SAND2013-8437C

Performance and Regulatory Compliance Impacts of Changes Included in the 2014 WIPP Compliance Recertification Application

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Presented at

The 2013 East Asia Forum on Radwaste Management
October 14 – 16, 2013
Beijing, China

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This research is funded by WIPP programs administered by the Office of Environmental Management (EM) of the U.S Department of Energy.

The Waste Isolation Pilot Plant (WIPP)

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)

- Waste is emplaced in a salt formation deep underground

- Regulatory compliance is demonstrated via Performance Assessment (PA)

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WIPP Recertification

Federal regulations require that the WIPP be recertified every five years following the first waste shipment of 1999.

- The current regulatory baseline is that established by the 2009 Performance Assessment Baseline Calculation (PABC-2009).
- The 2014 Compliance Recertification Performance Assessment (CRA-2014 PA) demonstrates continued compliance of the WIPP with federal containment requirements.
- A number of changes/refinements are included in the CRA-2014 PA (e.g. incorporate new data and experimental results).

"Standard" Updates Included in the CRA-2014 PA

- Drilling Rate
- Plugging Pattern Probabilities
- Inventory
  - Radionuclides
  - Waste Materials
  - Organics
- Radionuclide Solubilities and their Uncertainty

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Repository Planned Changes Included

Revised Panel Closure Design

- A revised panel closure design is included in the CRA-2014 PA.

Additional Excavated Volume

- Additional excavated volume is included in the WIPP experimental region for proposed salt disposal experiments.

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Parameter and Implementation Refinements Included in the CRA-2014 PA

- Steel Corrosion Rate
- Waste Shear Strength
- Probability of Brine Pocket Encounter during Hypothetical Drilling Intrusion
- Radionuclide Concentration/Brine Volume Dependence
- Expanded Water Balance
- Colloid Enhancement Parameters

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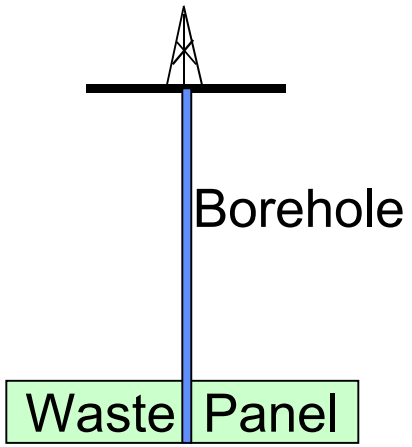
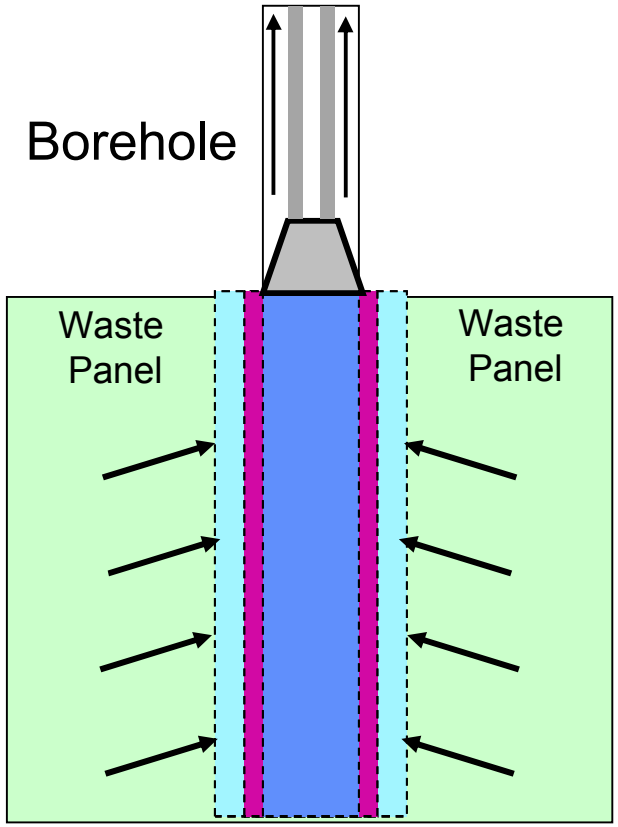
Direct Release Mechanisms Considered in WIPP PA

Inadvertent Human Intrusion (Drilling) Results in Direct Releases





Cuttings (Solids from Drilling)

Cavings (Solids from Drilling)

Spallings (Solids from Pressure Release)

Direct Brine Release (DBR) (Brine from Pressure Release)

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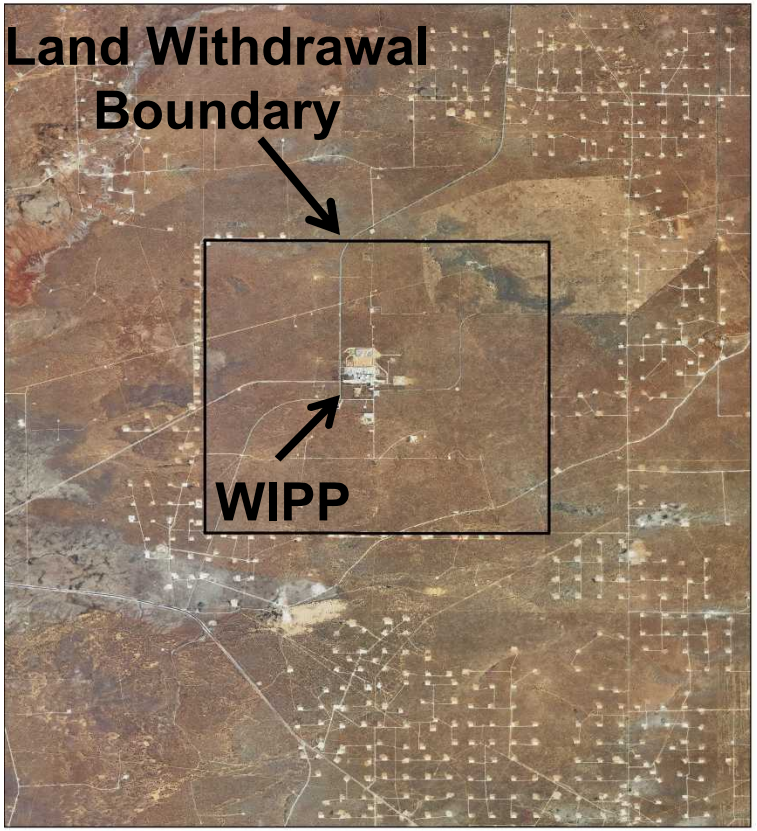
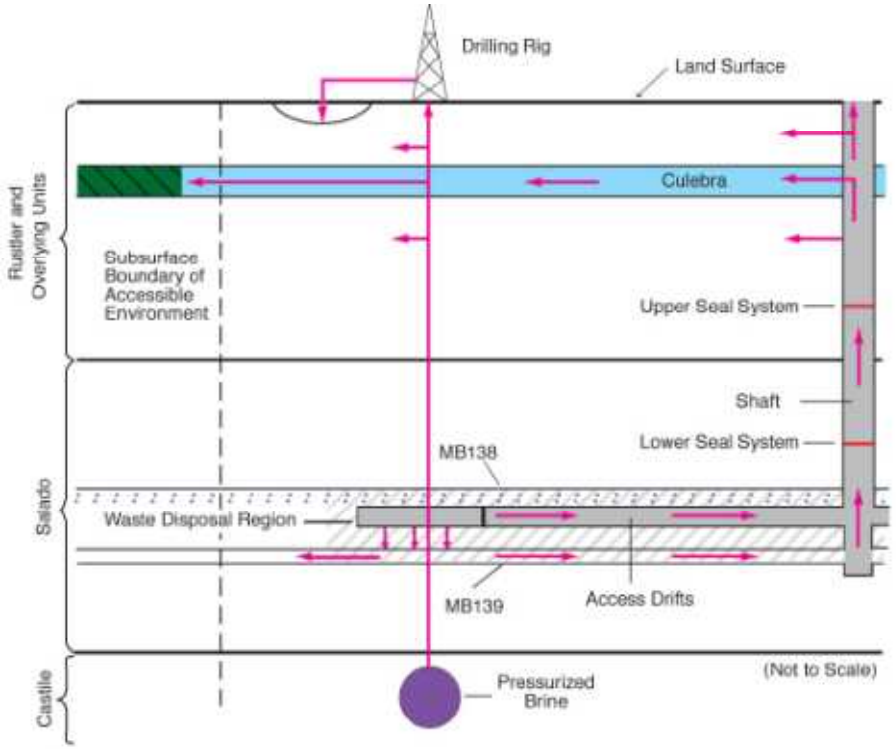
Long-Term Direct Release Mechanisms Considered in WIPP PA

Radionuclide Transport through Groundwater Comprise Long-Term Releases





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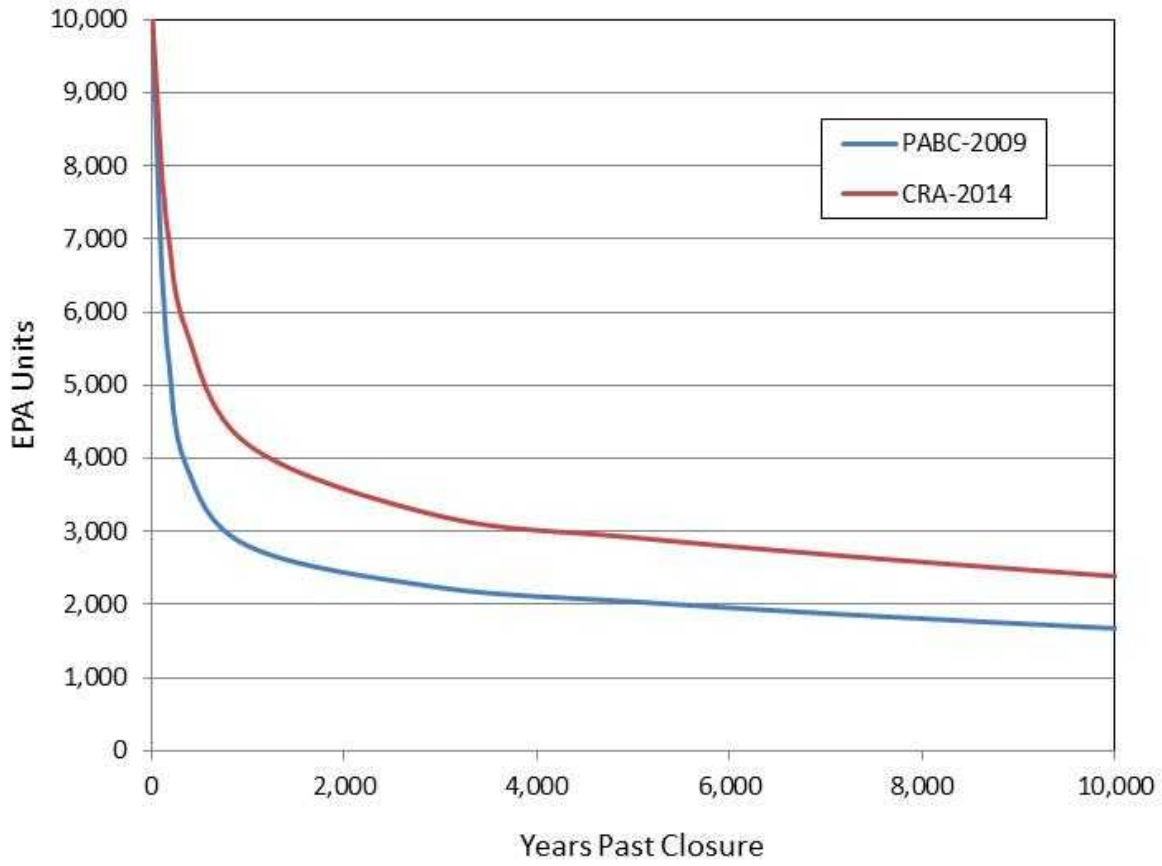
Waste Inventory

Inventory parameters in the CRA-2014 PA are updated to reflect information collected through December 31, 2011.



Difference primarily due to increased ^{239}Pu in the CRA-2014 PA waste inventory

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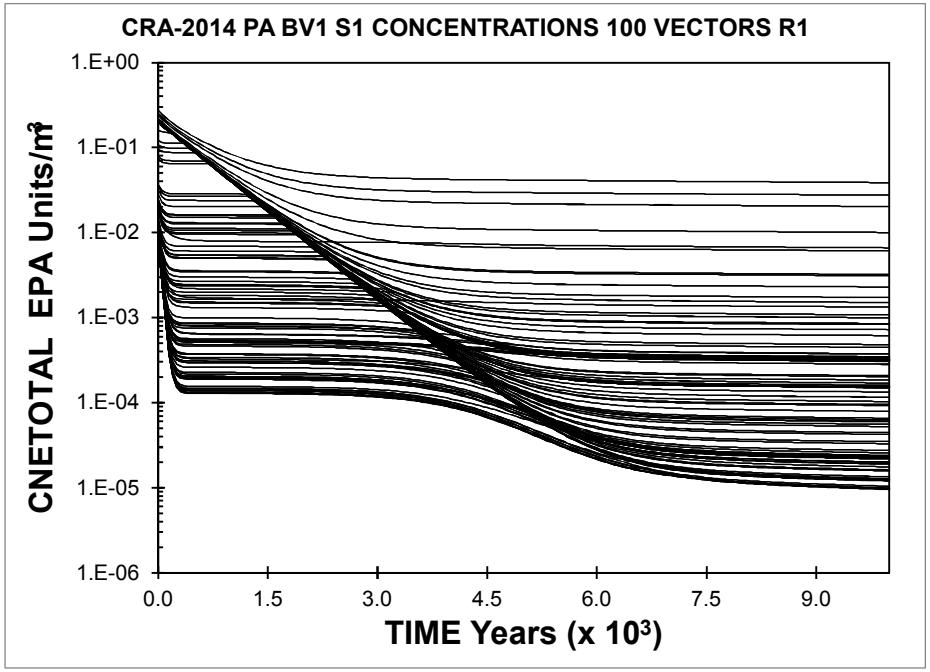
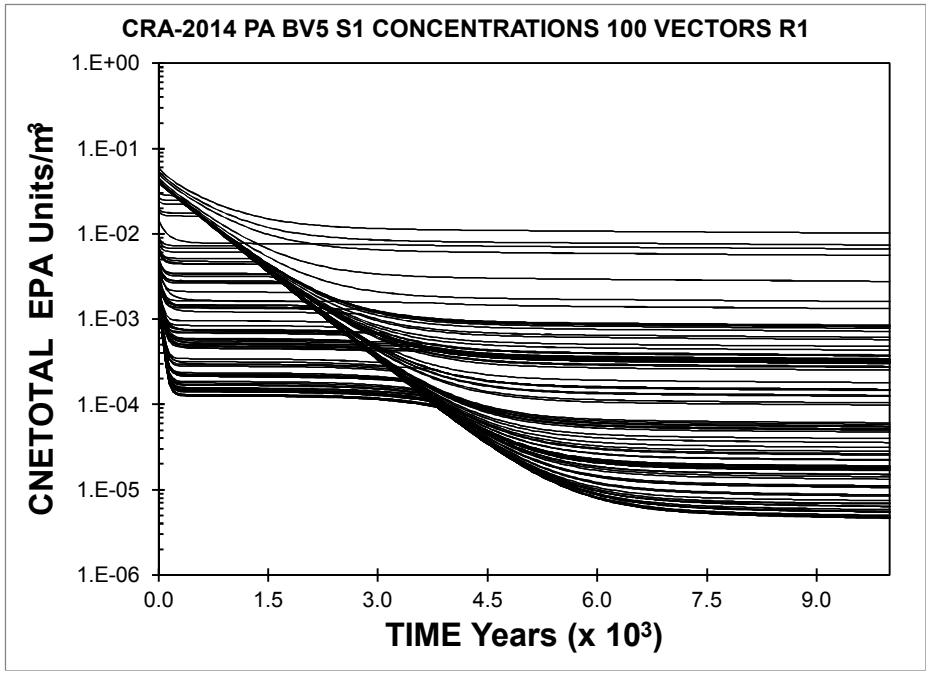
Radionuclide Concentration Dependence on Repository Brine Volume

Radionuclide concentrations in brine are dependent on the repository brine volume.





Total mobilized radionuclide concentrations (CNETOTAL) decrease as brine volumes increase.

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Water Budget Refinement

Repository water balance is refined to include a more complete set of gas and brine producing and consuming reactions for the existing conceptual model.

- MgO hydration consumes water and produces brucite.
- The carbonation of brucite forms hydromagnesite.
- Hydromagnesite dehydrates to form magnesite.
- Iron hydroxide sulfidation produces water.

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CRA-2014 PA Approach

CRA-2014 PA changes are included sequentially so that compliance impacts can be reasonably isolated.

The CRA-2014 PA is comprised of 4 cases:

Case CRA14-BL

Includes:

- New Panel Closure
- Additional Excavation
- Updated Inventory
- Updated Solubilities (Single Brine Volume)
- Updated Drilling Parameters
- Revised Colloid Factors

Case CRA14-TP

Includes CRA14-BL changes plus:

- Waste shear strength update
- Update to the probability of encountering pressurized brine during a hypothetical drilling intrusion

Case CRA14-BV

Includes CRA14-TP changes plus:

- Variable Brine Volume

Case CRA14-0

Includes CRA14-BV changes plus:

- Steel Corrosion Update
- Water Budget Refinement

Case CRA14-0 includes all changes in the CRA-2014 PA, and is the "formal" compliance calculation.

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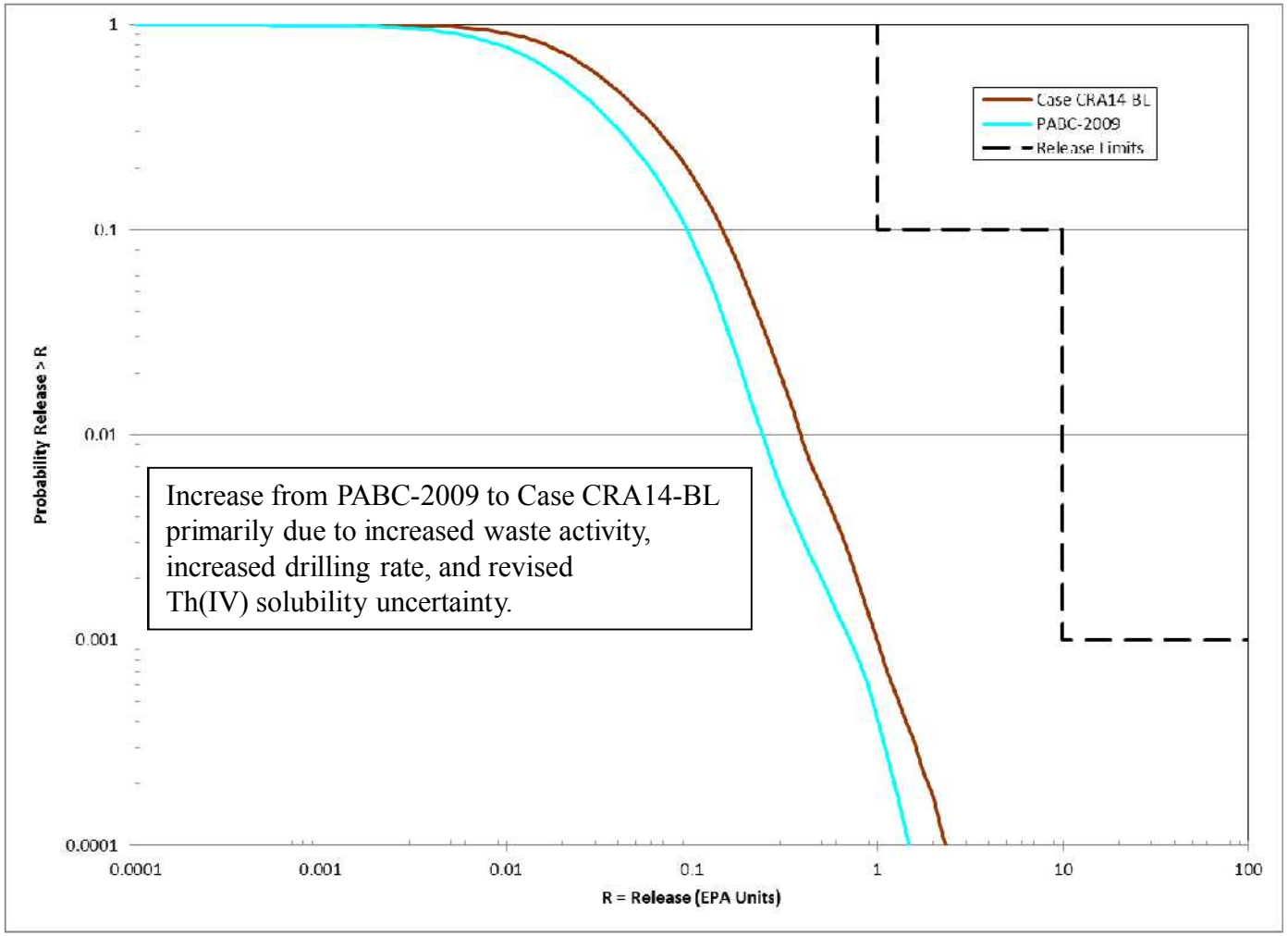
Case CRA14-BL Results



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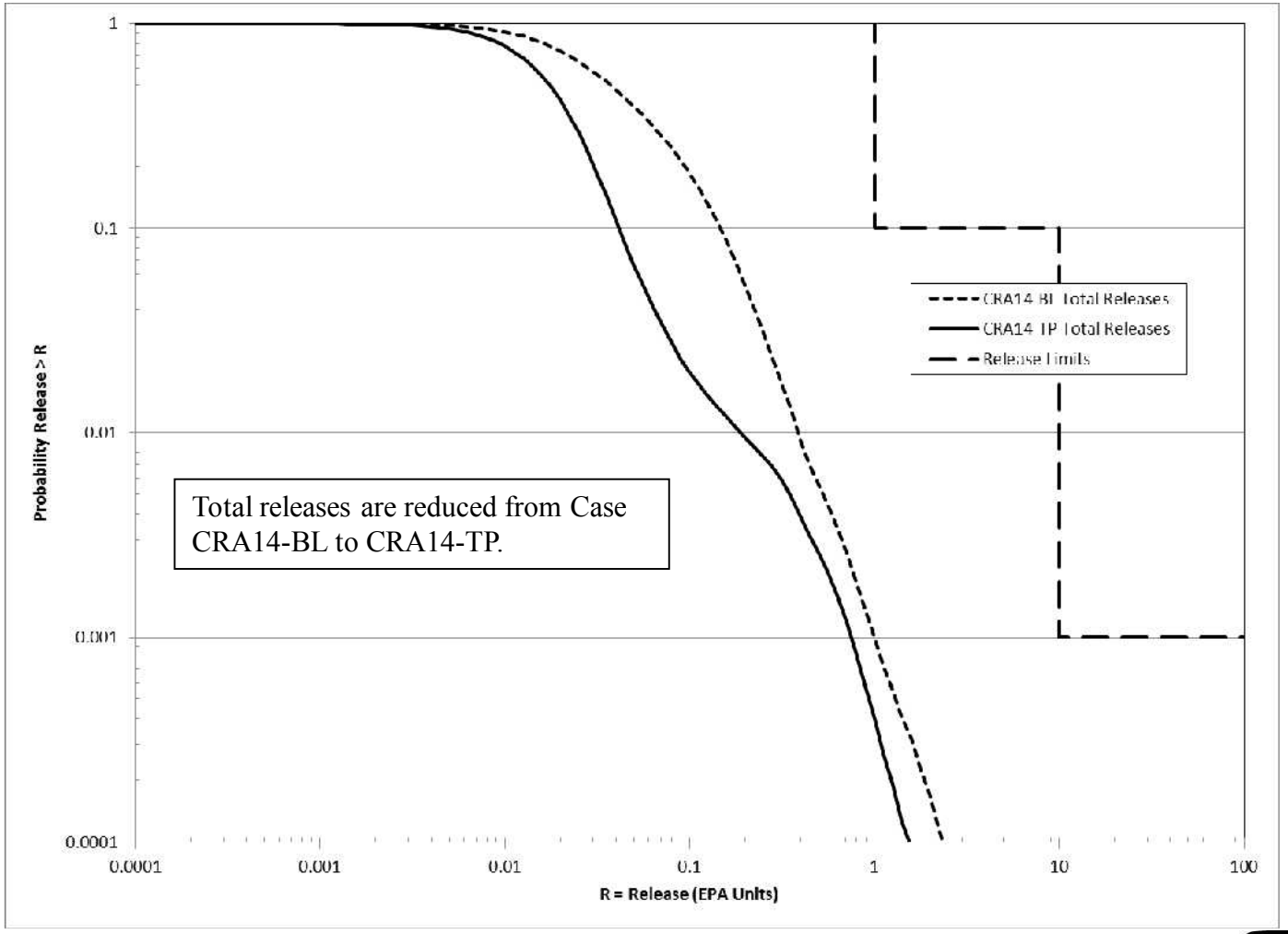
Case CRA14-TP Results



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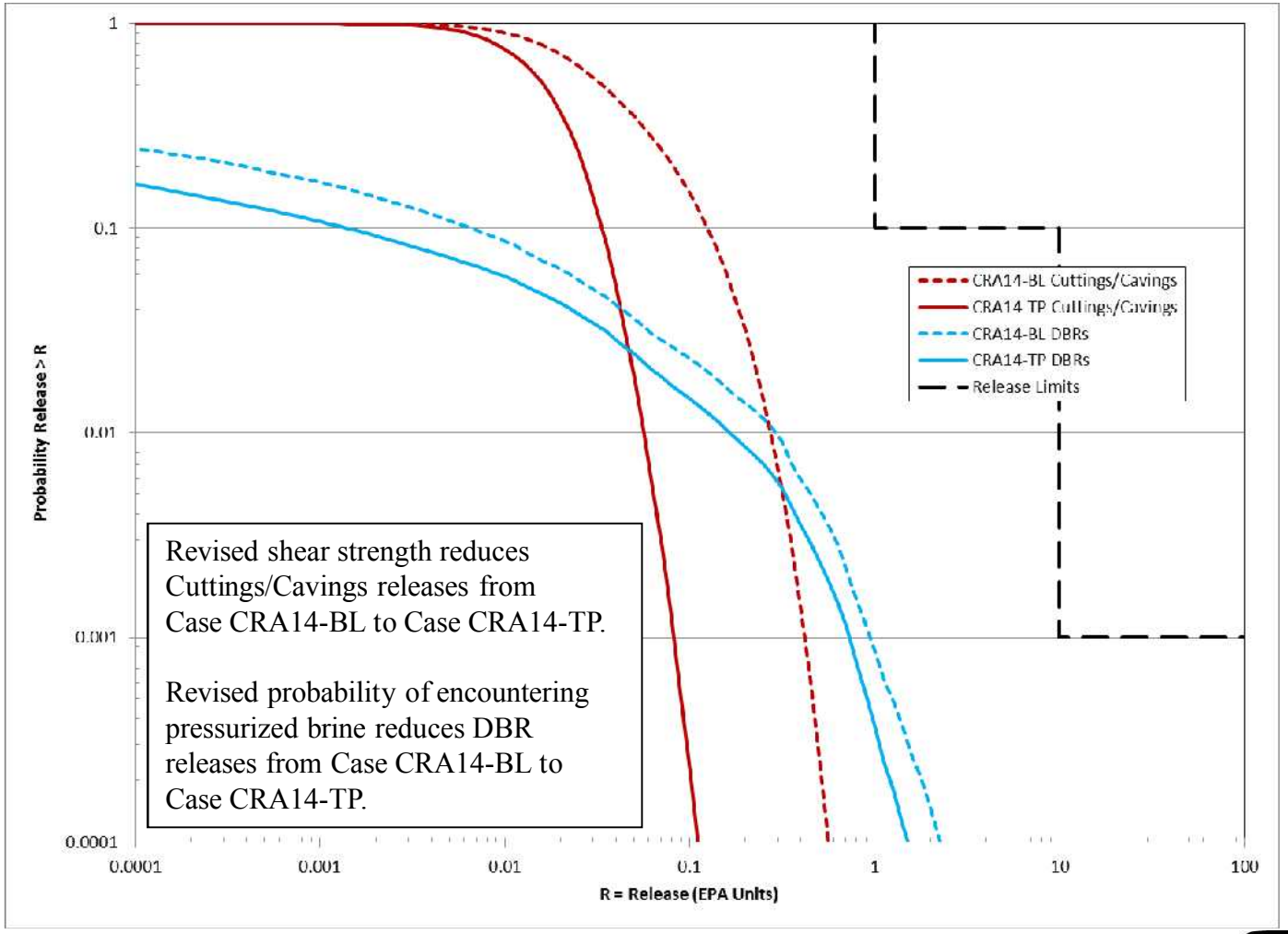
Case CRA14-TP Results



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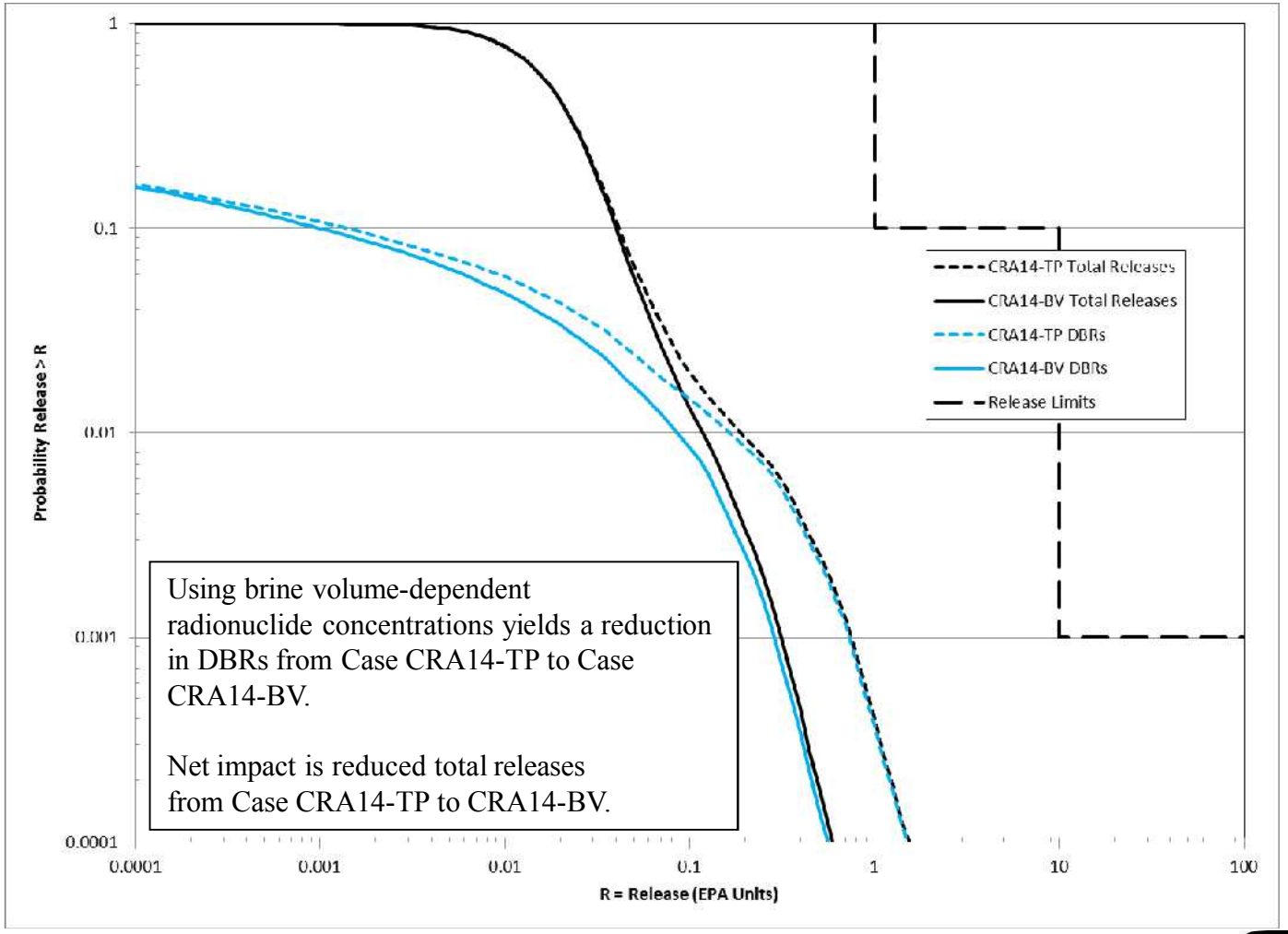
Case CRA14-BV Results



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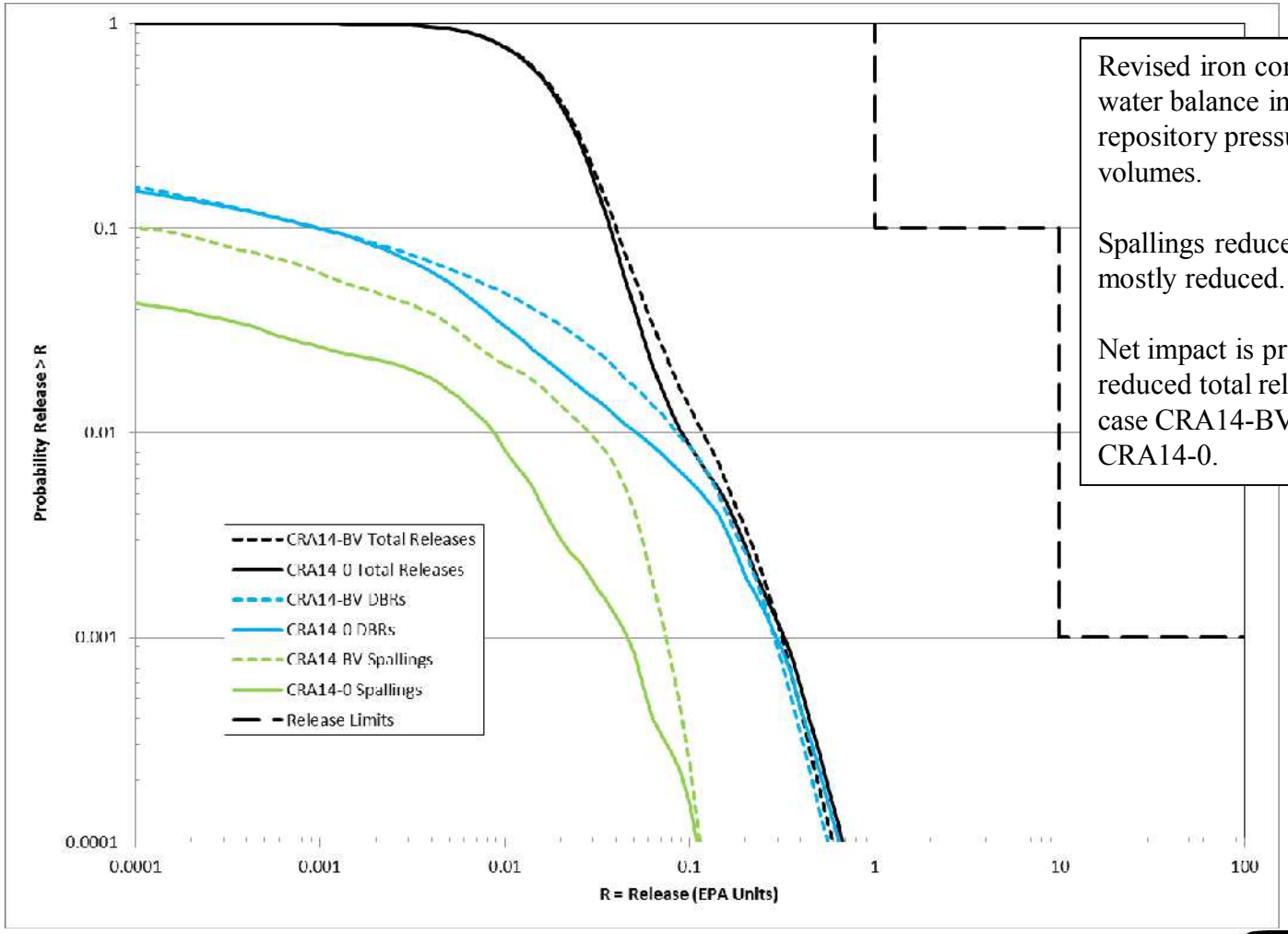
CRA14-0 Results



Revised iron corrosion and water balance impact repository pressures and brine volumes.

Spallings reduced, DBRs mostly reduced.

Net impact is primarily reduced total releases from case CRA14-BV to Case CRA14-0.

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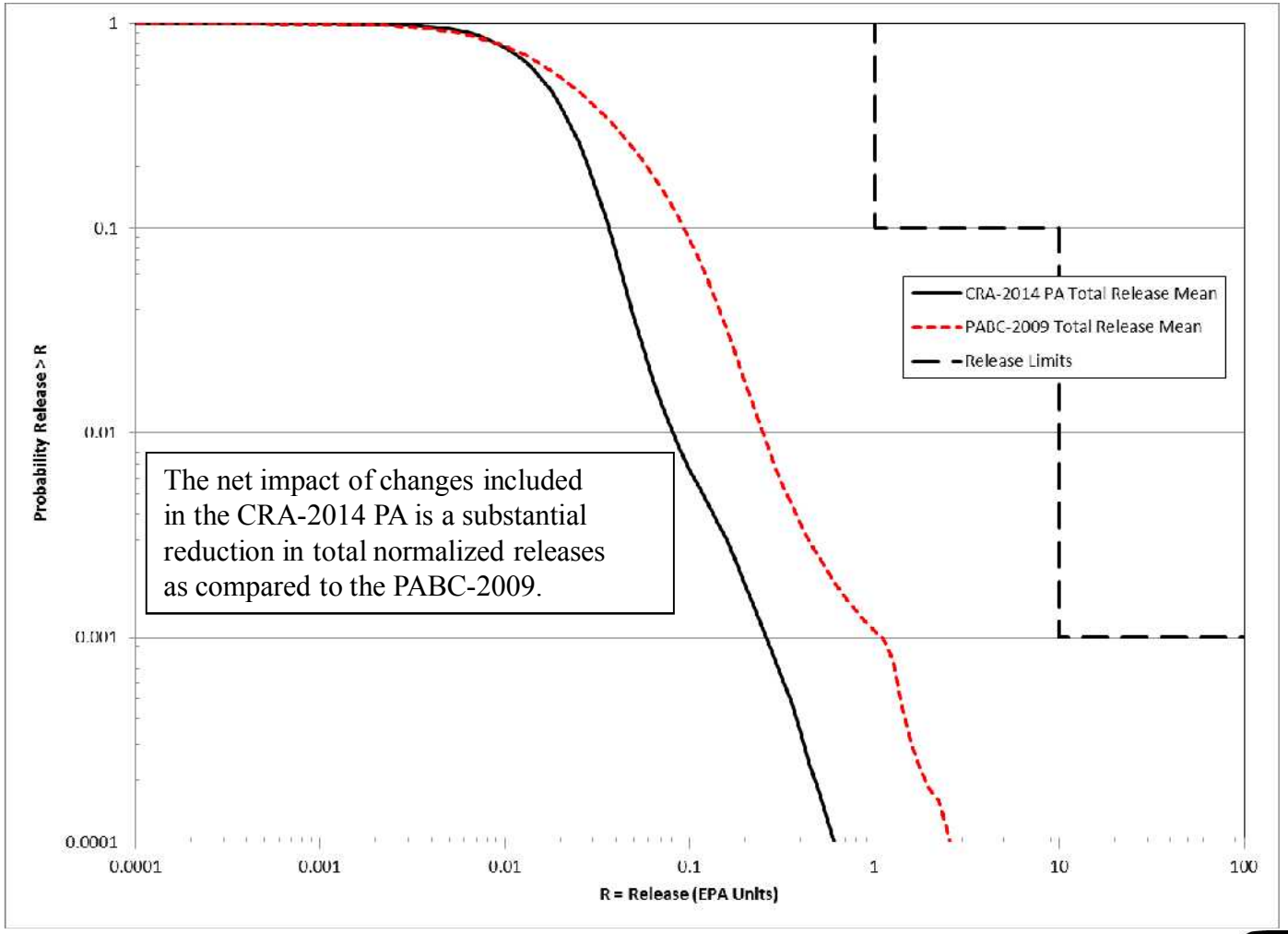
CRA-2014 PA Main Result



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Summary

- The CRA-2014 PA includes planned repository changes and numerous refinements/updates.
- Changes are included sequentially so that compliance impacts can be reasonably isolated.
- Total normalized releases obtained in the CRA-2014 PA are less than those found in the PABC-2009. The WIPP remains in compliance with federal containment requirements.