SAND2007-3344C

A General Review of WIPP

KHNP Training Program
Module 1: Orientation

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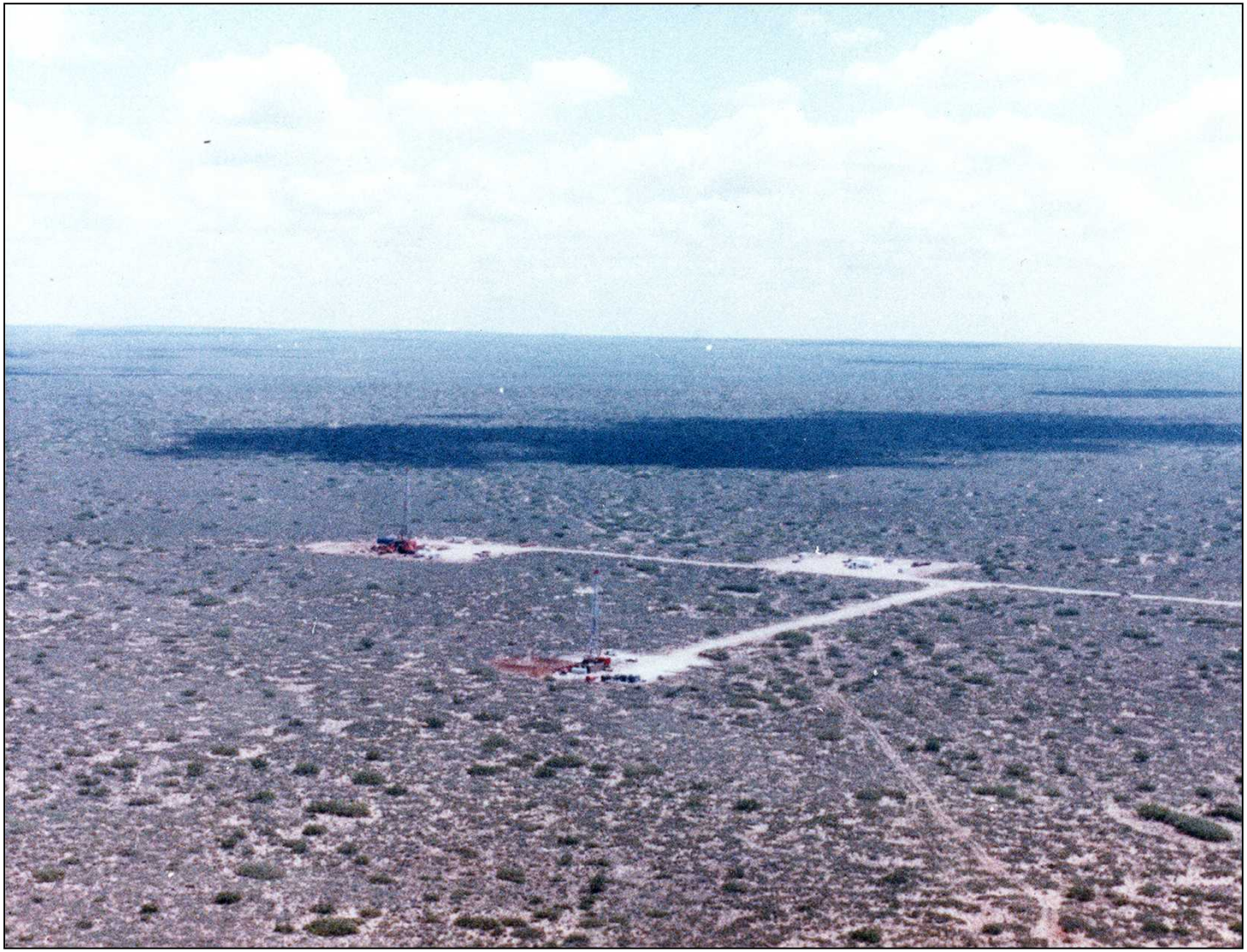
Early WIPP Site Studies



Bedded Salt, Chosen Purposefully, for the Siting of the US Defense Nuclear Wastes

- **Salt can be mined easily**
- **Salt is known to flow slowly under the pressure of overlying beds, and therefore will consolidate around the waste and isolate it in place**
- **Salt is essentially impermeable**
- **Fractures in salt are self healing**
- **Salt that has existed underground for millions of years will almost certainly remain stable for millions of years into the future**
- **Salt has a relatively high thermal conductivity**
- **Wide geographic distribution (many potential sites)**

Disposal of TRU Waste

- **The Waste Isolation Pilot Plant (WIPP)**
  - Site in southeastern New Mexico selected in 1975
  - Disposal began in 1999
  - Site closure could be in 2025-2030
- **Geology and hydrology provide primary isolation**
  - Bedded salt host rock
    - extremely low permeability
    - creeping behavior
  - Semiarid region, little potable water, no significant aquifers
- **Lesser role for engineered barriers**
  - No long-term role for waste containers
  - Shaft seals
  - MgO backfill used as chemical conditioner

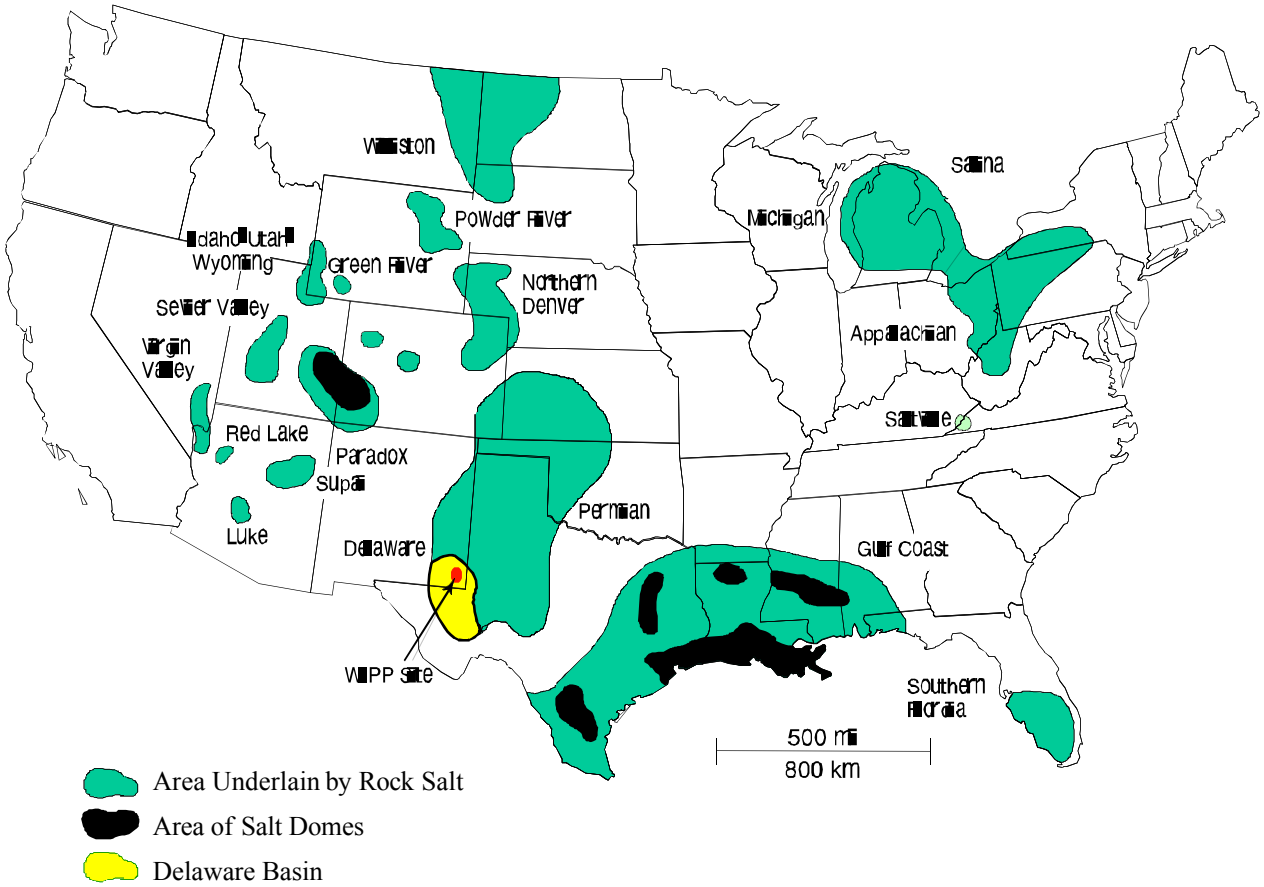
Map of Salt Deposits in U.S.

TRU Timeline

1942:
LANL chosen as site to build first nuclear bomb

1957:
NAS recommended salt for permanent underground disposal

1973:
NM chosen as potential disposal site



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Congress passes the *DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980.*

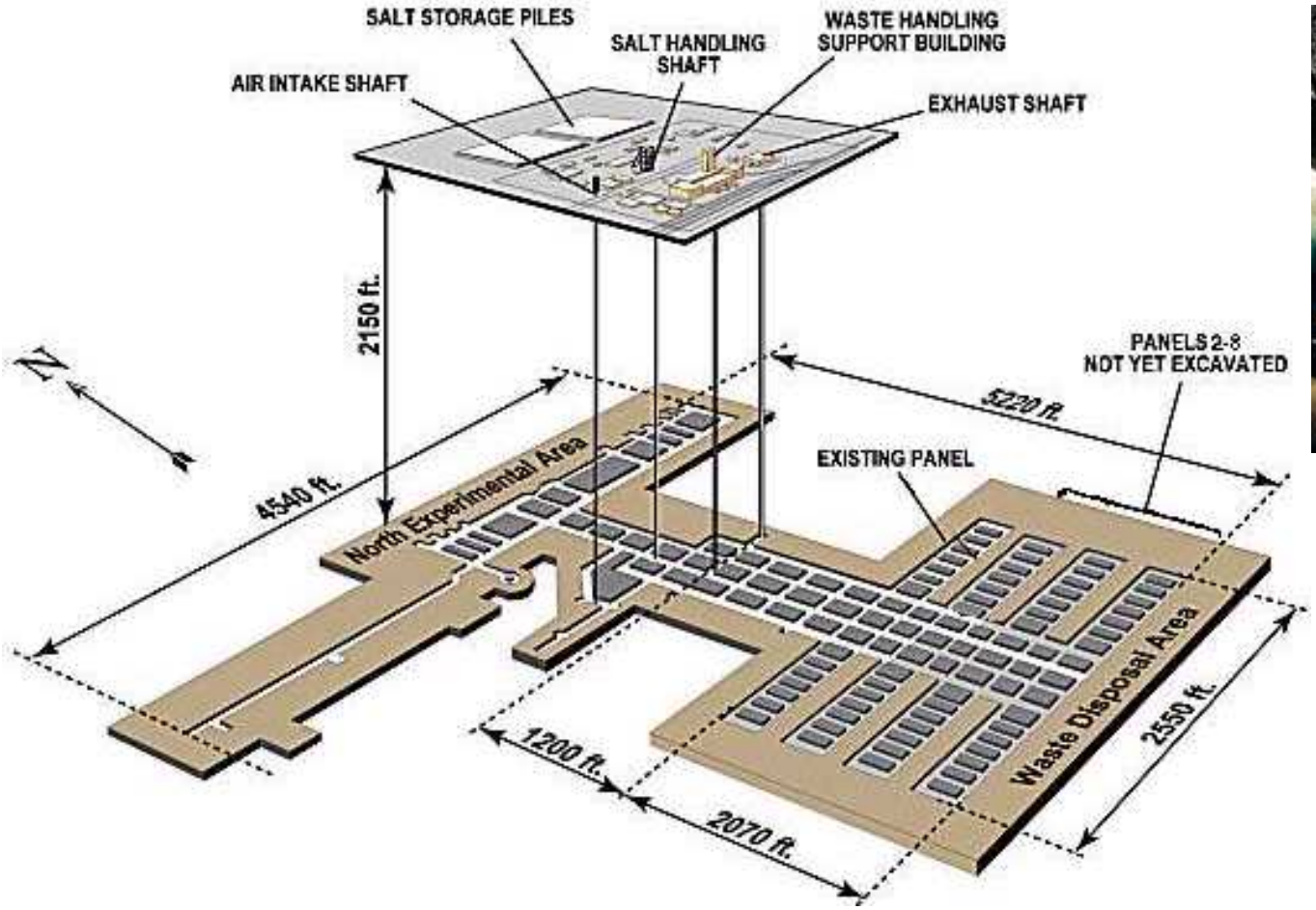
Act authorized DOE to construct WIPP and to seek New Mexico endorsement to operate a geologic repository for waste generated for defense purposes (weapons development waste). Firmly separated weapons production waste disposal from power production waste disposal in the US.

December 29, 1979

Substantial influence by both local and state politicians to proceed. Economic impact (jobs) drove influence but "good science" demanded at every step!

Senator Pete Domenici

Underground excavation at WIPP begins. First underground rooms are completed in 1983.



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West-East Geologic Cross Section of Delaware Basin

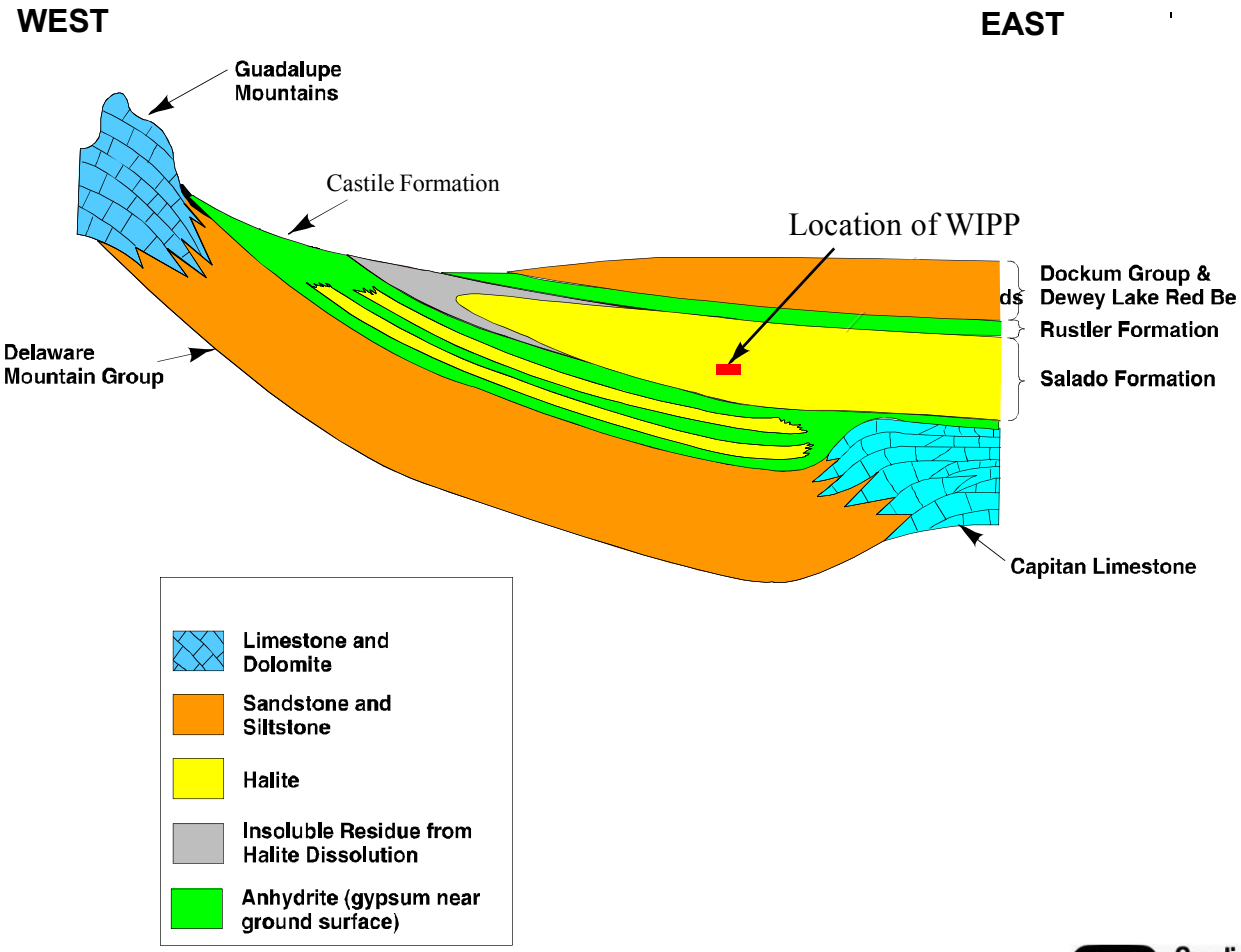
1981:
First shaft completed

1996:
CCA submitted to EPA

1998:
WIPP certified by EPA

1999:
First waste shipment received

2004:
First recertification



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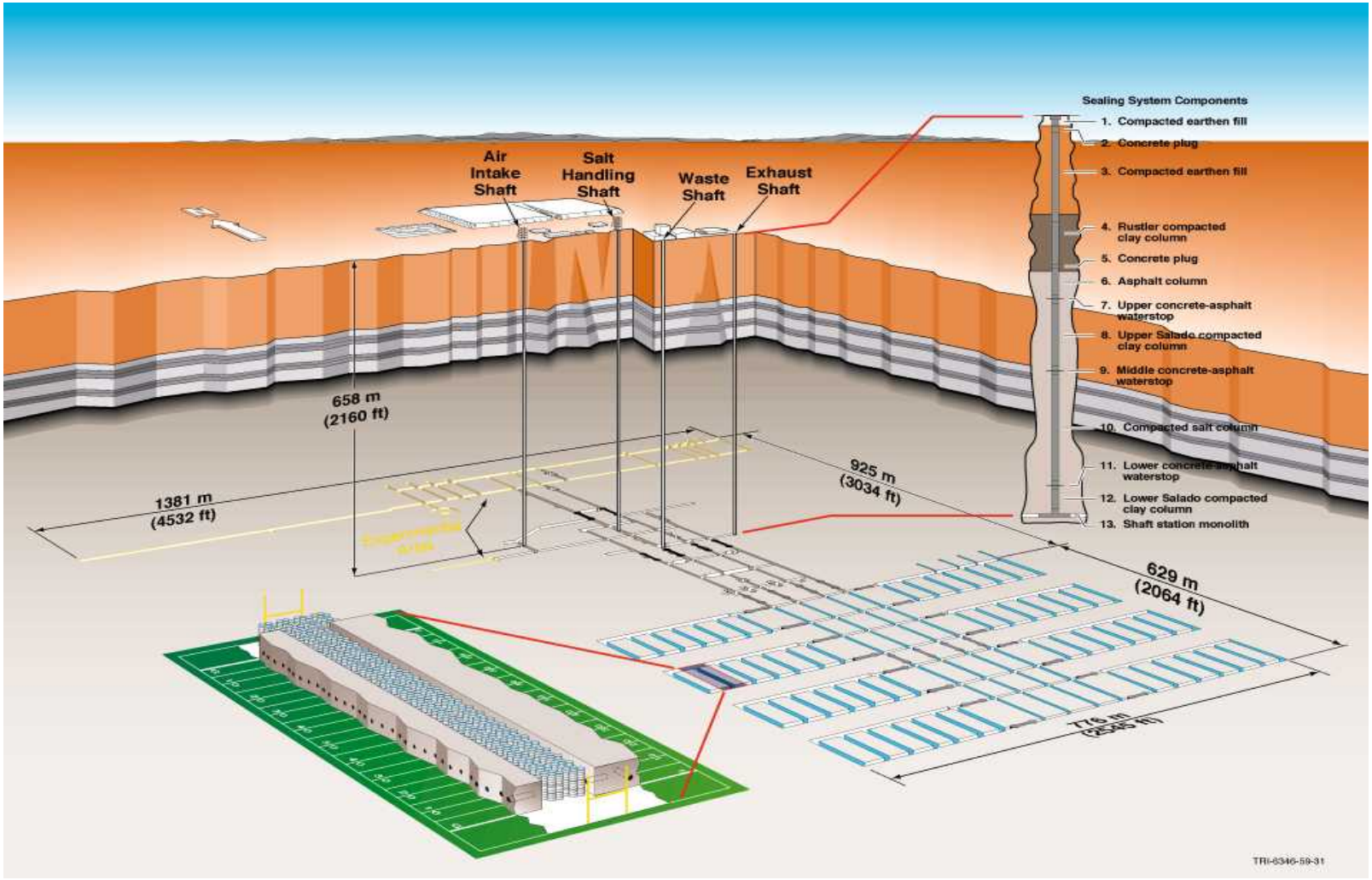

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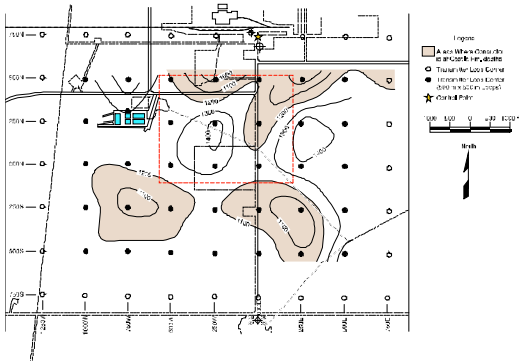
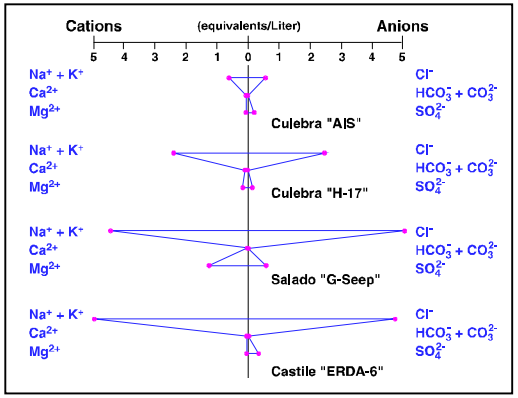
WIPP Site Characterization



Geophysical surveys



Geochemical sampling and analysis

Geomechanical testing

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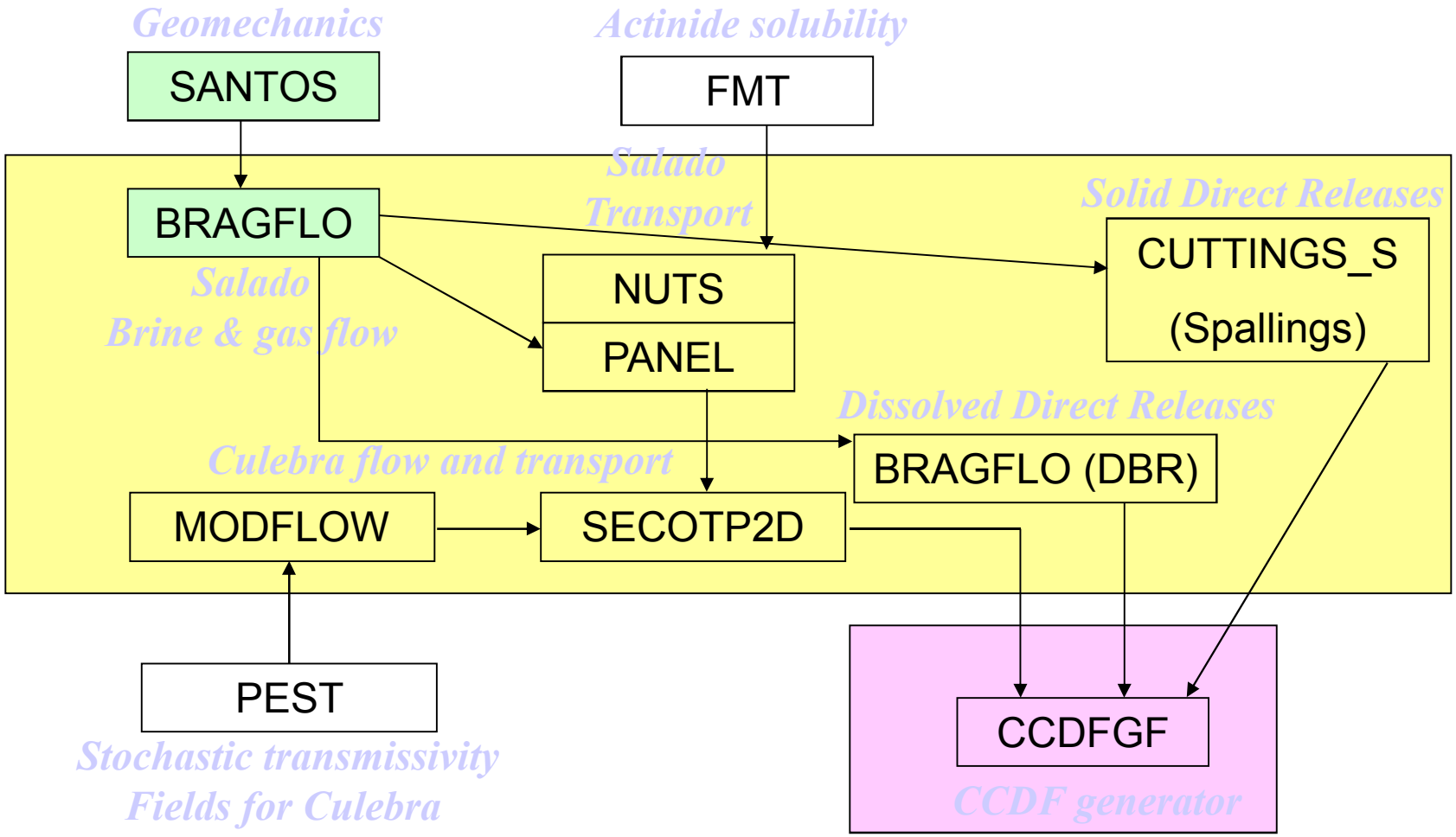
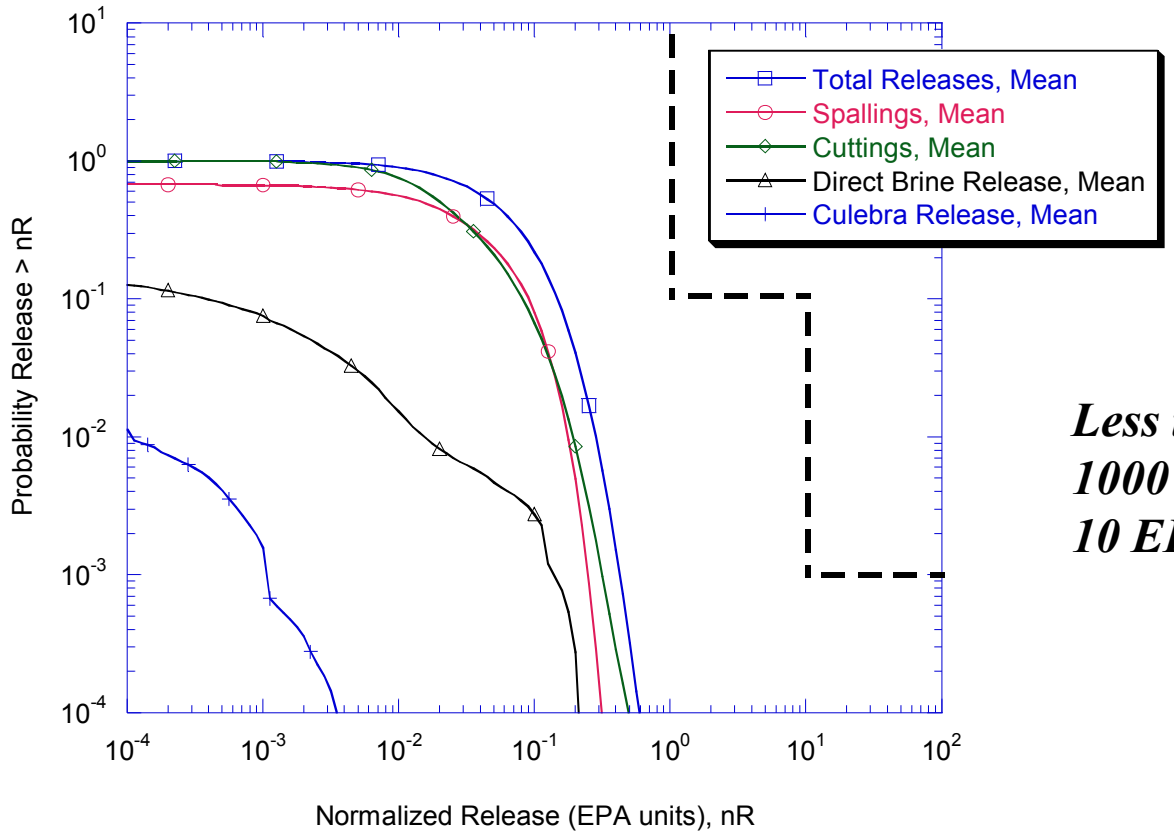
Performance Assessment Methodology

- Features, Events, and Processes (FEPs)
- Conceptual Model Development and Review
- Process Models
- Scenario Development
- Release Mechanisms
- Treatment of Uncertainty

WIPP Performance Models



CCDF is a Measure of Compliance



Less than 1 chance in 10 of exceeding 1 EPA unit

Less than 1 chance in 1000 of exceeding 10 EPA units

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Safety Assessment for the WIPP

- Numerical modeling of the behavior of the system shows
  - Essentially no 10,000-yr releases from undisturbed performance
  - Releases that might result from human intrusion (assumed to be a drilling accident) are within EPA limits
- Analyses include broad uncertainty in natural and engineered systems
- Performance is most sensitive to assumptions about future human actions