Gate 5-10, has not yet been finalized. It should be noted that this is the only compliance point for the entire repository. The compliance point also appears to have been selected because it is at the far southern boundary of the Nevada Test Site, rather than for any unique radionuclide detection capabilities. Without any final standard, it is impossible for Inyo County to assess and verify the DOE's claims of compliant repository operations. Therefore, the final Repository EIS should incorporate the EPA's final rule regarding acceptable radiation releases from the repository.

Emergency preparedness in Southeast Inyo County

The first responder to any release of nuclear material in Southeast Inyo County is the Southern Inyo Fire Protection District (SIFPD). The SIFPD has a volunteer staff of approximately 10, with one full time paid employee who acts as Chief. Response times vary based on the location of an incident. In the past, the SIFPD has received limited training to respond to a nuclear release through the DOE's Training Emergency Preparedness Program (TEPP). It is anticipated that the SIFPD would need numerous full-time, paid employees, in addition to its current volunteer staff, if a shipping campaign to Yucca Mountain is initiated. In addition, the SIFPD would need specialized equipment and detection devices, along with a rigorous training plan to adequately deal with a release of radionuclides in Southeast Inyo County. The Final Rail EIS should incorporate the DOE's contingency plans for any type of radioactive release in Inyo County.

Impacts to the Timbisha Shoshone Tribe

The U.S. Department of the Interior has recognized the Timbisha Shoshone Tribe as an "affected Indian tribe" under the Nuclear Waste Policy Act. Neither the draft SEIS nor the draft Rail EIS recognize the proximity of the tribe to the site and the likely impacts that will be felt throughout each phase of the Yucca Mountain Project by the Timbisha Shoshone. The final EIS's should asses and analyze impacts to the tribe's drinking water supply, impacts from truck transport of nuclear materials through tribal lands, socio-economic impacts, impacts to cultural resources, and environmental justice issues.

NEPA Procedural Concerns

The spirit and intent of NEPA is to maximize public input regarding the environmental impacts of actions undertaken by federal agencies. NEPA public meetings allow impacted citizens and other members of the public the opportunity to formally comment on any potential impacts on federal projects. The DOE has scheduled only one public meeting for all three NEPA draft EIS's in the State of California. California will be highly impacted from the Yucca Mountain Project, specifically from the transportation of nuclear materials in the state. It is estimated that 7.5 million people in California live within one mile of federal interstates that will be used for shipment. One meeting is wholly inadequate, given the anticipated impacts to the state, for citizens to participate effectively in the NEPA process. Additionally, the single meeting location, in Lone Pine, California, is in an area that will experience little to no impact from the Yucca Mountain Project. Finally, Inyo County would recommend that question and answer periods during any public hearing be placed on the administrative record.

Thank you for the opportunity to comment on the draft Repository SEIS and the draft Rail EIS. Inyo County believes that its comments will allow the DOE to make the most informed decision regarding impacts to Inyo County, the severity of such impacts, and appropriate mitigation measures.

Please contact Matt Gaffney, Project Coordinator, Yucca Mountain Repository Assessment Office, at (760)-873-7423 if you have any questions.

Sincerely,

Supervisor Jim Bilyeu, Chairperson
Inyo County Board of Supervisors

Supplement to Inyo County's comments on groundwater impacts

This supplemental section discusses in detailed scope Inyo County's groundwater studies program, and specific oversights found in the draft Repository Supplemental Impact Statement (draft SEIS). It is incorporated by reference in the main text of the County's comment letter. The County's general conclusions regarding the adequacy of the draft SEIS are:

1. The draft SEIS does not fully reference or utilize DOE sponsored Inyo County hydrogeology research on the Lower Carbonate Aquifer (LCA).

2. The draft SEIS does not fully or accurately characterize the LCA.

3. The draft SEIS does not adequately discuss the upward gradient in the LCA as a barrier to radionuclide transport, or possible impacts on repository performance with a possible loss in the upward gradient due to regional groundwater usage.

1. The draft SEIS does not fully reference or utilize DOE sponsored Inyo County hydrogeology research on the LCA

The 2002 FEIS and SEIS references and utilizes data from the Nye County Early Warning Drilling Program. Inyo County geologic and hydrologic studies are referenced in a single paragraph in Section 3.1.4.2.1 (Regional Groundwater), with minor notations in various texts. A brief summary of Inyo County's research is provided with references.

With funding from the U.S. Department of Energy (DOE), Inyo County has been conducting geological and hydrological studies since 1997. Specifically, the County is concerned with potential transport, by ground water, of radionuclides into Inyo County, including Death Valley, and the evaluation of a connection between the LCA and the biosphere. Key research conducted includes:

- Geological mapping.
- Construction of a LCA monitoring well on eastside of Southern Funeral Mountain Range.
- Geophysical surveys of portions of the Amargosa Valley and Death Valley areas.
- Geochemical sampling and testing of springs and wells in Death Valley National Park.
- Numerical groundwater modeling of the LCA in the Amargosa Valley and Southern Funeral Mountain Range.

All of these materials are, and have been, available to the DOE. The DOE should analyze and incorporate all of Inyo County's findings regarding groundwater impacts in its Final

SEIS. All of the materials supporting Inyo County's findings regarding groundwater impacts can be found below.

References

Bredehoeft, et. al., 2005, The Lower Carbonate Aquifer as a Barrier to Radionuclide Transport, Waste Management Conference 05, WM 5482.

Bredehoeft, et. al., 2007, Radionuclide Transport from Yucca Mountain and Inter-basin Fow in Death Valley, Waste Management Conference 07, WM 7120.

Bredehoeft, et. al., 2007, Radionuclide Transport from Yucca Mountain and Inter-basin Flow in Death Valley: Testimony to U.S. Nuclear Waste Technical Review Board, May 15.

Inyo County, September 2005, Death Valley Lower Carbonate Aquifer Monitoring Program-Wells Down Gradient of the Proposed Yucca Mountain Nuclear Waste Repository: U.S. Department of Energy Cooperative Agreement DE-FC08-02RW12162 Final Project Report.

Inyo County, August 2007, Death Valley Lower Carbonate Aquifer Monitoring Program-Wells Down Gradient of the Proposed Yucca Mountain Nuclear Waste Repository: U.S. Department of Energy Cooperative Agreement DE-FC28-06RW12368 Year One Project Report.

King, et. al., 2003, Inyo County, California, Regional Ground Water Monitoring Program, Testimony to U.S. Nuclear Waste Technical Review Board, October.

King, et. al., 1999, Death Valley Springs Geochemical Investigation, Yucca Mountain Nuclear Repository, Inyo County Oversight-1998, www.hydrodynamics-group.com, March.

2. The draft SEIS does not fully or accurately characterize the LCA

The draft SEIS provides only a limited characterization of the LCA. The draft SEIS characterization of the LCA should be expanded because of the importance of the LCA as a barrier to radionuclide transport at Yucca Mountain. A discussion of the LCA should also accurately represent the current data on the LCA.

Bredehoeft, et. al., Waste Management 2007 Conference paper and Bredehoeft's testimony in May 2007 to the Nuclear Waste Technical Review Board provides a characterization of the aerial distribution and hydraulic properties of the LCA at and down gradient of Yucca Mountain. The paper also describes Inyo's understanding of the LCA and which has been provided to the DOE's for its consideration. The following is a concise summary of the properties and characteristics of the LCA.

DEATH VALLEY REGIONAL GROUNDWATER MODEL

Concern about the potential transport of contaminants from both the Nevada Test Site and from Yucca Mountain led to groundwater flow models being developed for both sites. Initially two separate models were developed—one for the Test Site by IT/GeoTrans and a second for Yucca Mountain by the United States Geological Survey (USGS). Initially this was a duplicative effort. It was decided to merge the two efforts into a single model under the leadership of the USGS.

A groundwater flow model of the area poses unique problems. The area is broken up into mountain ranges and intervening valleys. In addition the area was at the continental margin during much of its geologic history; the facies of many of the stratigraphic units change in the area of the model. While there are outcrops of the rocks in the mountain ranges, there are few drill holes in the valleys that penetrate the LCA. Creating the model was a challenging problem.

The final USGS model design is unusual. The model consists of 16 layers that are created based loosely upon elevation—they are more or less horizontal slices of rock. Superimposed on the layers is the usual horizontal finite difference grid—cells are 1500 meters by 1500 meters in the east-west and north south-direction. Using this grid system the rocks that underlie the region can be assigned into the grid cells within the model (5).

This modeling system has both strengths and weaknesses. Its strength is that it readily accommodates the rapid horizontal changes in lithology that occur within the region—all the differing rocks are readily accommodated. The scheme has the disadvantage that it is hard to follow a given aquifer through the model. For example, one has to search for all the cells in each layer that contain Paleozoic carbonate. One then has to aggregate the information from the layers to obtain a picture of the total carbonate rock at any location. If several layers at any given location contain Paleozoic carbonate the head representing the aquifer at that location has to be interpreted from the head in each of the model layers

Geology in the Model

There are few drill holes in the area of the Death Valley flow system model that reach the Paleozoic carbonate aquifer beneath the valleys. Outcrops of the various stratigraphic units, including Paleozoic carbonate rocks occur in the mountain ranges. However, in order to fully populate the model it is necessary to interpret the geology, especially the geology beneath the valleys. Geologists constructed a series of cross-sections through the area of the model that depicted their interpretation of the geology.

Geologic mapping in the mountain ranges where the rocks are exposed is a more or less straightforward procedure. However, interpreting the geology beneath the valleys is a much more subjective endeavor, even when it is guided by regional geophysics. There is the further problem that the data must be interpolated from the cross-sections to the model grid; errors in input can occur in this procedure.

In summary, the USGS Death Valley Regional Flow System Model has the advantage that the laterally discontinuous nature of rocks in the region are accommodated. The model has the disadvantage that it is difficult to extract information of interest. It is Inyo's intent to extract from the USGS as much information as possible that pertains to the LCA.

The Palezoic Carbonate Aquifer

Of particular concern to Inyo County is the Paleozoic carbonate aquifer, or LCA. Inyo County has extracted from the USGS Death Valley Regional Flow Model the data pertaining to the Paleozoic carbonate aquifer. Figure 1 is a distribution map for the carbonate taken from the USGS Regional model area (see next page).

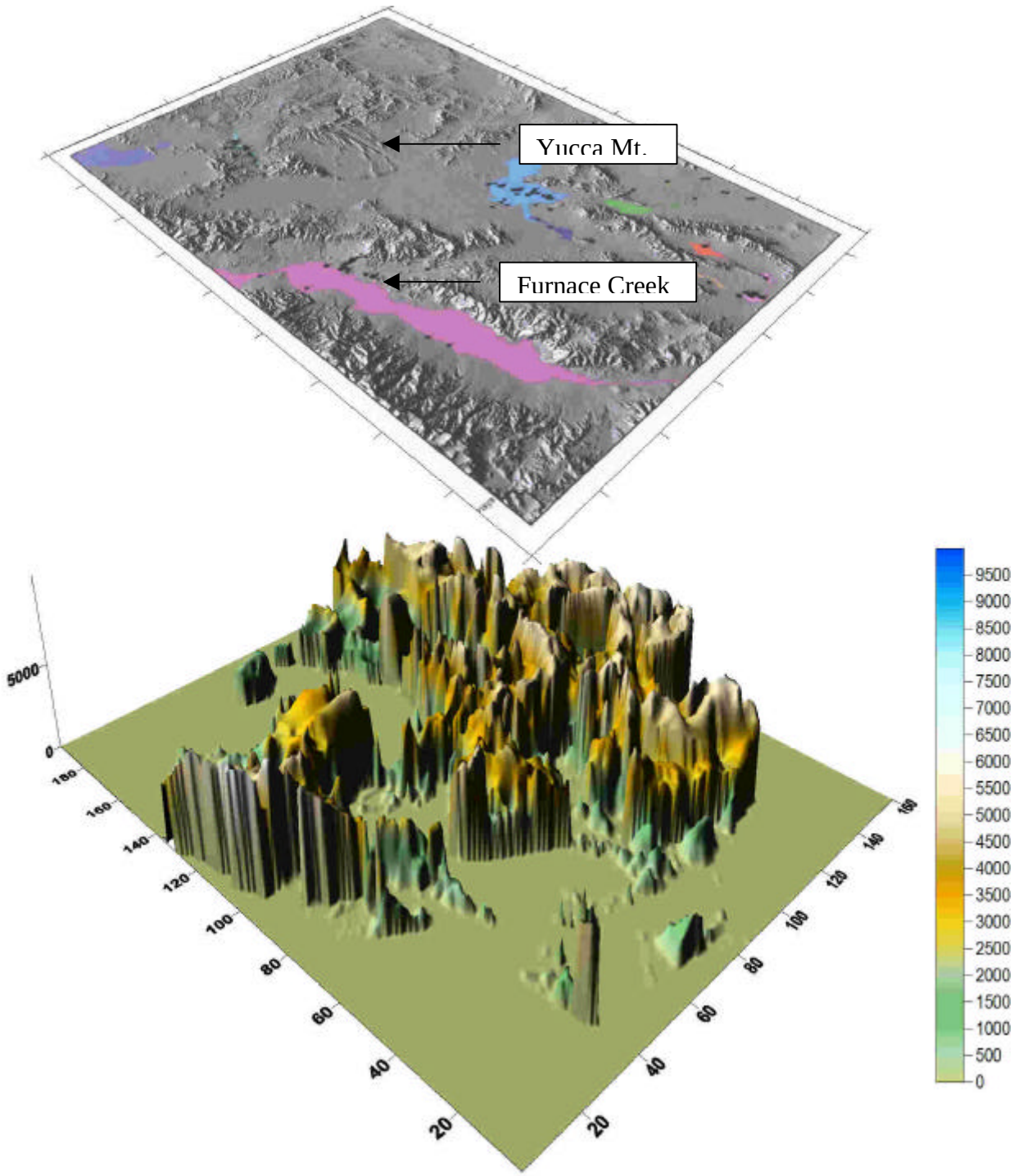

Figure 1. Distribution of Carbonate Rocks in the Death Valley Regional Flow System Model.

As Figure 1 illustrates, the carbonate rocks are discontinuous across the region. In places they are very thick, reaching more than 5000 meters in thickness. A large mass of

carbonate rock underlies Yucca Mountain and the Amargosa Valley that extends through the Southern Funeral Mountains.

The potentiometric surface for the area indicates an area of low gradients over the Amargosa Valley that is bound by an area of high gradients through the Southern Funeral Mountain Range to the southwest to a spring discharge area in Death Valley. the area of low gradients discharge occurs at Ash Meadows, and to a lesser amount in Pahrump Valley, Shoshone and Tecopa.

Amargosa Valley Sub-Region

Inyo County's focus is on Yucca Mountain, the Amargosa Valley, and the Southern Funeral Mountains. It is through this area that the Paleozoic carbonate aquifer provides a potential pathway for contaminants to be transported from Yucca Mountain to the biosphere.

We extracted from the USGS regional model the thickness of the Paleozoic carbonate rock in the sub region. Figure 2 is an isolith map for the Paleozoic carbonate rock within the sub-region. Not all of the sub-region contains carbonate. Beneath the Amargosa Valley the Paleozoic carbonate rocks are greater than 5000 meters thick. In this area, even extensional basin and range faults with large vertical throws would juxtapose carbonate rocks against carbonate rocks across the faults. With such large thickness of carbonate rock one can understand why the aquifer integrates the subsurface flow at depth.

Each researcher working on the hydrogeology of the Paleozoic carbonate aquifer has a somewhat different conceptual image of what forms the interconnected pore space of the Paleozoic carbonate aquifer. The brittle carbonate rocks are broken up by the tectonics of the basin and range. Joints and faults in the rock have been enlarged by subsequent dissolution of the rock. Caverns are known to occur—Devils Hole is a good example. The question arises: can one drill anywhere in the carbonate rock terrain and obtain a reasonable productive water well—a well producing several hundred gallons a minute or more? Experienced Nevada ground-water hydrologists believe this is possible, provided that one drills a "sufficient" thickness of carbonate rock.

Recently the Southern Nevada Water Authority (SNWA) proposed to pump groundwater from valleys to the south and east of Ely, Nevada and pipe it to Las Vegas. Estimates vary for their proposed withdrawal; but they talk in terms of 190 million cubic meters annually (150,000 acre-feet). One of their early requests to the Nevada State Engineer is for a water right to pump 110 million cubic meters (90,000 acre-feet) annually from Spring Valley. SNWA's contractor, Durbin & Associates, assembled hydraulic conductivity values for the entire Paleozoic carbonate region as input for a model of Spring Valley. Figure 3 illustrates a cumulative distribution of transmissivity taken from the SNWA data.

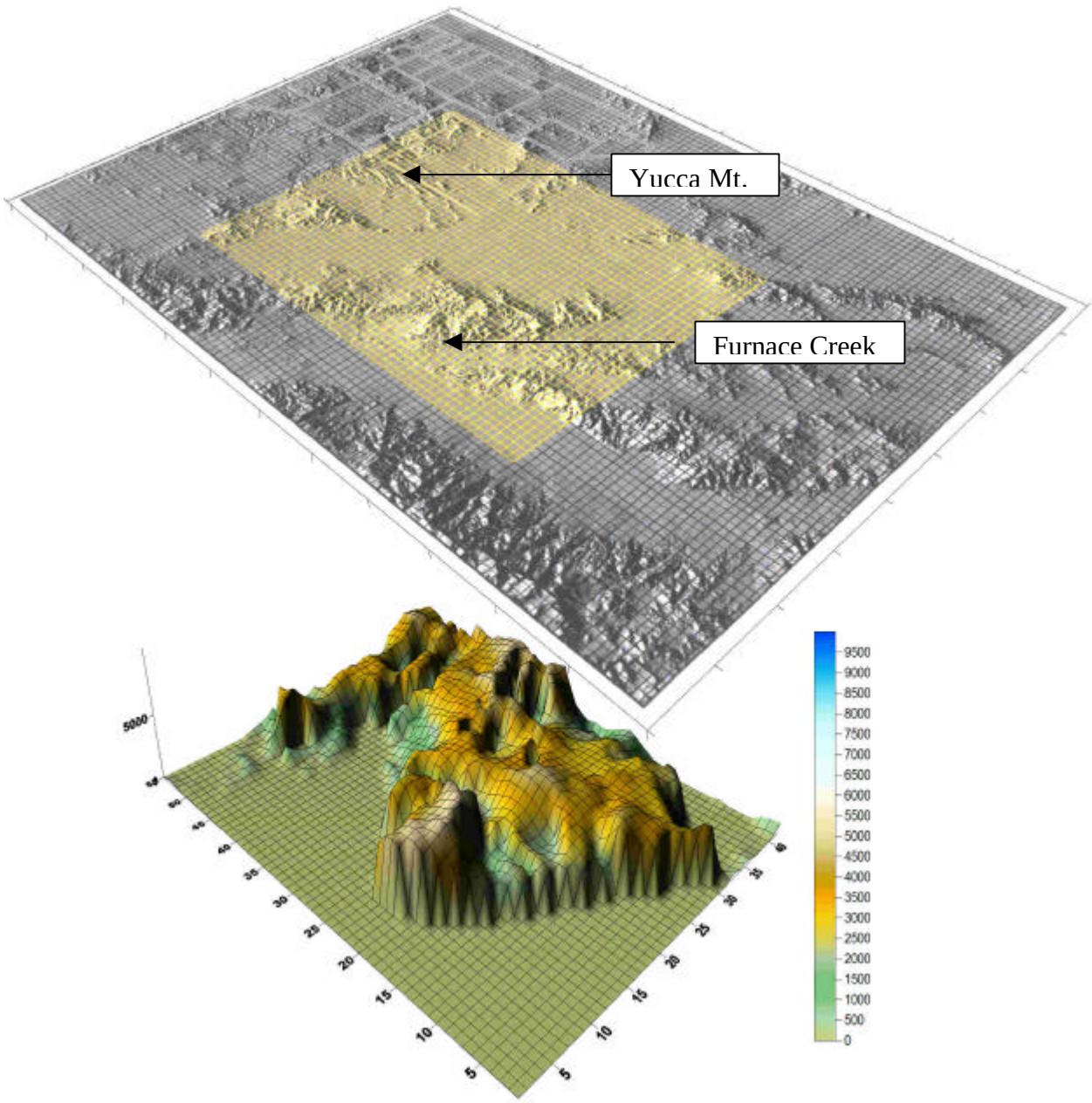

Figure 2. Thickness of the Paleozoic Carbonate Rocks in the Sub-Region.

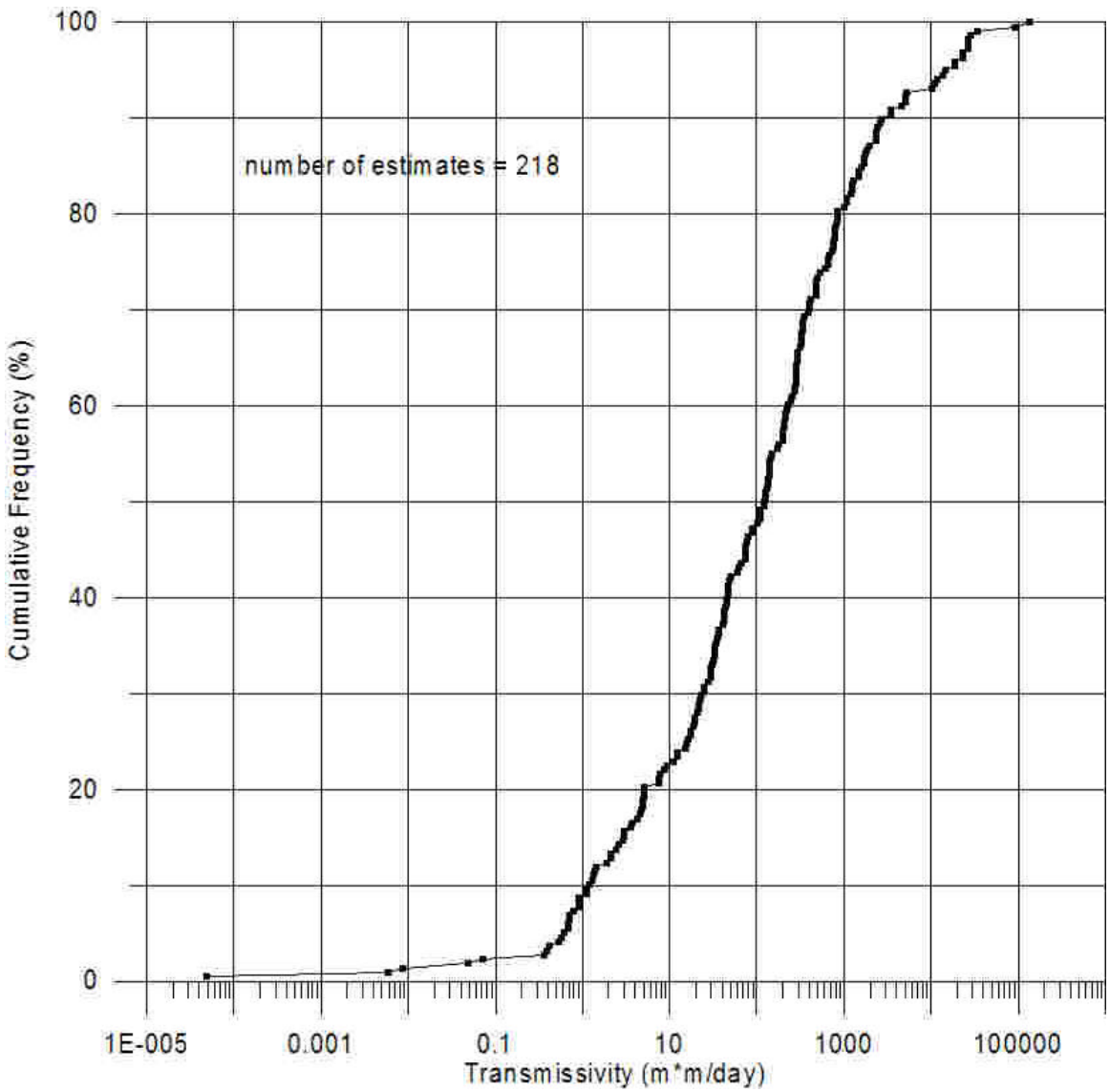

Figure 3. Cumulative Distribution of Transmissivity from SNWA Data (SNWA, 2006).

The data suggest that there is approximately an 85% chance of obtaining a well that yields 0.4 cubic meters per minute with 30 meters of drawdown (100 gpm with 100 feet of drawdown). It also indicates that there is approximately a 10% chance that a well with 30 meters of drawdown will yield approximately 8 cubic meters per minute (2000 gallons per minute with 100 feet of drawdown).

One can calculate a hydraulic conductivity from the Transmissivity data. The usual assumption is that the screened interval, or the open-hole section of the portion of the well tested should be divided into the transmissivity to obtain a local estimate of the hydraulic conductivity. If one compares the cumulative ratio of the cumulative distributions you see that the hydraulic conductivity generally represents approximately 30 meters of tested well section. This suggests that there is about an 85% chance that if

one drills a sufficiently thick section of Paleozoic carbonate rock one will find a 30 meter, or smaller zone that is sufficiently permeable to yield a good well (defined as more than 100 gallons per minute with 100 feet of drawdown).

In other words, the simple conceptual model of the hydraulic conductivity in the aquifer shows the aquifer contains at least a permeable zone, maybe 10 meters, or several tens of meters thick, more or less everywhere where the Carbonate rocks are more than several hundred meters thick. The permeability is enhanced where it is associated with recent faulting within the carbonate units. Barriers to flow seem to occur where the carbonate is juxtaposed against less permeable rock. Caves are known in the carbonate rock; for example, Devils Hole is a known cave.

There is some suggestion in the carbonate data that the hydraulic conductivity decreases with depth; however, the data is very scattered. Some workers explain that this scatter is due to burial; on the other hand, the temperature rises with depth making the water less viscous, increasing the hydraulic conductivity. Researchers seem to assume a depth of burial beneath which the hydraulic conductivity does not decrease further. This seems questionable, given the noisy nature of the data, that correcting the hydraulic conductivity for depth adds much to the precision of the analysis.

The conceptual model may not be all that important when one's concern is only the movement of water. However, when you begin to transport chemical constituents the nature of the conduit for flow becomes all-important—more on the permeability/porosity conceptual model below.

A Simple Flow Model

One simple way to investigate the system is to assume that the principal pathway for flow is mostly through the Paleozoic carbonate aquifer. With this thought in mind one can construct a model for flow through only the carbonate rock; this is a simplistic, first-order approximation for the system; but it provides insight. The USGS in their RASA study used a two-layer idealized model—this model is even simpler.

In the Ash Meadows/Amargosa area the largest amount of recharge comes from the Spring Mountains. The big discharge areas are in Ash Meadows, Pahrump Valley, in the area of Shoshone and Tecopa, and in Death Valley. Approximately 75% of the recharge comes from the Spring Mountains.

Inyo County created a one-layer model of the Paleozoic carbonate aquifer. As suggested above, this is a kind of zero-order model that provides insight into how contaminants might move through the carbonate aquifer. In this model the aquifer is decoupled from the overlying Tertiary deposits. Where the Paleozoic carbonate aquifer has been penetrated in the area, a good low-permeability confining layer overlies the aquifer. We know that this isolates the aquifer, not totally, but certainly to a great degree. So the simple model is only useful in that it provides an estimate of how contaminants might move. Figure 4 is a computed steady-state potentiometric surface generated from the one

layer model. Flow is continuous in the aquifer from the area of Yucca Mountain to the discharge area in Death Valley.

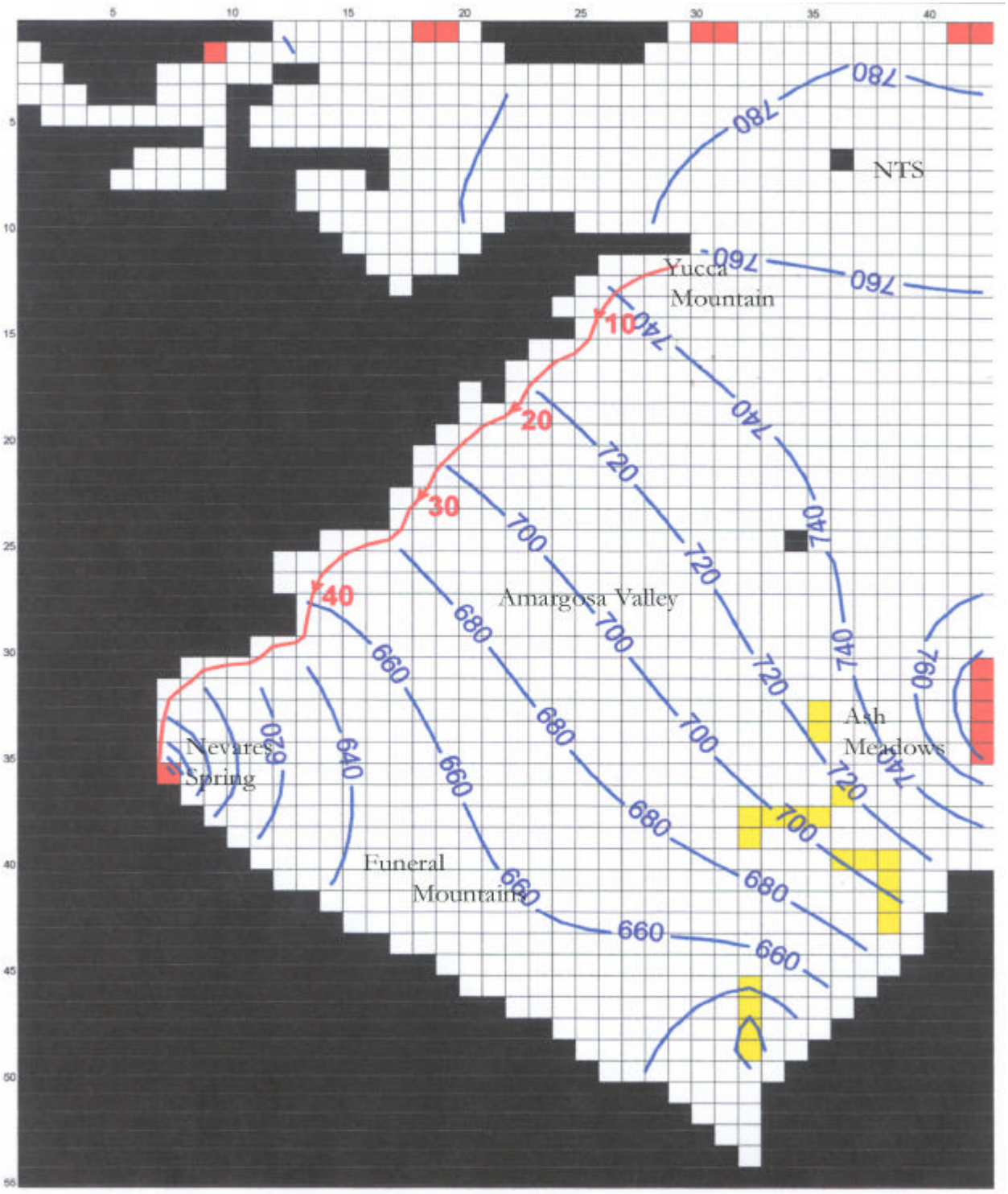

Figure 4. Map of Steady State Hydraulic Head from the one Layer Carbonate Aquifer Model.

The yellow areas are spring discharge areas. The red line is a particle track for a particle introduced in the vicinity of Yucca Mountain that exits in Death Valley—the red numbers are estimates in years of the time of travel for the particle.

Potential for Contaminant Travel Through the Carbonate Aquifer

One common way to estimate the time of travel of a chemical constituent is to assume that the constituent moves with the velocity of the water. In groundwater flow, Darcy's Law defines the groundwater velocity as:

$$v = K/\varepsilon\ (\partial h/\partial l)$$

Where v is the groundwater velocity, K is the hydraulic conductivity, ε is the porosity, and $(\partial h/\partial l)$ is the gradient in hydraulic head. The question becomes what is the appropriate porosity to apply to the calculation? This again raises the issue of how one conceives the connected pore space in the aquifer. There are several investigations that shed some information on this issue.

Winograd and Pearson investigated the isotopic content of major springs in the Ash meadows complex. They focused particularly on carbon 14 that varied greatly between individual springs. They concluded that the carbon 14 content of the springs was best explained by what they termed "mega scale channeling" within the aquifer.

One hole in the vicinity of Yucca Mountain, UE 25p1, penetrated approximately 500 m of the Paleozoic carbonate aquifer. Galloway and Rojstaczer (10) studied earth tide signals in the carbonate aquifer. They concluded that the aquifer was well confined, and that the storage coefficient derived from their analysis indicated porosity less than 1%. Craig and Robison (11) estimated from a pumping test that the transmissivity of the carbonate aquifer penetrated by the hole was 59 m^2/day this is approximately mid-range in the transmissivity distribution (see Figure 3).

The evidence suggests that the porosity one assigns to the carbonate aquifer to estimate the velocity of groundwater flow should be less than 1%. This is consistent with a fractured zone in the thick carbonate sediments that is highly permeable.

The particle path line, shown on Figure 4, is calculated using a permeable zone 100 meters thick, with a porosity of 0.1%. With this calculation it takes less than 50 years for the particle to travel though the aquifer from vicinity of Yucca Mountain to Death Valley. If the porosity were 1% the travel time would be 500 years.

What Protects the Carbonate Aquifer at Yucca Mountain

Borehole UE 25p1 had a hydraulic head in the Paleozoic carbonate aquifer that was 15 m higher than the hydraulic head in the overlying Tertiary volcanic rocks. This higher head has the potential to move groundwater upward from the carbonate into the overlying volcanic sequence of rocks. As long as the head relationship remains as presently

observed the carbonate is protected from contamination moving downward from the repository to the carbonate aquifer.

Summary and Conclusions

The Paleozoic carbonate aquifer, or LCA in the Death Valley flow system has been the site of intensive investigation since the 1950s. Conventional wisdom, that has become doctrine, has the carbonate aquifer integrating the ground water flow in the area. The investigations have intensified as the Federal Government has embarked on building a nuclear repository at Yucca Mountain. One of the more ambitious of the projects has been the construction of the USGS Death Valley Regional Ground Water Flow Model.

Any model of contaminant transport through the carbonate aquifer depends heavily upon how one pictures the connected pore space in the carbonate rocks. Inyo's conceptual model is of a thick carbonate sequence that contains a zone ten to several tens of meters thick where the rocks are fractured and provide a permeable pathway for flow. The information suggests that everywhere there is a reasonable thickness of carbonate rock one can obtain a reasonably good water well, provided he/she drills a sufficient thickness of the rock. One can enhance his/her chances of getting a really good well by going to places where recent tectonics movements in the region have further disturbed the carbonate rocks.

Finally with this model in mind transport through the carbonate aquifer from a location near the site of the repository at Yucca Mountain to the biosphere in Death Valley will be relatively rapid. Our calculation with a permeable zone 100 m thick and porosity of 0.1% indicates a transit time of less than 50 years; if the porosity is of the order of 1% the time is of the order of 500 years.

3. The draft SEIS does not adequately discuss the upward gradient in the LCA as a barrier to radionuclide transport or possible impacts on repository performance with a possible loss in the upward gradient due to regional groundwater pumping

The importance of the upward gradient in the LCA as a barrier to radionuclide transport at Yucca Mountain, and the potential impact of down gradient pumping on repository Total System Performance Assessment (TSPA), is not discussed in the draft SEIS. It is also evident from discussions with DOE-Office of Civilian Radioactive Waste Management (OCRWM) that the hydraulic relationship between the LCA and the Tertiary aquifers is misunderstood. The upward gradient in the LCA represents an important natural barrier to radionuclide transport from Yucca Mountain. It is believed that downward migration of radionuclides through the Tertiary Saturated Zone aquifers will be stopped by the higher hydraulic head or pressure from the LCA. Thus, understanding the hydraulic relationship between the Tertiary and LCA is critical TSPA analysis.

The upward gradient in the LCA has been established from water level measurement in LCA monitoring wells UE25p1, Nye County well 2DB, National Park Service Ash Meadow wells GF-2A and 2B, and Inyo County well BLM #1. This data indicated the LCA has an upward gradient at Yucca Mountain and over most of the Amargosa Valley. Geochemical data from the Nye County Early Warning Drilling Program Wells show a carbonate signature that indicates a hydraulic connection between the Tertiary and LCA.

Numerical groundwater modeling has been performed for the region at and down gradient of the Yucca Mountain repository by the United States Geological Survey (Belcher, 2004), by the State of Nevada Engineer's Office (Water Rights Ruling 5750), and by The Hydrodynamics Group, LLC (WM 2007). These numerical groundwater models demonstrate the hydraulic connection between the Tertiary and LCA systems. The models show that the potentiometric surface in the Tertiary aquifer system is supported by the upward gradient in the LCA.

Hydraulic head is one of the more ephemeral of hydrologic conditions. Head is subject to change by development of groundwater for water supply in the Amargosa Valley south of the repository site. The population of southern Nevada is growing rapidly. Local groundwater is looked to for a large portion of the water supply. Both the valley fill deposits and the Paleozoic Carbonate Aquifer are targets for development. Groundwater pumping, lowering the hydraulic head, could eliminate the upward hydraulic head gradient that serves as the barrier to contaminate movement into the LCA at Yucca Mountain.

Current pumping rates from water wells in the Amargosa Valley and Yucca Mountain areas were modeled into the future for a 1,000-year period. Both the Nevada State Engineer's and Hydrodynamics models show an approximate 10-meter drop in the saturated zone water level below Yucca Mountain after 1,000 years of pumping at current rates (Bredehoeft, et. al., 2007).

A reduction in water level in the Tertiary aquifer will cause a loss of head, or hydraulic gradient, in the LCA. As water is withdrawn from the Tertiary aquifer at a rate that exceeds recharge, the hydraulic system will approach a new equilibrium. The upward gradient in the LCA will go to support the lowered head in the Tertiary auqifer. The net result, over time, will be a lowering and possible loss of the fragile upward gradient in the LCA.

Therefore, ground water development could destroy the upward head gradient in the LCA that currently serves as a barrier to downward contaminant movement at Yucca Mountain. Should contaminants reach the LCA, they will be transported quickly to the springs in Death Valley. The TSPA and Pre-Closure Safety Analysis should take into account potential groundwater impacts to Inyo County.

Conclusion

The ultimate conclusion from Inyo's groundwater studies is that the LCA is a good pathway for contamination to the biosphere. Every effort should be made to keep contaminants out of the LCA that may include protection of the upward hydraulic gradient in the Paleozoic carbonate aquifer. The draft SEIS needs to address the importance of the upward gradient in the LCA as a barrier to radionuclide transport from Yucca Mountain, and the potential impacts and mitigation of those impacts on total system performance.

Specific comments/recommendations on the draft SEIS

Inyo County respectfully provides the following comments on specific sections of the SEIS.

Section 3.1.3 Geology, pg 3-16
DOE provides a detailed discussion of Nye Counties geological studies related to Yucca Mountain. Inyo County recommends that DOE add a third paragraph describing the County's geological studies related to Yucca Mountain.

Section 3.1.3.1.1 Site Stratigraphy and Lithology, pg 3-17
DOE should identify the source for the Paleozoic Era carbonate rocks at the Ue25P1 well. It should also include the stratigraphy and lithology from Nye County well 2DB, NPS wells GF-2A and 2B, and Inyo well BLM #1.

Section 3.1.3.1.2 Selection of Repository Host Rock, pg 3-18
The DOE should add a fifth reason for selection of the Yucca Mountain repository site. Specifically, 5) the upward gradient of the LCA as a barrier to radionuclide transport.

Figure 3-5, pg 3-20
The white geological unit below Yucca Mountain should be identified on the figure and in the legend.

Section 3.1.4.2.1 Regional Groundwater, pg 3-27
The first paragraph of this section does not reference Inyo County geological studies and well drilling data. The Final EIS should specifically reference Inyo's work in describing the Carbonate aquifers in the Death Valley region.

Section 3.1.4.2.1 Regional Groundwater, pg 3-29
Inyo County disagrees with the statements in the first paragraph at the top of page 3-29: "Although carbonate aquifers are regionally extensive, they are not necessarily extensively interconnected and often occur in compartments (DIRS Nye County Nuclear Waste Repository Project Office-NWRPO 2001, p.F53) that might or might not have a hydraulic connection to the carbonate rock in an adjacent compartment." First, the Nye County research does not accurately represent the regional data collected on the LCA by Inyo County and the NPS. Second, the USGS Death Valley Regional Groundwater model, publications by Winograd, USGS, and Inyo County's models of the LCA aquifer system indicate that the LCA is highly connected and provides a bases for inter-basin flow between the Amargosa Valley and Death Valley through the Southern Funeral Mountain range.

The second paragraph on page 3-29 should include a discussion on the observed regional upward gradient in the LCA with its contribution to the regional groundwater table.

Section 3.1.4.2.1 Regional Groundwater, Basins, pg 3-31
Paragraph three does not reference Inyo County in relation to groundwater conditions and movement in the Death Valley region. Belcher, 2004 and Bredehoeft, et. al., 2005 and 2007 groundwater models characterize groundwater flow through the Amargosa Valley basin. An explanation of this research should be included.

Section 3.1.4.2.1 Regional Groundwater, Basins, pg 3-32
Paragraph one provides a reasonable explanation of Inyo County's studies with emphasizes on geochemical data. The County recommends the DOE include the results of Inyo's geological mapping, geophysical surveys, LCA monitoring wells, and numerical groundwater modeling for completeness.

The County disagrees with the last sentence of the first paragraph that states "However, water that moves south from the volcanic aquifers (such as Yucca Mountain area) is not a primary source for those discharges. Chemical modeling and groundwater models suggest some portion of waters from the Yucca Mountain area contribute to the flows to Death Valley.'

A paragraph should be added after the first paragraph to discuss the LCA flow system.

Section 3.1.4.2.1 Regional Groundwater, Uses, pg 3-32 & 33 and Table 3-4, pg 3-34
The discussion of water uses in the Amargosa Valley does not discuss the potential impacts of groundwater withdrawals from the Amargosa Farms area on the regional water table that includes Yucca Mountain. Some discussion on the findings of the Nevada States Engineer's Water Rights Ruling 5750 should be included.

DOE should ensure the perennial yields stated for the Amargosa Desert reflect the Nevada States Engineer's Water Rights Ruling 5750.

Section 3.1.4.2.2 Groundwater at Yucca Mountain, Saturated Zone, pg 3-39
Inyo County agrees with the majority of the discussion presented in the second paragraph. However, the last sentence should be changed to state:

This is significant in the assessment of the postclosure performance of the proposed repository (see Chapter 5 of this draft SEIS) because it constrains the pathway by which *radionulcides* could move after repository closure ***providing the upward gradient in the LCA is preserved over time.***

Section 3.1.4.2.2 Groundwater at Yucca Mountain, Saturated Zone, Water Sources and Movement, pg 3-42
The first paragraph of Water Sources and Movement need to be qualified. The groundwater pumping referred to appears to be limited to only pumping at the Yucca Mountain repository site, which has relatively low and stable volumes of water for some time. However, the critical issue is the impact of the large scale regional pumping on the stability of water levels at Yucca Mountain. As discussed earlier, projections of current

pumping in the Amargosa Valley for 1,000 years could results in a 3-meter drop in the water table below Yucca Mountain. This situation should be addressed the Final SEIS.

Section 3.1.4.2.2 Groundwater at Yucca Mountain, Saturated Zone, Inflow to Volcanic Aquifers at Yucca Mountain, pg 3-45

Inyo County disagrees with the last sentence of this section that states "The amount of inflow from the carbonate aquifer, if it exists, is unknown." The thermal modeling of the upward gradient in Ue25p1 and the regional groundwater modeling of the LCA in the Yucca Mountain region shows that inflow from the LCA into the Tertiary aquifers exists. This section should be corrected to reflect the current data from the LCA studies.

SEIS Section 8 Cumulative Impacts

Section 8 of the SEIS makes no mention of the potential impacts from a potential loss of the upward gradient in the LCA on the TSPA of the Yucca Mountain. Limiting the discussion of what impacts the repository will have on the environment versus impacts the environment may have on repository performance is not responsive to the goals of the NEPA process. The DOE should include a discussion on the significance of the upward gradient of the LCA on repository performance.

SEIS Section Best Management Practices

Section 9 of the draft SEIS provides a detailed discussion on the issues that may impact Nye County concerning the proposed Yucca Mountain repository. Yucca Mountain has the potential for radionuclide transport into Inyo County through the major springs in Death Valley National Park via the LCA or at Franklin Lake Playa via the volcanic Tertiary aquifers. The DOE should provide the same level of effort to discuss potential impacts to Inyo County due to the potential of radionuclide contamination of groundwater.

ATTACHMENT 3

AFFIDAVIT OF EUGENE I. SMITH

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 63-001
U.S. DEPARTMENT OF ENERGY	)	
	)	
(High-Level Waste Repository)	)	December 17, 2008
	)	

AFFIDAVIT OF EUGENE I. SMITH

I, Eugene I. Smith, the undersigned affiant, do hereby make the following statements based upon my own knowledge, information, and belief.

1. My name is Eugene I. Smith. I have a Ph.D. Degree in Geology. I have over 40 years of experience in volcanology and geology that includes 20 years of experience dealing with volcanic issues regarding Yucca Mountain. Since 2007, I have worked for the County of Inyo as a consultant evaluating the importance of the Greenwater Range in Inyo County to hazard assessment at Yucca Mountain, Nevada. My curriculum vita is attached to this Affidavit as Attachment A.

2. I am currently Professor of Geology at the University of Nevada, Las Vegas and I am the co-owner of Geoscience Consultants. In my capacity as a consultant to the County of Inyo, I have extensively studied DOE's activities and analyses of the Yucca Mountain site and potential repository impacts and have reviewed the findings of other government agencies and scientific panels as they relate to DOE's site suitability evaluations.

3. I am executing this Affidavit in support of the County of Inyo's Petition for Leave to Intervene as a Party (Petition) in the above-captioned proceeding.

4. In order to offer an expert opinion for the County of Inyo in the instant proceedings, I have reviewed and am familiar with the portions of the following documents relevant to my expert opinion: the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High –Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F)(2002); *Final Supplemental Environmental Impact Statement Repository for the Disposal of Spent Nuclear Fuel and High –Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F-S1) (2008); the Petition to Intervene of the County of Inyo, including the accompanying Contentions.

4. Contentions 8 and 9 comprised of several paragraphs are contained in the Petition. I hereby adopt as my own opinions the statements contained within Paragraph 5 of Contentions 7 and 8 that are based upon research conducted by me and scientific colleagues. Those two contentions are listed as INY-SAFETY-4, and INY-NEPA-4.

Further, the affiant sayeth not.

Eugene I. Smith

The above-named affiant personally appeared before me this 21 day of December, 2008, and executed this affidavit.

Notary Public

My Commission expires: 4-8-12

NOTARY PUBLIC
STATE OF NEVADA
County of Clark
THOMAS C. ENGLUND
No: 00-39982-1
My Appointment Expires April 8, 2012

ATTACHMENT A

TO

AFFIDAVIT OF EUGENE I. SMITH

CURRICULUM VITAE
EUGENE I. SMITH

November 1, 2008

Mailing Address: Department of Geoscience
University of Nevada (UNLV)
Las Vegas, Nevada 89154-4010

gene.smith@unlv.edu

Telephone: office: (702) 895-3971
FAX: (702)) 895-4064

Educational Background:

University	Degree	Year
University of New Mexico	Ph.D.	1970
University of New Mexico	M.S.	1968
Wayne State University	B.S.	1965

Specialties:, Volcanology, Igneous Petrology, Geochemistry, Tectonics, Planetary Geology

Professional Experience:

8/88 to present: Professor of Geology, UNLV

7/83-7/86: Chair, Department of Geoscience, UNLV

9/80 to 8/88: Associate Professor of Geology, UNLV

9/76-8/80: Associate Professor of Earth Science, University of Wisconsin-Parkside

9/72-9/76: Assistant Professor of Earth Science, University of Wisconsin-Parkside

9/70-6/72: Post-doctoral Research Associate to Professor W.E. Elston, Department of Geology, University of New Mexico

9/68-8/70: Graduate Research Assistant to Professor W.E. Elston, Department of Geology, University of New Mexico

8/68-8/80:	Geologist WAE, U.S. Geological Survey, Branch of Astrogeology, Flagstaff, AZ
6/66-7/68:	Geological Field Assistant WAE, U.S. Geological Survey, Branch of Astrogeology, Flagstaff, AZ
6/64-9/64:	Undergraduate Research Assistant to Professor A.J. Mozola, Department of Geology, Wayne State University, Detroit, MI

Professional Society Memberships:

American Association for the Advancement of Science
American Geophysical Union
Geological Society of America (Fellow)
Geological Society of Nevada
IAVCEI-International Association of Volcanology and Chemistry of the Earth's Interior
Mineralogical Society of America
Phi Kappa Phi
Sigma Gamma Epsilon
Sigma Xi

Grants:

- Bureau of Land Management contract to study the geology of the Sloan Canyon NCA (2006-2008).
- Bureau of Land Management contract to study the geology of the Sloan Canyon NCA (2005)
- Nevada Agency for Nuclear Projects grant to study basaltic volcanism in the Great Basin (2000-2001).
- U.S. Navy Geothermal Office Grant to study volcanic rocks in the Lava Mountains, (1998-1999.
- U.S. Navy Geothermal Office Grant *with Rodney Metcalf* to study volcanic rocks in the Lava Mountains, California and the Mt. Perkins Pluton, Arizona (1996-1998).
- Grants from Nevada Nuclear Waste Project Office (NWPO) to study late- Miocene and younger volcanic activity in southern Nevada (ten years of funding) (1985-1996).
- NSF Grant with J. Faulds and P. Gans to study the structural and geochemical development of the northern Colorado River extensional corridor (1991-1993).
- UNLV Research Council grant to support the study of Tertiary volcanic rocks in Clark County, Nevada (1983).
- NASA Grant NGR 50-009-001 for the study of volcanic fields in California, New Mexico and Wisconsin. The grant also funded the study of volcanic domes and craters on Mars, Mercury, Moon and Earth (6 years of funding)(1973-1979).
- Four University of Wisconsin research grants to support the study of Precambrian igneous rocks of south-central Wisconsin (1973-1977).

Awards:

- Recipient of the Harry Reid Nevada Star Award for Research (2006).
- Recipient of UNLV College of Sciences Distinguished Researcher Award, 1999.
- National Defense Education Act (NDEA) Title IV Fellowship, 9/65-6/68

Current Research:

1. Geology of Quaternary-Pliocene basalts in the southern and central Great Basin and Colorado Plateau.
2. Volcanic hazard studies related to placing a nuclear waste repository at Yucca Mountain, Nevada.
3. Geology of basalts in the Yellowstone Plateau volcanic field, implications for the future development of the Yellowstone volcanic system.
4. Geochemical, structural and field study of the volcanic and plutonic rocks of the Lake Mead Volcanic Field.
5. The formation of intermediate composition igneous rocks in an extensional environment.

Editorial Responsibilities

- Associate editor of the Geological Society of America Bulletin 1999-2008
- Associate editor of the Journal of Geophysical Research (Geochemistry and Volcanology)-1996-1999

Research Advisor for the following students:

University of New Mexico:
- Anthony Sanchez

University of Wisconsin-Parkside:
- James Grimes
- Bill Stupak
- Jill Hartnell
- Ray Spangers
- Cliff Brandon

UNLV:

- **Crow, H. Clay, III**, 1984, *Geochemistry of shonkinites, syenites, and granites associated with the Sulfide Queen carbonatite body, Mountain Pass, California [MS thesis]*: Las Vegas, University of Nevada, 56 p.

- **Myers, Ingrid A.**, 1984, *Geology and mineralization at the Cyclopic mine, Mohave County, Arizona [MS thesis]*: Las Vegas, University of Nevada, 64 p.

- **Mills, James G., Jr.**, 1985, *The geology and geochemistry of volcanic and plutonic rocks in the Hoover Dam 7 1/2 minute quadrangle, Clark County, Nevada and Mohave County, Arizona [MS thesis]*: Las Vegas, University of Nevada, 119 p.

- **Timm, John J.**, 1985, *Age and significance of paleozoic sedimentary rocks in the southern River Mountains, Clark County, Nevada [MS thesis]*: Las Vegas, University of Nevada, 62 p.
- **Feuerbach, Daniel L.**, 1986, *Geology of the Wilson Ridge pluton : a mid-Miocene quartz monzonite intrusion in the northern Black Mountains, Mohave County, Arizona and Clark County, Nevada [MS thesis]*: Las Vegas, University of Nevada, 79 p.
- **Naumann, Terry R.**, 1987, *Geology of the central Boulder Canyon quadrangle, Clark County, Nevada [MS thesis]*: Las Vegas, University of Nevada, 68 p.
- **Schmidt, Casey S.**, 1987, *A mid-Miocene caldera in the central McCullough Mountains, Clark County, Nevada [MS thesis]*: Las Vegas, University of Nevada, 78 p.
- **Sewall, Angela J.**, 1988, *Structure and geochemistry of the upper plate of the Saddle Island detachment, Lake Mead, Nevada [MS thesis]*: Las Vegas, University of Nevada, 84 p.
- **Cole, Erin D.**, 1989, *Petrogenesis of late Cenozoic alkalic basalt near the eastern boundary of the Basin-And-Range: Upper Grand Wash trough, Arizona and Gold Butte, Nevada [MS thesis]*: Las Vegas, University of Nevada, 68 p.
- **Larsen, Lance L.**, 1989, *The origin of the Wilson Ridge pluton and its enclaves, northwestern Arizona: Implications for the generation of a calc-alkaline intermediate pluton in an extensional environment [MS thesis]*: Las Vegas, University of Nevada, 81 p.
- **Bridwell, Hayden L.**, 1991, *The Sloan Sag: A mid-Miocene volcanotectonic depression, north-central McCullough Mountains, southern Nevada [MS thesis]*: Las Vegas, University Of Nevada, 147 p.
- **Cascadden, Tracy E.**, 1991, *Style of volcanism and extensional tectonics in the eastern Basin and Range Province: northern Mojave Co., Arizona [MS thesis]*: Las Vegas, University Of Nevada, 156 p.
- **Morikawa, Shirley A.**, 1993, *The Geology of the Tuff of Bridge Spring: southern Nevada and northwestern Arizona [MS thesis]*: Las Vegas, University of Nevada, 165 pp.
- **Rash, Kelly B.**, 1995, *Geology and geochemistry of Tertiary volcanic rocks in the northern Reveille and southern Pancake Ranges, Nye County, Nevada [MS thesis]*: Las Vegas, University of Nevada, 171 p.
- **Sánchez, Alexander**, 1995, *Mafic volcanism in the Colorado Plateau / Basin-and-Range transition zone, Hurricane, Utah [MS thesis]*: Las Vegas, University of Nevada, 92 p.
- **Boland, Kelly A.**, 1996, *The petrogenesis of andsites produced during regional extension: Examples from the northern McCullough Range, Nevada and Xitle volcano, Mexico [MS thesis]*: Las Vegas, University of Nevada, 127 p.
- **Dickson, Loretta D.**, 1997, *Volcanology and geochemistry of Pliocene and Quaternary basalts on Citadel Mountain, Lunar Crater volcanic field, Pancake Range, Nevada [MS*

thesis]: Las Vegas, University of Nevada, 146 p. (Received the UNLV Alumni Association award for the most outstanding thesis for the academic year 1997-98)

- **Downing Reina**, 2000, *Imaging the Mantle in Southwestern, Utah Using Geochemistry, and Geographic Information Systems* [MS thesis]: Las Vegas, University of Nevada, 129 p.
- **Keenan, Deborah L.**, 2000, *A study of the Lava Mountians, San Bernadino County, California* [MS thesis]: Las Vegas, University of Nevada, 81p.
- **Herrington, Juliana**, 2000, *Significance of the prevolcanic conglomerate of the Colorado River extensional corridor, Nevada and Arizona* [MS thesis]: Las Vegas, University of Nevada, 83p.
- **Sanford, Aaron L.**, 2000, *Geologic history of the McCullough Pass caldera* [MS thesis]: Las Vegas, University of Nevada, 111p.
- **Elizabeth Stickney**, 2004, *Quaternary basaltic volcanism in the northern part of the Lunar Crater volcanic field, Nevada*:, 103 p.
- **Matt Faust,** 2005, *Petrogenesis and geochemistry of Pleistocene and Pliocene basalt flows of the Pine Valley Volcanic Field, Utah and their relationship to the tectonics of the Utah Transition Zone* [MS thesis]: University of Nevada), 116 p.
- **Denise Honn,** 2005, *Nested Calderas of the northern Kawich Range, central Nevada* [MS thesis]: Lasa Vegas, University of Nevada, 92 p.
- **Denise Honn Ph.D**. *Linking a volcanic-plutonic system in the River Mountains and Wilson Ridge Pluton*. (work in progress).
- **Shara Leavitt**, 2006, *Volcanology and Petrogenesis of the Navajo Lake Volcanic Field, Utah* : [MS thesis]: Las Vegas, University of Nevada, 94 p.
- **Kristeen Bennett**, 2006, *Petrogenesis of Pleistocene basalts in the Norris-Mammoth Corridor, Yellowstone National Park* : [MS thesis]: Las Vegas, University of Nevada, 120 p.
- **Matt McKelvey,** *Geology of the southern Reveille Range, Nevada:* [MS thesis]: Las Vegas, University of Nevada, 103 p..
- **Audrey Rager (Ph.D.),** *Basalts, tectonics and Corona on Venus, How is important is plate tectonics* (work in progress).
- **Ashley Tibbetts (Ph.D.),** *Geology of the Death Valley volcanic field (work in progress).*
- **Christi Emery,** *Volcanology of the southern Quinn Canyon Range, central Nevada (work in progress).*
- **Racheal Johnsen,** *Volcanology of two volcanic fields in SW Utah, implications for tectonics and mantle source (work in progress).*

Students who left UNLV before completing their degrees

- Jeff Nejedly
- Robert Yasek
- Tom Wickham
- Joe Blaylock
- Heather Putnam

Post-Doctoral Research Associates

- Jim Faulds (now an research scientist with the Nevada Bureau of Mines and Geology)
- Mark Martin (now a research fellow at MIT)
- Jim Mills (now an associate professor at DePauw University, Indiana)
- Tim Bradshaw (now a science advisor to the House of Lords, London)
- Gene Yogodzinski (now an assistant professor at the University of South Carolina)

Research Associates *(Professional Staff with M.S. degrees)*

- Dan Feuerbach
- Terry Naumann
- Alex Sánchez
- Shirley Morikowa
- Deb Keenan
- Denise Honn

PUBLICATIONS:

A. Journal Articles in refereed journals, symposium volumes and maps:

1. Elston, W.E., Lambert, P.W. and Smith, E.I., 1968, Striated cones: wind abrasion features, not shatter cones: in Short, N.M., and French, B.M., eds., Shock Metamorphism of Natural Materials, Mono Book Corporation, Baltimore, p. 287- 290.

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Plus over 300 reports to the Nevada Nuclear Project Office, U.S. Navy's Geothermal Project Office and the Bureau of Land Managment.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 63-001
U.S. DEPARTMENT OF ENERGY	)	
	)	
(High-Level Waste Repository)	)	December 22, 2008
_____	)	

CERTIFICATE OF SERVICE

I hereby certify the foregoing "Petition For Leave To Intervene By The County Of Inyo, California On An Application By The U.S. Department Of Energy For Authority To Construct A Geologic High-Level Waste Repository At A Geologic Repository Operations Area At Yucca Mountain, Nevada" has been served via the Nuclear Regulatory Commission's Electronic Information Exchange ("EIE") upon those on the Service List maintained by the EIE for the above-captioned proceeding.

Dated: December 22, 2008

Respectfully submitted,

[Signed electronically]
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