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NUCLEAR ENERGY INSTITUTE

November 17, 2015

Ms. Cindy K. Bladey
Office of Administration
Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Subject: Comments of the Nuclear Energy Institute on U.S. NRC Draft Supplement to the U.S. Department of Energy 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, NUREG-2184 (Docket ID: NRC-2015-0051)

Dear Ms. Bladey:

On August 21, 2015, the U.S. Nuclear Regulatory Commission (NRC) announced the availability of the NRC "draft Supplement to the U.S. Department of Energy's 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, NUREG-2184" for comment. 80 Fed. Reg. 50,875. The NRC subsequently extended the public comment period from October 20 to November 20, 2015; see 80 Fed. Reg. 56,501 (Sept. 18, 2015). The Nuclear Energy Institute (NEI)¹ appreciates the opportunity to provide the attached comments on the draft Supplemental Environmental Impact Statement (SEIS) on behalf of the nuclear energy industry (Attachments 1 and 2).

The NRC's draft SEIS represents a logical and important step forward in the Yucca Mountain licensing process as required by the Nuclear Waste Policy Act of 1982, the Yucca Mountain Development Act of 2002 and the courts.² The draft SEIS establishes another foundational component to be considered, along with the extensive body of existing scientific and technical knowledge about Yucca Mountain, in determining whether or not to issue an NRC license for the U.S. Department of Energy (DOE) to construct a geologic repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada.

¹ The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

² *In re Aiken County*, 725 F.3d 255 (D.C. Cir. 2013).

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Ms. Cindy K. Bladey
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As described by the NRC, the draft SEIS evaluates "the potential environmental impacts on groundwater and impacts associated with the discharge of any contaminated groundwater to the ground surface due to potential releases from a geologic repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nye County, Nevada." 80 Fed. Reg. at 50,876. The draft SEIS supplements DOE environmental impact statements (EISs) for Yucca Mountain issued in 2002 and 2008. Notably, the NRC has appropriately limited the scope of the draft SEIS to those areas defined in the NRC's September 2008 Adoption Determination Report (ADR) regarding the 2002 and 2008 DOE EISs. Those issues include assessing the potential environmental impacts from the proposed repository on groundwater and from surface discharges of groundwater. 80 Fed. Reg. at 50,876. This approach is consistent with the requirements of the National Environmental Policy Act (NEPA) as discussed in more detail in the attached comments.

The draft SEIS provides the information that the NRC staff determined was necessary to complete the DOE's environmental impact statements. Importantly, the NRC staff has found that "all of the impacts on the resources evaluated would be SMALL." 80 Fed. Reg. at 50,876.

Based on this conclusion, and that of the NRC's Safety Evaluation Report for the Yucca Mountain repository, we believe that the NRC should, to the extent that funding and DOE participation can be obtained, seek to proceed with the next phase of the Yucca Mountain licensing process. Completion of the NRC's licensing process will provide yet another opportunity for the body of scientific and technical knowledge about Yucca Mountain to be tested. The NRC staff's safety review of the DOE Yucca Mountain license application is complete. With the issuance of the final SEIS, the NRC's environmental review will be complete as well. At that time, it will be appropriate for the NRC's independent Atomic Safety and Licensing Board to promptly conduct a hearing and rule on contested issues so that the NRC can reach a final decision on whether or not to grant a construction authorization for the proposed repository at Yucca Mountain.

NEI welcomes this step forward in the NRC licensing process, and we look forward to continued participation in the Yucca Mountain licensing process. Please contact me if you have any questions.

Sincerely,



Rodney McCullum

Attachments

- c: Dr. William J. Boyle, Office of Used Nuclear Fuel Disposition Research & Development, DOE
- Ms. Melissa Bates, Office of Used Nuclear Fuel Disposition Research & Development, DOE
- Mr. Mark D. Lombard, NMSS/DSFM, NRC

November 20, 2015

**NUCLEAR ENERGY INSTITUTE COMMENTS ON NRC DRAFT SUPPLEMENT TO
THE U.S. DEPARTMENT OF ENERGY ENVIRONMENTAL IMPACT STATEMENT
FOR A GEOLOGIC REPOSITORY FOR THE DISPOSAL OF SPENT NUCLEAR
FUEL AND HIGH-LEVEL WASTE AT YUCCA MOUNTAIN, NEVADA**
Docket ID NRC 2015-0051

The Nuclear Energy Institute, Inc. (NEI)¹ appreciates the opportunity to submit the following comments on the U.S. Nuclear Regulatory Commission (NRC) draft Supplement to the U.S. Department of Energy (DOE) 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 (NUREG-2184). See 80 Fed. Reg. 50,875 (Aug. 21, 2015).

I. The Scope of the Draft SEIS is Appropriate and in Accordance with NEPA

As described by the NRC, NRC's draft Supplemental Environmental Impact Statement (SEIS) for the proposed Yucca Mountain repository evaluates "the potential environmental impacts on groundwater and impacts associated with the discharge of any contaminated groundwater to the ground surface due to potential releases from a geologic repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nye County, Nevada." 80 Fed. Reg. at 50,876; draft SEIS executive summary at xi. The draft SEIS supplements DOE environmental impact statements (EISs) for Yucca Mountain issued in 2002 and 2008, in accordance with the findings and scope outlined in the NRC's 2008 "Adoption Determination Report for the U.S. Department of Energy's Environmental Impact Statements for the Proposed Geologic Repository at Yucca Mountain" (NRC ADAMS Accession No. ML082420342) (ADR).

In the ADR, the NRC found that:

DOE's environmental impact statements (EISs) did not adequately characterize impacts from potential contaminant releases to groundwater and from surface discharges of groundwater. Specifically, DOE's analysis does not provide adequate discussion of the cumulative amounts of radiological and nonradiological contaminants that may enter the groundwater over time and how these contaminants would behave in the aquifer and surrounding environments." ADR, Sec. 3.2.1.4.2; draft SEIS at xi.

Accordingly, the NRC has appropriately defined the scope of the draft SEIS as providing the necessary information identified in the ADR, which encompasses two distinct but related aspects of potential impacts on the groundwater system: (i) the nature and extent of the repository's impacts on groundwater in the aquifer (beyond the regulatory compliance location) and (ii) the potential impacts of the discharge of potentially contaminated groundwater to the ground surface. Draft SEIS at p. xi. This focused scope is in accordance with the limited

¹ The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

circumstances requiring supplementation of environmental impact statements under the National Environmental Policy Act (NEPA).

As explained in the ADR, DOE prepared environmental impact statements (EISs) in 2002 and 2008 to assess potential environmental impacts associated with the construction, operation, and closure of a geologic repository for the nation's high-level waste and spent nuclear fuel. ADR at ES-1. Pursuant to NRC regulations at 10 C.F.R. § 51.109(c), the NRC reviewed the DOE environmental impact statements to determine if it was practicable to adopt them. *Id.* 10 C.F.R. § 51.109(c) provides that the NRC staff will find it practicable to adopt any EIS prepared by DOE in connection with a geologic repository unless:

- (1)(i) The action proposed to be taken by the Commission differs from the action proposed in the license application submitted by the Secretary of Energy; and
 - (ii) The difference may significantly affect the quality of the human environment;
or
- (2) Significant and substantial new information or new considerations render such environmental impact statement inadequate.

With respect to the first criterion, the NRC staff determined that the proposed action to be taken by the Commission is substantially the same as that described in DOE's license application for the proposed Yucca Mountain repository. ADR at ES-1. With respect to the second criterion, the NRC staff "identified significant and substantial considerations that render the groundwater analysis of the 2002 EIS and the Repository Supplemental EIS inadequate." *Id.* According to the NRC Staff, the 2002 EIS and the 2008 Repository Supplemental EIS did "not adequately characterize the potential impact of the proposed action on groundwater and from surface water discharges." *Id.* This is because the staff found "that the analysis in DOE's EISs does not provide adequate discussion of the cumulative amounts of radiological and nonradiological contaminants that may enter the groundwater over time and how these contaminants would behave in the aquifer and surrounding environments." 80 Fed. Reg. at 50,876. The staff concluded that it would be practicable for the NRC to adopt the DOE EISs if supplemented with the information necessary to address the identified shortcomings. ADR at ES-1. The SEIS provides the necessary information. 80 Fed. Reg. at 50,876.

The NRC staff's evaluation completes the agency's obligations under NEPA with respect to Yucca Mountain, and the draft SEIS is fully consistent with NEPA requirements concerning supplementation of environmental impact statements. Longstanding U.S. Supreme Court precedent holds that preparation of a supplemental environmental impact statement is required only where information that is both new and significant comes to light. *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360, 373-74 (1989). This means that EIS supplementation is required only "if the new information is sufficient to show that the remaining [federal] action will 'affect the quality of the human environment' in a significant manner or to a significant extent not already considered." *Id.* at 374 (emphasis added). A claim that new information is available is not enough. A federal agency "need not supplement an EIS every time new information comes to light after the EIS is finalized," otherwise agency decisionmaking would be

rendered "intractable, always awaiting updated information only to find the new information outdated by the time a decision is made." *Id.* at 373 (footnote omitted).

In other words, a supplemental EIS is required only where new information "provides a seriously different picture of the environmental landscape." *Nat'l Comm. for the New River v. FERC*, 373 F.3d 1323, 1330 (D.C. Cir. 2004) (emphasis in original), quoting *City of Olmsted Falls v. FAA*, 292 F.3d 261, 274 (D.C. Cir. 2002). The Commission has adopted this same standard. *Hydro Resources, Inc.*, CLI-01-04, 53 N.R.C. 31, 52 (2001) ("The new circumstance must reveal a seriously different picture of the environmental impact of the proposed project.") (internal quotes and citations omitted); *DTE Electric Co.* (Fermi Nuclear Power Plant, Unit 3), CLI-15-10, 81 N.R.C. __, slip op. at 11 (Apr. 23, 2015) ("Supplementation is required when the new information presents 'a seriously different picture of the environmental impact of the proposed project from what was previously envisioned'").

Because the scope of the draft SEIS was limited pursuant to the staff's ADR regarding potential environmental impacts from the proposed repository on groundwater and from surface discharges of groundwater, the draft SEIS appropriately adheres to the requirements set forth in 10 C.F.R. § 51.109(c), as well as longstanding Supreme Court and Commission precedent on the limited circumstances requiring the supplementation of environmental impact statements under NEPA.

II. The NRC's Conclusion of "SMALL" Environmental Impact is Well Founded and Fully Consistent with the NRC's Yucca Mountain Safety Analysis Report

The SEIS represents a fresh, critical, and comprehensive analysis by NRC environmental protection experts that adds to the considerable body of scientific and technical information supporting the development of a repository at Yucca Mountain. The NRC has drawn upon the most up-to-date studies by the DOE, the U.S. Geological Survey, Nye County Nevada, Inyo County Nevada, the State of Nevada Division of Water Resources, and the Bureau of Land Management to evaluate potential repository-related groundwater releases and address how changes in climate or groundwater use could affect the potential for radiological releases from the repository. These studies demonstrate that the characteristics of groundwater flow in the vicinity of Yucca Mountain are very well understood and provide a sound basis for a thorough evaluation of the nature and extent of the repository's impact on groundwater in the aquifer (beyond the regulatory compliance location) and the potential impacts of the discharge of potentially contaminated groundwater to the ground surface.

The NRC's commitment to a thorough and critical evaluation is also evident in the extensive public comment opportunities that have been offered on this draft SEIS. The NRC has provided ample time for the public to review the document, including a 30-day extension of the public comment period. Additionally, the NRC has held three public meetings and two conference calls during the last several months to assure that public and stakeholder views on the draft SEIS are considered.

Most of the verbal comments offered at the NRC public meetings and conference calls were focused on broader views of the Yucca Mountain project rather than the specific scope or

content of the draft SEIS. However, we note that some testimony offered at the Amargosa Valley public meeting by Mr. Patrick Donnelly of the Amargosa Conservancy, and other individuals, appeared to contradict the well-developed understanding of groundwater flow in the Yucca Mountain region reflected in the draft SEIS references. NEI asked independent experts with over 15 years of experience in repository performance assessment, including hydrologic monitoring to evaluate the concerns expressed. These experts found that the recent study cited by Mr. Donnelly was not inconsistent with the Death Valley Regional Flow System model used in the SEIS and concluded, "The current analysis presented by the NRC does reflect the best available information and science." This independent evaluation is attached (Attachment 2).

The NRC concludes, consistent with previous studies, that all of the impacts on the resources evaluated in the draft SEIS would be "SMALL" – that is, "the environmental impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource." Draft SEIS, at p. xii and p. 5-1. The NRC further concludes that the peak estimated annual individual radiological exposure over the million year period at any of the evaluated locations is 1.3 mrem [0.013 mSv]. *Id.* This estimated exposure is less than 10% of the NRC's regulatory limits and less than 1% of naturally-occurring background radiation. Draft SEIS, p. 5-1.

The NRC's cumulative impacts analysis in the draft SEIS is also instructive. Cumulative impacts on groundwater and from surface discharges of groundwater include the potential impacts of the proposed repository when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. Notably, the NRC concludes that:

The incremental impacts from the proposed repository on groundwater resources and from surface discharges of groundwater would be SMALL. The cumulative impacts from the proposed repository when added to other past, present, and reasonably foreseeable Federal and non-Federal activities . . . would also be SMALL.

Draft SEIS, p. 4-20. The draft SEIS's conclusion that all of the impacts on the resources evaluated would be "small" is consistent with the NRC's conclusion in its January 2015 Final Safety Evaluation Report that the repository will protect public health and safety for one million years.

In summary, the comprehensive, critical analysis set forth in the draft SEIS establishes another foundational component to be considered, along with the extensive body of existing scientific and technical knowledge about Yucca Mountain, in determining whether or not to issue an NRC license for DOE to construct a geologic repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada.

October 26, 2015

Rod McCullum
Nuclear Energy Institute
1201 F Street NW, Suite 1100
Washington, DC 20004

Subject: Response to Comments by Mr. Donnelly to the NRC regarding groundwater flow modeling associated with the proposed Yucca Mountain repository

Dear Mr. McCullum,

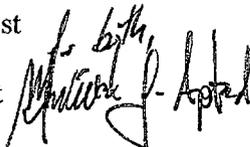
Per your request, we have examined the recent comments by Mr. Patrick Donnelly to NRC on September 17, 2015 in Amargosa Valley, Nevada regarding the models and data used in the Death Valley Regional Flow System (DVRFS) model that was applied by the Nuclear Regulatory Commission (NRC) to develop and analyze likely groundwater flow paths from the regulatory compliance location on the Nevada National Security Site (NNSS) boundary, approximately 18 km [11 mi] south of the footprint of the proposed Yucca Mountain repository to points of possible natural or anthropogenic groundwater discharge. Our response is attached.

Our qualifications for making this response are based on INTERA staff's key roles and responsibilities within both the Yucca Mountain program from 1991 through 2009 and the Electric Power Research Institute (EPRI) independent overview program from 1991 to 2008. These roles have included managing, conducting and integrating the performance assessment activities, including hydrological modeling, from 1995 to 2006. In addition, INTERA led the Underground Test Area groundwater monitoring and modeling for the Nevada National Security Site (NNSS) from 2006 to 2015. In this capacity, INTERA staff developed and integrated modeling efforts to evaluate the migration of contaminants resulting from underground nuclear testing at the NNSS.

Best regards,

Robert Andrews, Principal Scientist

Michael Apted, Principal Scientist



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Response to Public Comments received by NRC related to alternative groundwater flow paths from Yucca Mountain to points of natural or anthropogenic groundwater discharge

Remarks from Mr. Patrick Donnelly to NRC on September 17, 2015 in Amargosa Valley, NV

Mr. Patrick Donnelly, the executive director at the Amargosa Conservancy, a small non-profit in Shoshone, California commented:

... the models and data utilized in developing [the draft NRC report *Supplement to the U.S. Department of Energy's 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*] are incomplete and do not reflect the current best knowledge and data available.

Mr. Donnelly goes on to state that the:

Nature Conservancy and the Amargosa Conservancy have funded hydrological investigations into the sources of water in our area, in Shoshone and Tecopa, for 10 years, and the most recent of these investigations have proved rather conclusively that the water coming out in our springs is from a blend of sources from the Pahrump Valley and from the Amargosa Desert.

Based on these investigations, Mr. Donnelly asserts that:

... the analysis presented in this Environmental Impact Statement supplement discounts the hydrologic connection between the Amargosa Desert and our area. Section 2.2.2 says that transport beyond Alkali Flat is unlikely ...

The recent work I had referenced is a State of the Basin Report, and this report confirms that water discharging in our area, particularly at Shoshone Spring on the west side of the basin, is comprised of water from the Amargosa Desert.

Based on these recent investigations, Mr. Donnelly concludes by stating:

So if this document is willing to entertain scenarios of million years from now and complete hypotheticals, then it seems that it is necessary to add to the supplement EIS an analysis of impacts to the ecology and communities which are reliant on groundwater discharge in Shoshone and Tecopa.

Response

The Death Valley Regional Flow System (DVRFS) model was used by the Nuclear Regulatory Commission (NRC) to develop likely groundwater flow paths from the regulatory compliance location on the Nevada National Security Site (NNSS) boundary approximately 18 km [11 mi] south of the analyzed repository footprint to points of possible natural or anthropogenic groundwater discharge. The DVRFS model was used to determine the likely discharge area for groundwater from areas down gradient from the regulatory compliance location under present-day transient conditions of pumping from the Amargosa Farms area is to the pumping centers in Amargosa Valley. This case was analyzed as Analysis Case 1. Similarly, the DVRFS model was used to determine the likely discharge area down gradient from the regulatory compliance location under present-day natural conditions (i.e., assuming no pumping from Amargosa Farms area) is to the Middle Basin or Furnace Creek area of Death Valley. This case was analyzed as Analysis Case 2.

Both of these potential flow paths are relevant for that portion of the DVRFS that is down gradient of the proposed Yucca Mountain repository. These flow paths do not purport to relate to the flow systems in other areas of the DVRFS model area, including areas to the southeast of Amargosa Farms along the Amargosa River, in the vicinity of Shoshone and Tecopa.

The issue being addressed by this supplement to DOE's EIS is the likely travel path of the relatively small amount of groundwater that originates in the vicinity of Yucca Mountain. Using NRC's estimate of the cross-sectional area of the potentially contaminated groundwater plume of about 300,000 m² (3 km wide by 100 m thick, see p. A-12) and a representative value for the groundwater specific discharge in this area of 0.00613 m/day (see p. 3-6, line 32), one can determine a representative groundwater volumetric flow rate of 672,000 m³/yr for the portion of the flow system that may become contaminated. This value is a small fraction (about 3.2%) of the current pumping rate of about 20,700,000 m³/yr (see p. 3-6, line 27) from Amargosa Farms. The flow rate of the potentially contaminated portion of the aquifer down gradient of the regulatory compliance location along the southern boundary of the NNSS is also a small fraction (about 13%) of the combined natural discharge at Middle Basin and Furnace Creek in Death Valley, a total discharge of 5.23 x 10⁶ m³/yr (see p. 3-20, lines 37 plus 39). These results indicate that the flow paths derived from particle tracking results using the DVRFS model are consistent with the volumetric discharge rates. The difference between the total discharge rates and the small fraction of the discharge derived from the portion of the aquifer that may become contaminated is due to other sources of groundwater contributing to the discharge at these locations.

The predicted flow paths and resulting particle tracks of the groundwater that originates from up gradient of Yucca Mountain and flows under Yucca Mountain to down gradient areas of natural or anthropogenic discharge represent only a small portion of the total groundwater budget in the DVRFS. The total discharge in the model area from evapotranspiration-dominated discharge areas (which includes the Shoshone and Tecopa areas) in the model area is about 115,457,000 m³/yr. The volumetric flow rate in the portion of the aquifer potentially contaminated by Yucca Mountain is only 0.6 % of this total discharge value (672,000/115,457,000). It bears noting that the Ash Meadows discharge area lies between the regulatory compliance boundary and the springs at Shoshone and Tecopa. The evapotranspiration discharge from Ash Meadows is estimated to be 22,203,000 m³/yr (Belcher and Sweetkind, 2000, Table C-1). The Ash Meadows area is not considered by NRC to be a discharge area

for groundwater flowing from Yucca Mountain because the source of its water is the Spring Mountains to the east (see p. 2-24, lines 33 to 39). However, groundwater that may be flowing in the general southerly direction would be expected to intersect and discharge at Ash Meadows rather than continue down gradient to the smaller discharge areas at Shoshone and Tecopa springs, with annual discharge rates estimated as 2,590,000 m³/yr and 7,894,000 m³/yr, respectively (Belcher and Sweetkind, 2010, Table C-1).

Although the DVRFS model could be used to investigate the sources of groundwater observed to discharge in the Shoshone and Tecopa springs areas, it has not been used for that purpose. As a result it is not possible to determine whether the DVRFS model is consistent with the recent investigations cited by Mr. Donnelly. That said, the observed regional potentials presented in the DVRFS model (Belcher and Sweetkind, 2010, Plate 1) indicate a regional potentiometric surface with high potential values (generally > 900 m) in the Spring Mountains to intermediate values in Ash Meadows (ranging from > 664 to > 732 m) to low potential values in springs such as Shoshone (> 500 m) and Tecopa (> 439 m) to even lower potential values (> -40 m to > -71 m) in Death Valley. These potential values are consistent with both the potential for groundwater in the Shoshone and Tecopa springs areas to be either derived from the recharge in the Spring Mountains or local flow from nearby sources. That is, the DVRFS model is not inconsistent with the recent investigation referenced by Mr. Donnelly.

While it has not been possible to locate the recent "State of the Basin" report referenced in Mr. Donnelly's remarks to determine the basis for the conclusions reached in that report, other studies have postulated the potential source of the groundwater discharging in the springs near Shoshone and Tecopa based on geochemical observations. For example, Larsen et al. (2001) sampled springs and seeps in the Tecopa area and analyzed the geochemistry to determine the possible origins of the water. These researchers categorized three end-member hydrochemical facies. Facies 1 waters were observed to have compositions consistent with meteoric recharge in the Spring Mountains and groundwater flow through the regional carbonate aquifer. Facies 2 waters are distinct and were interpreted to originate from fractured strata beneath the regional carbonate aquifer. Facies 3 waters are similar to basin-fill aquifer waters in the Amargosa Desert but with interactions with saline, alkaline lake deposits of the Plio-Pleistocene Lake Tecopa beds.

Sperry and Larsen (2007) extended the work of Larsen et al (2001) and noted that the Tecopa Hot Springs are isolated and poorly understood. Based on additional sampling of the springs and seeps in the area, chemical and isotopic analyses of the sampled water and detailed geologic mapping in Tecopa Hills, Sperry and Larsen (2007) confirmed the existence of three distinct hydrochemical facies or categories, with the first two again representing regional water compositions and the category 3 waters being interpreted as representing partially evaporated local groundwater that originated along long flow paths. Geologic mapping performed by Sperry and Larsen (2007) suggests that spring discharge is related to ground-water flow from the northeast, with water moving along a northeast-oriented joint system.

In conclusion, the recent study cited by Mr. Donnelly that the water discharging from the Shoshone and Tecopa springs may be derived from local recharge in the Amargosa Desert and Pahrump Valley is consistent with other geochemical studies reported by Larsen et al (2001) and Sperry and Larsen

(2007). This observation is not inconsistent with the observations and results of the DVRFS model. These observations of the local groundwater regime in the middle Amargosa Basin near Shoshone and Tecopa, do not affect the groundwater flow paths or flow rates in the area of the Amargosa Valley between Yucca Mountain and Amargosa Farms or between Yucca Mountain and the Middle Basin and Furnace Creek areas of Death Valley. As such, the current analysis presented by the NRC does reflect the best available information and science. Therefore, there is no need to evaluate the impacts of the Yucca Mountain repository to the ecology and communities of Shoshone or Tecopa, California.

Belcher, W.R. and D.S. Sweetkind, eds. 2010. *Death Valley Regional Groundwater Flow System, Nevada and California—Hydrogeologic Framework and Transient Groundwater Flow Model*, U.S. Geological Survey Professional Paper 1711, 398 pp.

Larsen, D., G.H. Swihart, and Y. Xiao, 2001. *Hydrochemistry and isotope composition of springs in the Tecopa basin, southeastern California, USA*, in *Chemical Geology*, vol. 179, pp. 17-35.

Sperry, J.B. and D. Larsen, 2007. *Geochemistry and hydraulic framework of an isolated hot spring, Tecopa Basin, California*, *Geological Society of America Abstracts with Programs*, vol. 39, no. 2, p. 33.