

Yucca Mountain Update

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Presentation to Nevada Legislature
Assembly Committee on Commerce and Labor
Subcommittee on Energy
March 20, 2017

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Potential Yucca Mountain Restart

“The Commission believes that the next two years will be critical for the State of Nevada in preventing the resurrection of the Yucca Mountain repository program and in protecting the State’s interests in the increasingly likely event the full NRC licensing proceeding is restarted. Senator Reid’s retirement, coupled with other changes in Congress and the Executive Branch, are likely to result in concerted efforts by Yucca Mountain supporters to restore funding for the DOE repository program and the NRC licensing proceeding. It is critical that the Governor and Legislature jointly continue to communicate Nevada’s steadfast opposition to Yucca Mountain. At the same time, the Governor and Legislature must assure that the Attorney General and the Agency for Nuclear Projects have sufficient funds to effectively represent Nevada in NRC’s Yucca Mountain licensing proceeding.”

Sen. Richard Bryan, Chairman, Nevada Commission on Nuclear Projects, Letter to Members of the Legislature

Report of Nevada Commission on Nuclear Projects, 2017

http://www.state.nv.us/nucwaste/news2017/pdf/nv2017comm_report_final.pdf

Proposed Federal Budget for Yucca Mountain Restart Announced March 16, 2017

The President's 2018 Budget:

- Provides \$120 million to restart licensing activities for the Yucca Mountain nuclear waste repository and initiate a robust interim storage program. These investments would accelerate progress on fulfilling the Federal Government's obligations to address nuclear waste, enhance national security, and reduce future taxpayer burden.

Office of Management and Budget, *America First: A Budget Blueprint to Make America Great Again* (March 2017), page 19.

Nevada Response to Yucca Mountain Restart

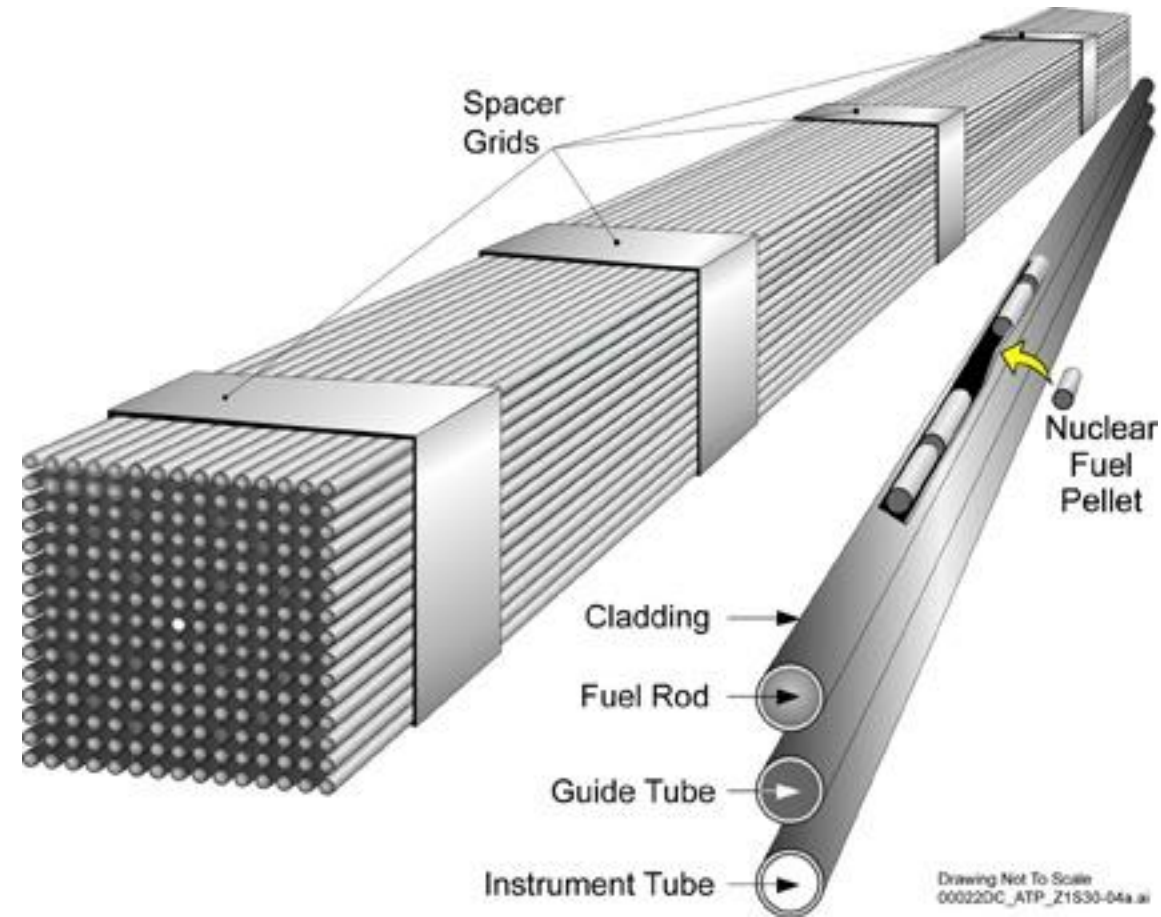
- Nevada Gov. Brian Sandoval, AG Adam Laxalt, and the Commission on Nuclear Projects are strongly opposed to Yucca Mountain
- State of Nevada plans to fully adjudicate 218 admitted contentions in opposition to DOE license application (LA) and submit 30-50 new contentions based on new information and NRC EIS Supplement
- Nevada estimates over 400 hearing days would be needed to adjudicate 250 contentions, plus time for discovery, motions and appeals, so legally mandated proceeding could require 4-5 years, and cost DOE \$1.66 billion, NRC \$330 million, Nevada \$50 million
- Nevada contentions challenge all aspects of DOE LA and EISs

Yucca Mountain Chronology

- 1982 – Nuclear Waste Policy Act (Two Geologic Repositories)
- 1987 – Nuclear Waste Policy Amendments Act (“Screw Nevada” Act, 2nd repository deferred)
- 2002 – Repository Site Recommendation by DOE (Congress Overrides Nevada Disapproval)
- 2008 – DOE License Application Submitted to NRC (includes Environmental Impact Statement)
- 2009 – NRC Licensing Board Admits Nevada and other Intervenor (Eventually 299 Contentions)
- 2010 – Unsuccessful DOE Motion to Withdraw License Application (DOE Terminated Project)
- 2010 – Blue Ribbon Commission (BRC) on America’s Nuclear Future (Final Report 2012)
- 2011 – Licensing Proceeding Suspended by NRC (Lack of Funding)
- 2013 – NRC Licensing Proceeding Restarted by Court Order (Limited by Available Funding)
- 2016 – NRC Staff Completes Activities Needed for Hearings (SER, EIS Supplement, Library)
- 2017 – Proponents in Congress Say They Will Fund Resumption of DOE and NRC Activities

Nuclear Fuel Assembly

(Commercial spent fuel would be 90% of 70,000 MTHM repository limit)



Spent Fuel Removed from Reactors and Stored On-site is Highly Radioactive and Thermally Hot

Pool storage at reactors usually needed for 5-10 years, regulated by NRC



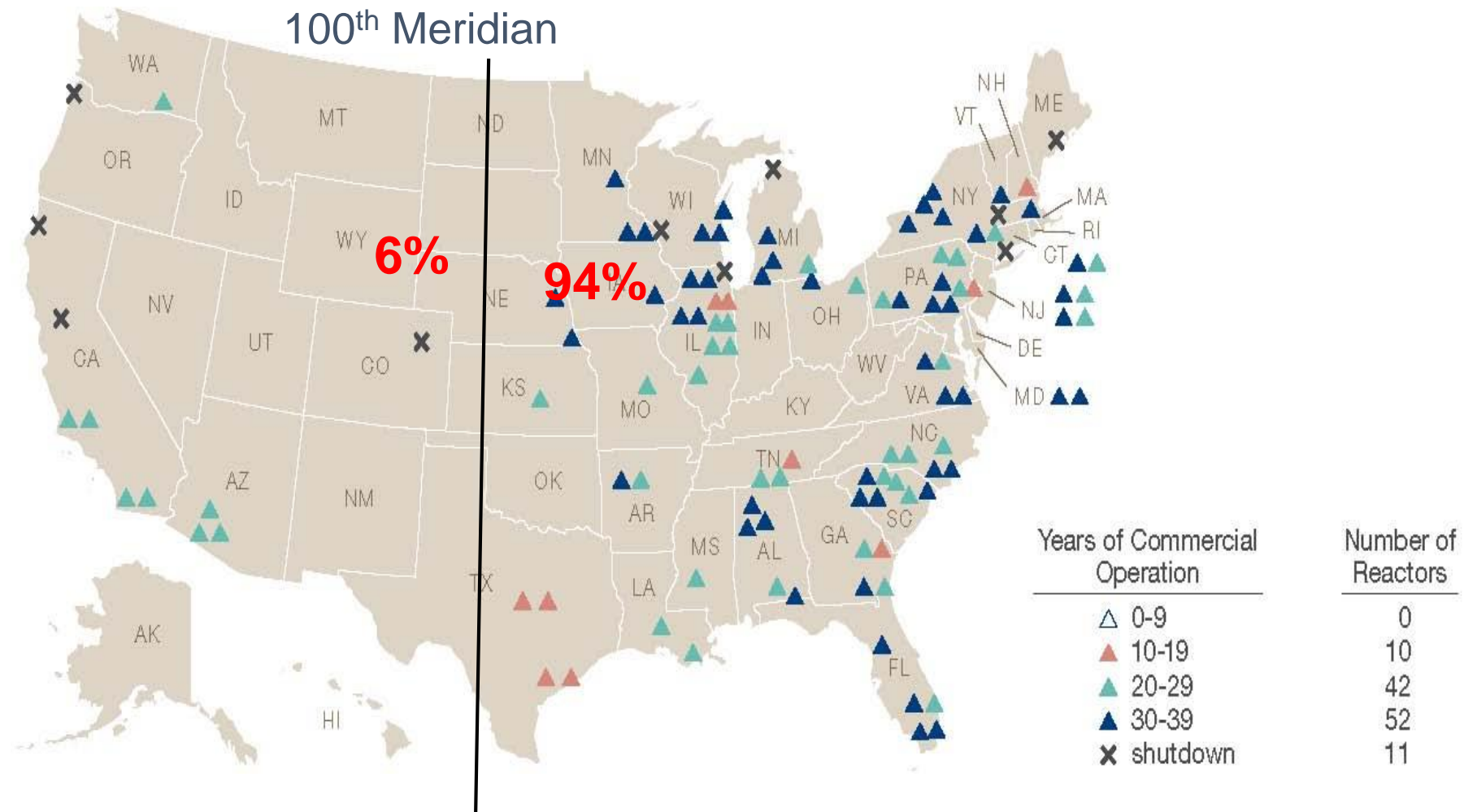
Dry Cask storage at reactors has been approved by NRC for up to 160 years



Spent Fuel Radiological Hazards Decline Over Decades

Age (years)	Activity (curies/assembly)	Surface Dose Rate (rem/hr)	Lethal Exposure (time to 450 rem)
1	2,500,000	234,000	7 seconds
5	600,000	46,800	35 seconds
10	400,000	23,400	70 seconds
50	100,000	8,640	188 seconds
100	50,000	2,150	750 seconds

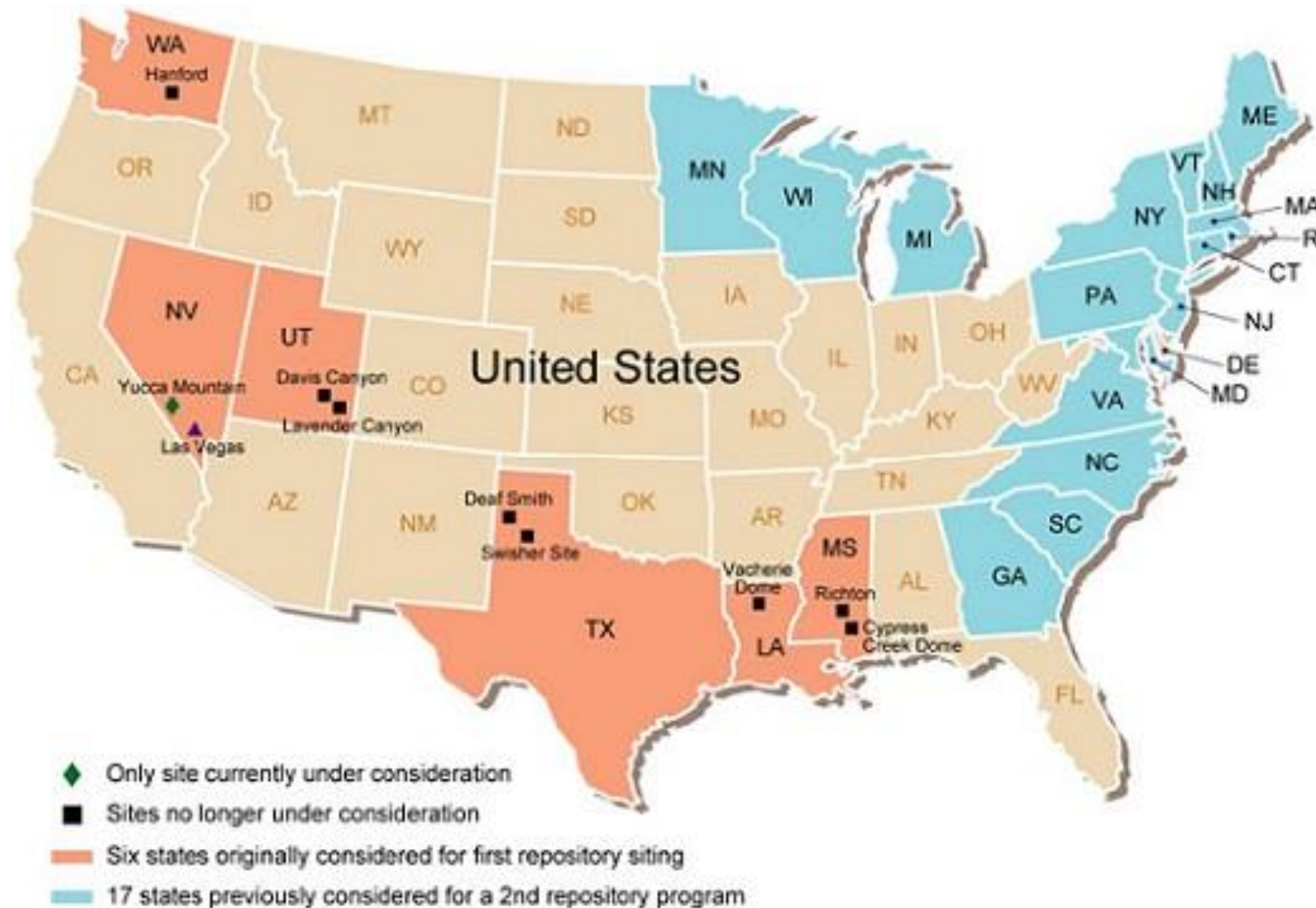
Source: Waste Confidence Rulemaking, DOE/NE-0007 (April 15, 1980) Table II-4, p. II-56; NRC Glossary, <http://www.nrc.gov/reading-rm/basic-ref/glossary/lethal-dose-ld.html>



Commercial SNF in Storage: East-West Distribution (2012)

Repository Sites Considered under 1982 NWPA

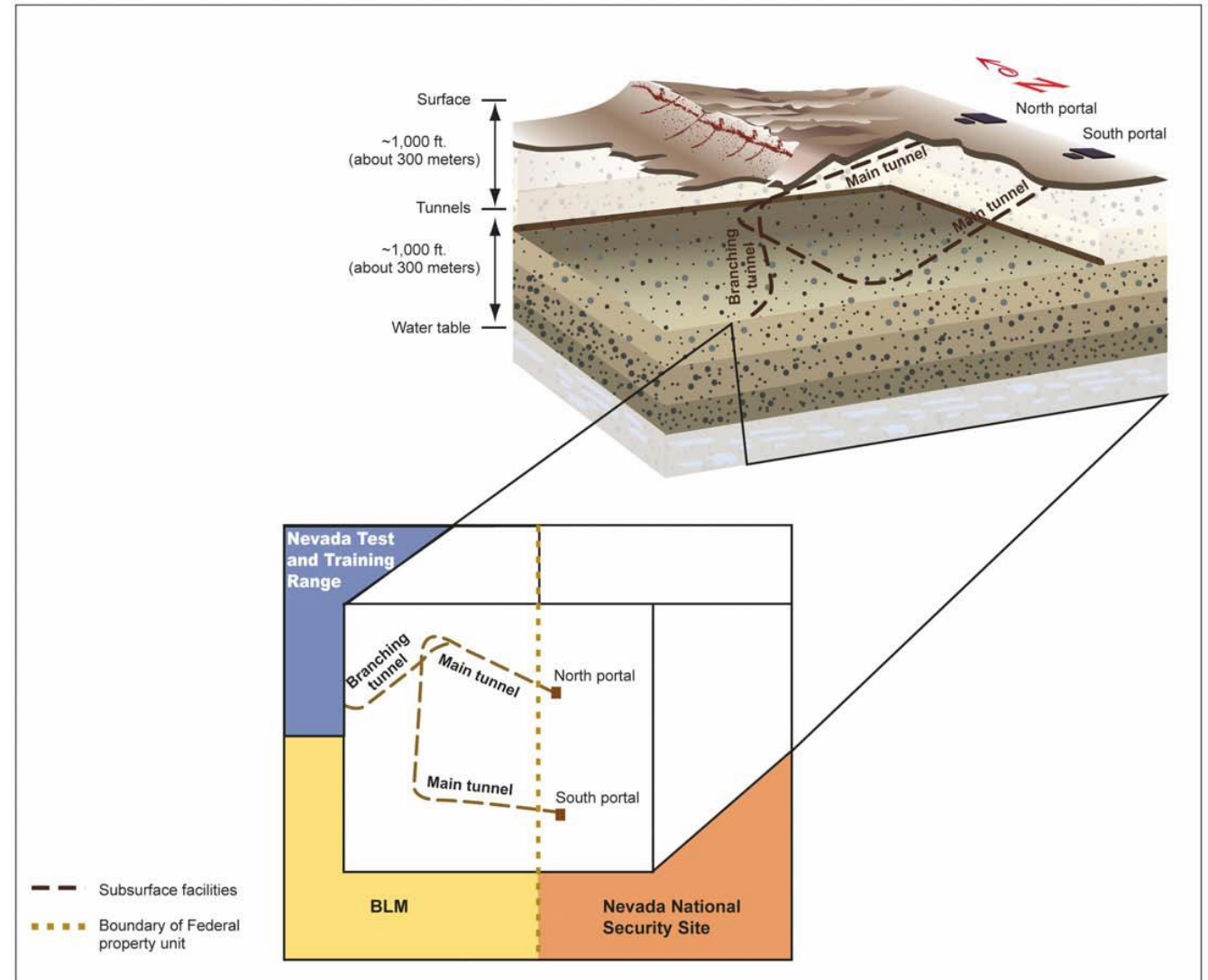
All Except Nevada Eliminated by 1987 NWPA Amendments



What Exists Today at Yucca Mountain

Only 5-Mile Exploratory Tunnel that cannot be used for storage or disposal

- No waste disposal tunnels (Over 40 miles needed beyond current 5 miles)
- No waste handling facilities
- No state water permit
- No construction authorization
- No railroad
- Expired BLM land withdrawal



Sources: GAO analysis of GAO and DOE data.

Yucca Mountain Repository Time Frames

- **Transportation, 50 Years or more**

- Construction of railroad
- Shipment of 9,495 rail casks (2,800 trains) & 2,650 truck casks
- If No 2nd Repository: 21,909 rail casks (about 6,700 trains) & 5,025 truck casks
- Concerns include accidents, sabotage, disruption of shipments by natural events

- **Preclosure Operations, 100 Years or more**

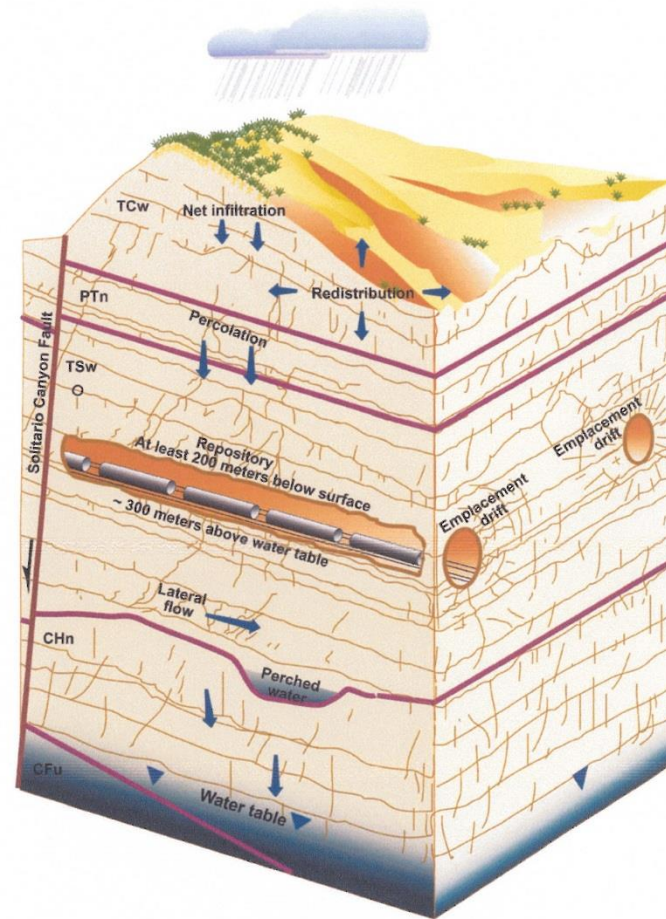
- Construction of surface facilities, underground tunnels and drifts
- Emplacement of 11,200 waste packages, and 11,500 drip shields (90 years later)
- If No 2nd Repository: 25,900 waste packages and 26,200 drip shields
- Concerns include human factors, military aircraft crashes into surface facilities, earthquake induced accidents in surface facilities and rock falls in drifts

- **Postclosure Performance, One Million Years**

- Repository closure, surface restoration, monitoring, and retrieval of waste if necessary
- Concerns include groundwater contamination, human intrusion, erosion, volcanism

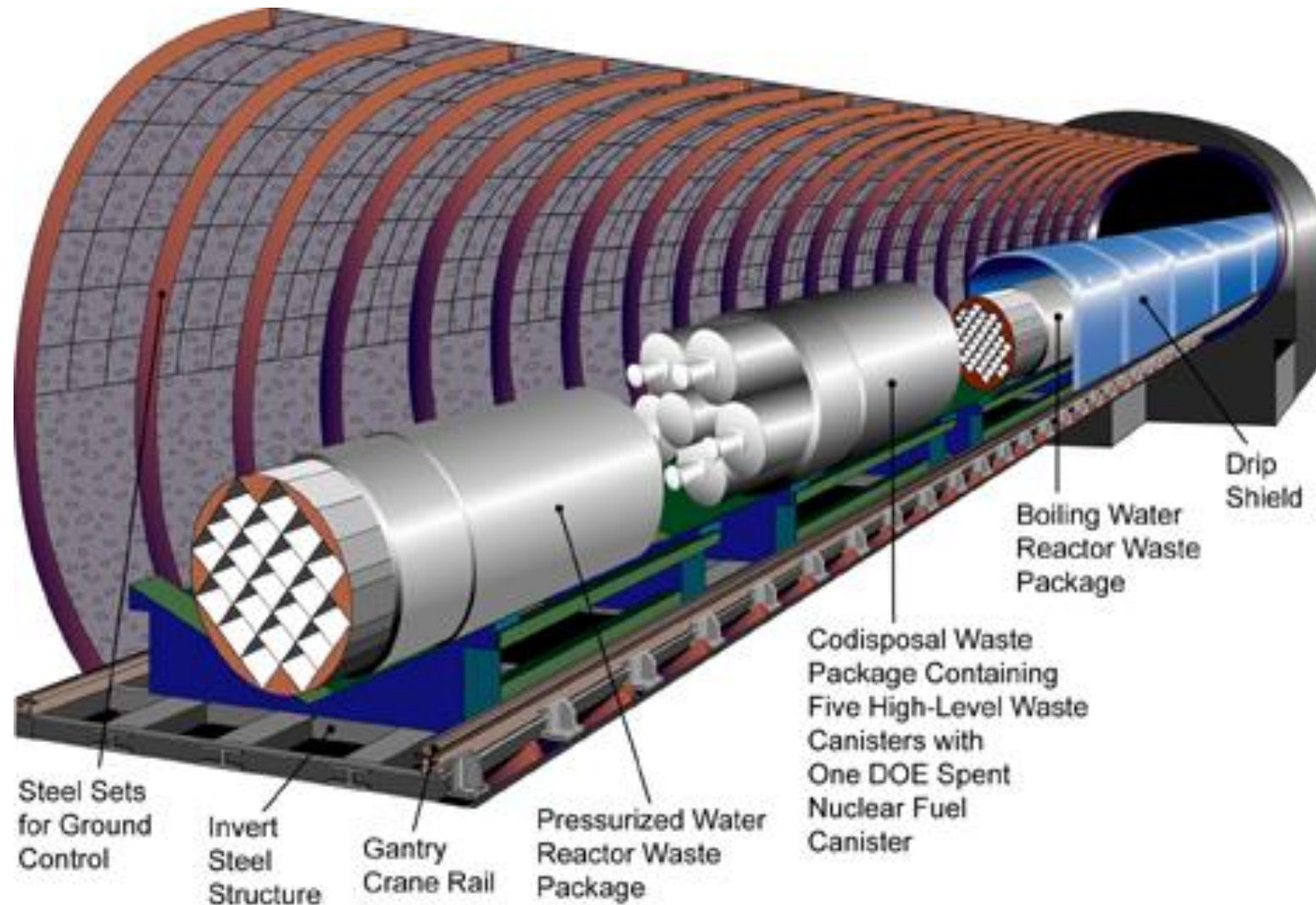
Contentions Challenge Site Suitability

Fractured rock, oxidizing groundwater, above water table



Contentions Challenge Disposal Concept

Titanium Drip Shields over Each Waste Package



Drawing Not to Scale
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Contentions Challenge Hot Repository Concept

Drifts will remain above water boiling point for about 1,000 years

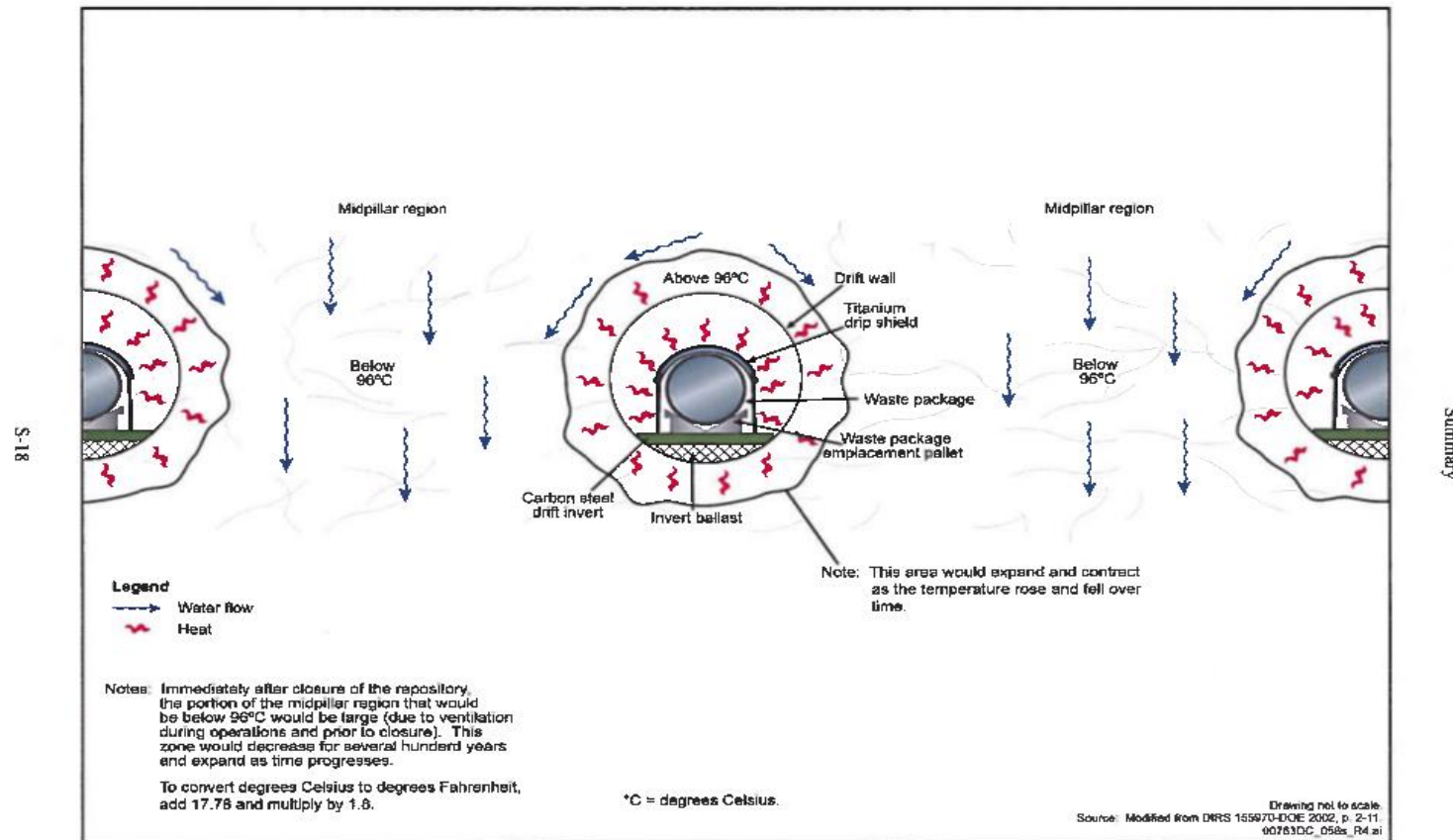
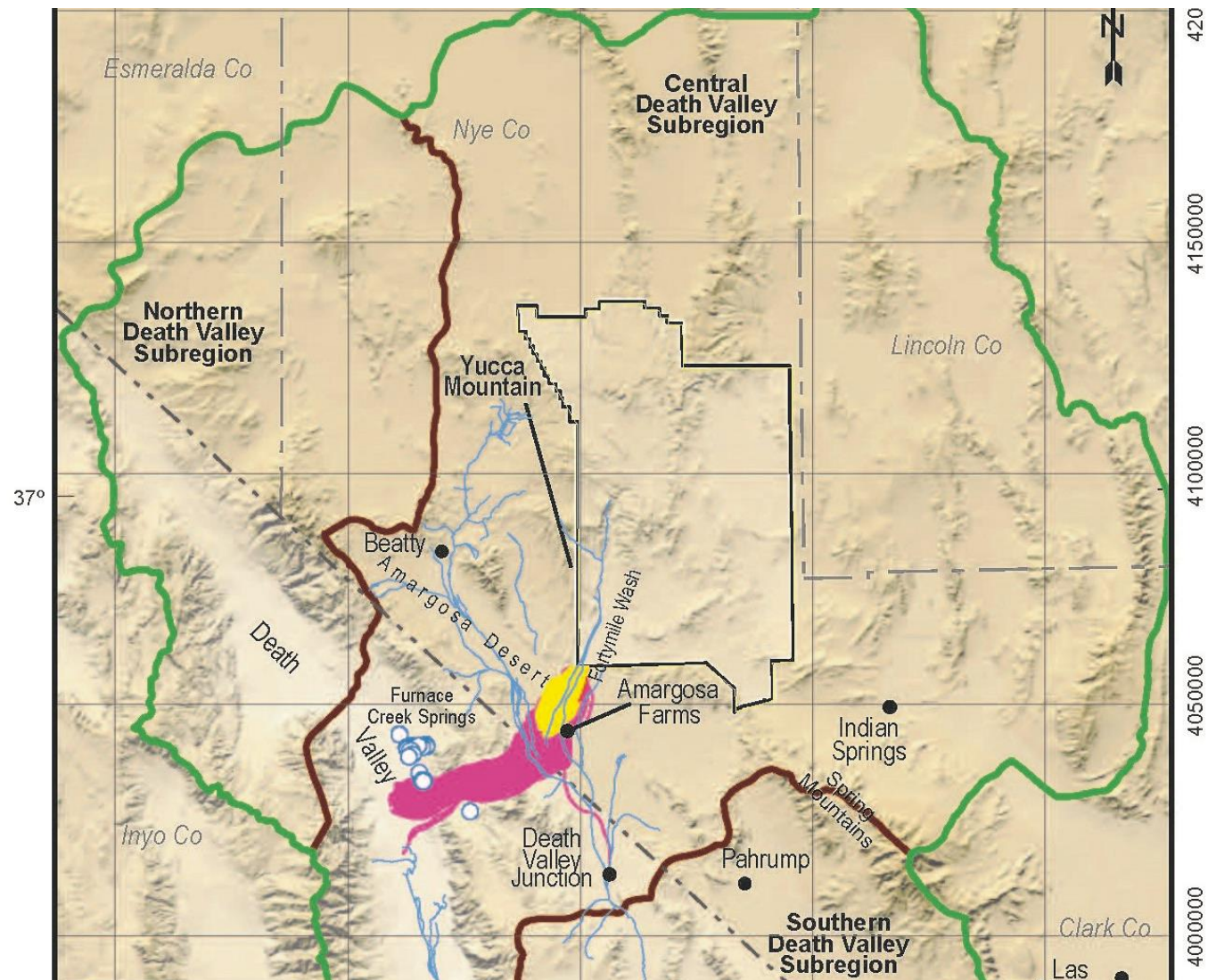


Figure S-8. Management of waste package emplacement using thermal energy density (artist's concept).

New Contentions Challenge Groundwater Impacts and Native American Cultural Impacts in Death Valley (NRC EIS Supplement, NUREG-2184)

Figure 2-5, Groundwater Flow Paths for Contaminants for the Pumping (Yellow) and No Pumping (Fuchsia) Analysis Cases



DOE Proposed Yucca Mountain Transportation System (2008 SEIS)

- Ship 9,495 rail casks (2,800 trains) & 2,650 truck casks over 50 years [p.6-8]
- If No 2nd Repository: 21,909 rail casks (about 6,700 trains) & 5,025 truck casks [p.8-41]
- Average 1-3 trains (3-5 casks per train) & 1-2 trucks (1 cask per truck) per week for 50 years
- Every day, for 50 years, one or more loaded casks on rail or road, from 76 shipping sites to a single national repository or storage site

NRC ASLB Admitted 46 Transportation NEPA Contentions (May 11, 2009 Order)

As California persuasively argues, “[w]ithout transportation of the waste to it, Yucca Mountain would be just a very large, fancy, and expensive hole in a mountain.”...there can be no serious dispute that the NRC’s NEPA responsibilities do not end at the boundaries of the proposed repository, but rather extend to the transportation of nuclear waste to the repository. The two are closely interdependent. Without the repository, waste would not be transported to Yucca Mountain. Without transportation of waste to it, construction of the repository would be irrational. Under NEPA, both must be considered.

Nevada NEPA Contentions

Transportation Radiological Impacts

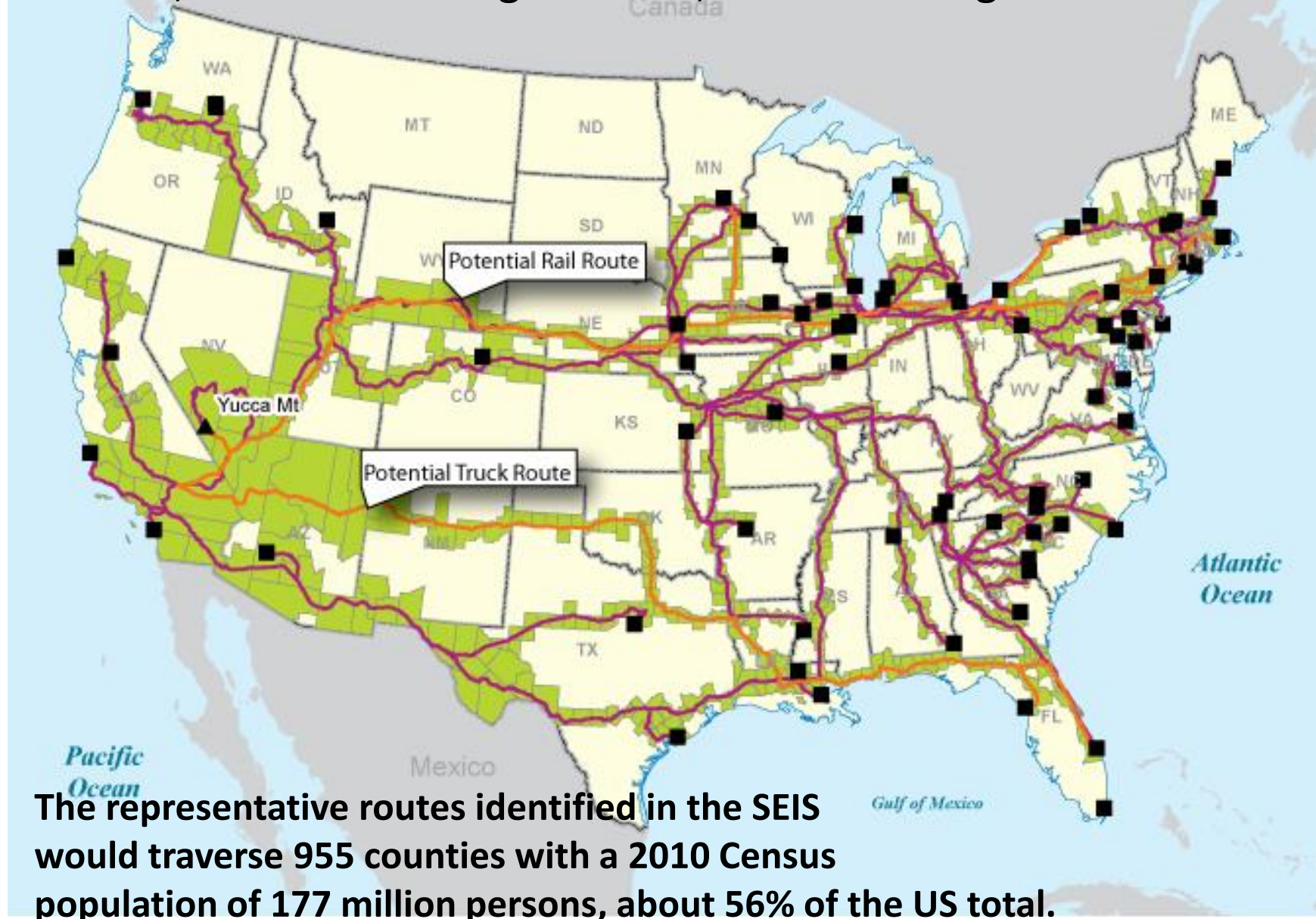
The DOE 2008 FSEIS evaluates four major categories of transportation radiological impacts:

- **incident-free exposures to members of the public residing near or traveling on transportation routes** (up to 0.016 rem to a person in a gridlock traffic jam); [Pp.6-20, 6-21, 8-41]
- **incident-free exposures to transportation workers** such as escorts, truck drivers, & inspectors (by administrative controls, DOE would limit individual doses to 0.5 rem per year; the allowable occupational dose is 5 rem per year); [Pp.6-21, 8-41]
- **release of radioactive material as a result of the maximum reasonably foreseeable transportation accident** (probability about 5 in one million per year), involving a fully engulfing fire, 34 rem dose to the maximally exposed individual, 16,000 person-rem population dose and 9.4 latent cancer fatalities in an urban area, and cleanup-costs of \$300,000 to \$10 billion; [Pp.6-15, 6-24, G-56]
- **release of radioactive material following a successful act of sabotage or terrorism**, using a high-energy density device, resulting in 27-43 rem dose to the maximally exposed individual, 32,000-47,000 person-rem population dose and 19-28 latent cancer fatalities in an urban area, and cleanup costs similar to a severe transportation accident. [Pp.6-27, CR-467]

Nevada contentions challenging the NEPA sufficiency of DOE's impact evaluations will be further evaluated in great detail in the restarted licensing proceeding.

Contentions Challenge Impacts of Transportation Assumptions

Rail/Truck Modal Mix, Use of Overweight Trucks, & Rail Routing



Contentions Challenge Impacts of Transportation Accidents (Long-Duration, High-Temperature Fires)

MacArthur Maze - 2007

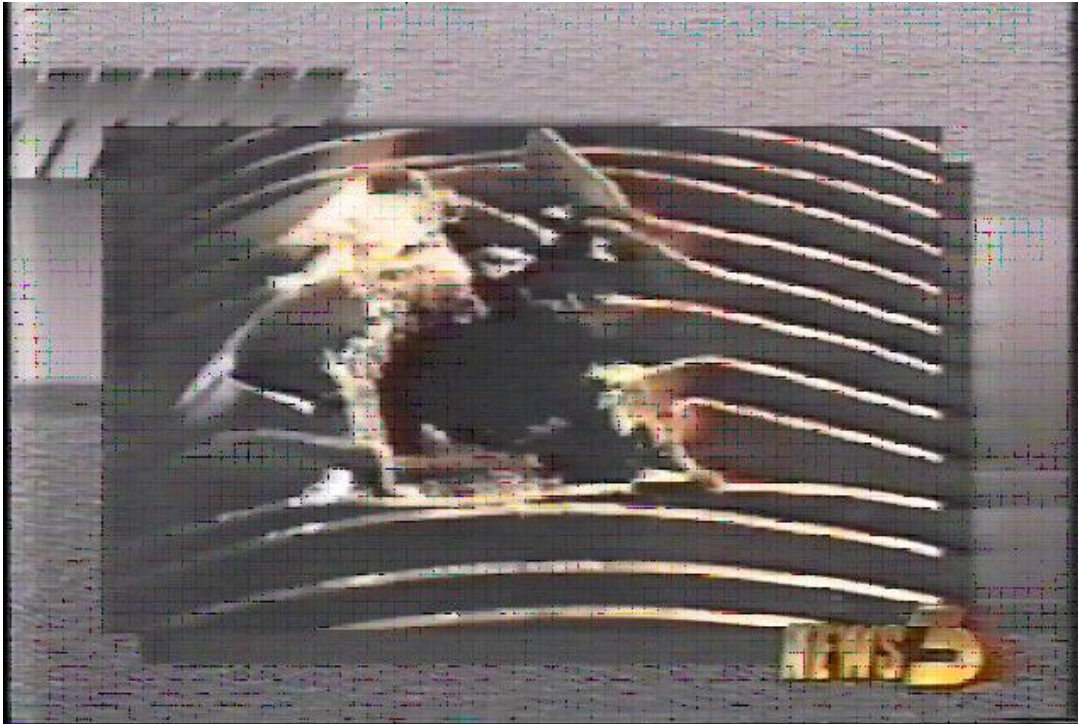


Baltimore Rail Tunnel - 2001



Contentions Challenge Impacts of Transportation Radiological Sabotage (Terrorist Attacks)

Truck Cask Test, 1982



Rail Cask Test, 1998



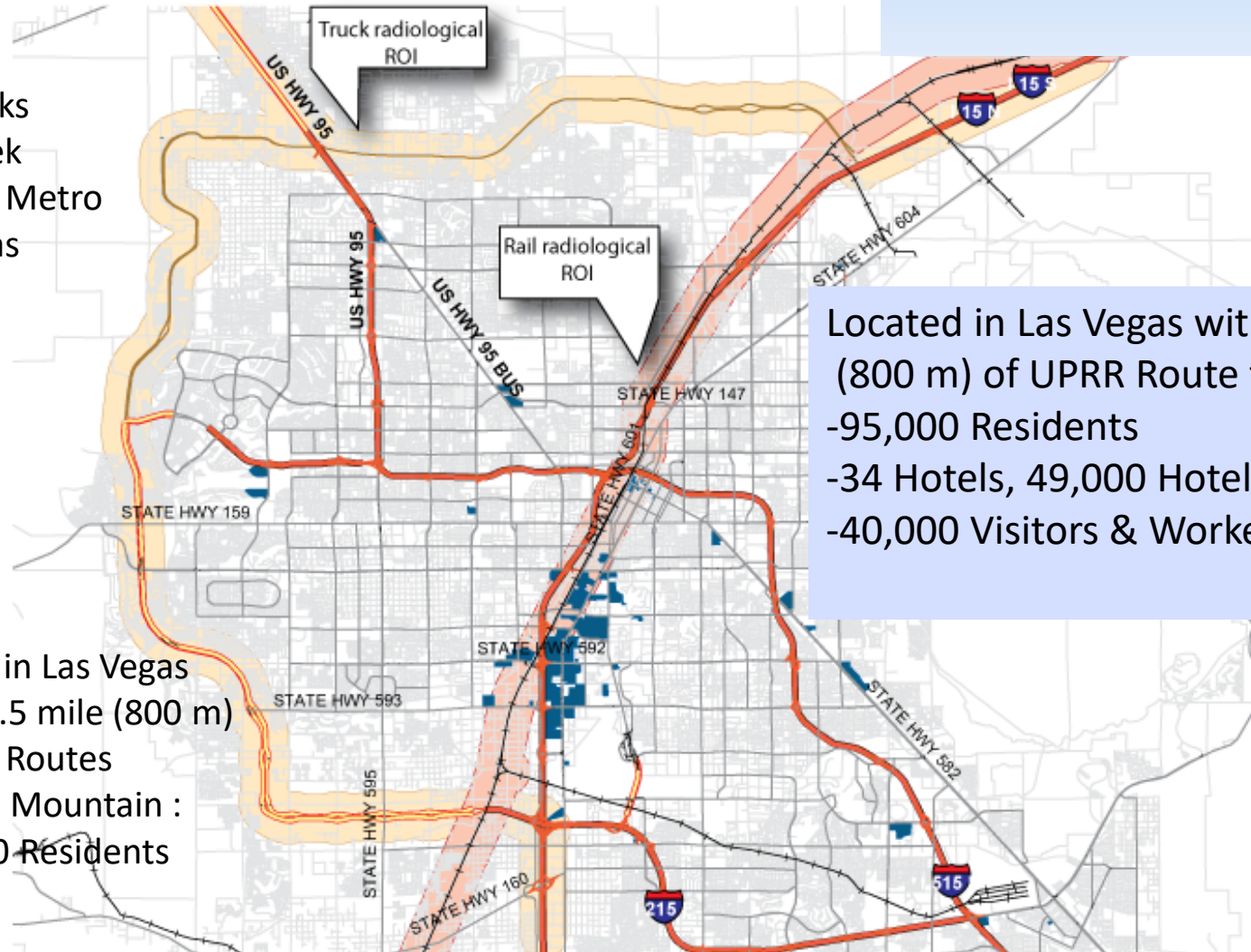
Contentions Challenge Las Vegas Impacts

Rail Casks through Las Vegas
to Yucca Mountain via Caliente
Minimum – 8% Maximum – 79%
4 - 110 trainloads per year

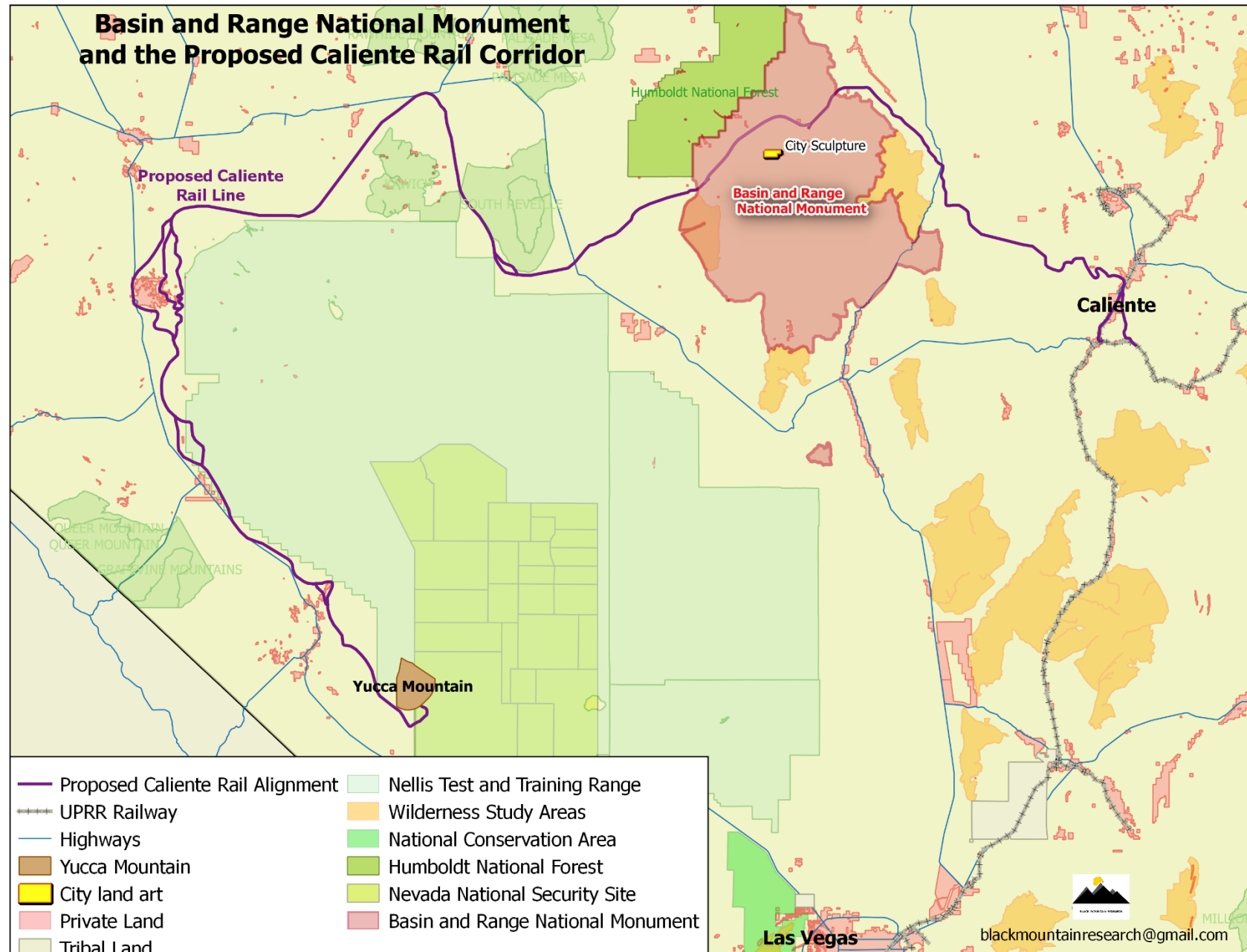
1-2 Trucks
per Week
through Metro
Las Vegas

Located in Las Vegas
within 0.5 mile (800 m)
of Truck Routes
to Yucca Mountain :
-113,000 Residents

Located in Las Vegas within 0.5 mile
(800 m) of UPRR Route to Caliente :
-95,000 Residents
-34 Hotels, 49,000 Hotel Rooms
-40,000 Visitors & Workers



Contentions Challenge Caliente Rail Impacts



Caliente Corridor NEPA Issues



Mountains = Cuts, Fills, Grades, Curves



Land Use Conflicts

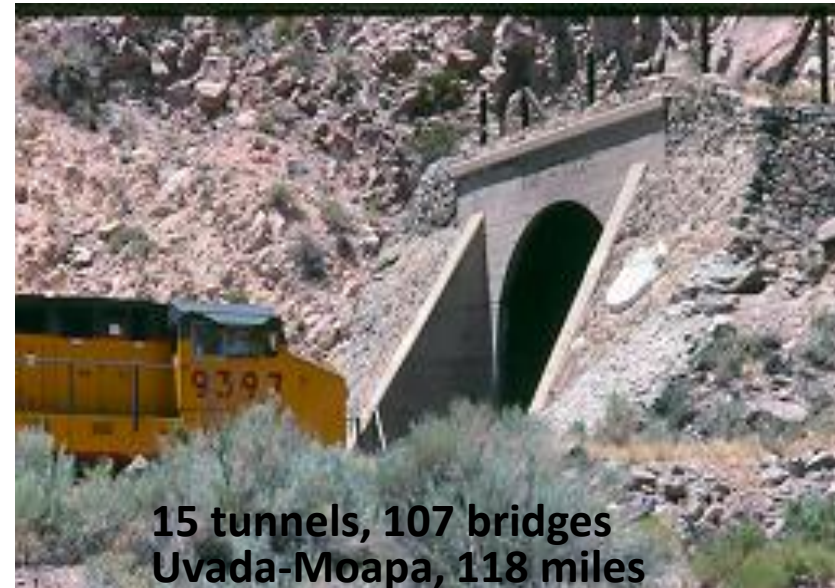
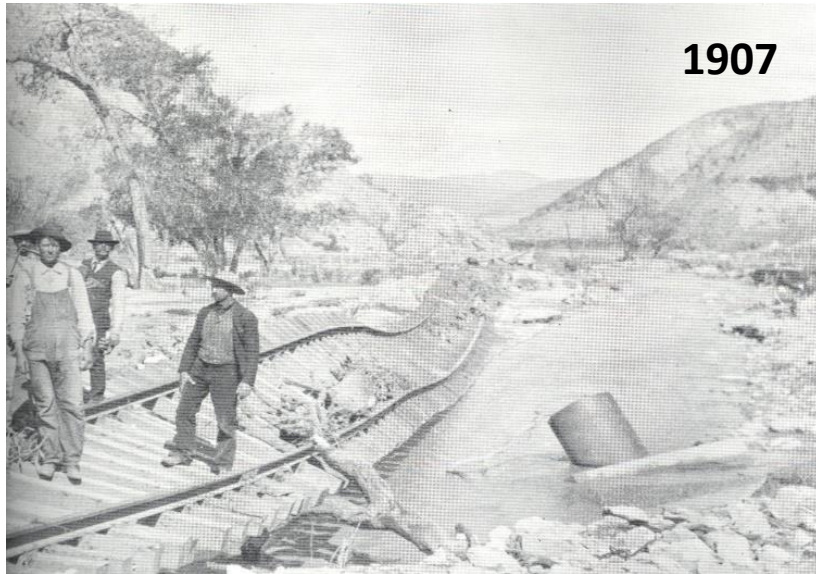


Bridges & Flood Hazards



Limited Economic Benefits

UP Mainline to Caliente Safety Issues



UNR 1991 Flood Warning

- “At MP 431.82 ...The bridge appears to have been designed to allow passage of the 25-year storm. However there is a 30% chance that a 100-year storm (probability of 0.01) will occur in any 35 years, and a 51% chance that a 50-year storm will occur during the same period.” (p.29)
- “From the analysis of the 100-year flow through the wash between the bridge at MP 431.82 versus the capacity of the channel provided, it was found that there is a significant danger of track becoming flooded or possibly the bridge washing out.” (p.52)

Norris, Gary, Survey and Evaluation of Nevada's Transportation Infrastructure: Task 3 – Railroads, University of Nevada, Reno, Prepared for State of Nevada Nuclear Waste Project Office, January, 1991

Bridge Washout at MP 431.81 (January 2005)



Nuclear Waste Informed Consent Act

- S. 95 (Heller & Cortez Masto), The Nuclear Waste Informed Consent Act: Extend consent to Nevada by restricting NRC Nuclear Waste Fund expenditures for a repository (January 11, 2017)*
- H.R. 456 (Titus, Kihuen, & Rosen), The Nuclear Waste Informed Consent Act: Extend consent to Nevada by restricting Nuclear Waste Fund expenditures for a repository (January 11, 2017)**
- Parties to written consent agreement with Secretary of Energy:
(1) Governor of the host State; (2) each affected unit of local government;
(3) any unit of general local government contiguous to the affected unit of local government if spent nuclear fuel or high-level radioactive waste will be transported through that unit of general local government for disposal at the repository; and (4) each affected Indian tribe

*Available on-line at: <https://www.congress.gov/bill/115th-congress/senate-bill/95>

**Available on-line: <https://www.congress.gov/bill/115th-congress/house-bill/456>

Getting Beyond Yucca Mountain - What U.S. Should Do With Nuclear Waste

- Walk away from Yucca Mountain
- Restructure nuclear waste program as recommended by BRC (2012)*
- Implement BRC recommendations about generic repository performance standards and repository consent-based siting
- Address stakeholder concerns about at-reactor storage
- Implement NAS (2006)** and BRC transportation recommendations
- Implement BRC recommendations about consolidated interim storage

*Available on-line at: <https://energy.gov/ne/downloads/blue-ribbon-commission-americas-nuclear-future-report-secretary-energy>

** Free download available at: <https://www.nap.edu/read/11538/chapter/1>