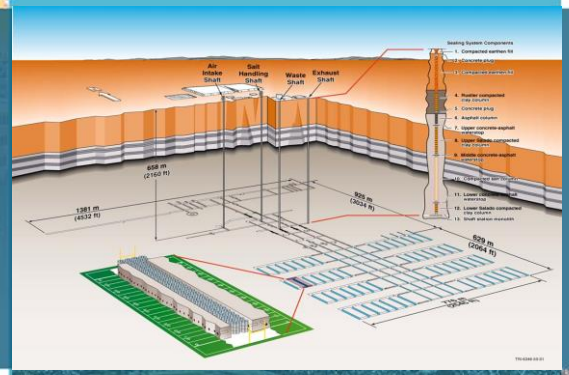
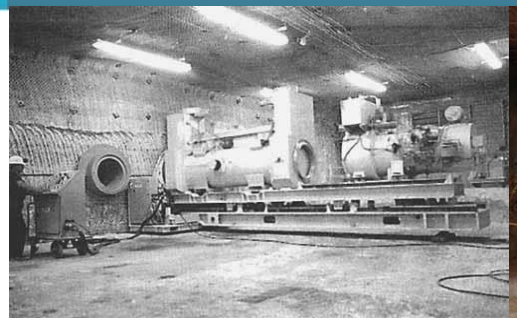
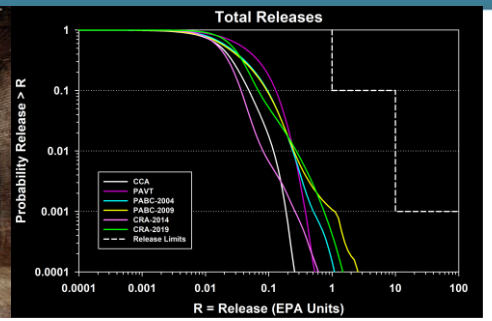
Sandia National Laboratories

Summary of Changes to Performance Assessment for the 2019 WIPP Compliance Recertification Application







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The Waste Isolation Pilot Plant (WIPP)

WIPP is a permanent disposal facility for transuranic (TRU) waste

- Located in southeast New Mexico
- Owned by U.S. Department of Energy (DOE)
- Certified by U.S. Environmental Protection Agency (EPA)
- Defense-related TRU waste is emplaced in a salt formation deep underground
- Regulatory compliance is demonstrated via Performance Assessment (PA)

WIPP Recertification

Public Law 102-579 (as amended by Public Law 104-201) requires that WIPP shall be subject to periodic recertification every five years following the first receipt of TRU waste, which occurred in March of 1999.

- The current performance assessment baseline is that established by the 2014 Compliance Recertification Application Performance Assessment (CRA-2014 PA).
- The 2019 Compliance Recertification Application Performance Assessment (CRA-2019 PA) demonstrates continued compliance of the WIPP with EPA containment requirements.
- A number of changes/refinements are included in the CRA-2019 PA (e.g., incorporate new data and experimental results).

Standard Updates Included in the CRA-2019 PA

- Drilling Rate
  - CRA-2014 Value: 0.00673
  - CRA-2019 Value: 0.00990
  - Measured in number of vertical boreholes per kilometer per year
- Plugging Pattern Probabilities
- Inventory
  - Radionuclides
  - Waste Materials
  - Organics
- Radionuclide Solubilities and their Uncertainty

Drilling rate and plugging pattern probabilities are updated based on a survey of current practices in the Delaware basin.

Parameter and Implementation Refinements Included in the CRA-2019 PA

Updated based on new information available

- Addition of brine radiolysis as part of the gas generation process model
- Colloid enhancement parameters

Updated based on EPA directed changes

- Hydromagnesite conversion rate
- Probability of brine pocket encounter during a hypothetical drilling intrusion
- Removal of iron sulfidation reactions
- Steel corrosion rate
- Waste shear strength

Abandonment of South End of Mine

Fire and release events in 2014

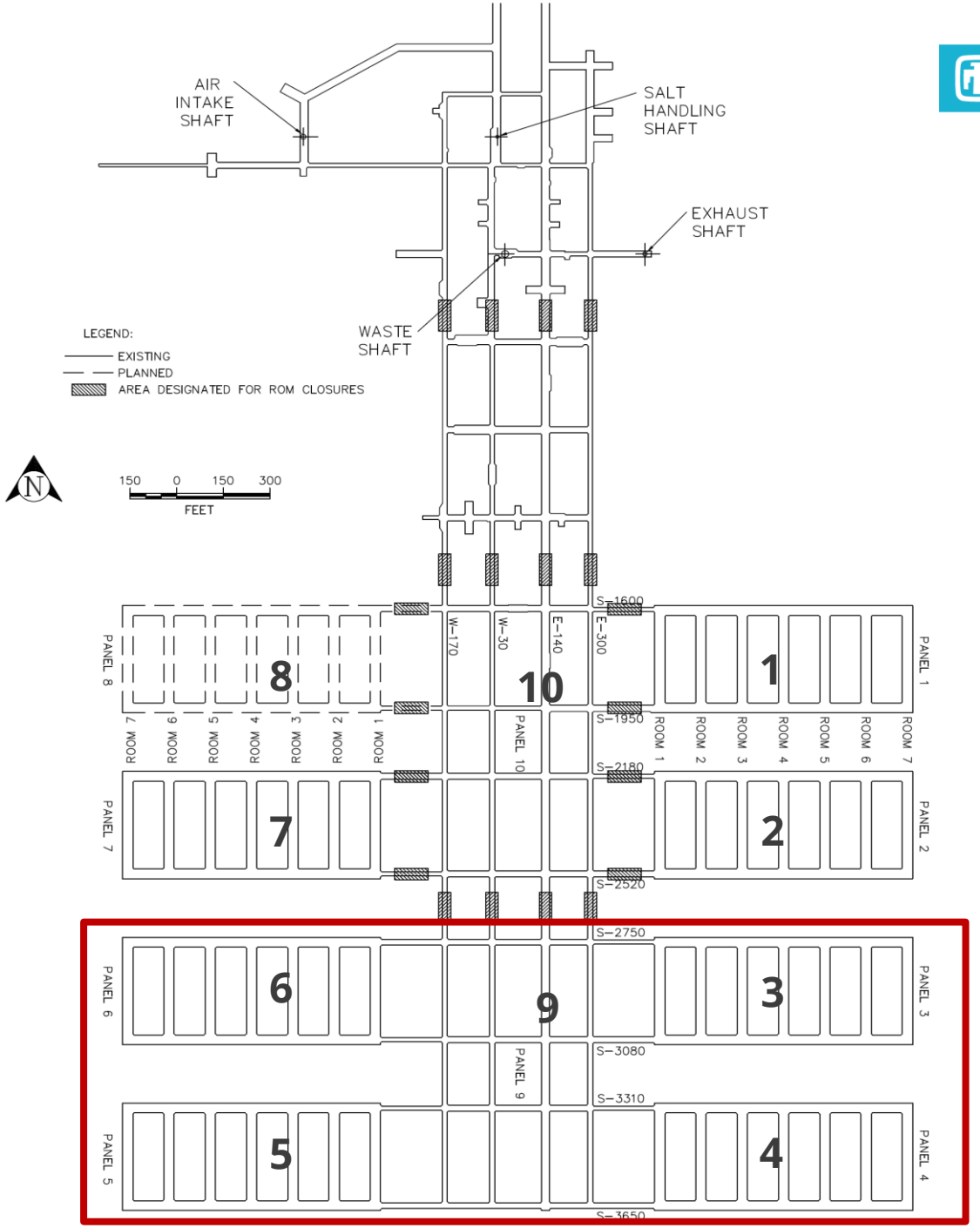
Access to south end was limited

- Ground control maintenance could not be performed, which resulted in deteriorating ground conditions in some areas.

Worker safety issue identified

- The safest resolution was to abandon the south end that contains Panels 3, 4, 5, 6, and 9
- Waste was already emplaced in south Panels 3, 4, 5, and 6, but not 9
- Unable to install run-of-mine-salt panel closures (ROMPCS) in Panels 3, 4, 5, and 6
- Installed ROMPCS between S-2520 and S-2750 drifts – between equivalent Panels 9 and 10.

Changes to PA were made to account for these operational changes.



Repository Planned Changes

No ROMPCS Panel Closures in the South

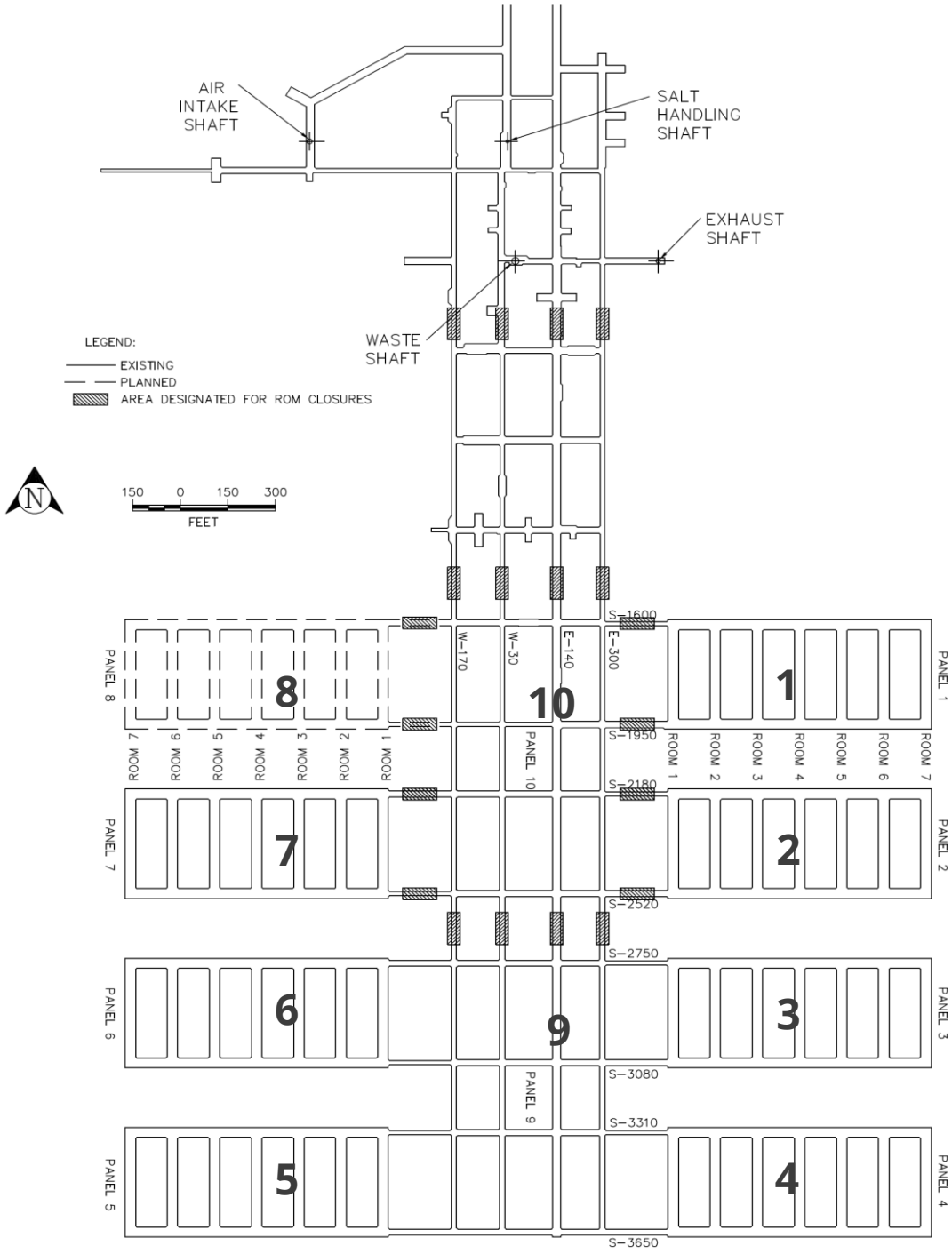
- No ROMS panel closures installed in Panels 3, 4, 5, and 6
- Installed ROMPCS between equivalent Panels 9 and 10; between S-2520 and S-2750 drifts

No Waste Disposal in Equivalent Panel 9

- No waste planned to be emplaced in Panel 9

Additional Shaft

- Planned fifth shaft and associated drifts added to provide increased airflow during the operational time period.



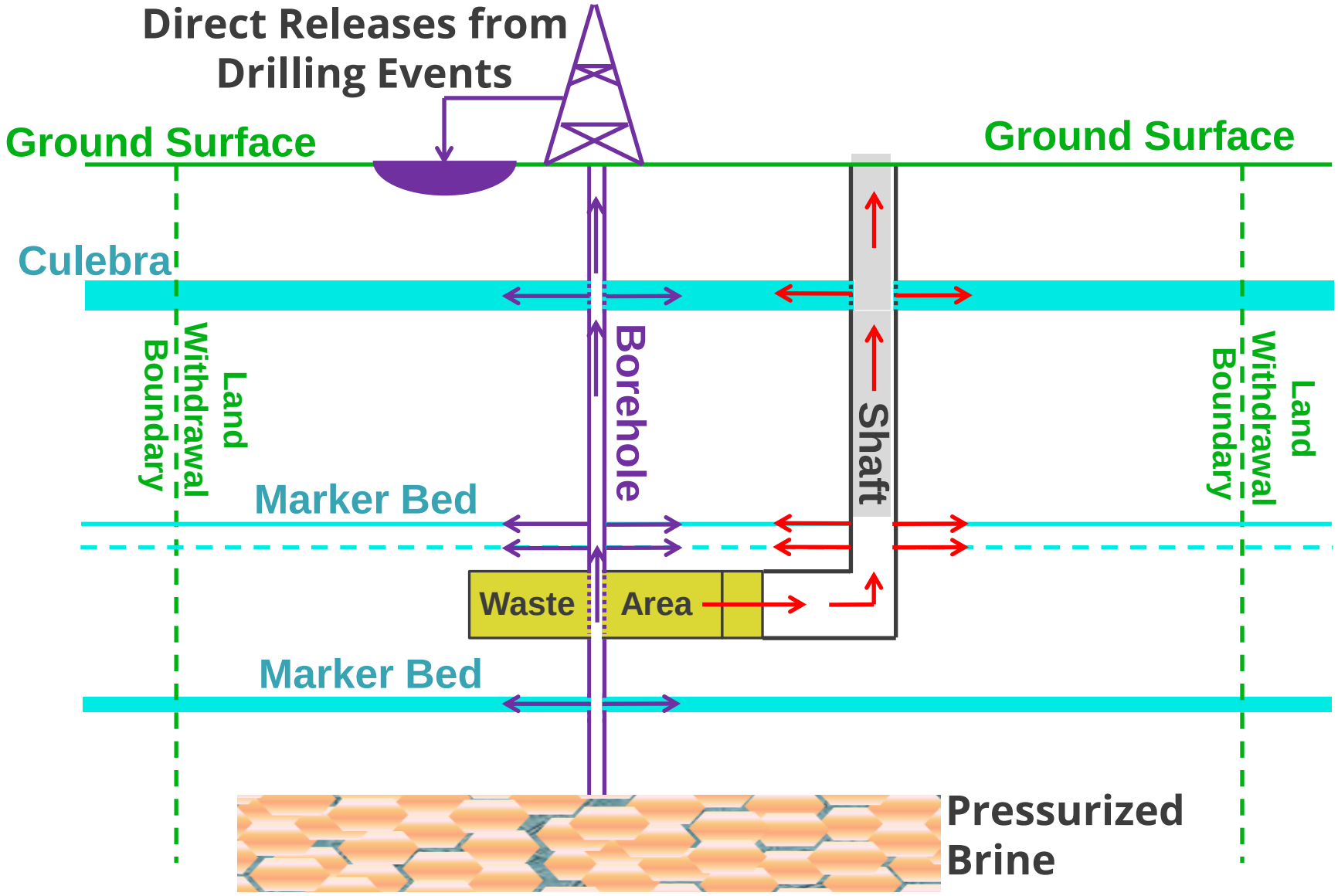
WIPP Performance Assessment

EPA regulations require performance assessment (PA) analyses to estimate the cumulative releases of radionuclides considering the associated uncertainties, caused by all significant processes and events that may affect the disposal system. Two scenarios are considered, undisturbed repository performance and disturbed repository performance

Undisturbed repository performance (see 40 CFR § 191.15 and 40 CFR Part 191 Subpart C) – in general, performance assessment models the effects of salt creep with fluid flow (e.g., pressurized brine and gas flow) and waste degradation processes within the waste disposal system. Results for CRA-2019, indicate that there are no releases to the accessible environment from the undisturbed repository. The behavior of the undisturbed performance of the disposal system will result in extremely effective isolation of the radioactive waste for the 10,000-year regulatory time period.

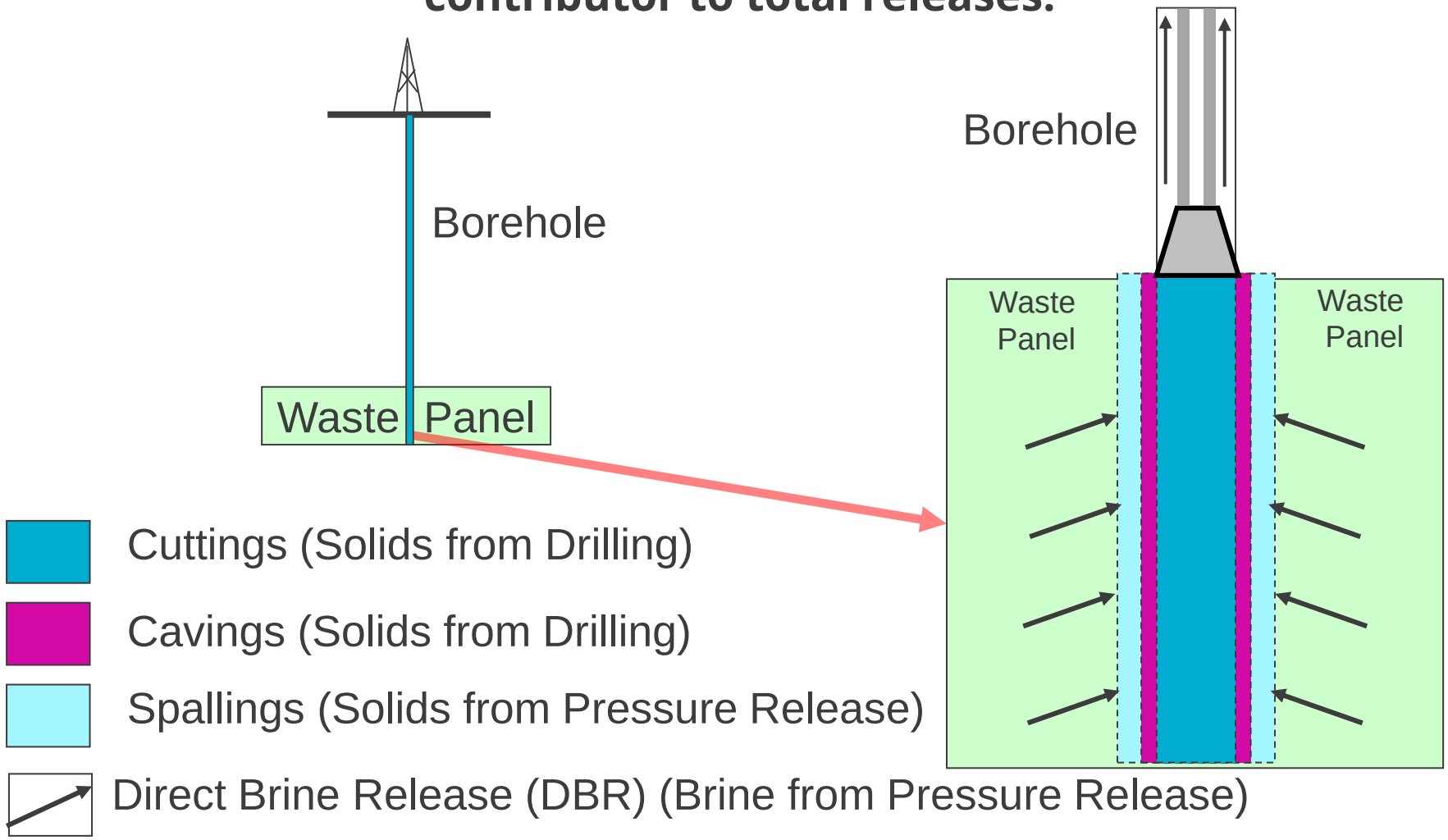
Disturbed repository performance (see 40 CFR 194.32, 194.33, & 194.41) - performance assessment is required by regulation to consider scenarios that include human intrusion into the repository by inadvertent and intermittent drilling and mining for resources after 100-years of active institutional controls. Inadvertent human intrusion is the only credible mechanism to release radionuclides to the accessible environment, and even still, releases are well beneath the compliance limits.

Release Pathways in WIPP PA



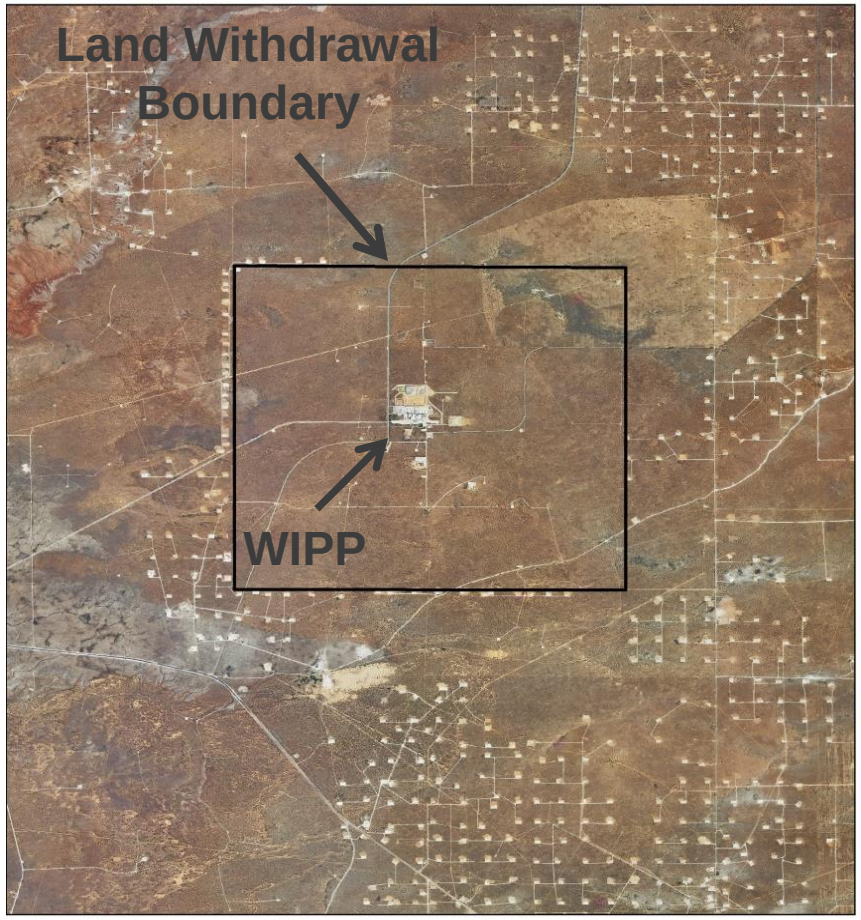
Direct Release Mechanisms

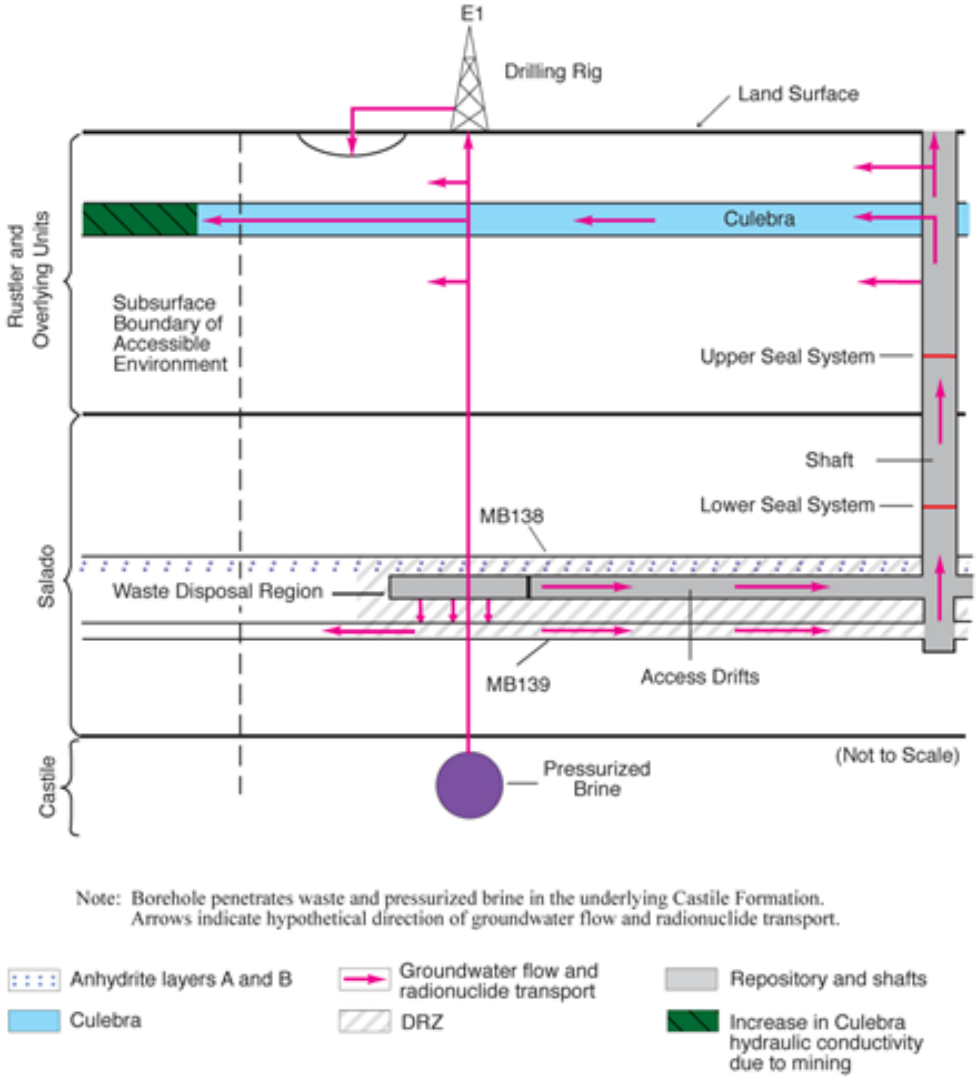
Direct releases comprise short-term releases, and are the main contributor to total releases.



Long-Term Direct Release Mechanism Considered in WIPP PA

Radionuclide transport through groundwater comprise long-term releases.

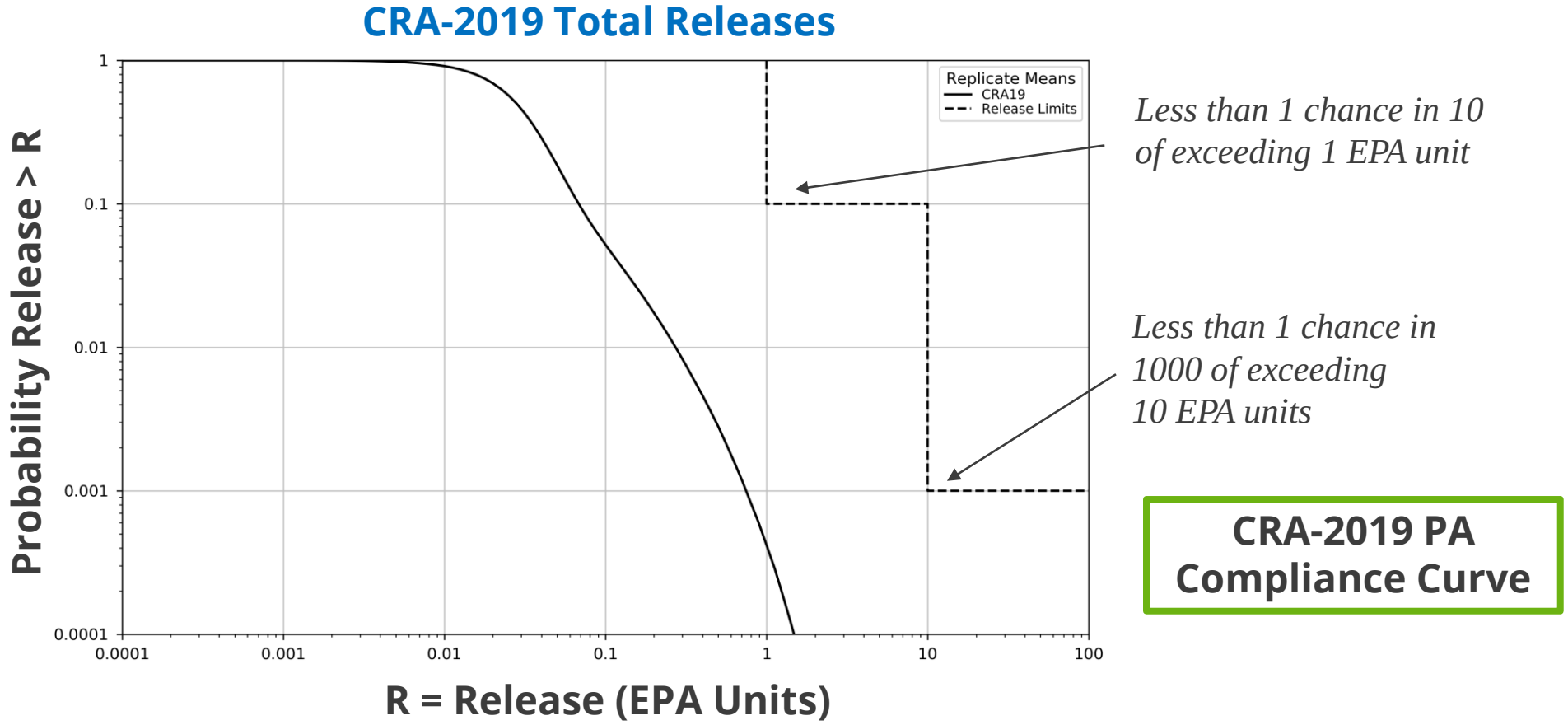




Mean Total Release CCDF

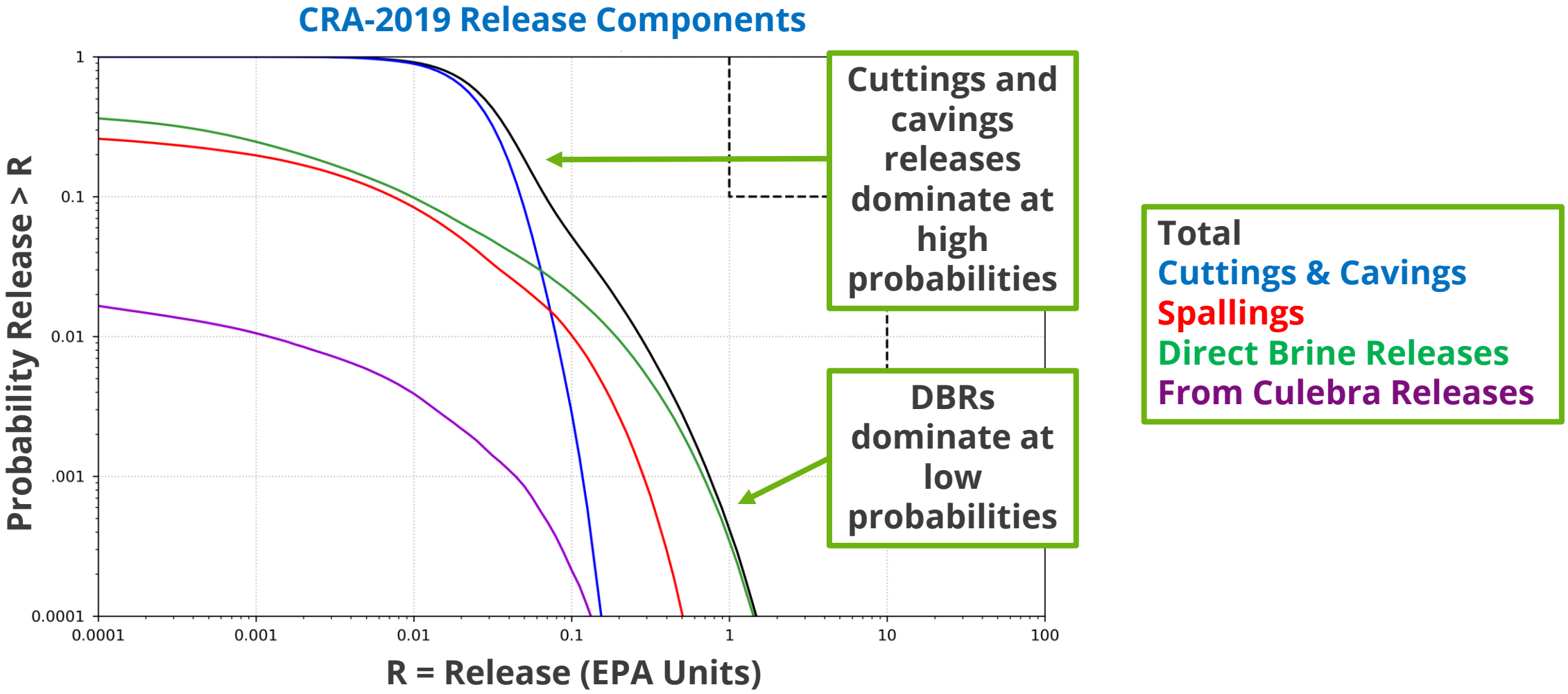
The total release Complementary Cumulative Distribution Function (CCDF) curve is the measure of compliance.

Releases are compared to regulatory release limits.

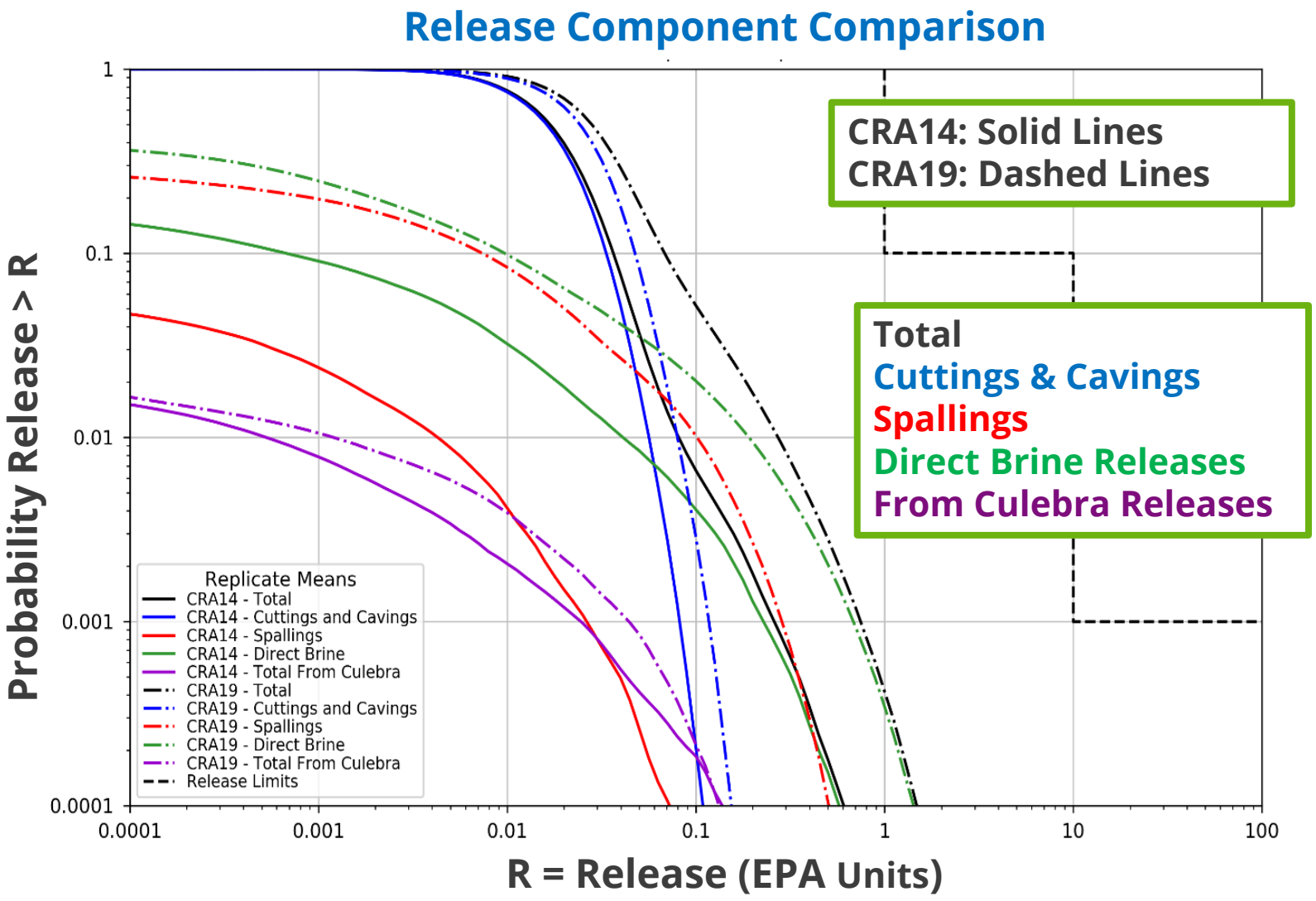


CCDFs for each Release Mechanism

Each Release Component is Quantified by a Complementary Cumulative Distribution Function (CCDF)



Results for Individual Release Mechanisms

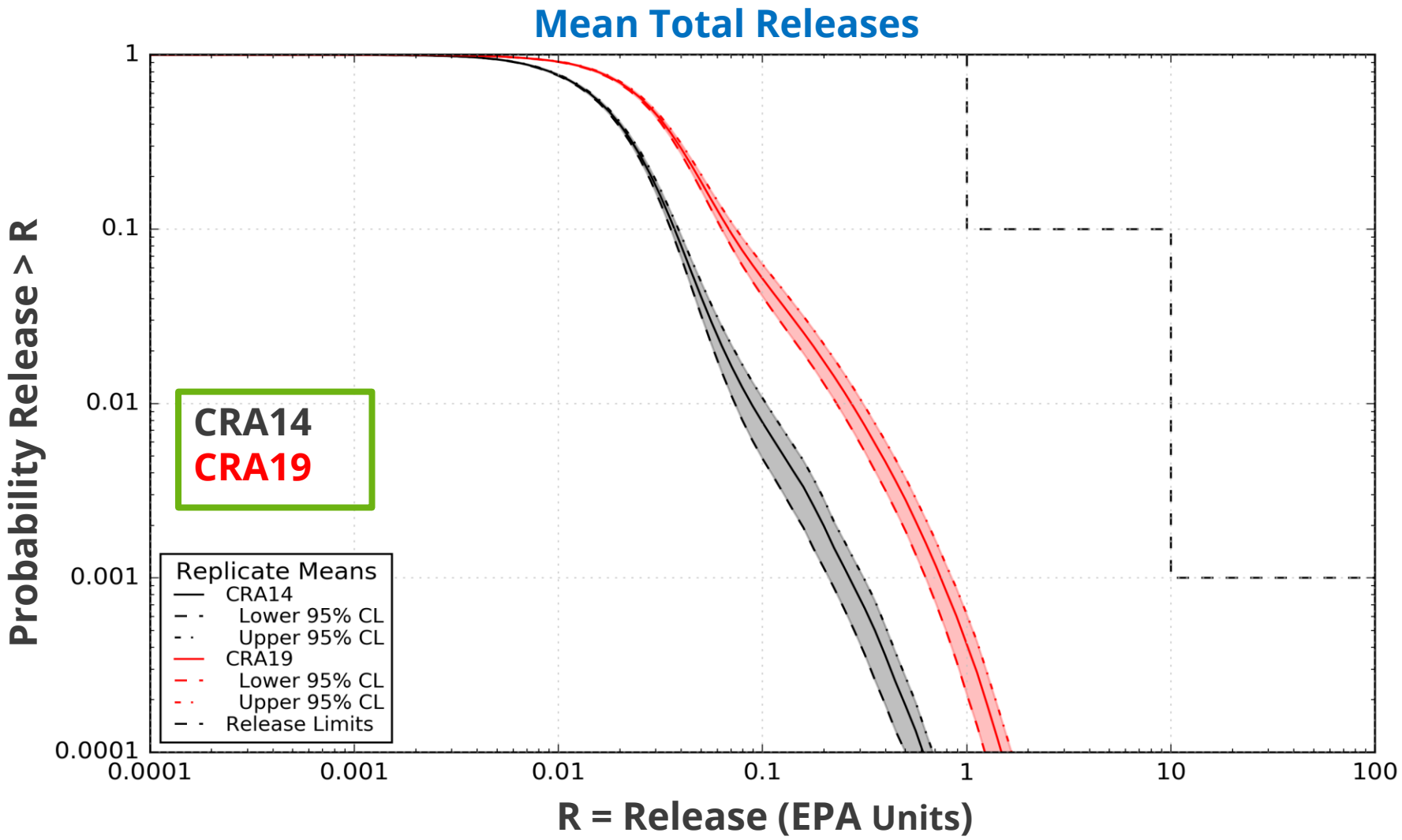


Releases are increased for all release mechanisms.

- Direct brine and spallings releases increased due to increased pressures in the repository.
- Cuttings and cavings releases increased due to increased drilling rate
- Culebra releases increased due to changes to various parameters.

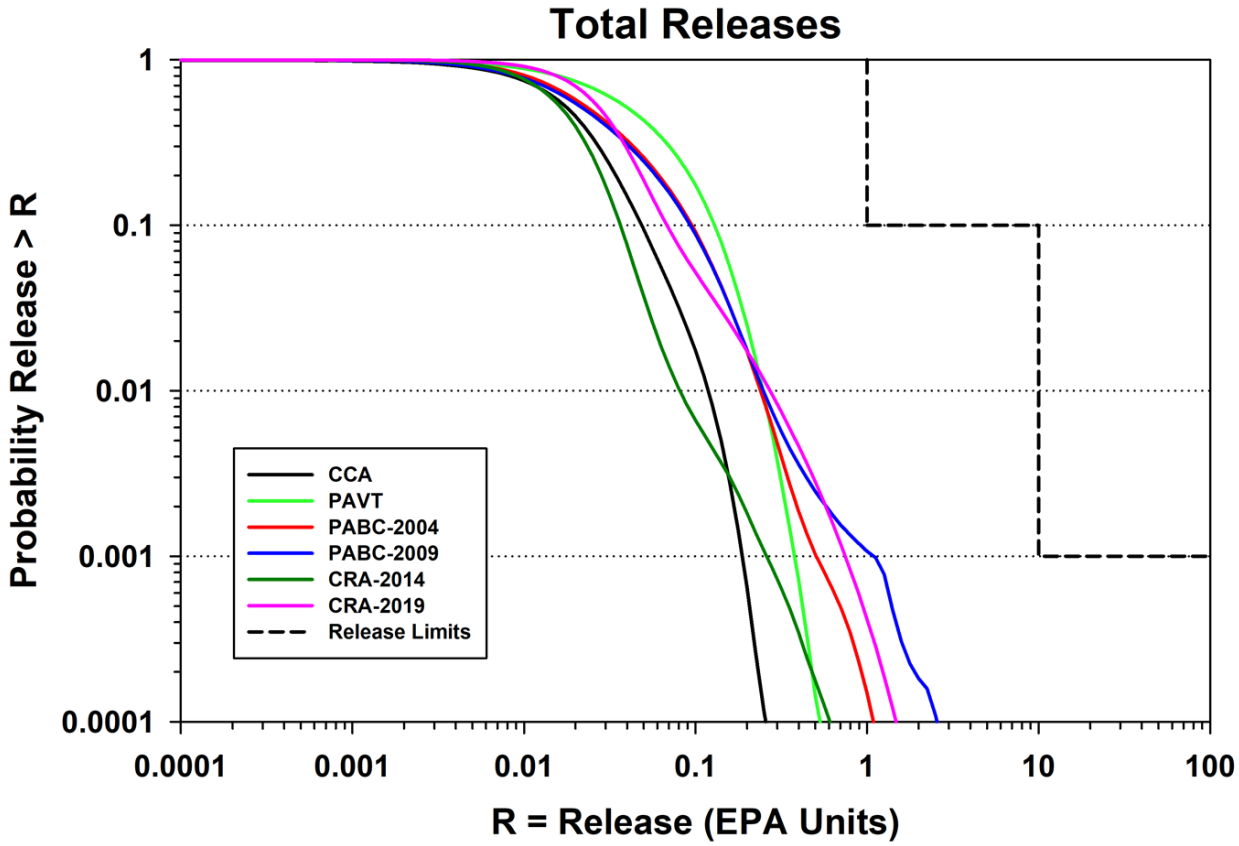
Overall Results

Mean total releases are increased at all probabilities.



Summary

As with all previous compliance-level performance assessments, the WIPP facility continues to comply with the release limits of 40 CFR 191.



The WIPP facility remains in compliance with EPA containment requirements.