

# **Groundwater Flow and Transport Class:**

## **Applications of Hydrogeology to Radioactive Waste Management**

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# Examples of Applied Hydrogeology

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- Yucca Mountain Project – Geological repository for spent nuclear fuel and high-level radioactive waste
- Nevada Test Site – Near surface disposal of low-level radioactive waste
- Idaho National Laboratory – Decommissioning of reprocessing facilities and underground high-level liquid waste tanks
- Repository Programs in Japan and Taiwan – Geological repositories for spent nuclear fuel and high-level radioactive waste

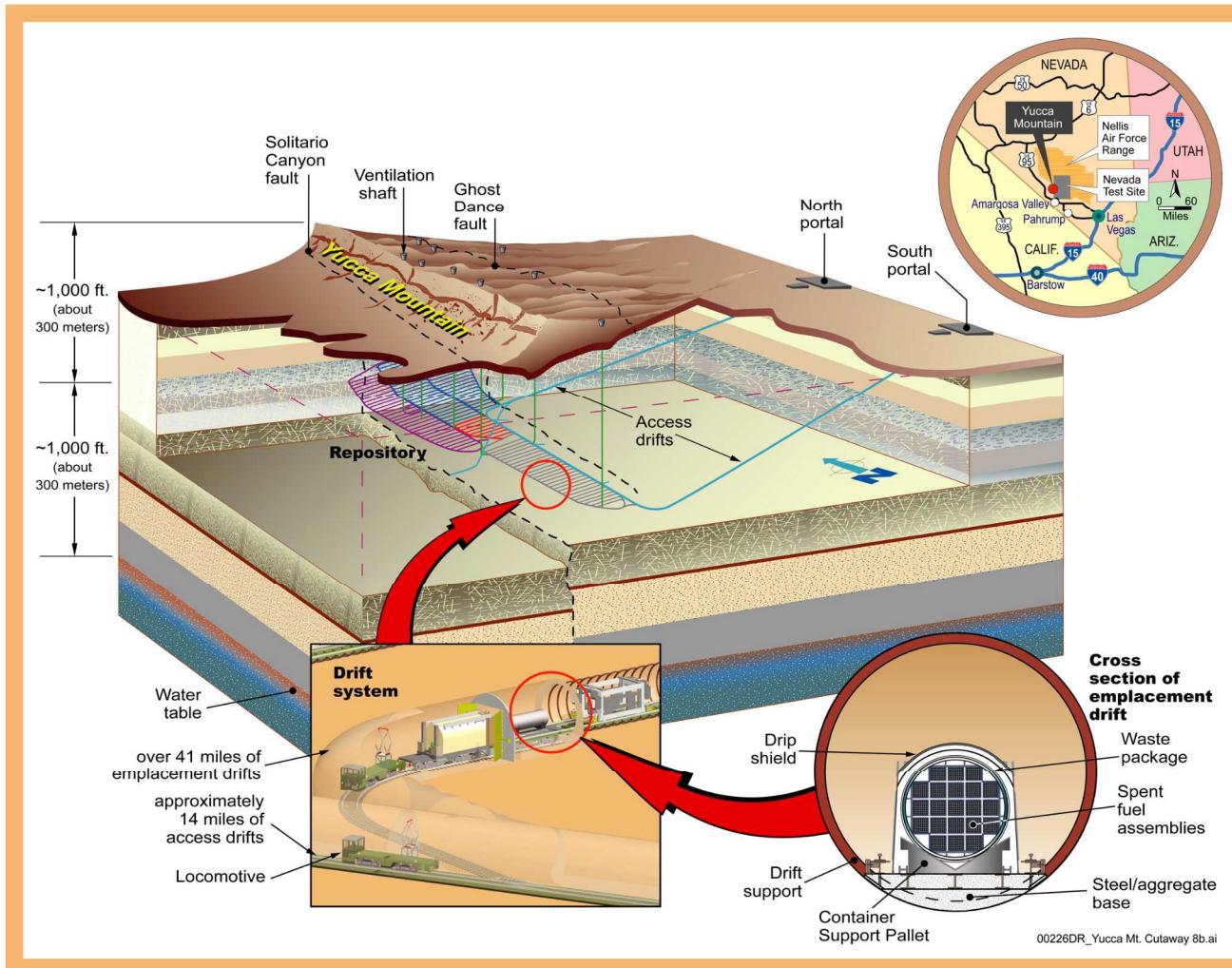


# Yucca Mountain

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- Proposed repository for spent nuclear fuel and high-level radioactive waste
- Objective of research is to assess risks of disposal system into the future
- Arid climate – limited infiltration
- Thick unsaturated zone (as deep as 600 m)
- Repository located in fractured volcanic tuff

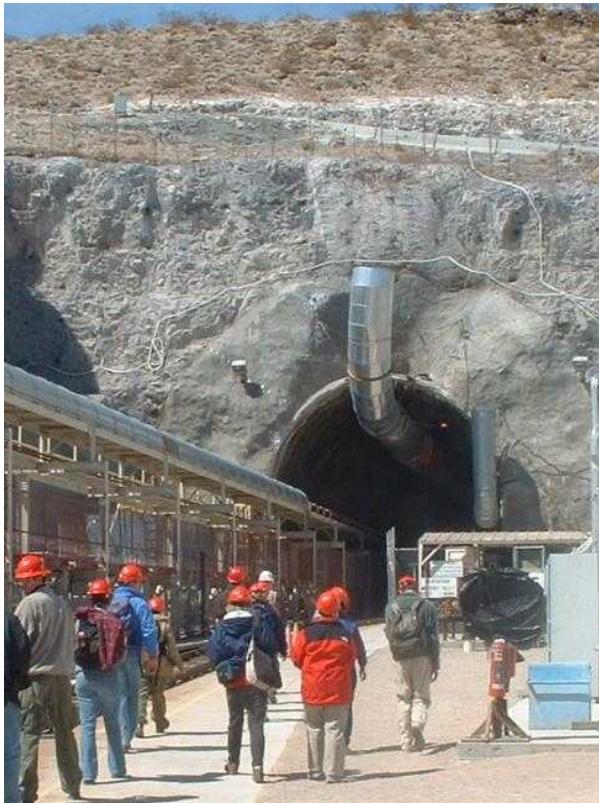
# Yucca Mountain





# Yucca Mountain

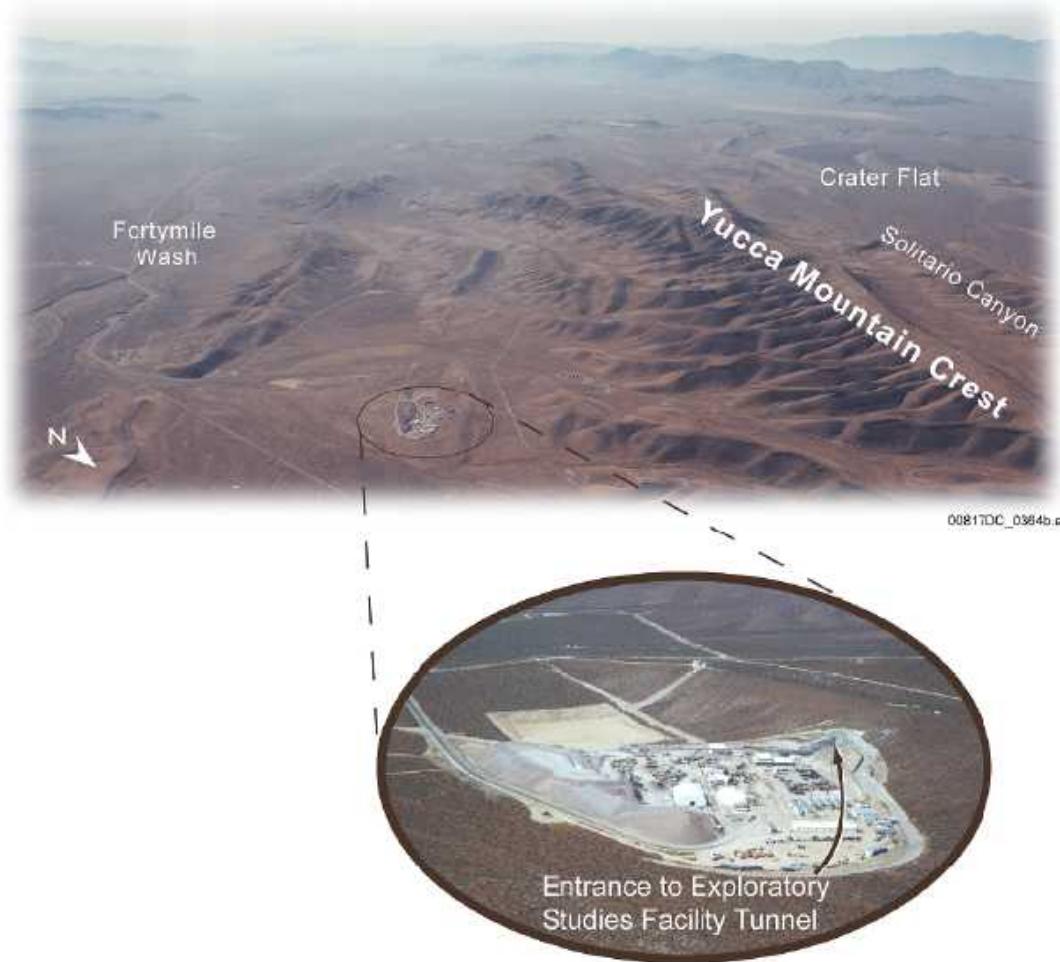
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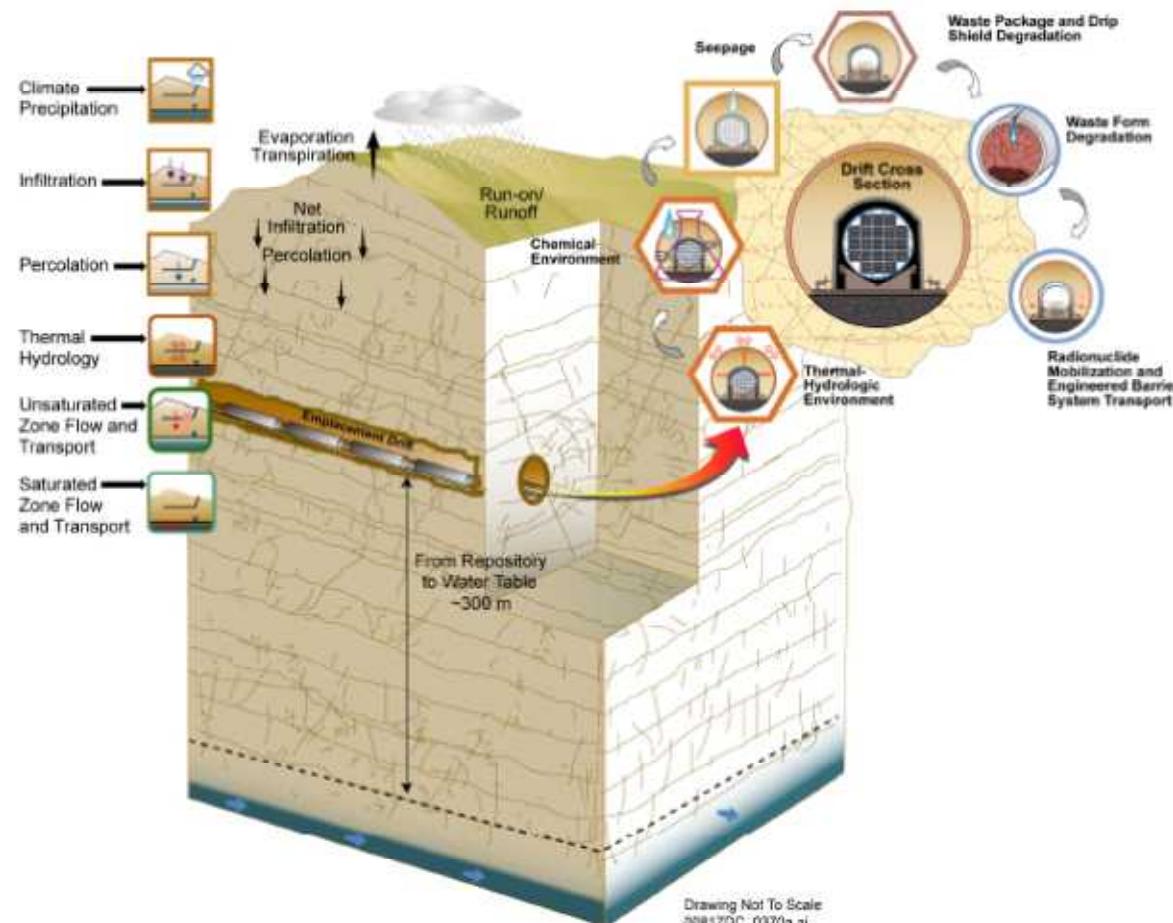


# Yucca Mountain

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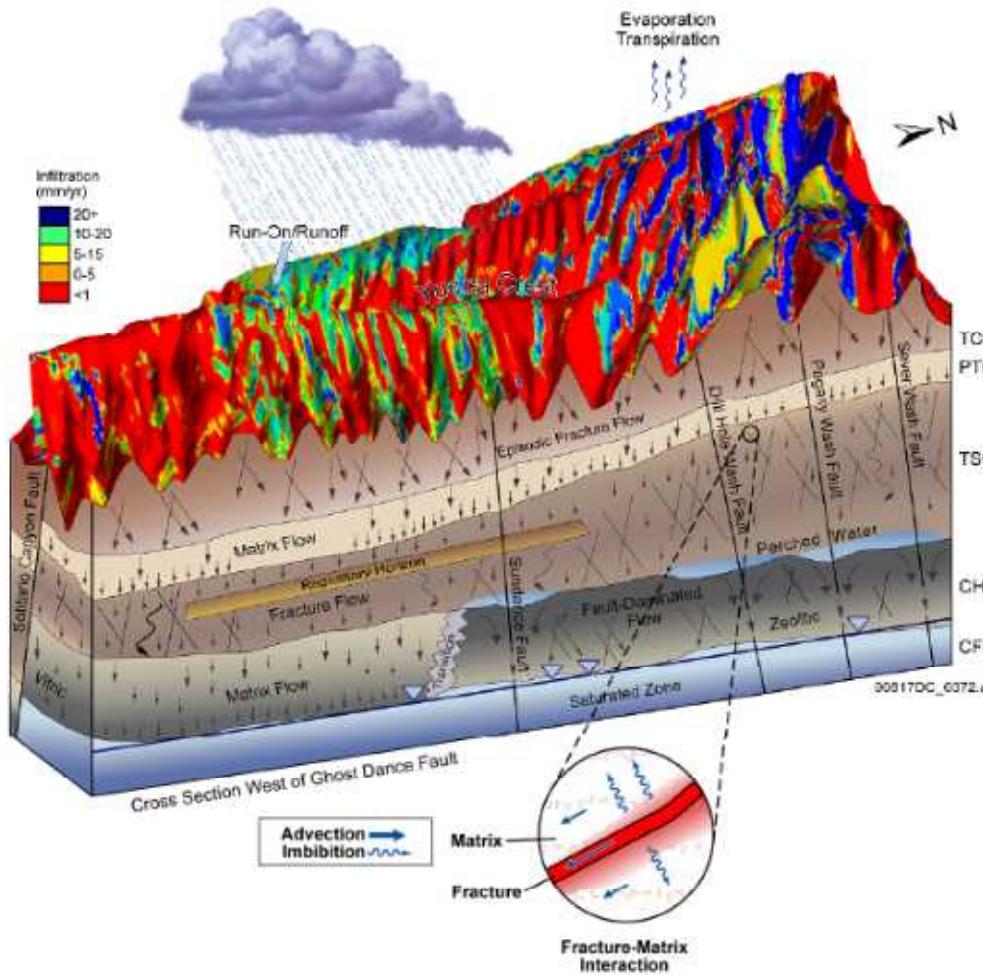
# Yucca Mountain





# Yucca Mountain

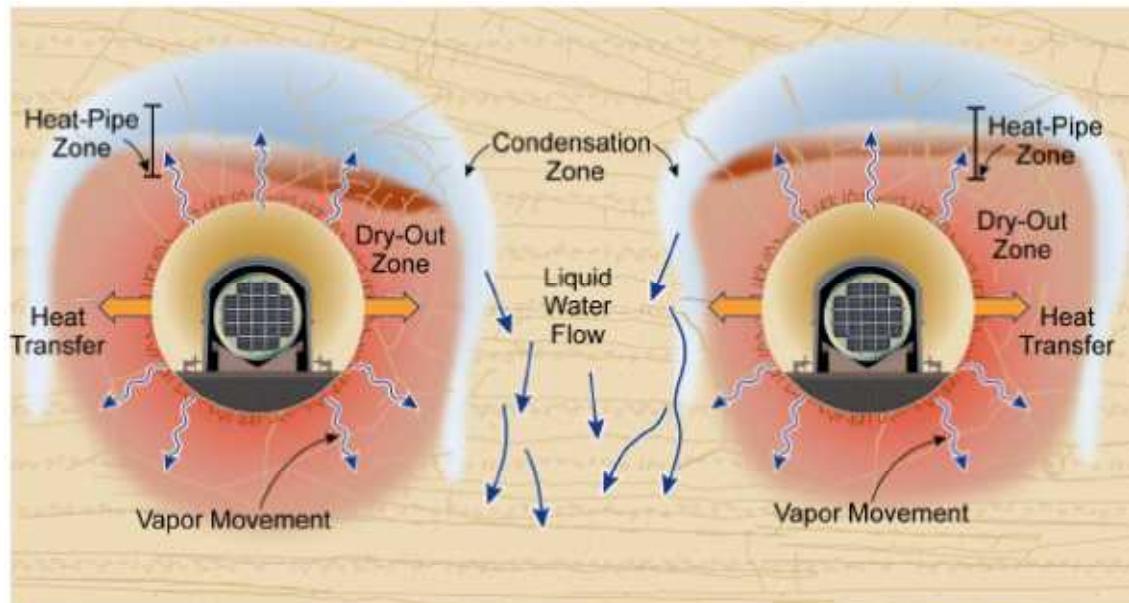
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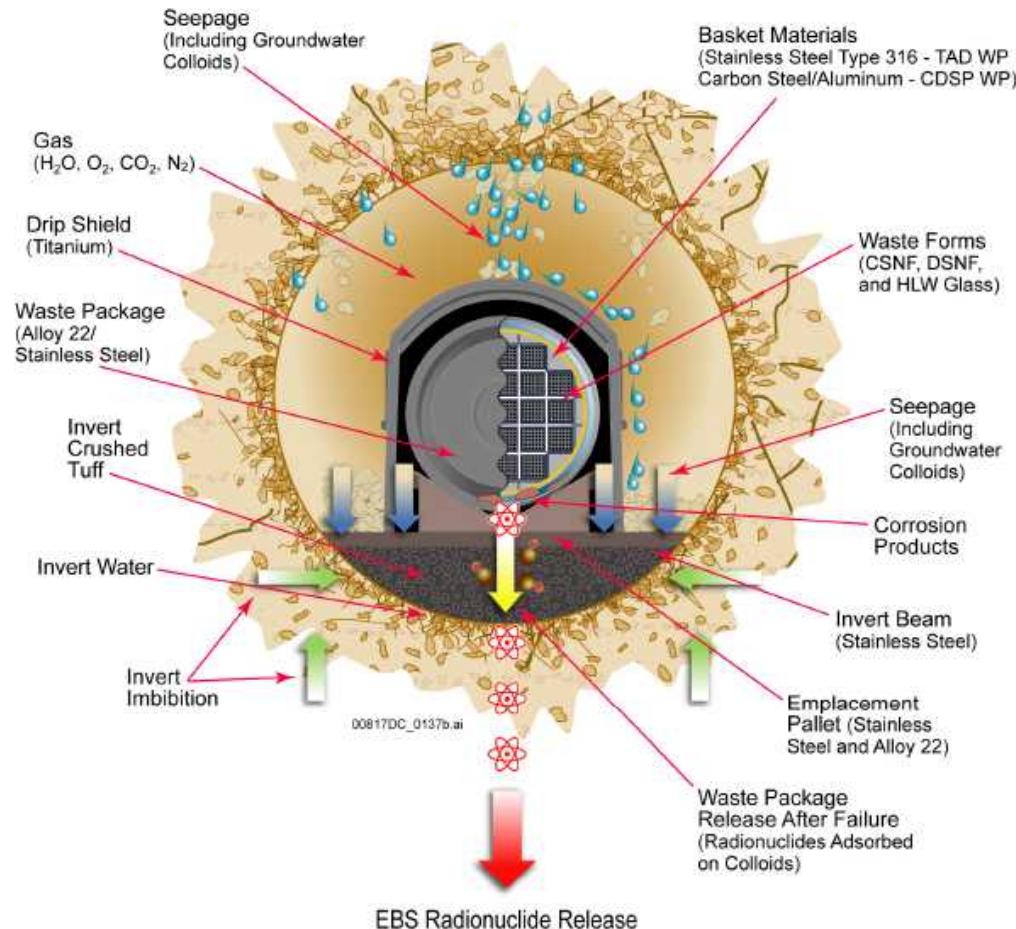
# Yucca Mountain

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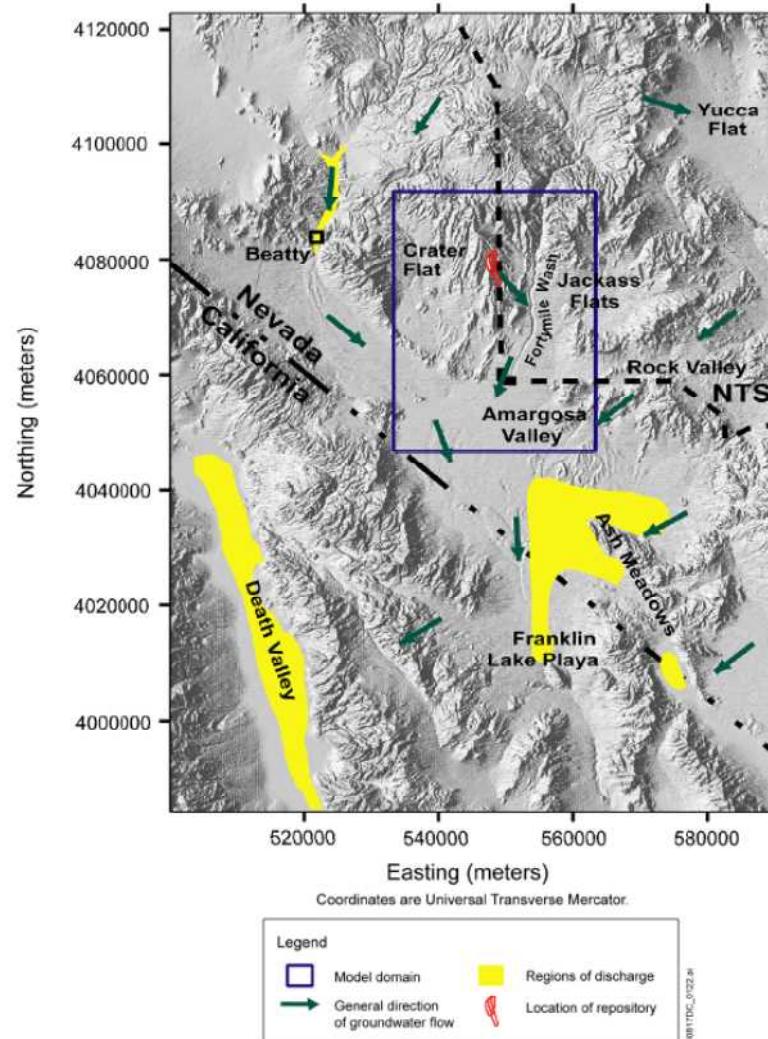


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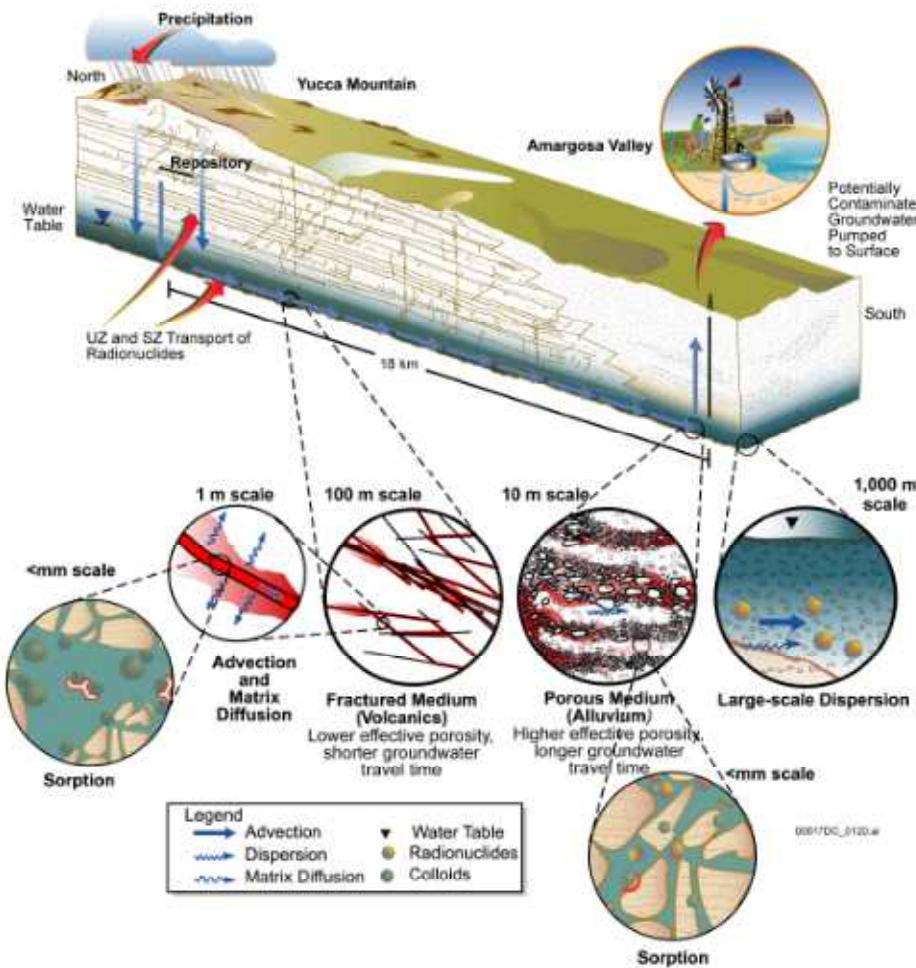
# Yucca Mountain



# Yucca Mountain



# Yucca Mountain





# Nevada Test Site

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- Former nuclear weapons testing facility
- Near surface disposal cells for low-level radioactive waste at several locations
- Arid climate – limited or no net infiltration
- Thick unsaturated zone
- Disposal cells located in thick alluvium (porous medium)



# Nevada Test Site

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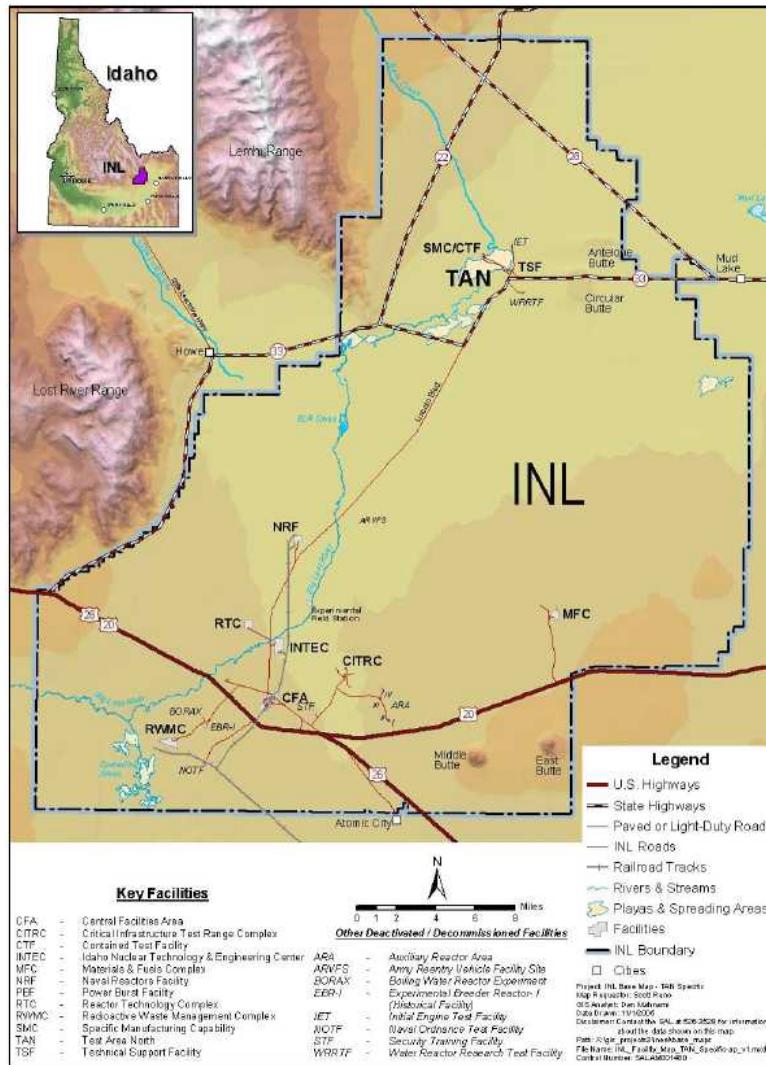


# **Idaho National Laboratory**

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- Nuclear engineering test facilities and fuel reprocessing facilities
- Contaminated surface facilities
- Underground liquid waste tanks and piping
- Contaminated soils from spills in the vadose zone
- Semi-arid climate
- Thick unsaturated zone
- Highly transmissive fractured basalt aquifer in the saturated zone

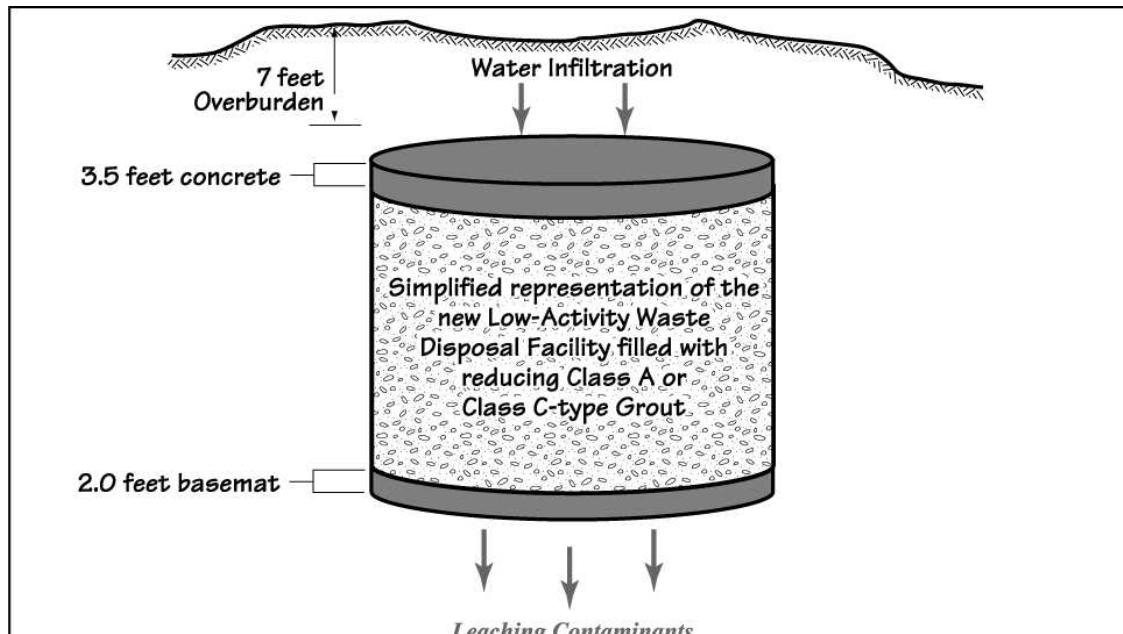
# Idaho National Laboratory





# Idaho National Laboratory

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**FIGURE C.9-10.**  
Conceptual diagram of Class A grout disposal in new Low-Activity Waste Disposal Facility.



# Repository Programs in Japan and Taiwan

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- Spent nuclear fuel and high-level radioactive waste repository programs are in the research stages
- Both Japan and Taiwan are seeking host communities for potential waste disposal sites
- Humid climate
- Seismically, tectonically, and/or volcanically active countries
- Japan has two underground research laboratories with ongoing groundwater hydrology programs