



Overview of Performance Assessment for the Waste Isolation Pilot Plant

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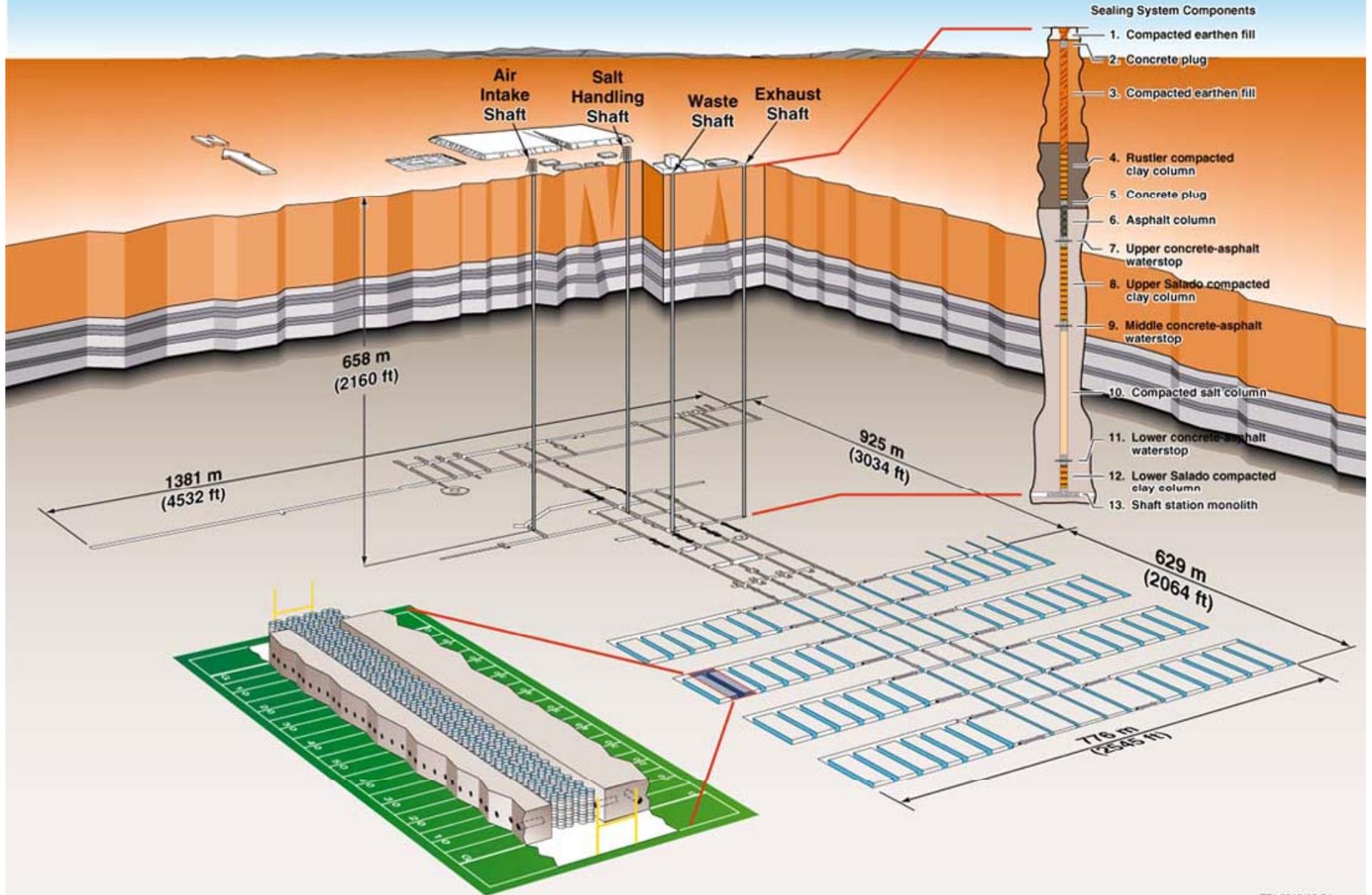


WIPP Background

- **WIPP is a permanent disposal facility for transuranic (TRU) waste**
 - Located in southeast New Mexico
 - Operated by U. S. Department of Energy (DOE)
 - Regulated by U. S. Environmental Protection Agency (EPA)



WIPP Layout





Regulatory History

- DOE submitted Compliance Certification Application (CCA) in 1996
 - WIPP was certified in 1998
- **Waste first received in 1999**
- DOE submitted Compliance Recertification Application (CRA-2004) in 2004
 - WIPP was recertified in 2006
- DOE submitted Compliance Recertification Application (CRA-2009) in 2009
 - Currently in EPA's review



WIPP Regulations

40 CFR 191 Subpart A

Management and Storage
Environmental Dose Limits
During Operational Period

1998-2033

Subpart C

**Ground-Water
Protection:**
Concentration Limits
For Undisturbed
Performance

Subpart B (191.13)

Containment: Release Limits
For Undisturbed and
Disturbed Performance

Subpart B (191.15)

Individual Protection:
Dose Limits For
Undisturbed Performance

Subpart B (191.14)

Assurance: Monitoring,
Institutional Controls,
**Multiple Barriers, Resource
Disincentive, Retrievability**

40 CFR 194

40 CFR 197

What?
How?





WIPP Regulatory Requirements

- Regulatory requirements were primary determinant for the development of the PA structure
 - The WIPP must be designed to provide *reasonable expectation* that *cumulative releases* of radionuclides to the accessible environment for *10,000 years* after disposal from all *significant processes and events* shall be less than specified *releases limits*





Performance Assessment Objectives

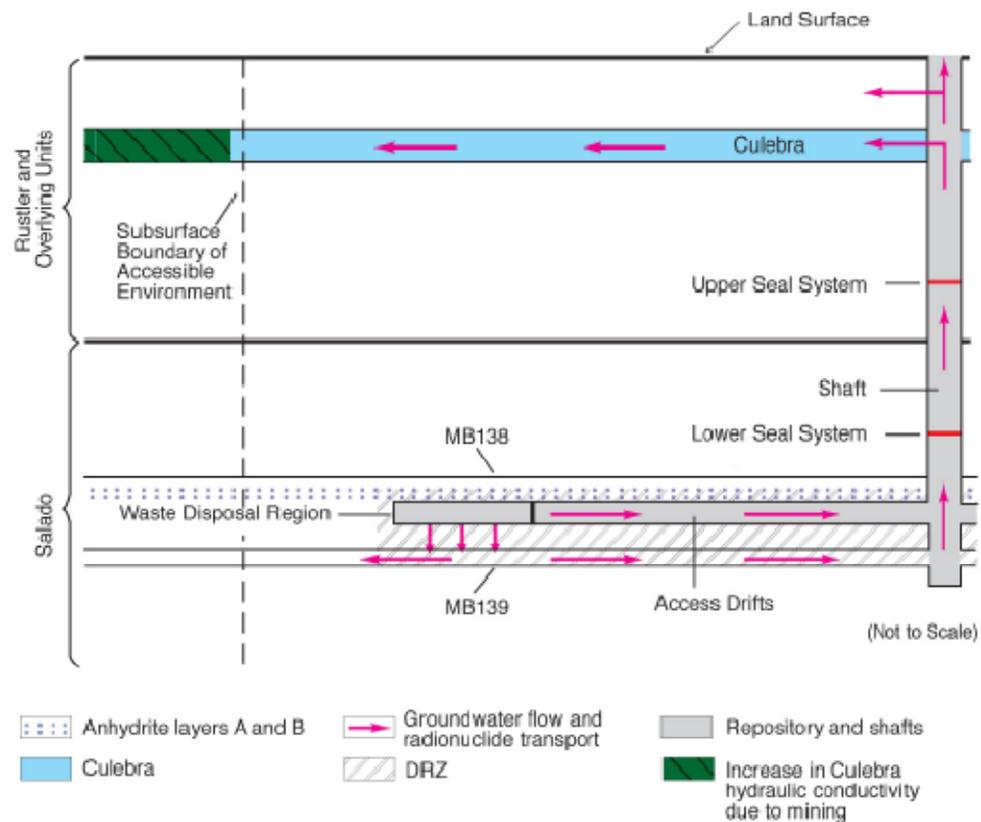
- **Quantitative, probabilistic estimate of the future performance of the repository system**
- **PA answers three questions about the repository system:**
 1. **What can happen after permanent closure?**
 2. **How likely is it to happen?**
 3. **What can result if it does happen?**
- **And one question about the analysis**

What level of confidence can be placed on the estimate? (uncertainty in analysis)





Undisturbed Repository Performance





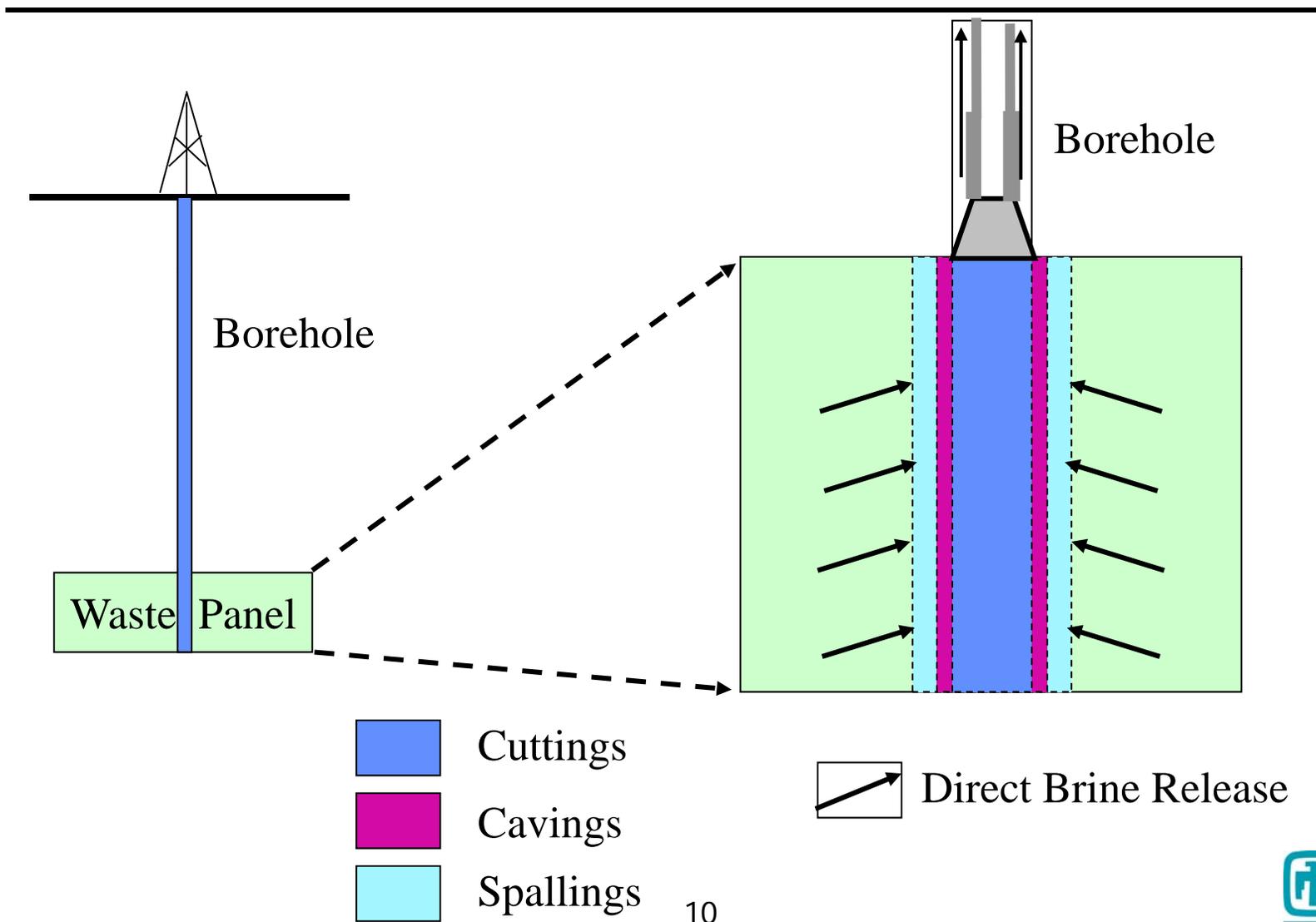
Release Mechanisms

- **Direct Releases (occur during or immediately after drilling)**
 - **Cuttings** (Solids from drilling)
 - **Cavings** (Solids from drilling)
 - **Spallings** (Solids from pressure release)
 - **Direct Brine Release** (Brine from pressure release)
- **Long-term Releases**
 - **Groundwater Transport in Culebra**
 - **Groundwater Transport in Salado**



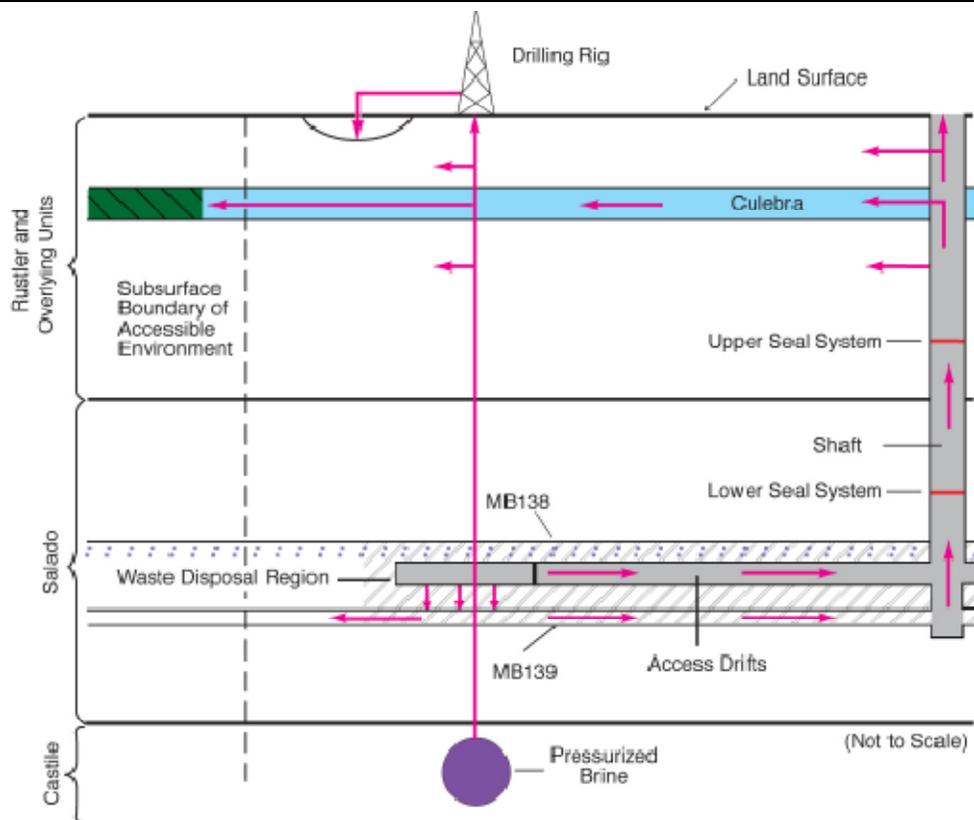


Schematic of Direct Releases





Disturbed Repository Performance



- | | | |
|--------------------------|---|--|
| Anhydrite layers A and B | Groundwater flow and radionuclide transport | Repository and shafts |
| Culebra | DRZ | Increase in Culebra hydraulic conductivity due to mining |





Changes in WIPP PA for Recertification

- **Over time, DOE has need to modify repository design and/or operations to:**
 - Improve worker safety
 - Reduce costs
 - Improve efficiency
- **Some proposed changes have required a formal impact assessment using PA modeling system**
- **The PA for recertification includes**
 - All the planned changes
 - “New” relevant information not previously included





Updated Information in the Latest WIPP PA

- **Modification and improvements to parameters, models and computers codes**
- **Regulatory parameter and model updates**
- **Corrections to all previously identified errors**



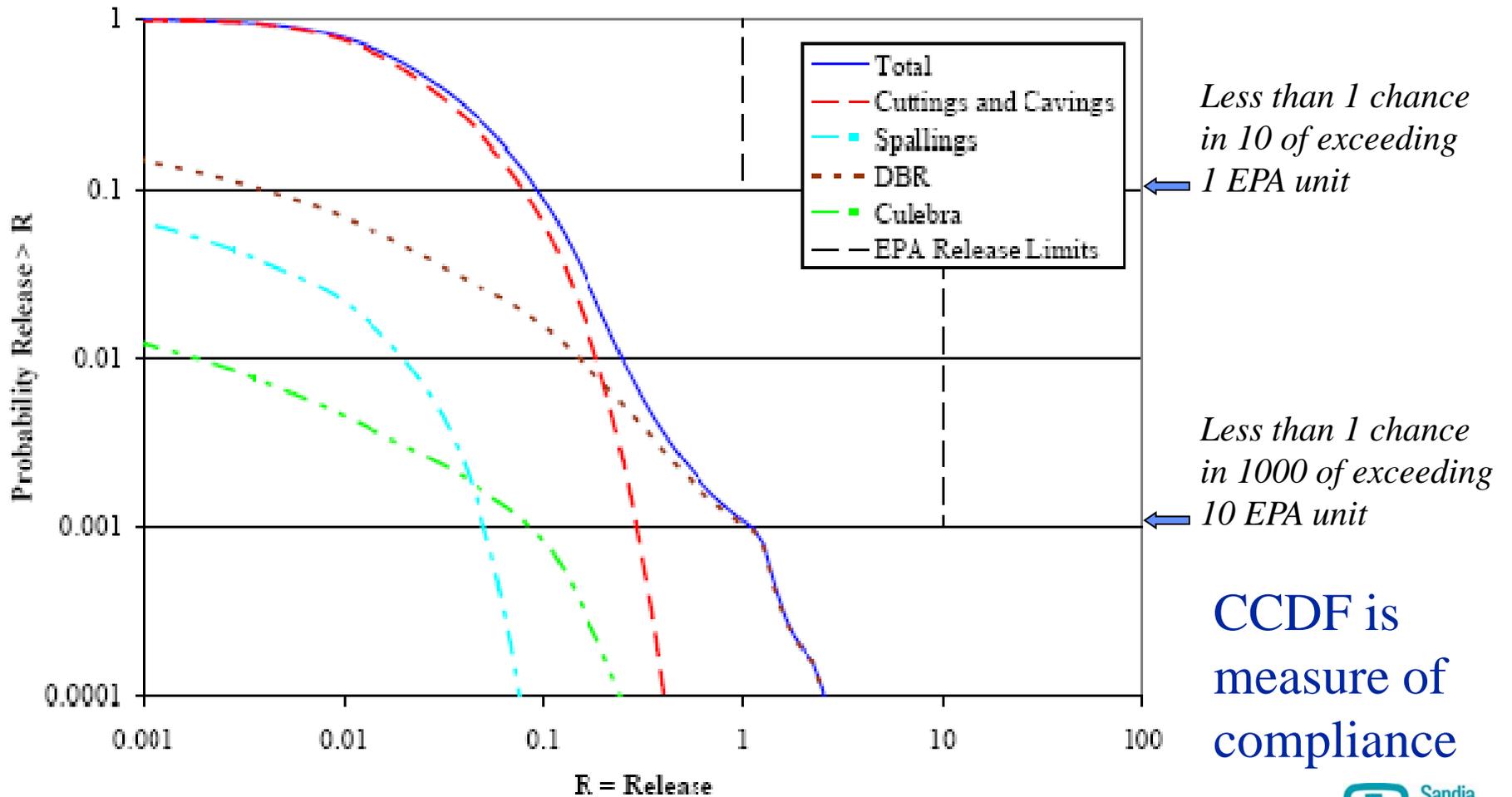


Individual Groundwater Protection (Undisturbed Performance)

- **Maximum annual dose**
 - Regulation: 15 mrem
 - Bounding calculation: 0.93 mrem
- **Gross alpha particle activity**
 - Regulation: 15 picocuries/Liter
 - Bounding calculation: 0.384 picocuries/Liter
- **^{226}Ra & ^{228}Ra concentration**
 - Regulation: 5 picocuries/Liter
 - Bounding calculation: 1.7×10^{-5} picocuries/Liter



Mean CCDF by Component (Disturbed Performance)





WIPP PA Modeling System

- **Demonstrates initial and continued compliance with EPA containment requirements**
- **Used to evaluate changes in the repository configuration**
- **Provides quantitative, probabilistic estimate of the future performance of the repository system**
- **Determines the relative importance of release mechanisms**

