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Reevaluating Transuranic Waste Characterization for the Waste Isolation Pilot Plant

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Daniel J. Clayton, Sean C. Dunagan and Moo Y. Lee
Sandia National Laboratories

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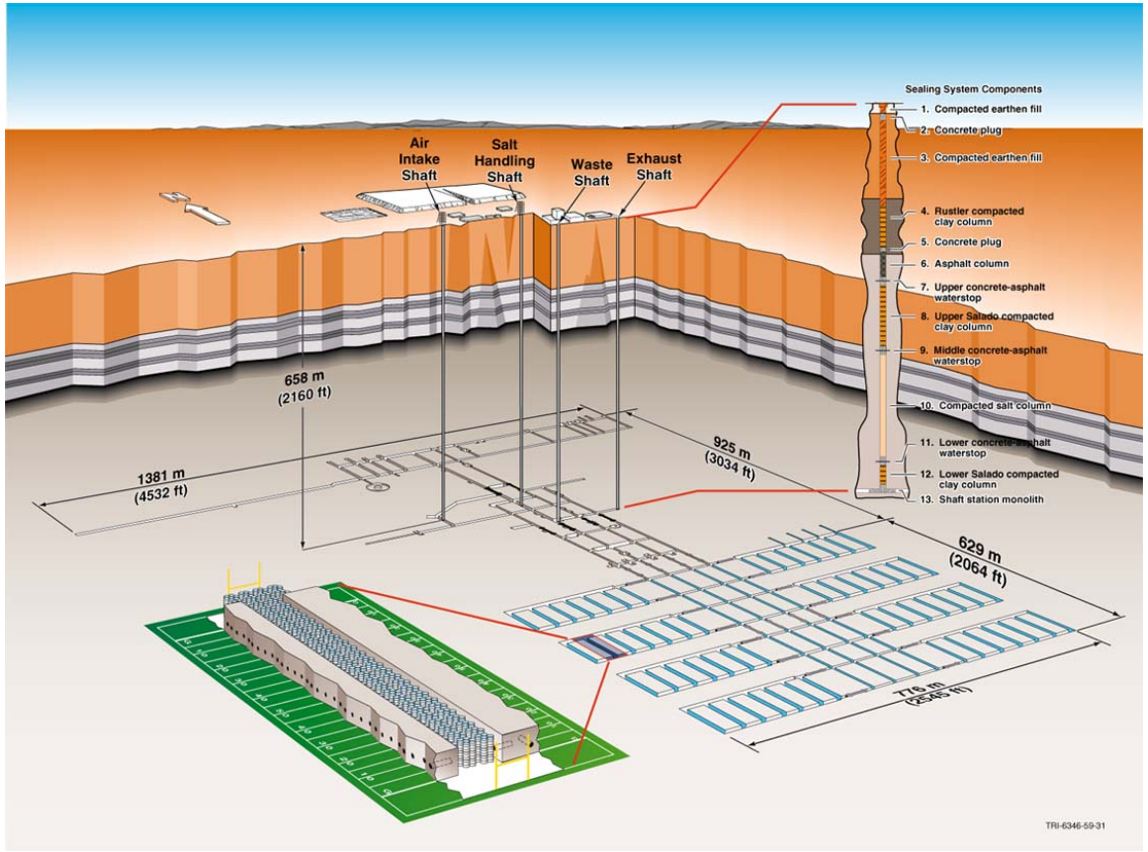
WIPP Background

- **Permanent disposal facility for transuranic waste**
- **Operated by U. S. Department of Energy for more than 10 years**
- **Regulated by U. S. Environmental Protection Agency (EPA)**



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Typical Waste

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Waste Characterization

- New Mexico Environmental Department (NMED)
  - Resource Conservation and Recovery Act (RCRA)
  - Near-term worker safety
  - Hazardous waste
- U.S. Environmental Protection Agency (EPA)
  - Title 40 CFR, Part 191 and 194
  - Long-term repository performance
- Costly and time-consuming processes
  - Visual Inspection
  - Real-Time Radiography

Containment Requirements

- Acknowledge many sources of uncertainty
- Defined in terms of release limits and corresponding probabilities
- Results assembled into complementary cumulative distribution functions (CCDFs)

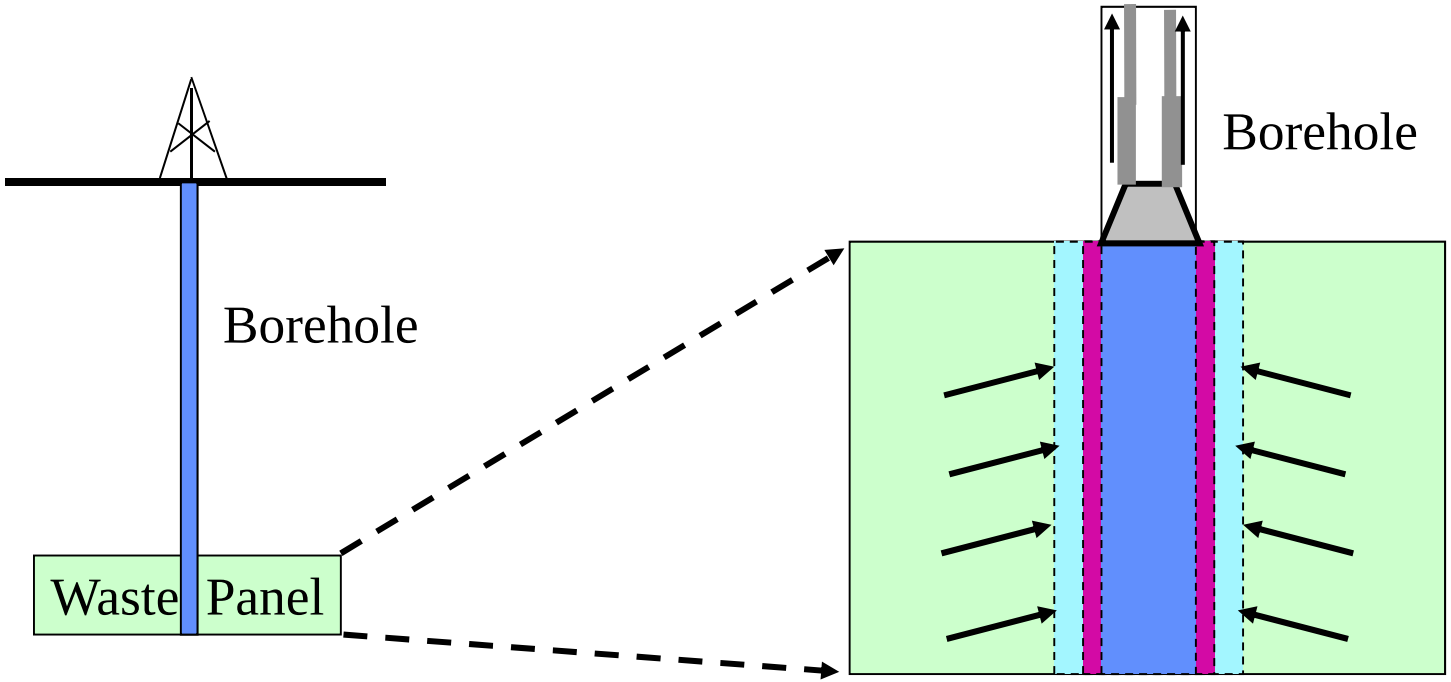
Performance Assessment Objectives

- **Quantitative, probabilistic estimate of the future performance of the repository system**
- **Performance assessment 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)

Releases

- **Releases calculated in terms of EPA units**
- **EPA units are a normalized measure of the exposure to an inadvertent intruder**



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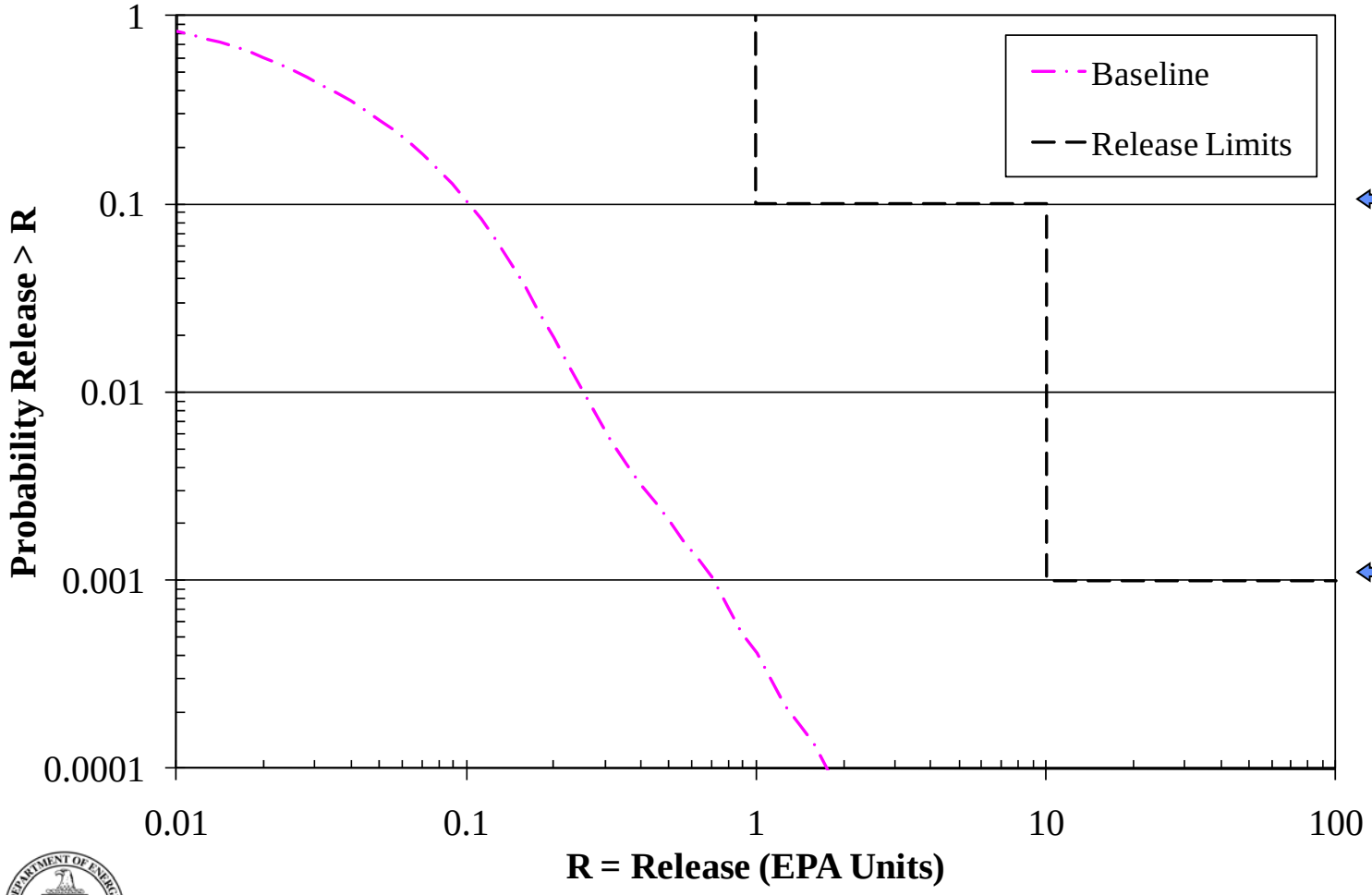
Baseline Results



Less than 1 chance in 10 of exceeding 1 EPA unit

Less than 1 chance in 1000 of exceeding 10 EPA unit

CCDF is measure of compliance

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Cellulosic, Plastic and Rubber (CPR)

- As they degrade, they can generate gases and increase repository pressure
- Magnesium oxide (MgO) added to sequester carbonate species and buffer against acidic condition
- Amount of MgO added to repository proportional to amount of CPR Materials

Waste Emplacement

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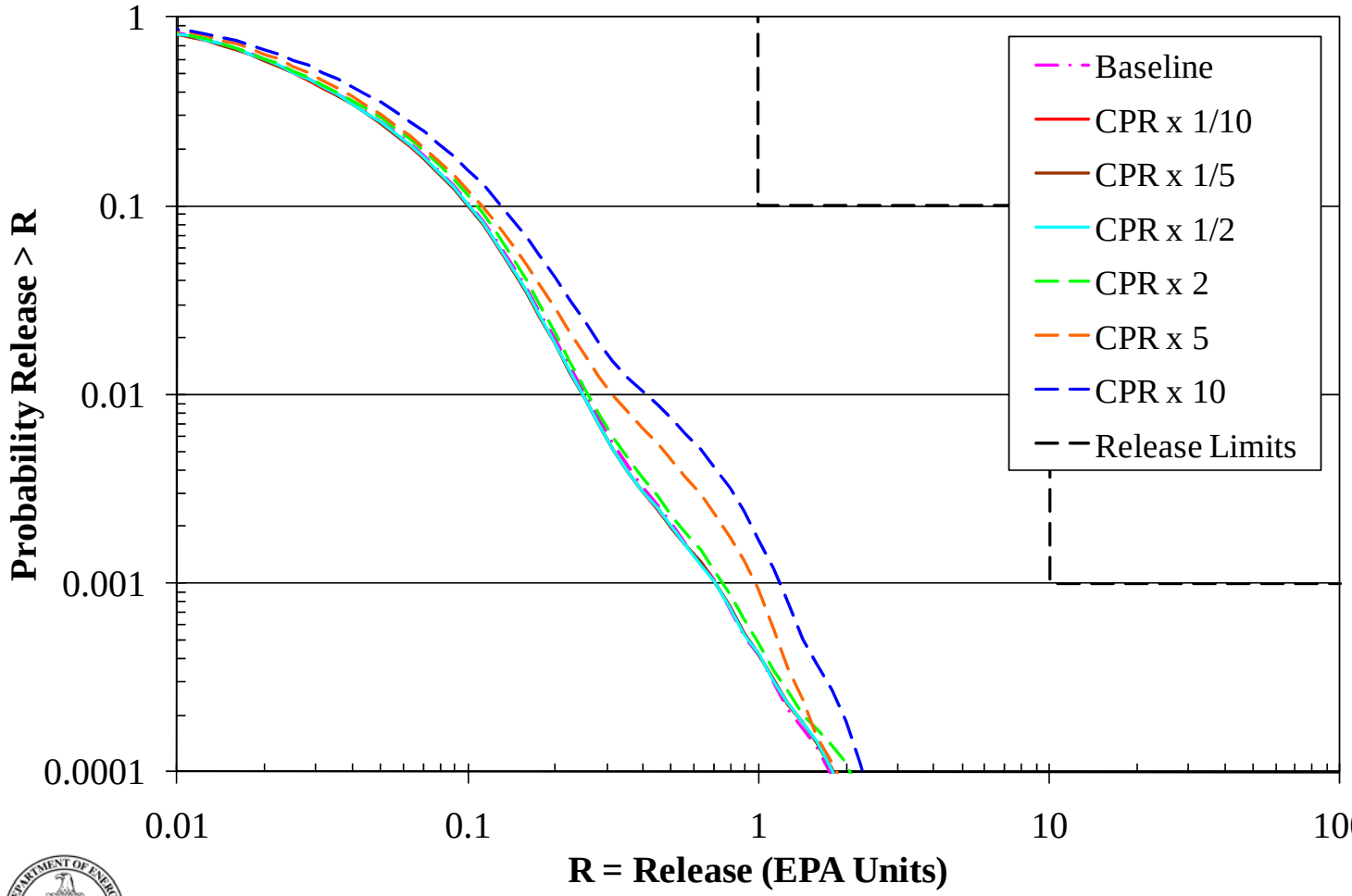
Impact Analysis

- **Analyzed sensitivity of baseline results to changes in the amount of CPR materials**
  - **Decreased by factors of 2, 5 and 10**
  - **Increased by factors of 2, 5 and 10**
- **Increased or decreased amount of MgO in proportion to the change in CPR materials**

Impact Analysis Results



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Implications

- **Reduce the stringency of characterization of CPR**
  - **Estimate based on a smaller sample set and/or historical data**
  - **Increased uncertainty in total amount of CPR in repository**
  - **May need to increase the amount of emplaced MgO to compensate**
- **Cost-benefit analysis is needed to determine potential gains**

Conclusions

- **WIPP waste characterization is a costly and time-consuming process, especially for CPR materials**
- **Long-term repository performance relatively insensitive to amount of CPR materials**
- **Could reduce the stringency of characterization of CPR**
- **Cost-benefit analysis is needed to determine potential gains**