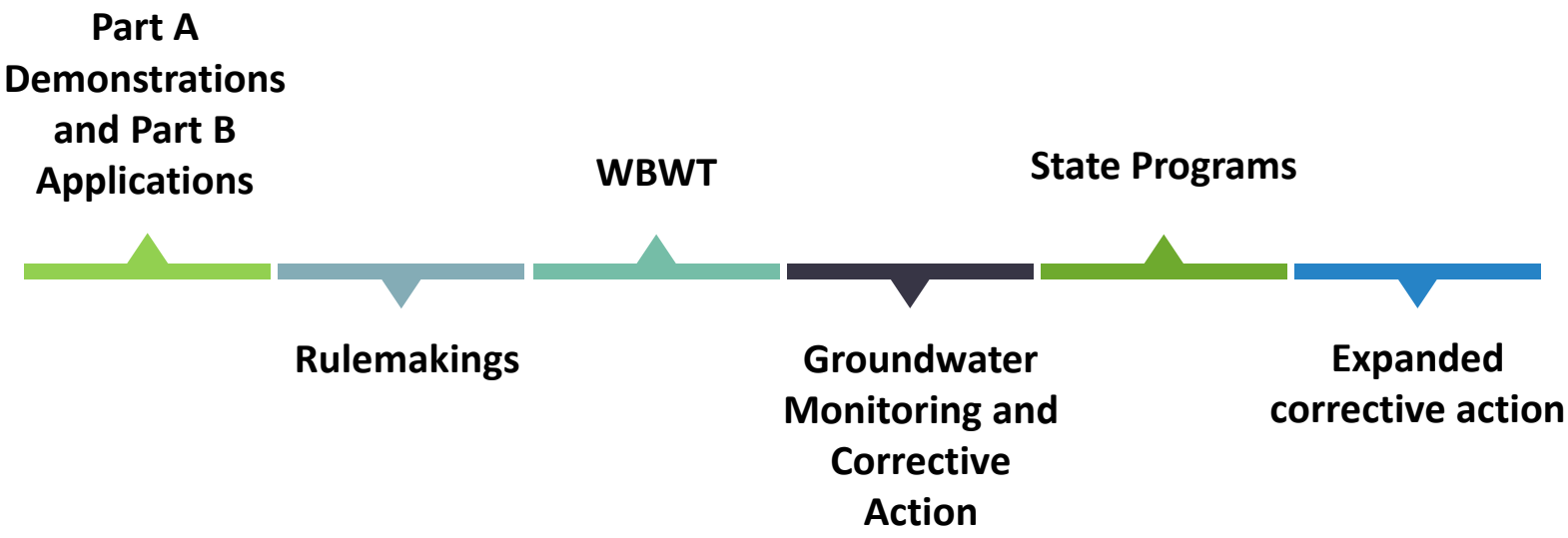
Coal Combustion Residuals Updates from U.S. EPA

ASTSWMO meeting

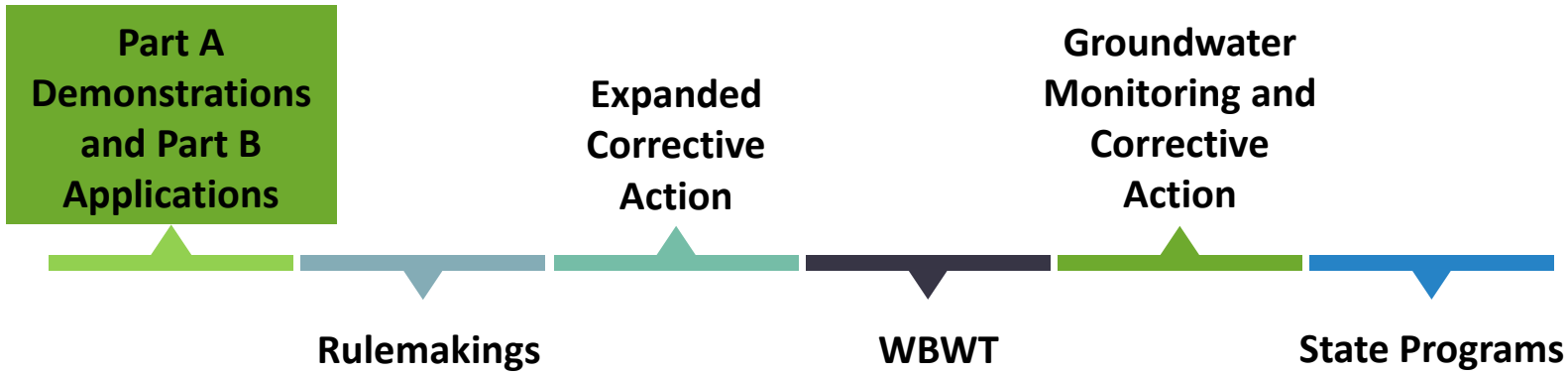
August 23, 2022

Purpose

To discuss EPA updates on: Part A and B implementation, collaboration with State partners (site-specific issues and program approval) and future rulemakings.



Coal Combustion Residuals Overview



Part A Demonstrations- January 11th

Four Incompleteness Determinations:

- Dallman Power Station in Springfield, Illinois
- Erickson Generating Station in Lansing, Michigan
- Meramec Energy Center in St. Louis, Missouri
- Sioux Energy Center in West Alton, Missouri

Ineligibility Determination:

- Greenidge in Dresden, New York

Four Proposed Determinations:

- Clifty Creek Power Station in Madison, Indiana (proposed denial)
- Gavin Power Plant in Cheshire, Ohio (proposed denial)
- H.L. Spurlock Power Station in Maysville, Kentucky (proposed conditional approval)
- Ottumwa Generating Station in Ottumwa, Iowa (proposed denial)

Public Comment Period: January 25 – February 23 (Some comment periods were extended until March 25)

Part A Demonstrations- July 12th

Two Proposed Determinations:

- Mountaineer Plant in Letart, West Virginia (proposed conditional approval)
- Calaveras Power Station in San Antonio, Texas (proposed conditional approval)

Public Comment Period: July 26- September 26

- The Agency extended the comment period on August 17 for an additional 30 days.

Part B Applications

We are working on proposals for these facilities:

- Apache Generating Station, Cochise, Arizona
- Belle River Power Plant, China Township, Michigan
- Coal Creek Station, Underwood, North Dakota
- Conemaugh Generating Station, New Florence, Pennsylvania
- Coronado Generating Station, St. Johns, Arizona
- Martin Lake Steam Electric Generating Station, Tatum, Texas
- Monroe Power Plant, Monroe, Michigan

One facility withdrew its application:

- Brame Energy Center, Lena, Louisiana

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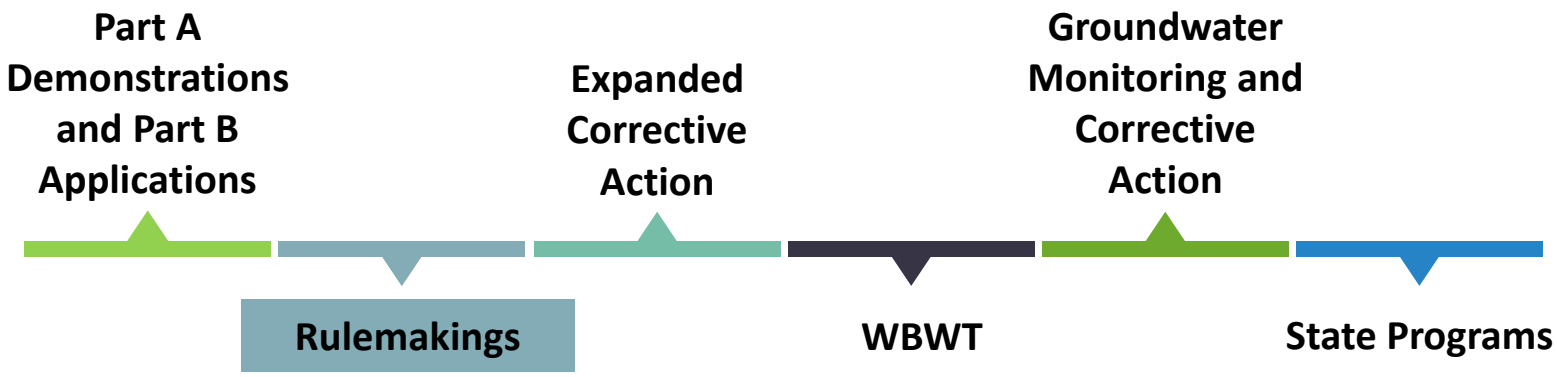

Rulemakings

EPA is working on four rulemakings:

- **Federal CCR Permit Program Final Rule:** Reviewing comments on the proposed rule and is moving through the steps to finalize it.
- **Legacy CCR Surface Impoundment Proposed Rule:** Reviewing the public input we received on legacy impoundments following the DC Circuit's remand of this issue. The next step will be to publish a proposed rule.
- **Part B, Part 2 Final Rule:** EPA proposed 4 items in the Part B rule and finalized the alternate liner demonstration in November 2020. EPA is reviewing public comments to determine how to address the other three items in a Part 2 final rulemaking for Part B.
- **Beneficial Use:** EPA is analyzing the information we have compiled from public input. We received feedback on the 2019 proposed rule, through stakeholder engagement meetings held from May to August 2020, and via the December 2020 NODA. We have also done outreach to state environmental agencies, and a literature review to determine a path forward for our reconsideration of the beneficial use definition criterion and the provisions for managing piles of coal ash.

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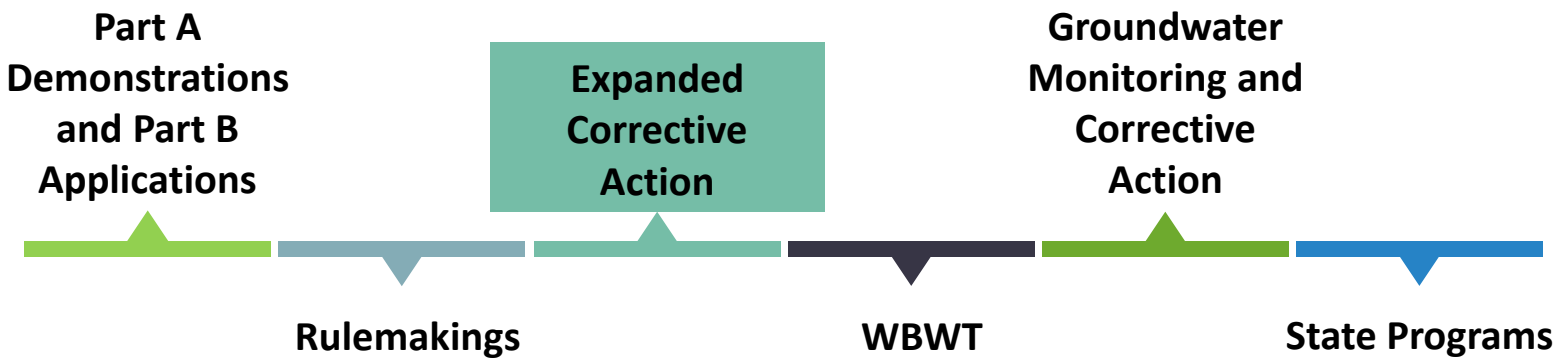

Expanded Corrective Action

Spring 2022 Regulatory Agenda (link below): corrective action requirements for all CCR contamination (regardless of how or when that CCR was placed) on site of a regulated facility.

Through implementation we have seen that unregulated units are contaminating groundwater:

- ASDs pointing to nonregulated units causing contamination
- Comments on inactive landfills

We want to hear about your experience in Subtitle C and any implementation challenges you have faced.

https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202204&RIN=2050-AH14

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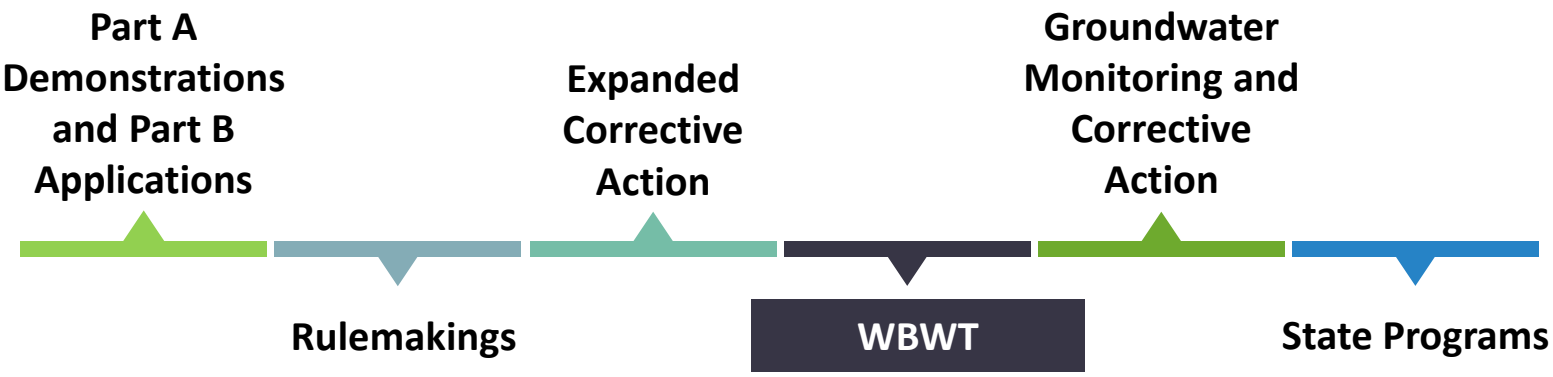


Closure and Waste Below the Water Table (WBWT)

Facilities need to document how the closure performance standards will be achieved 40 CFR 257.102(b).

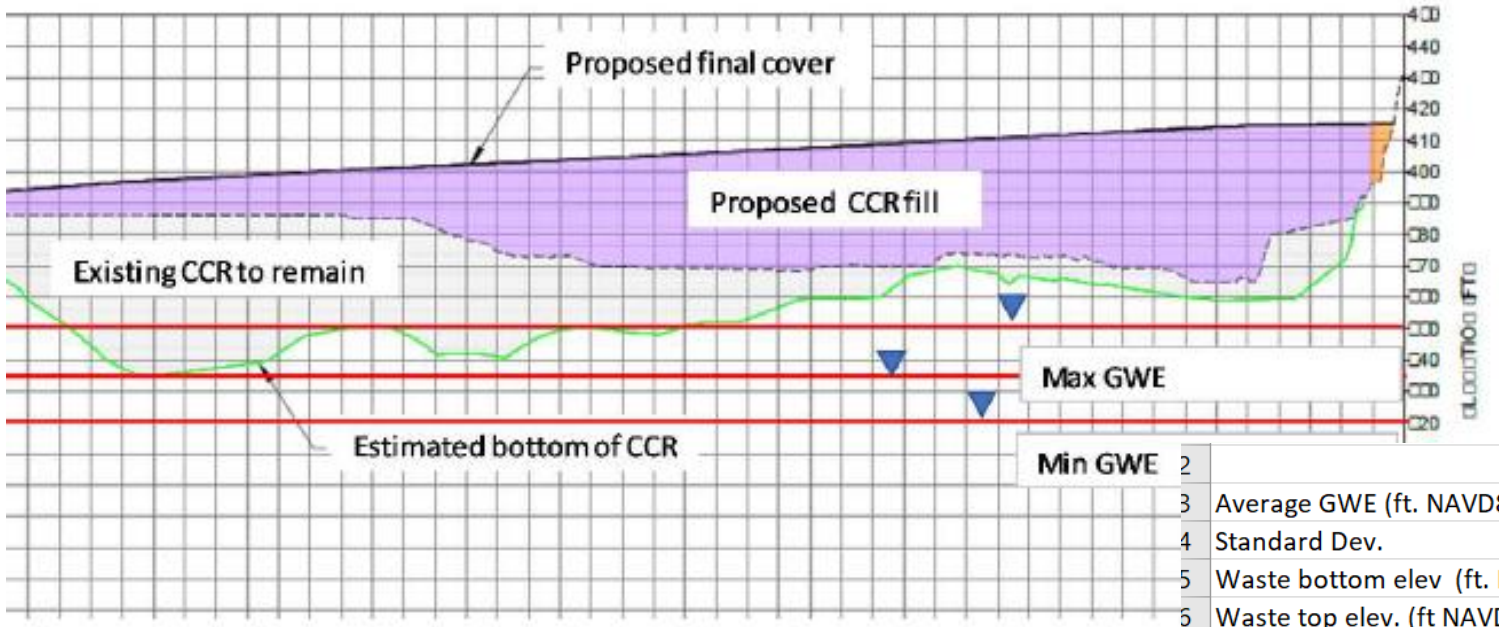
Key closure in place standards under 40 CFR 257.102(d):

- Control, minimize or eliminate post closure infiltration of liquids into the waste and releases from the impoundment.
- Minimization of further maintenance.
- Free liquids must be eliminated prior to installing the final cover system.
- Preclude the probability of future impoundment of water.

EPA (and its contractors) began reviewing several closure plans, groundwater monitoring reports, history of construction, permit applications, and other supporting documents

- Primary goal: Where is the water table in relation to the bottom of the unit and how much CCR is saturated?
- Common themes began emerging, and at times it was difficult to evaluate if the performance standards were being achieved

Closure and Waste Below the Water Table (WBWT)



		Average	Maximum	Minimum
Average GWE (ft. NAVD88)		421.3505	424.3386	417.7029
Standard Dev.		8.194068	9.094889	7.427958
Waste bottom elev (ft. NAVD88)		422		
Waste top elev. (ft NAVD88)		459	477	441
Estimated waste thickness		37	55	19
Saturated waste thickness (ft)		-0.64947	2.338571	-4.29714
Volume of waste (CY)		3290000		
Estimated waste thickness (ft)		39.21647		
	Avg	Max	Min	
E-W GW elevation difference (ft)	16.34426	17.95	13.793	
% of area that is saturated	0.674549	0.844568	0.402741	
Avg depth in saturated area (ft)	5.5125	7.58	2.7775	
% of total depth saturated in saturate	15%	40%	5%	
% of total volume saturated	10%	34%	2%	
Saturated volume (CY)	330640.6	1108527	66913.32	

Closure and Waste Below the Water Table (WBWT)

Considerations EPA Uses to Evaluate Closure Performance Standards:

1. Don't guess. Clear evidence showing the water table in relation to the CCR unit should normally be available
   - Piezometer and monitoring well data
   - Cross sections
   - Narrative in closure plan
2. Free Liquids
   - Closure plan should include a narrative description of how all freestanding liquid and separable porewater, including groundwater, will be eliminated from the CCR unit prior to the installation of a cover system
3. Infiltration
   - An evaluation or model that estimates groundwater levels in response to the cover system and any other engineering controls
   - A description of how the overall closure strategy will control, minimize, or eliminate infiltration from all sides into the unit **and post closure releases of CCR from the unit**

Closure and Waste Below the Water Table (WBWT)

4. Minimization of Further Maintenance
   - For any engineering control other than the cover system, describe its role in addressing free liquids, including leachate and groundwater
   - Explain if the controls will be passive (e.g., gravity driven) or active (e.g., pumping)
   - Estimate the amount of time these controls will need to be maintained, especially if they are active
5. Preclude Future Impoundment of Water
   - If CCR remains in contact with groundwater throughout post closure, would that not mean the unit is still impounding liquids and CCR?

Closure and Waste Below the Water Table (WBWT)

Groundwater issues identified during WBWT reviews:

- Incomplete conceptual site model
  - Groundwater flow pathways not adequately characterized
  - Extraction / production well influences not considered
  - Complex geology (e.g., preferential pathways, karst features in bedrock, etc.) not adequately evaluated
  - Lack of groundwater elevation predictions after closure activities are complete
- Inadequate groundwater monitoring well network
  - Lack of adequate background well coverage for aquifers that are hydraulically connected to the uppermost aquifer
  - Unmonitored downgradient boundaries, especially at units with radial flow
  - Inadequate vertical design of the well network to address all contaminant migration pathways
  - Lack of well screens for bedrock wells (no discrete sampling interval)

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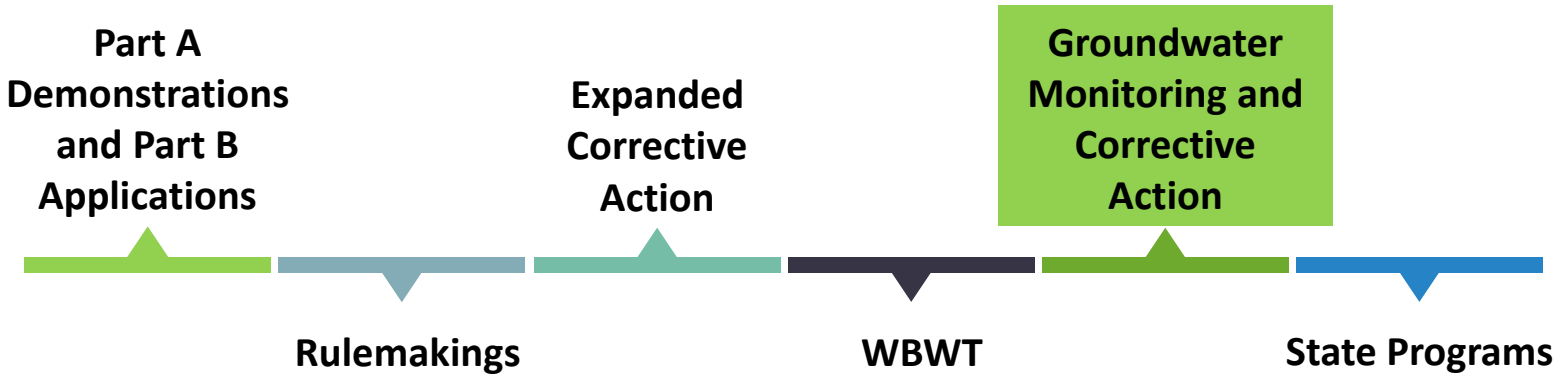


Groundwater Monitoring and Corrective Action

Requirements for design of groundwater monitoring systems

- Upgradient background wells must characterize groundwater not affected by the CCR unit
- Compliance wells must characterize groundwater quality at downgradient waste boundary and monitor all potential contaminant pathways
- Design (number and spacing of wells) must be based on site-specific information such as:
  - Aquifer thickness
  - Groundwater flow rate and direction (including seasonal / temporal fluctuations)
  - Geologic units (e.g., stratigraphy, lithology, hydraulic conductivities, porosities)

Groundwater Monitoring and Corrective Action

Reporting requirements

- Reports must include all data obtained under groundwater monitoring and corrective action requirements

Reporting issues identified

- Required statistical analyses and analytical data were missing

Data analysis requirements

- The lowest quantitation limits that can reliably be achieved by the lab must be used
- Groundwater data must be statistically analyzed to identify statistically significant increases above background or levels above groundwater protection standards

Data analysis issues identified

- Some quantitation (reporting) limits were relatively high and above regulatory limits
- Some data were excluded from statistical analyses (e.g., cleaner background data or higher detections in compliance wells)

Alternate Source Demonstrations

If an SSI or SSL is detected in a CCR unit's groundwater monitoring network, a facility may demonstrate that a source other than the CCR unit resulted in the SSI or SSL by completing an Alternate Source Demonstration (ASD). 40 CFR § § 257.94(e)(2), 257.95(g)(3)(ii).

A successful ASD must rebut the site-specific monitoring data and analysis which resulted in the SSI or SSL. Merely speculative or theoretical bases for conclusions are insufficient

ASD issues identified

- ASD presents general information about a potential alternate source but lacks site-specific data to demonstrate the alternate source caused the SSI/SSL
- ASD presents multiple hypothetical sources but provides no evidence to support any of them

Groundwater Monitoring and Corrective Action

Requirements to assess corrective measures:

- Once corrective action is required, the release and site conditions must be characterized
- Potential cleanup technologies (i.e., corrective measures) must be assessed according to criteria in 40 CFR § 257.96(c)
- Remedy must be selected as soon as feasible, based on the results of the assessment

Assessment issues identified:

- Characterization of a release wasn't sufficient (e.g., plume boundary wasn't identified or was only delineated laterally and not vertically)
- Assessment didn't consider all criteria in 40 CFR § 257.96(c) (e.g., the time component, likelihood of further releases, etc.)
- Assessment for one or more criteria was not supported by data or analysis, or facts were inconsistently applied across multiple criteria
  - Assessments of remedies were skewed or biased rather than supported by data
- Remedy selection has not occurred as soon as feasible

Groundwater Monitoring and Corrective Action

Monitored Natural Attenuation (MNA)

- Most MNA mechanisms are not relevant to inorganic metals, because they break down chemical compounds. CCR constituents are atomic elements and they do not break down.
  - Attenuation mechanisms for inorganic metals are limited to immobilization (through absorption or adsorption) or dilution and dispersion
  - Dilution and dispersion are not generally acceptable as a primary remedy because they amount to releases
- Determining the existence, and demonstrating the irreversibility, of MNA mechanisms is necessary to assess MNA as a corrective measure according to criteria in 40 CFR § 257.96(c) (e.g., performance, reliability)

MNA issues identified

- No specific attenuation mechanisms were identified for the released contaminants at a site
- No site data were provided that indicate an attenuation mechanism is occurring at a site
- The assessment seemed to switch back and forth between MNA mechanisms, depending on which would assess more favorably under each criterion

CCR Site Characterization and Remediation

Objectives

- Provide real-world examples of site characterization and corrective measures assessment work at CCR units

Note: Nothing in this presentation is intended to communicate a determination of compliance, endorsement, or a formal agency position.

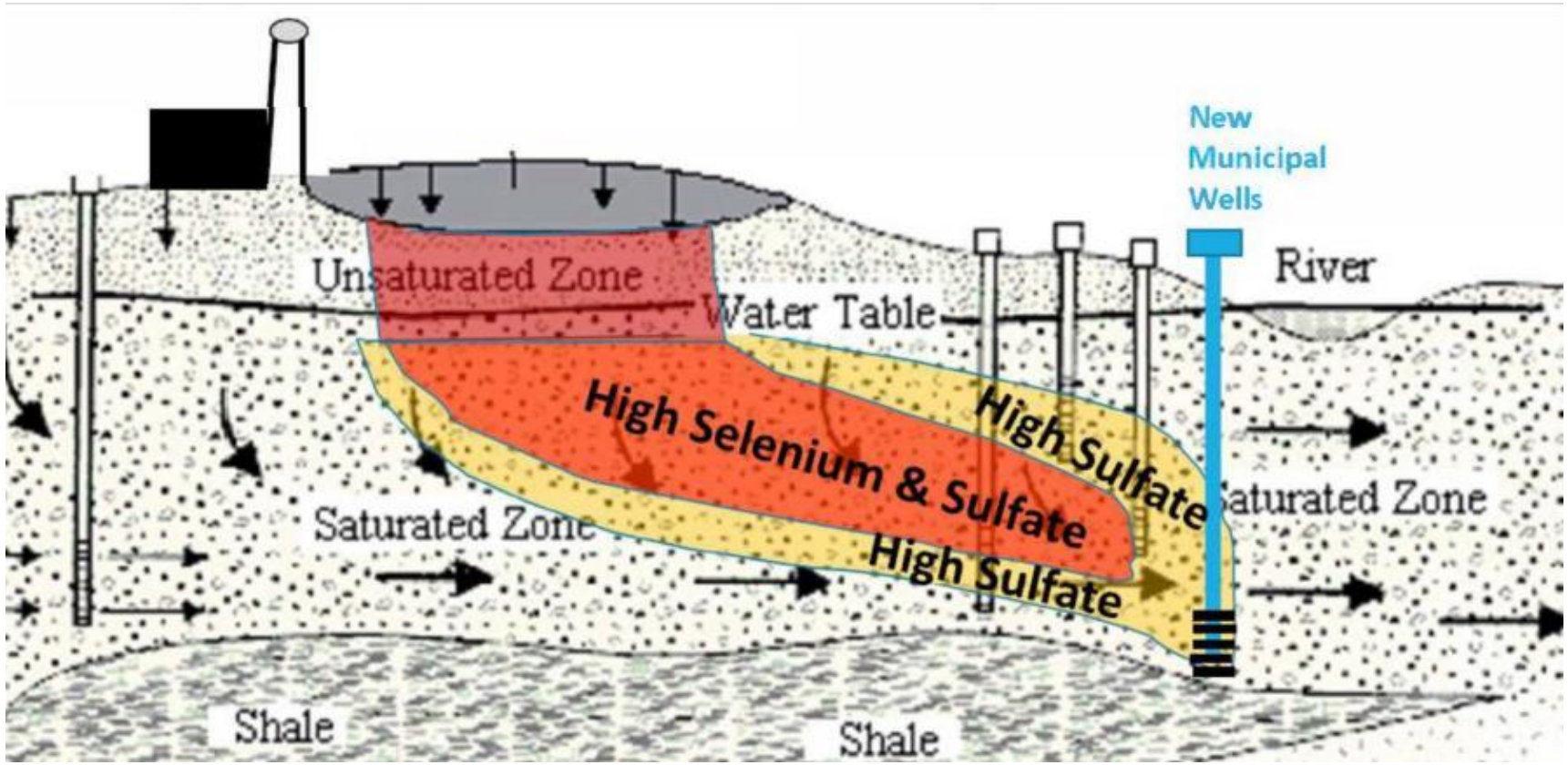
CCR Site Characterization and Remediation

Review of Assessment of Corrective Measures reports

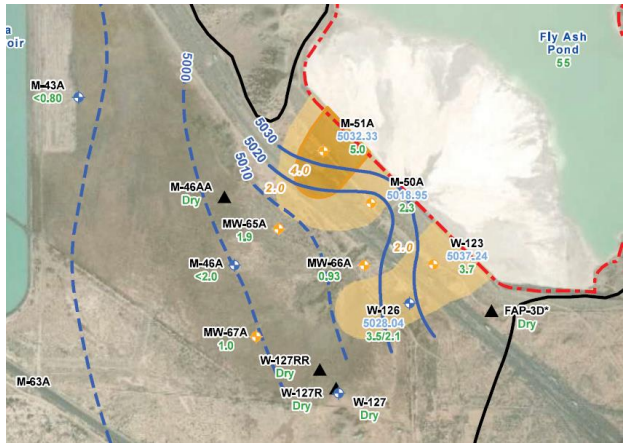
- Characterization of release
  - Vertical depiction
  - Lateral depiction
  - Narrative explanation
- Characterization of site conditions that may affect the remedy ultimately selected
  - Groundwater narrative
  - Soils narrative
- Predicting post-closure flow conditions
- Range of corrective measures assessed

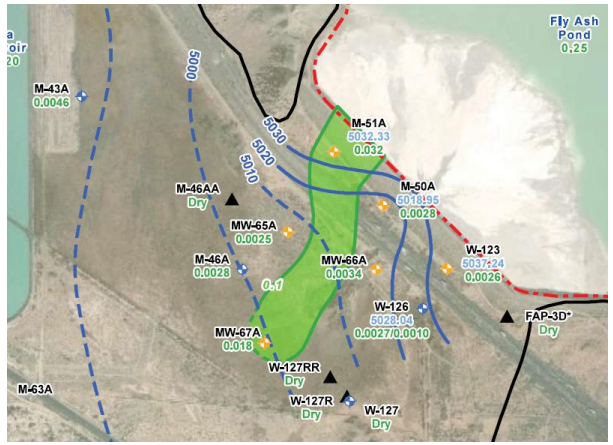
All examples come from Assessment of Corrective Measures (ACM) Reports published prior to January 2020

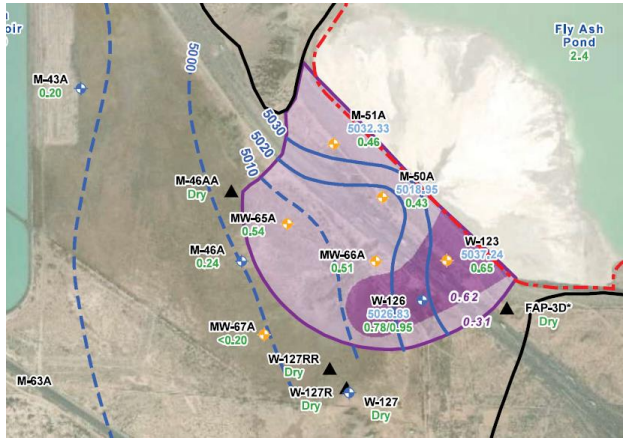
Characterization of release with multiple constituents - vertical

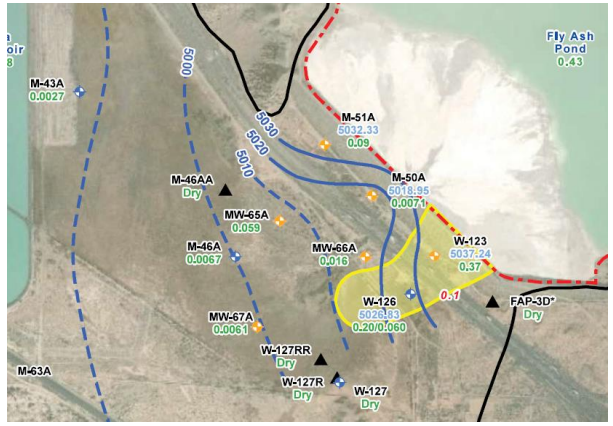


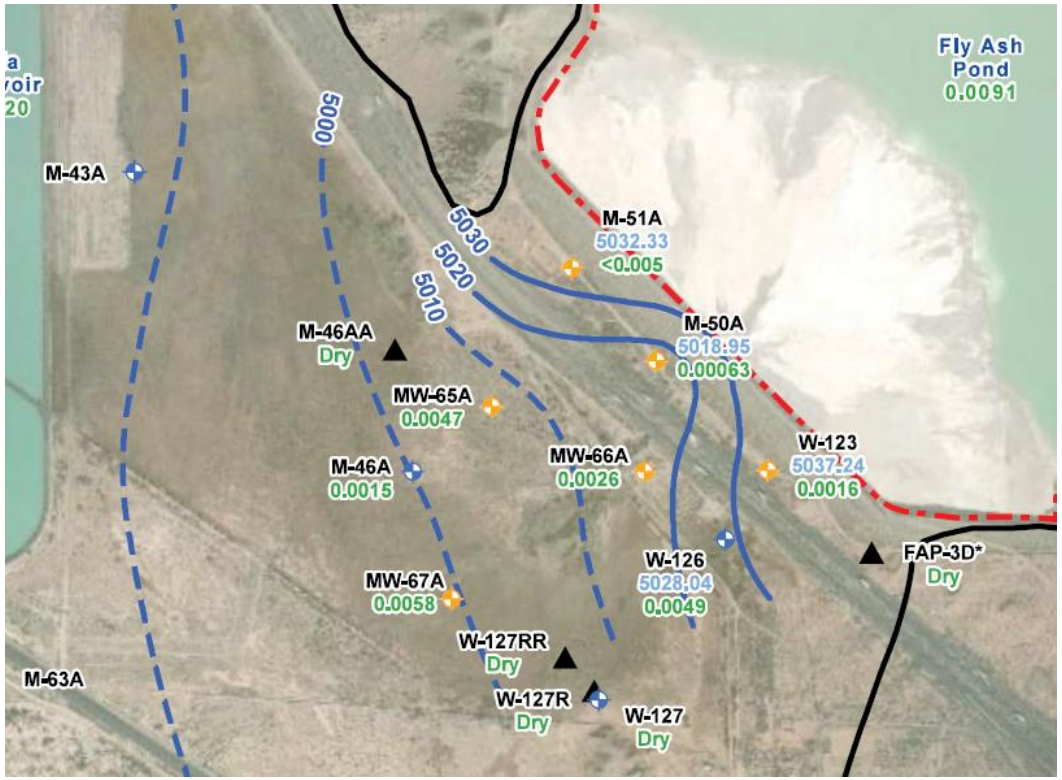
Characterization of release with multiple contaminants - lateral



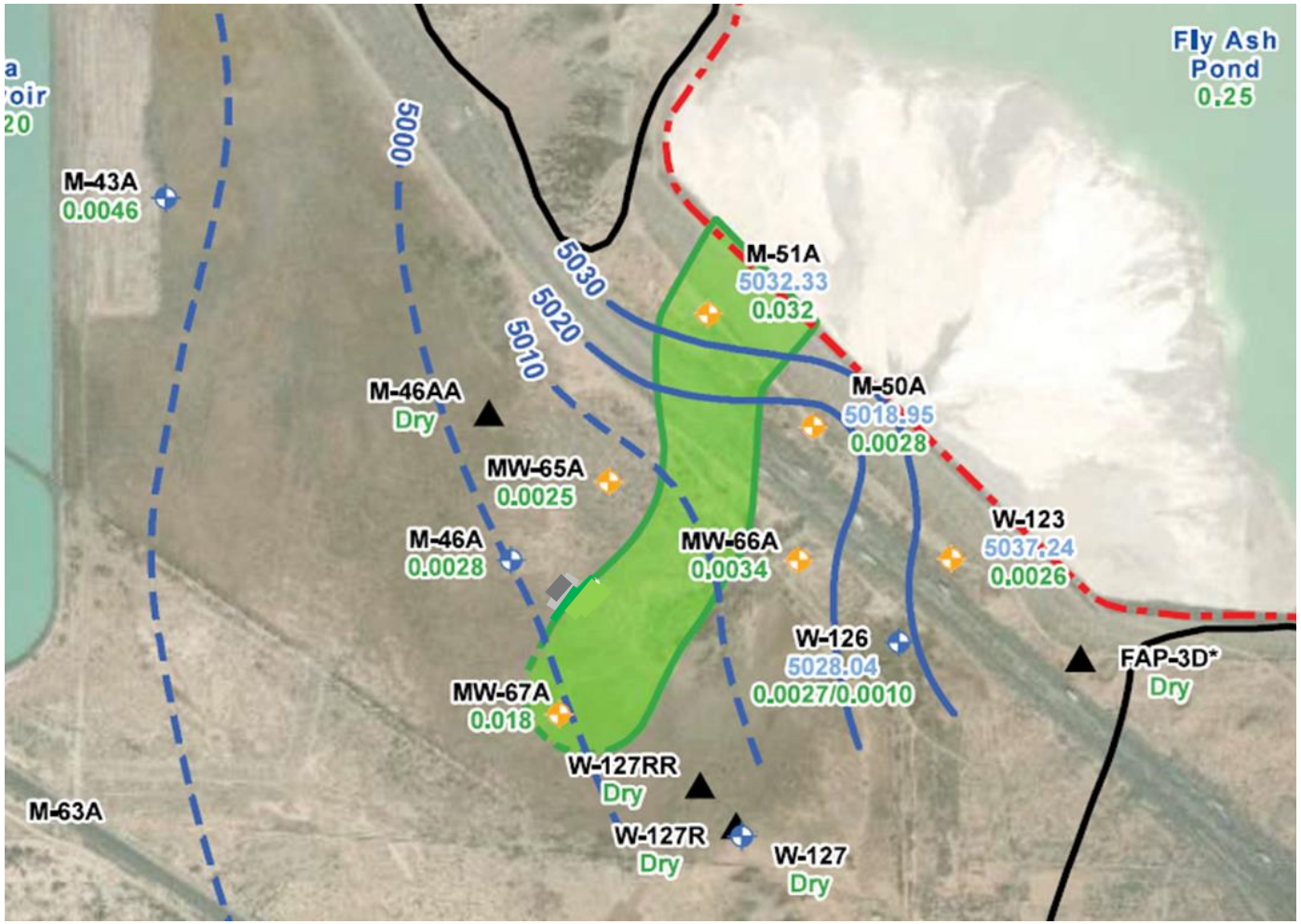








Constituent 1



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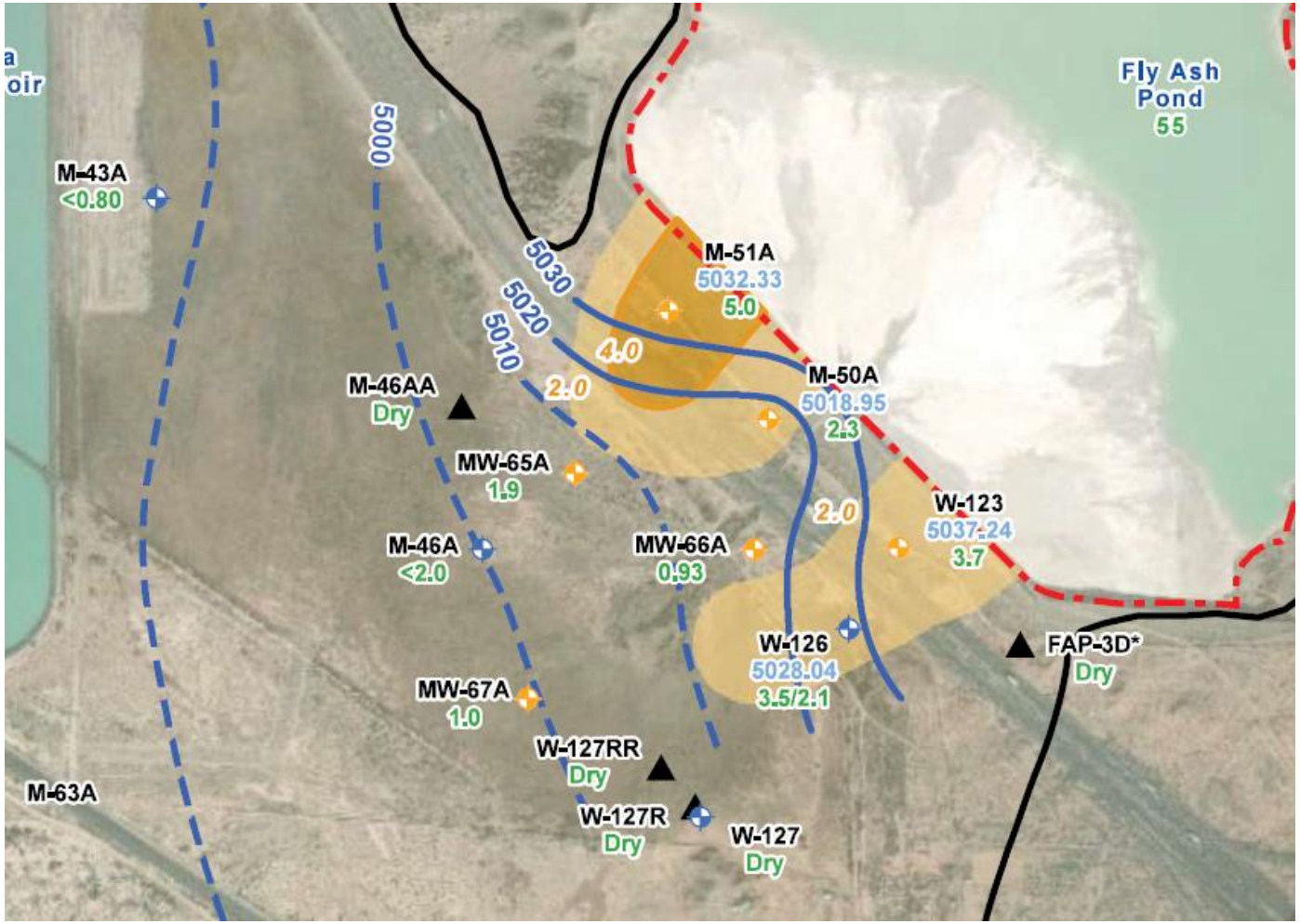

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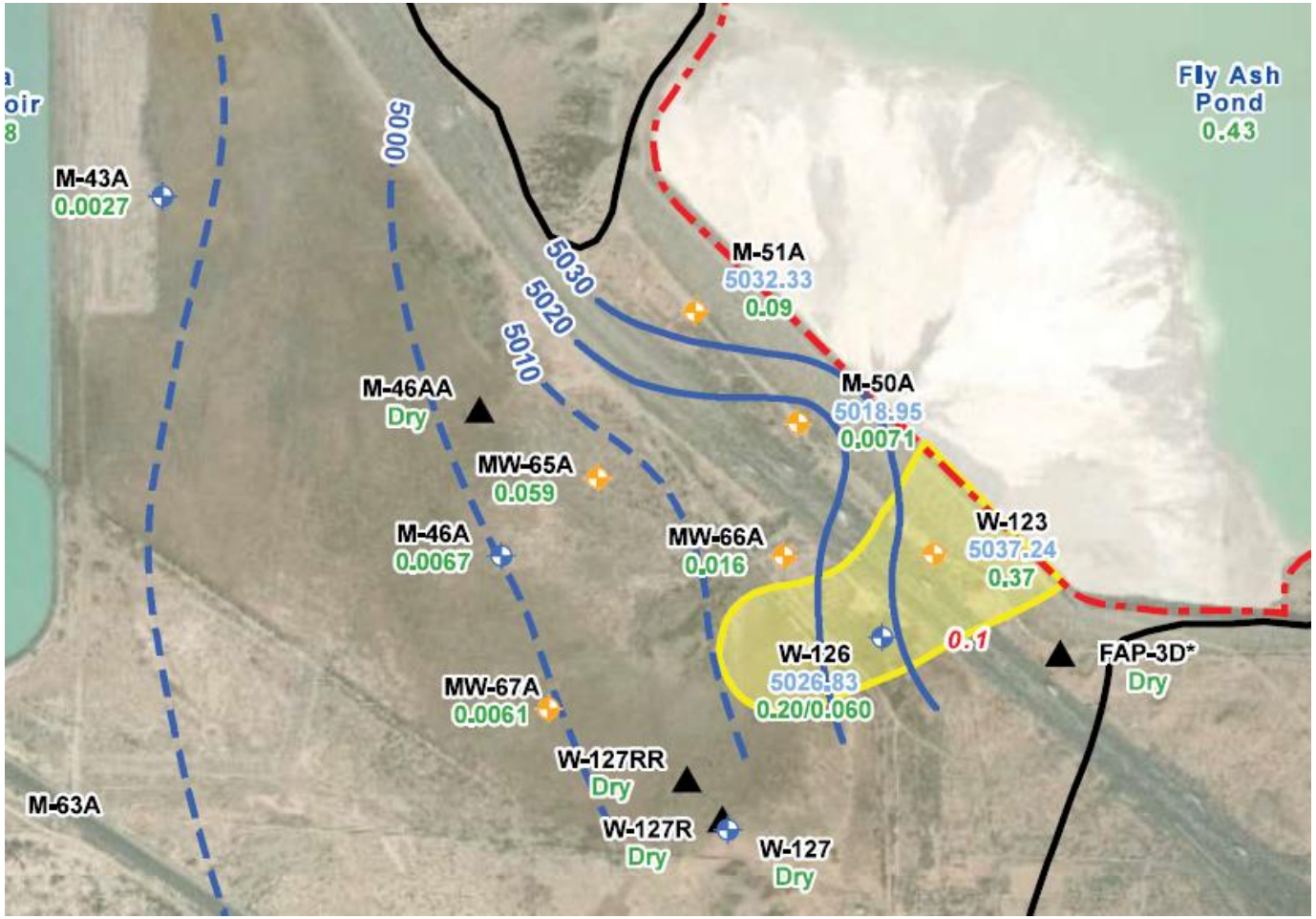

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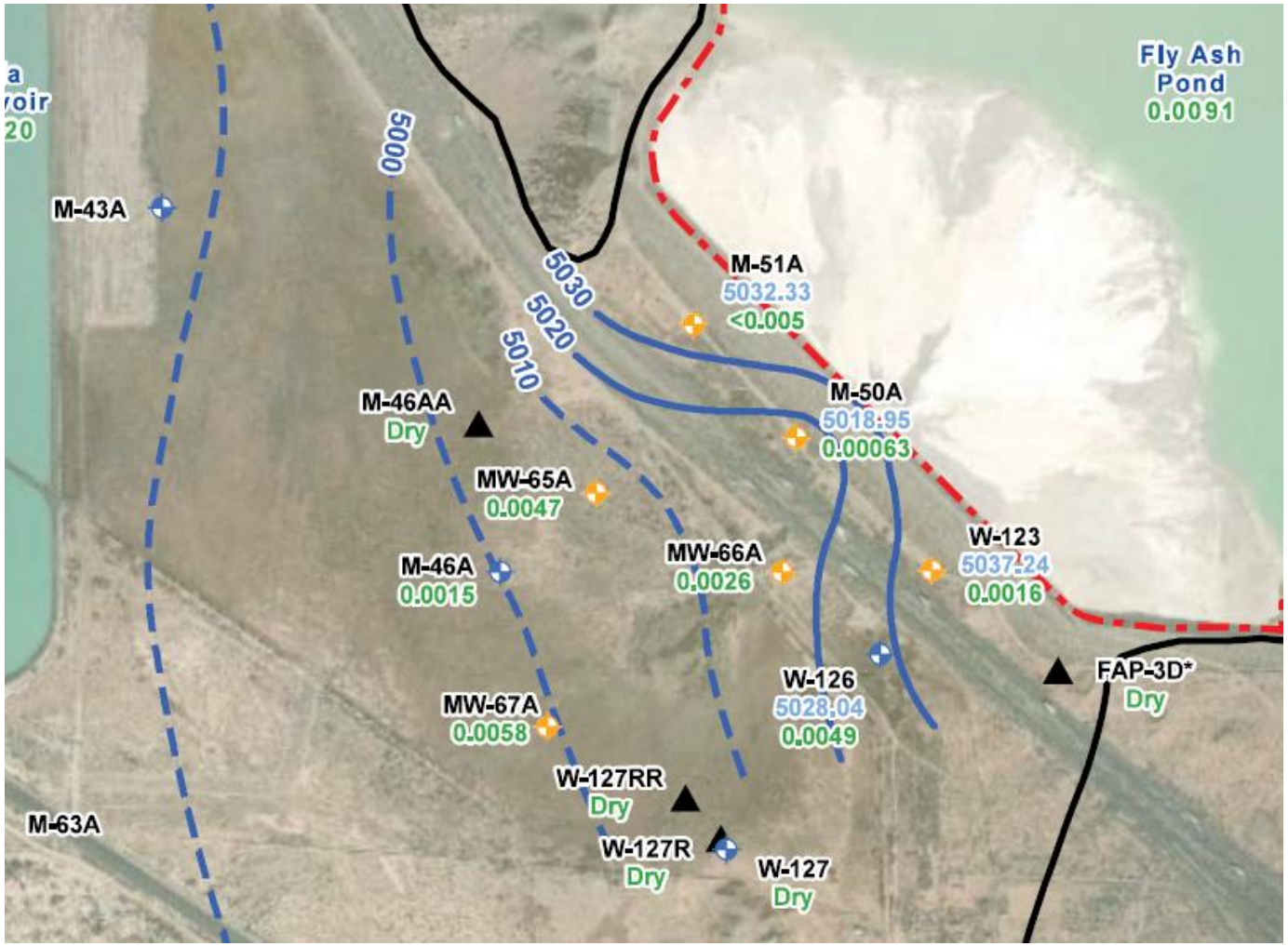
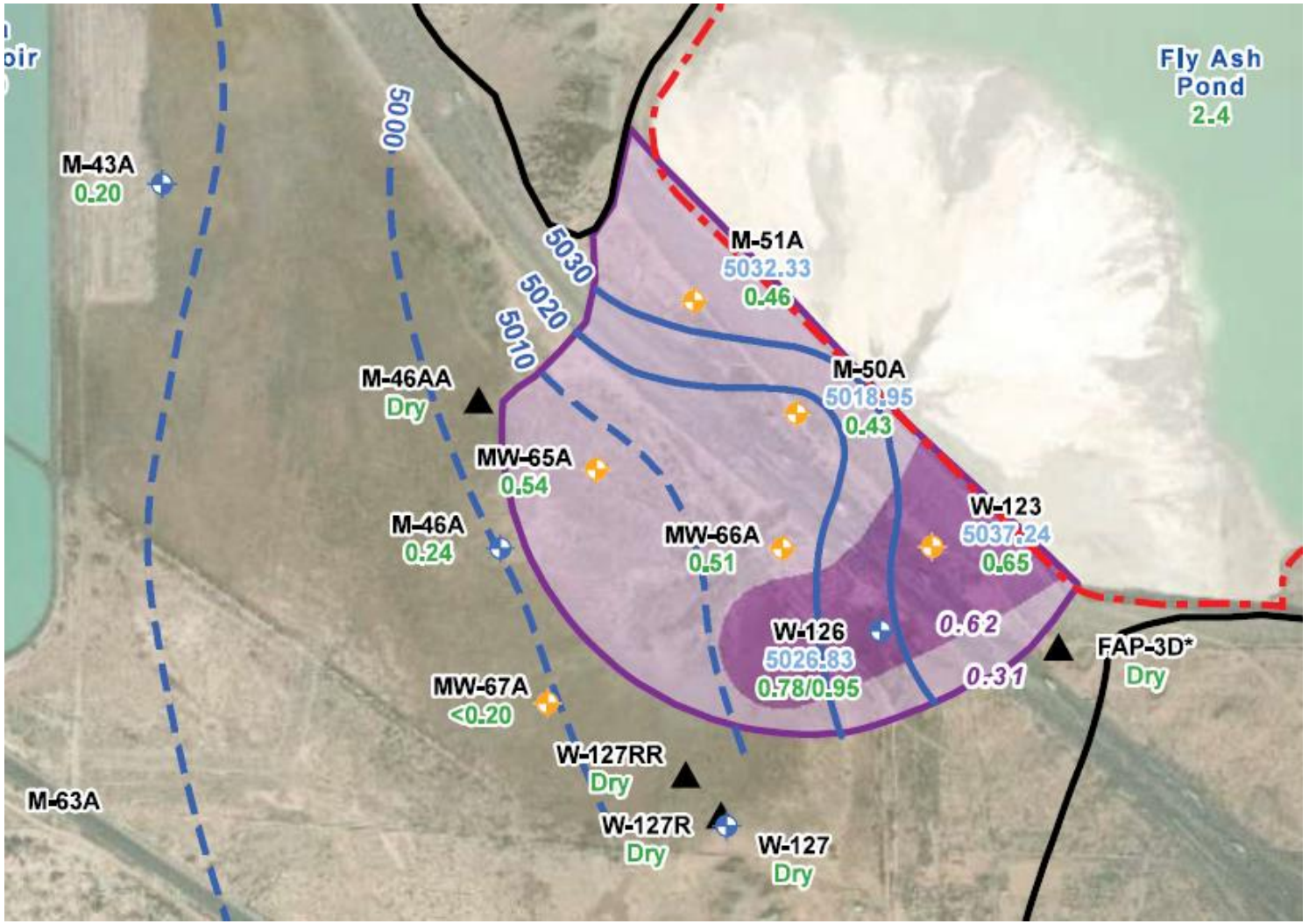


Constituent 5



Characterization of release - narrative

In a different 2019 ACM, groundwater data collected to characterize site conditions after a cobalt release included:

- Concentrations of cobalt exceeded the GWPS (0.0564 mg/l) in all CCR monitoring wells except MW-7 on at least one occasion since October 2016 (Figure X). In May 2019, all wells except MW-7 detected cobalt above the GWPS. A sample from the adjacent surface water body in May 2019 did not detect cobalt (<.003 mg/l). Cobalt is likely present as Co^{+2} based on pH and Eh data (Figure Y).

The following soil data and analysis were also presented:

- Cobalt: Total cobalt in soil ranged from 1.68 – 6.29 mg/kg. The environmentally-available fraction ranged from 1.4 mg/kg (SB-3) to 4.39 mg/kg (SB-2), representing 58%-83% of total cobalt. Most environmentally-available cobalt was present in the metal hydroxide fractions in SB-1 and SB-2, and the largest proportion of exchangeable cobalt was present in SB-3.

Characterization of site conditions (GW) - narrative

In that same 2019 ACM, groundwater data collected to characterize site conditions included:

- Each GW sample was analyzed for pH, dissolved oxygen, oxidation reduction potential (ORP), conductivity and temperature. These parameters were used to evaluate geochemical conditions in the groundwater and support modeling.
- Oxidized iron (ferric iron, Fe^{+3}) concentrations varied, ranging from non-detect (<0.05 mg/l) to 8.81 mg/l in May 2019 (Appendix X). Reduced iron (Fe^{+2}) concentrations were non-detect (<0.05 mg/l) at all CCR monitoring wells except MW-1 and MW-2. The highest concentration of Fe^{+2} was 49.5 mg/l in MW-1, over 40 times more than any other well. This value corresponded to the highest measurements of beryllium, cobalt and lithium in the Ash Pond area.

Characterization of site conditions (soil) - narrative

In that same 2019 ACM, the following soil data and analysis were presented:

- Iron: While not a COI, iron and its minerals commonly represent one of the most abundant reservoirs for metal/metalloid attenuation in soils (Dzombak and Morel 1990; Smith 1999). Iron was present in all soil samples analyzed, varying from 5,192 (SB-3) to 13,933 (SB-2). In all samples, the non-environmentally available (sulfide and residual) fractions accounted for the largest proportion of total iron (54% to 64%) and, as such, most of the iron is not environmentally available. The remainder of the iron in the samples is present across the exchangeable (except SB-1), carbonate (only in SB-2), amorphous metal, and metal hydroxide phases.
- Aluminum: Aluminum is not a COI at the site, but it has been well studied as a sorbing medium in soils (e.g., Karamalidis and Dzombak 2011). Total aluminum in soils ranged from 14,244 to 33,160 mg/kg, and the environmentally-available fraction ranged from 1,044 at SB-3 to 1,989 mg/kg at SB-2. Aluminum in the soil at the site is, therefore, largely (~84% to 87%) present in the residual, or silicate-bound fraction. This fraction is likely as least partially represented by hydrous aluminum phyllosilicate.

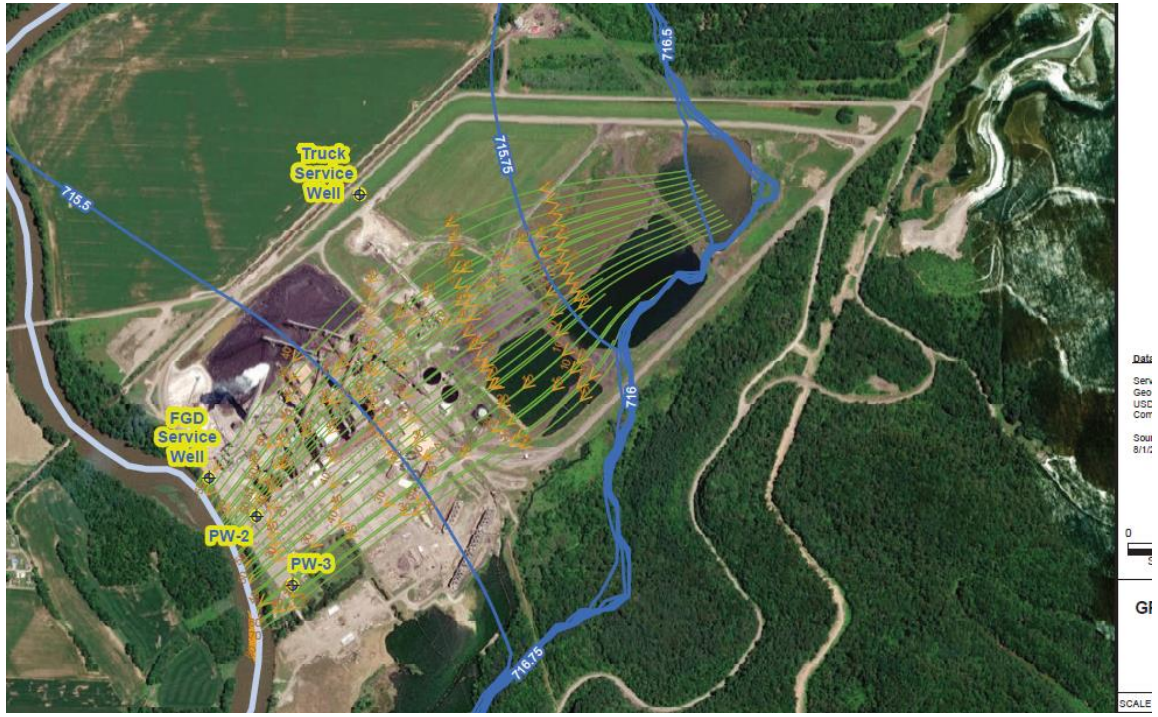
Range of Corrective Measures

- Potential Groundwater Corrective Measures
- The following presents a summary of potential groundwater corrective measures evaluated as part of this ACM. Based on site-specific information and knowledge of corrective alternatives, the following remedies—or combination of remedies—are being considered using the evaluation criteria specified in 40 CFR 257.96(c):
  - Monitored natural attenuation (MNA)
  - Hydraulic containment
    - Pump-and-treat
  - Permeable reactive barrier (PRB) walls
  - Vertical barrier walls
  - Geochemical manipulation (in situ injection)
  - Permeation grouting
  - In situ solidification/stabilization (ISS)

Predicting future flow conditions after closure

Narrative:

- After the constant heads are removed from the CCR unit and pumping of production wells has ceased, the model predicts a significantly reduced gradient of approximately 0.0001 and flow that is primarily to the south, southwest with travel times on the order of 40 to 50 years from the surface impoundments to the river.



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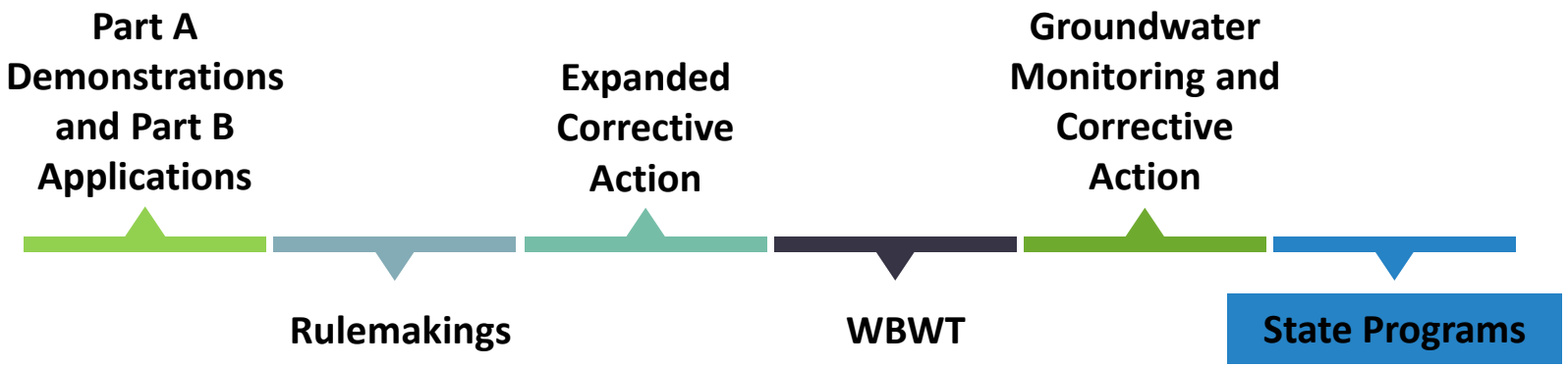

State Programs

Our state partners are critical in achieving our mission.

- EPA knows that there have been real challenges in moving state programs forward in a changing environment.
- While we expect to issue additional rules for CCR operations, such as the federal permit rule and the legacy rule, we continue to encourage the states to move forward with program approvals.
- EPA has been working with about 20 states on drafting regulations and state CCR permit program application packages, as states are in various stages of their regulatory processes.

Public Participation Guidelines

40 CFR 239.6

- Used in MSWLF Regs
- Requires documents for permit determinations are made available for review and comment, final determinations on permit applications are made known to public and the state shall ensure that public comments on permit determinations are considered.

CCR State Permit Program Interim Final Guidance Document

- Provides that documents are made available for public review and comment, final determinations on permit applications are made known to the public and public comments are considered.
- Also states that public participation is integral to a permitting program. Mentions open dialogue, outreach, environmental justice, technical assistance needs, using traditional and new media effectively, etc.

40 CFR Part 124 Subpart A

- Included in EPA Proposed Federal CCR Permit Program Rule.
- May be a good starting point for states developing/submitting permitting program.
- More recent (and therefore more robust than 239.6) and would likely result in less need for the state to come in with a revised program once federal permitting rule goes final.

Public Participation, continued

Public Participation Core Components

- Public notice of pending and final decisions
- Documents made available for review
- Public comment period
- Public meeting or hearing
- Translation services

Public Participation, continued

- EPA recommends that States offer public participation opportunities at various stages in the permitting process:
  - Permit application
  - Draft permit
  - Final permit
  - Major permit modifications
- EPA suggests that states provide the same public participation for major modifications as for draft permits
- Definition of what constitutes a “major” modification should be considered
  - Ideally, a state permitting program would provide for public participation for any modification that is not purely administrative or ministerial and that could impact the protection of human health and the environment.
  - See Federal CCR permit program proposed rule permit modification language in *§* 257.151 that lists examples

STAG Funding

- To provide assistance to the states for CCR permit programs, Congress appropriated 3 million dollars in FY 2021 and 4 million in FY 2022 in State and Tribal Assistance Grant funding.
- The Agency is completing the program design requirements and we expect to solicit applications from eligible states in late 2022 or early 2023.
- Current Schedule:
  - August 2022: Draft Program Guidance under review by OGC/OGD
  - September 2022: LCRD DDs to send letter and guidance to states requesting confirmation of participation in program
  - October/November: Regions send confirmed States link for applying and allocation amount. Regions work with states on workplan commitments/required application materials
  - December 2022/January 2023: Regions award grants

Questions?

We welcome any questions at this time.

- HQ contact information
  - Richard Huggins- huggins.richard@epa.gov Office of Resource Conservation and Recovery
  - Mary Jackson- jackson.mary@epa.gov Office of Resource Conservation and Recovery
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