Exceptional service in the national interest

SAND2012-8035P

Sandia National Laboratories

Underground Salt Research Laboratory at the Waste Isolation Pilot Plant

Frank Hansen PhD PE

3rd US/German Workshop on Salt Repository Research, Design and Operations

Albuquerque, NM, USA

October 9-10, 2012

Sandia National Laboratories

Verantwortung für Generationen / Responsibility for Generations DBE TECHNOLOGY GmbH

PTKA Project Management Agency Karlsruhe within Karlsruhe Institute of Technology

U.S. DEPARTMENT OF ENERGY | NNSA

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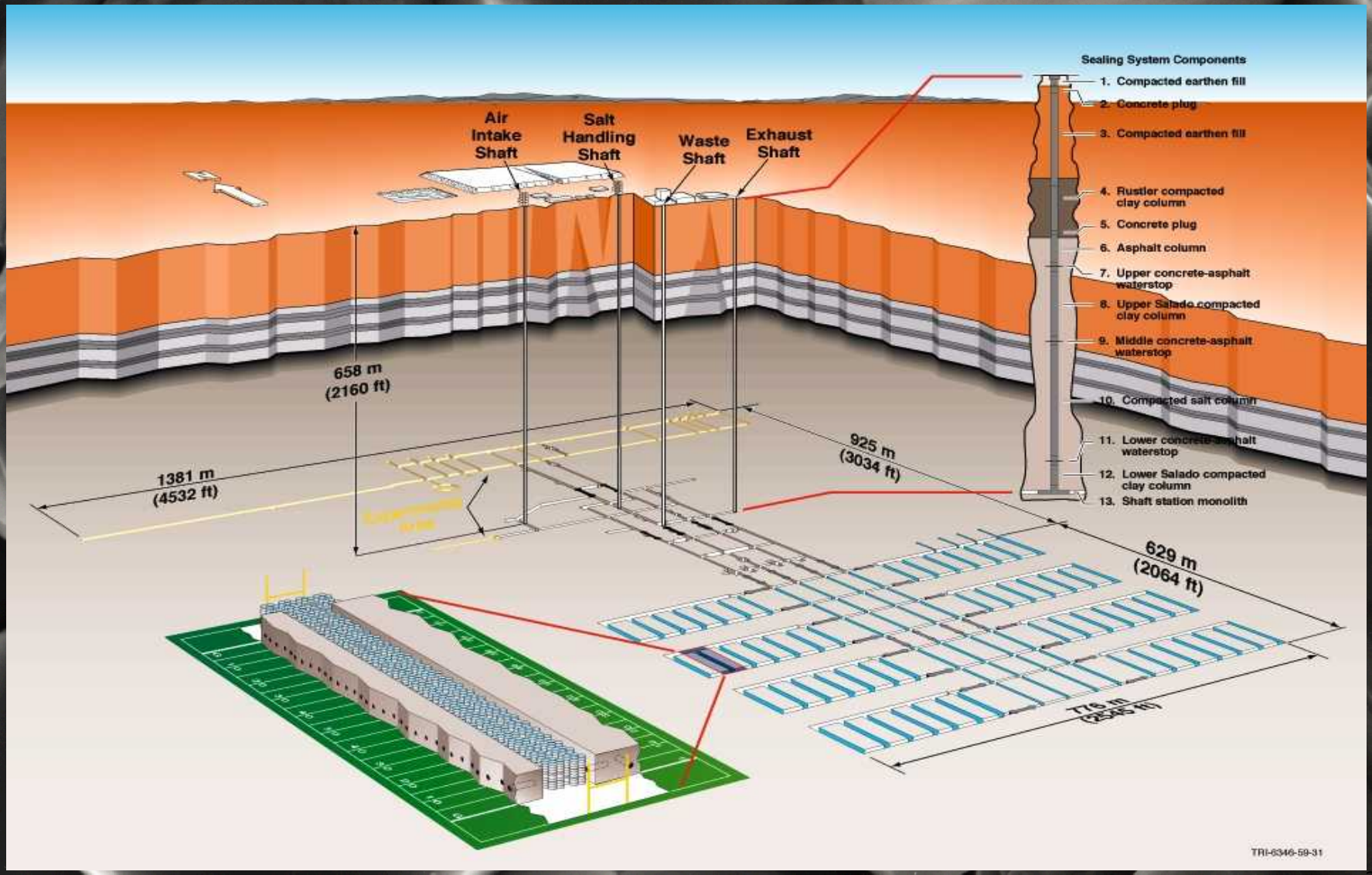
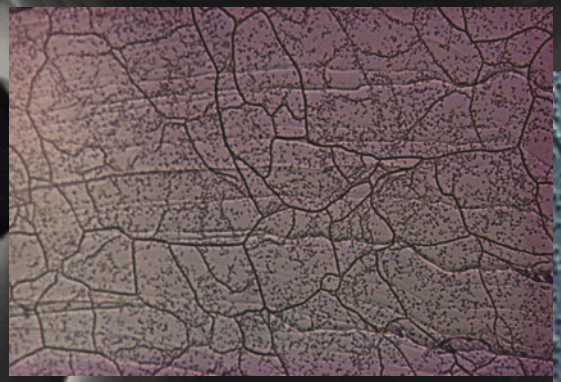
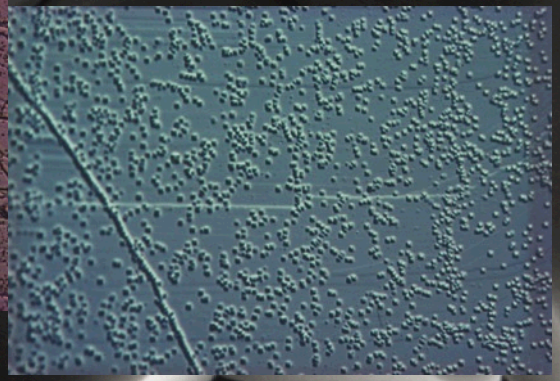
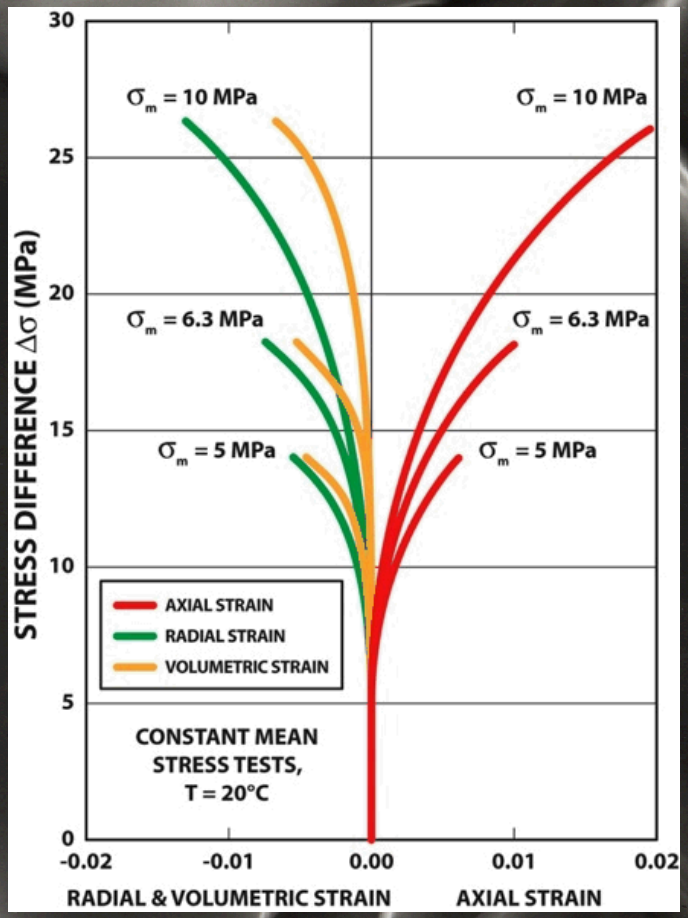
WIPP Underground Layout



Salt Behavior is Well Understood







Full-Scale Tests in Salt

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YEAR	PROJECT	LOCATION	DESCRIPTION
1965-1969	Lyons mine, Project Salt Vault	Lyons, Kansas	Irradiated fuel & electric heaters
1968	Asse salt and potash mine	Germany	Electric heaters
1979-1982	Avery Island	Louisiana	Brine migration
1983-1985	Asse (U.S./German Cooperative)	Germany	Brine migration under heat & radiation
1984-1994	WIPP	Carlsbad, NM	1.Defense HLW Mockup 2.Defense HLW Over-test 3.Heated axisymmetric

Large-Scale Underground Experiments

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Room H

DHLW

BAMBUS II

Advanced Multi-physics Modeling will Aid Salt Analyses & Performance Assessment

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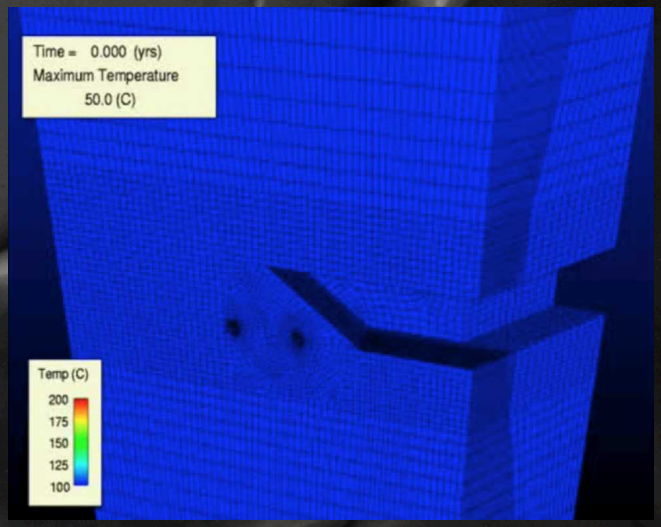
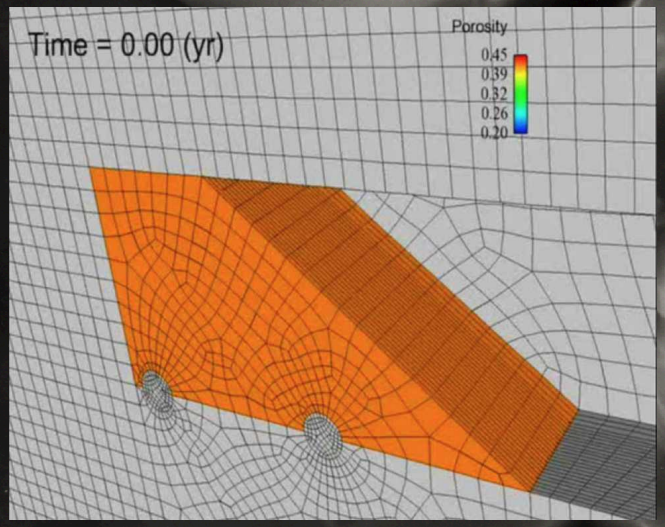
Temperature Contour

Coupled Salt Consolidation

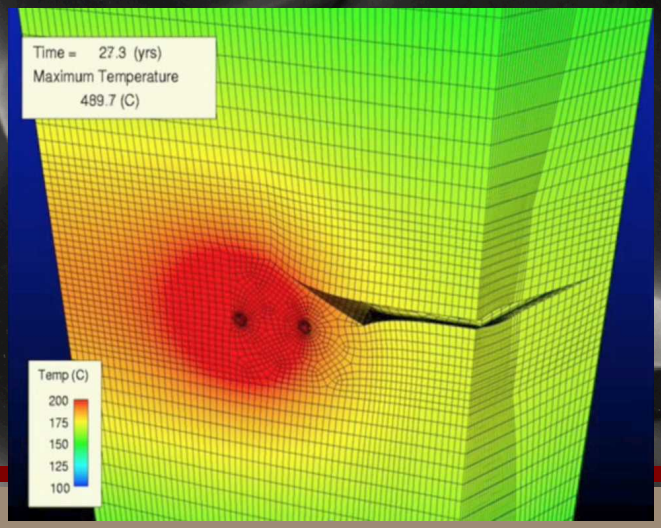
0 YEARS

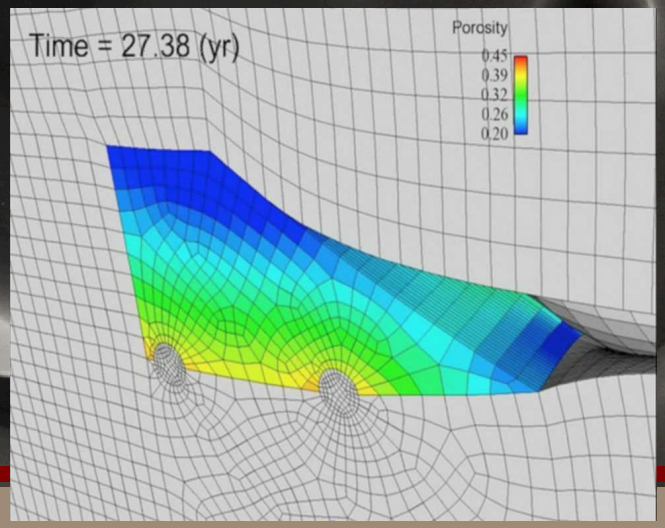




0 YEARS

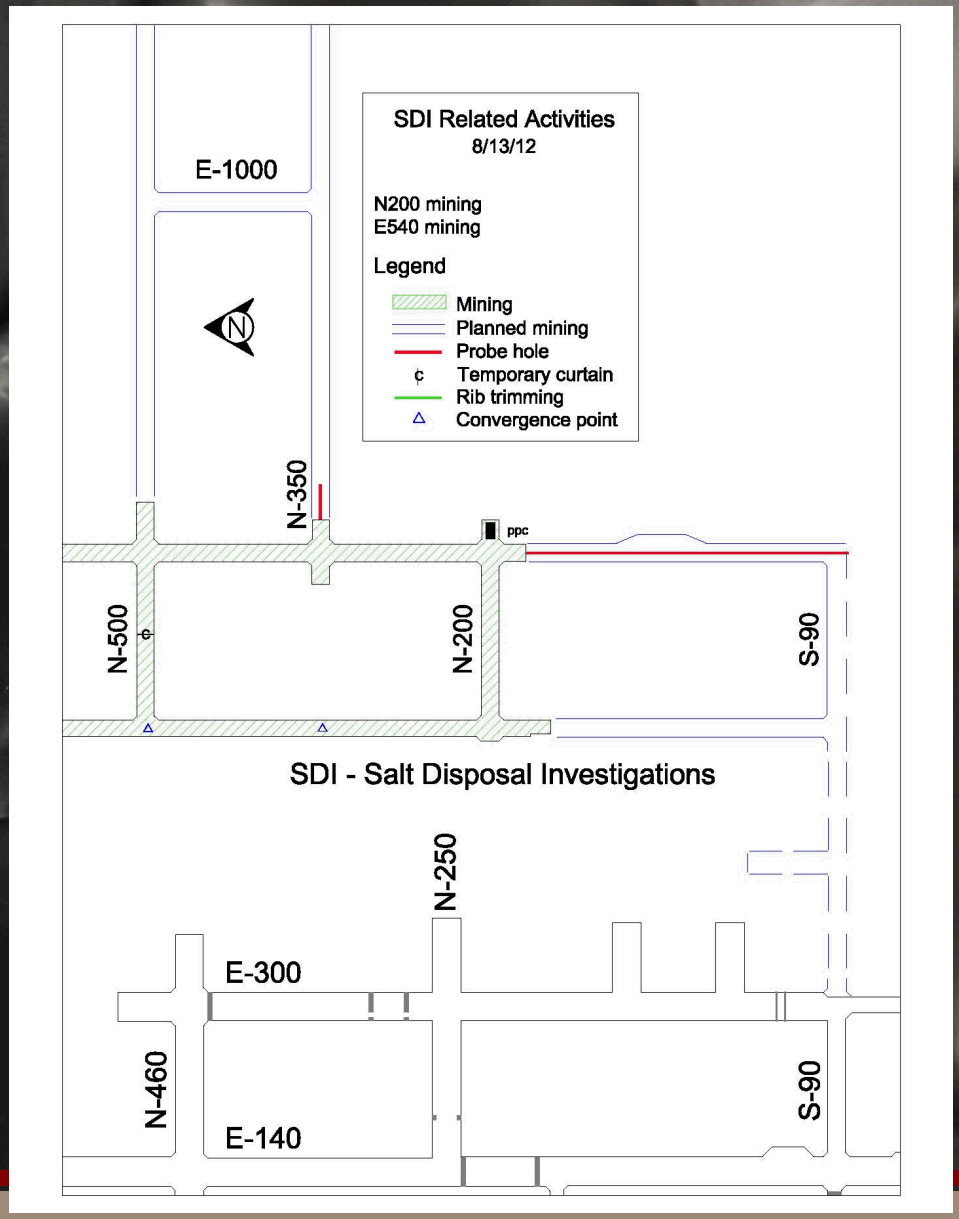
27.3 YEARS





27.38 YEARS

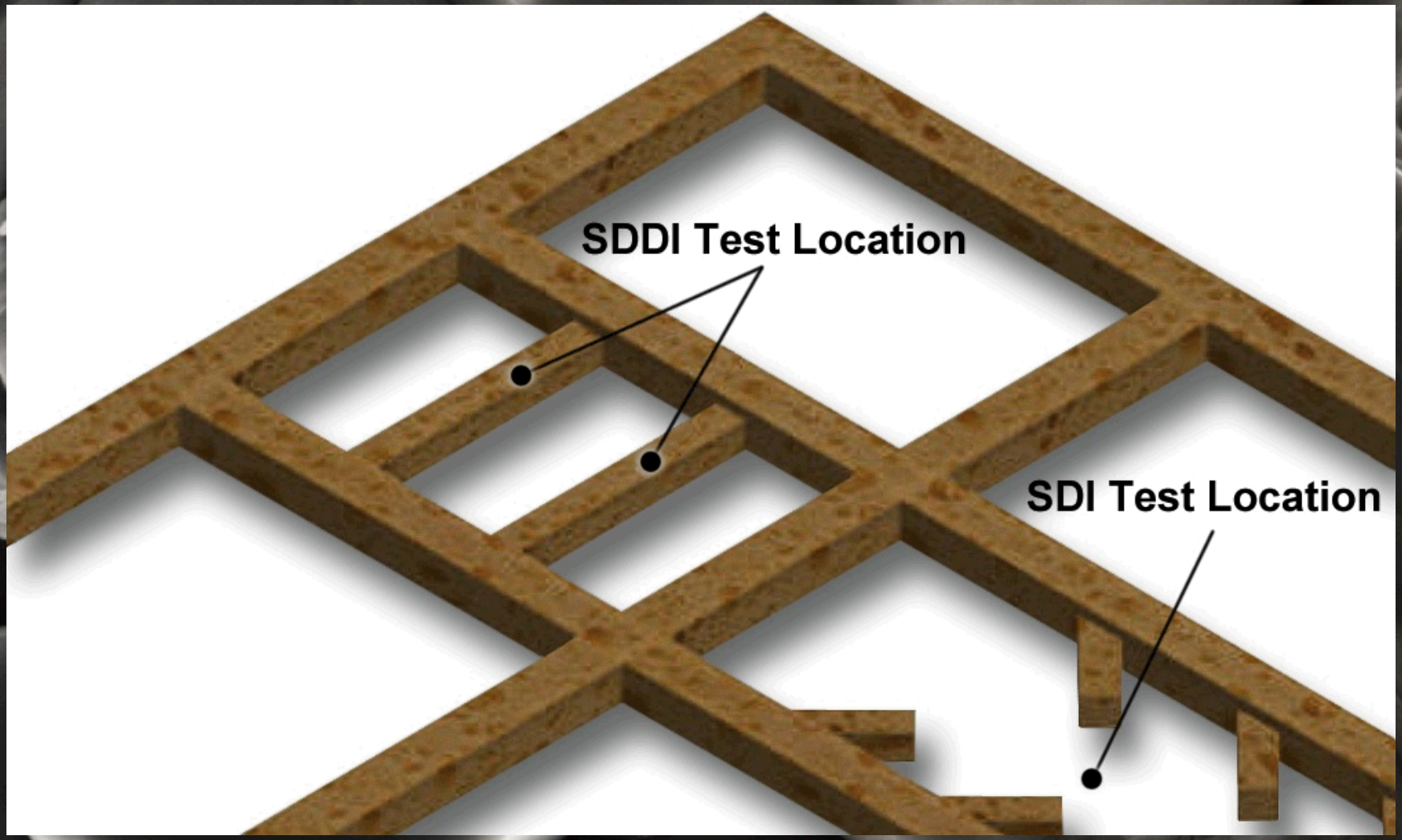
Progress on the SDI Access Drifts



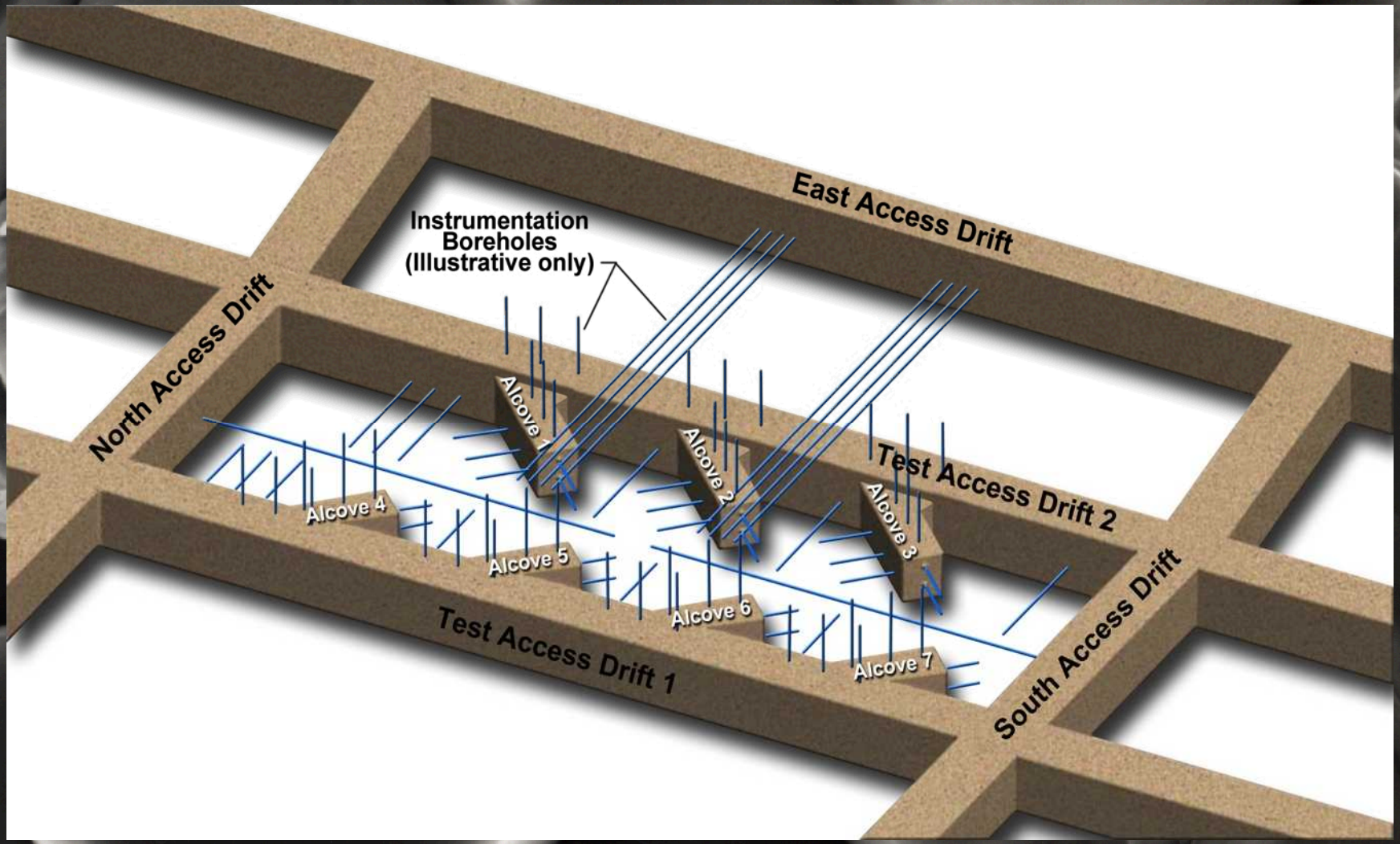
URL Potential Activities at WIPP

- Salt Defense Disposal Investigations (SDDI)
- Salt Disposal Investigations (SDI)
- Large-Scale Seal Demonstration
- Mining Research
- Wedge Pillar Test
- Mine-By DRZ Measurement
- International Test Bed

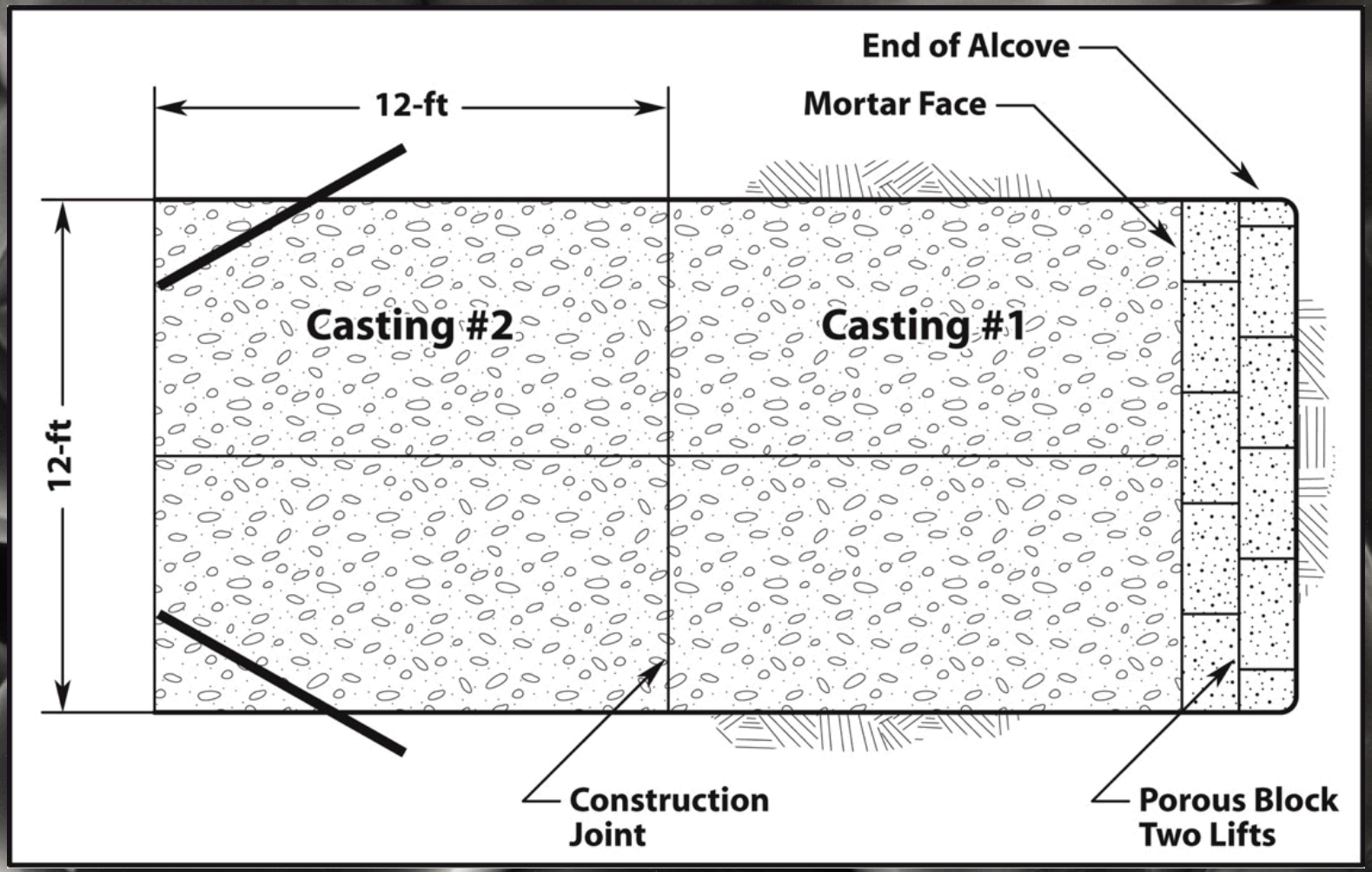
SDDI Mining Layout



Concept for SDI Test Layout



Large-scale Seal Demonstration



Stress Distribution in Wedge Pillar

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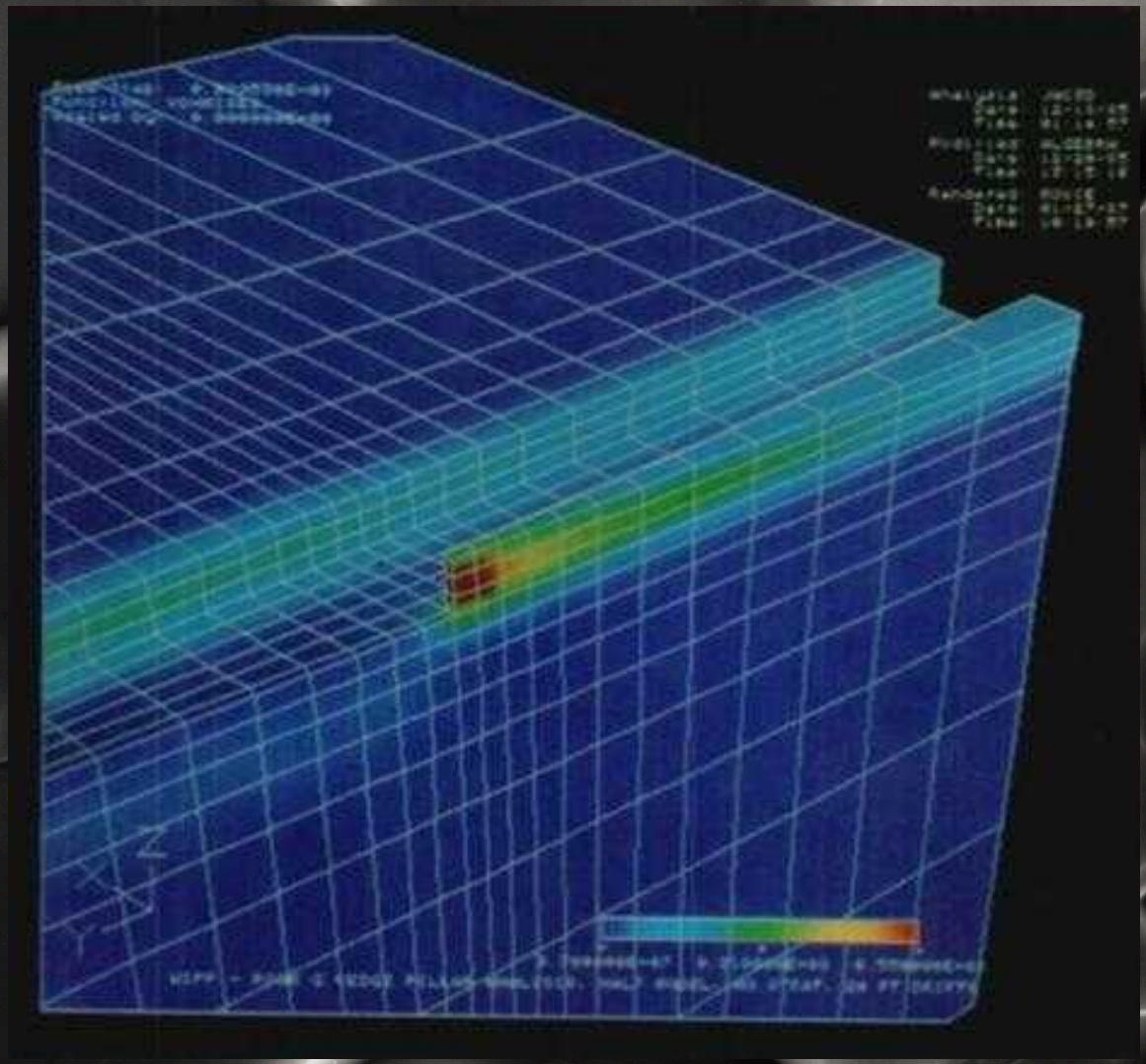
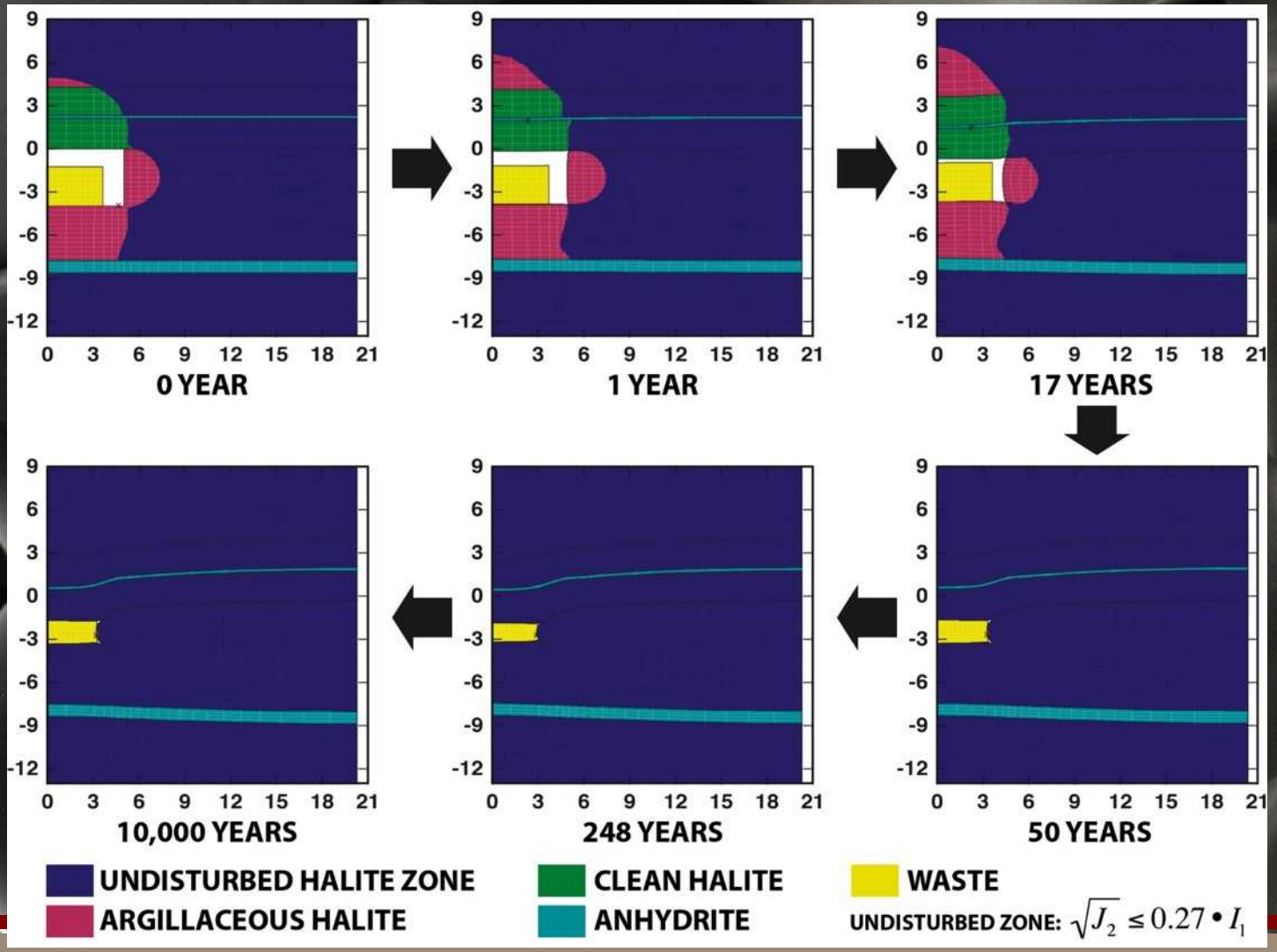


Disturbed Rock Zone Around a Disposal Room



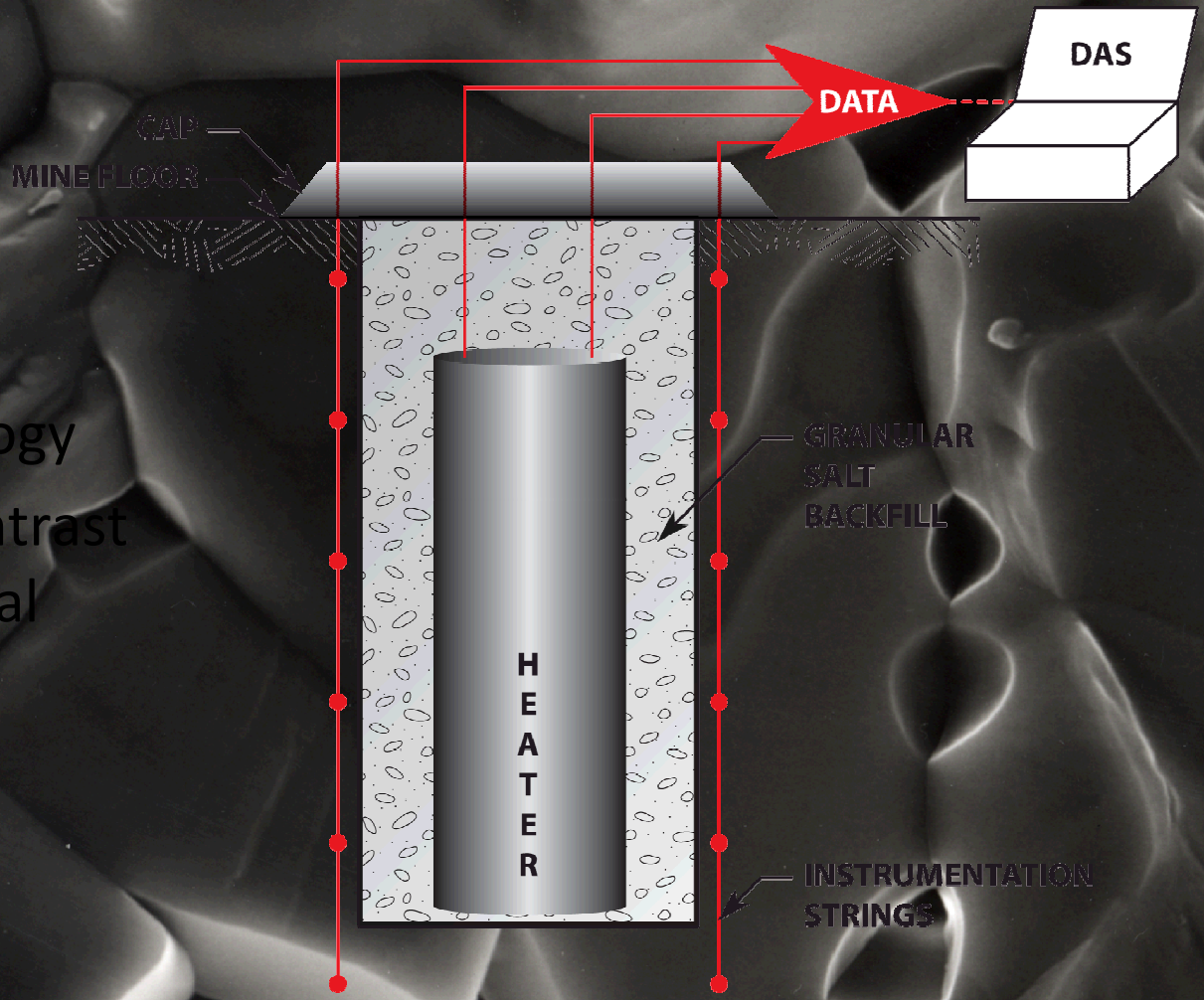
Elevated Temperature Tests on WIPP Salt

Decrepitation at 275C

Plastic flow at 250C

Potential Single Heater Test

- Utility
  - Overdrive experiment
  - Observe phenomenology
  - Compare/contrast bedded/domal response



Extended RD&D Consideration

- Develop and exchange rock salt information among nations currently pursuing or considering rock salt as a candidate deep geological repository medium.
- Collaborate with international peers and stimulate interest in salt as a viable repository host medium.
- Identify and perform fundamental joint research into areas where understanding is incomplete.
- Exchange and transfer advanced methods and tools developed for salt disposal to industry
- Characterize and qualify the information available.
- Promote information exchange on approaches, methods, methodologies, and technologies
- Outreach to other salt related applications.
- Afford technical experts access to and interchanges with the latest international developments in salt mechanics sciences.
- Inform and provide advice on conceptual topics, performance descriptions and modeling.
- Publish results, models, reliability, data quality, and evaluate national and international RD&D activities.
- Develop a central library of acquired salt data, information, and knowledge with broad access provided via the internet.
- Address the fundamental issue of knowledge management.
- Reinvigorate the science (chemistry and physics) of rock salt through education, training development of new researchers and students.
- Perform fundamental research.