REINHOLD ENVIRONMENTAL Ltd.

2017 APC & Wastewater Round Table & Expo Presentation

July 17 & 18, 2017 in Charlotte, NC / Hosted by Duke Energy

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CCR Industry Overview

A View from the Websites – Part 1

Agenda

01 Perception of CCR management at the onset of the CCR Rules

02 What is the reality of CCR management today?

03 What does tomorrow hold for CCR Units?

04 The future of CCR management — how will it change?

Then

Perception of CCR Management at the onset of the CCR Rules

There were numerous ponds holding CCRs

Disney World is approx 47 mi^2

2012

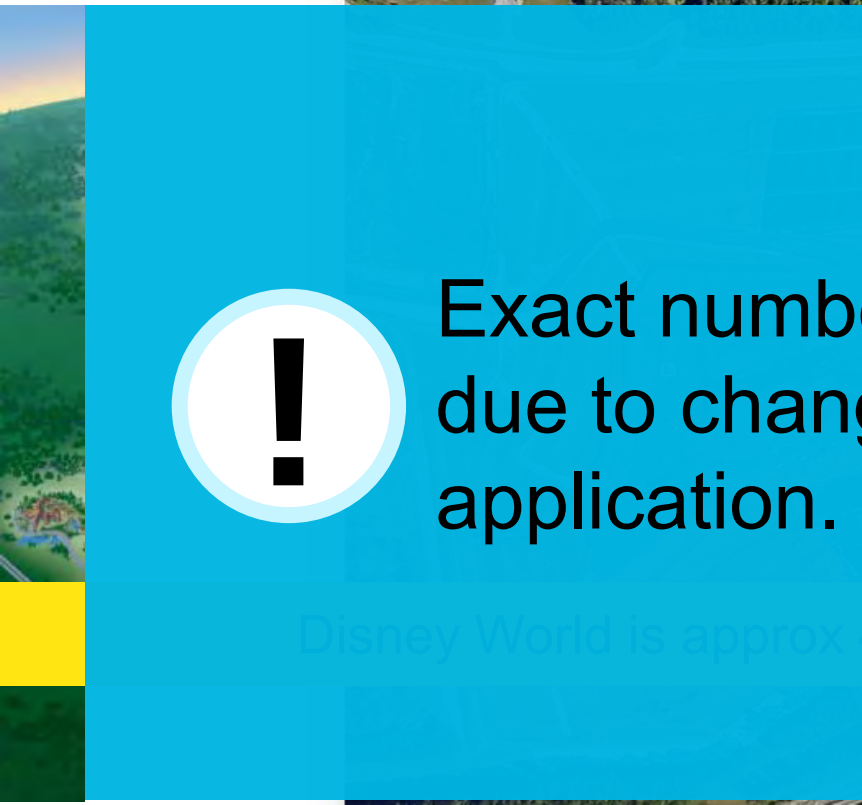
653 Impoundments;
~300 Landfills

>32,000 acres or **50** square miles

OM

Perception of CCR Management at the onset of the CCR Rules

There were numerous ponds holding CCRs



Exact number of impoundments shifts due to changing definitions and application.

Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards

Continual efforts to assess CCR units proves to find safe, stable structures.

Review ca
of failure

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Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Review causes of failure | EPA Site Assessments | CCR Rule

Failure in the wet stack's dike

Failure in an abandoned pipe

Aerial view of unlined coal ash pond at retired North Carolina power plant and the contaminated Dan River (Credit: Waterkeeper Alliance)

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Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Review causes of failure | **EPA Site Assessments** | CCR Rule

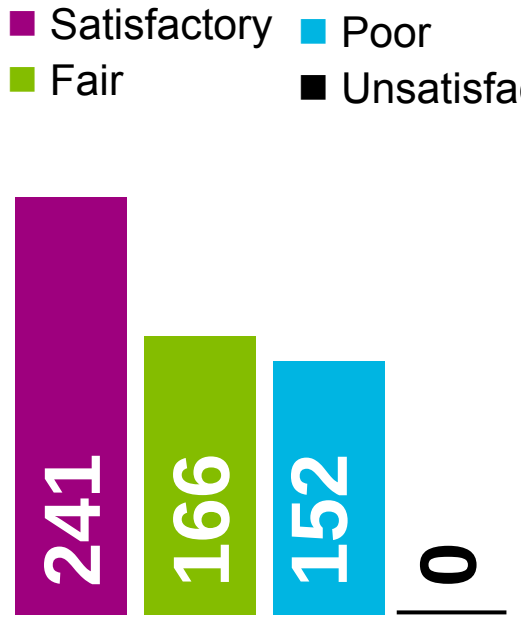
559 Total number of units reviewed

235 Facilities with 559 impoundments surveyed

Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Review causes of failure | **EPA Site Assessments** | CCR Rule



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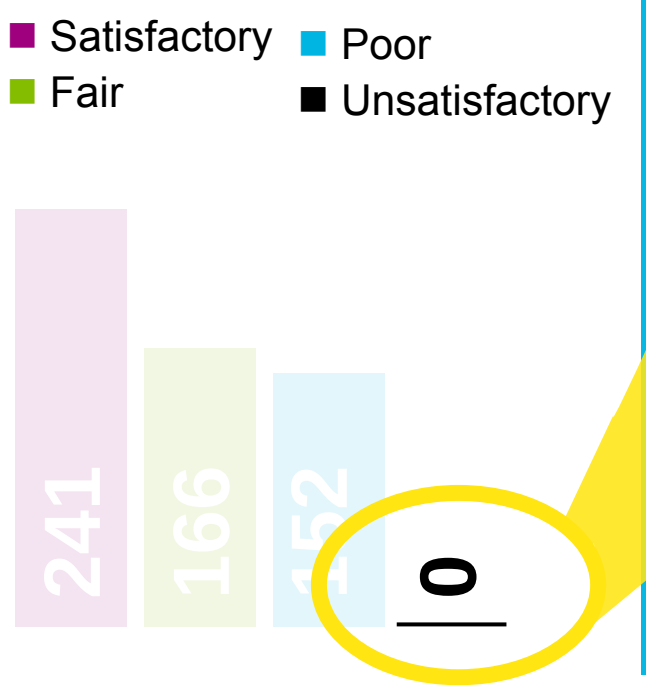
Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Review causes of failure | **EPA Site Assessments** | CCR Rule



"Expert experience has shown that only impoundments rated as **"unsatisfactory"** pose immediate safety threats". Additionally, ratings such as fair or poor may be due to **lack of information** available at the time.

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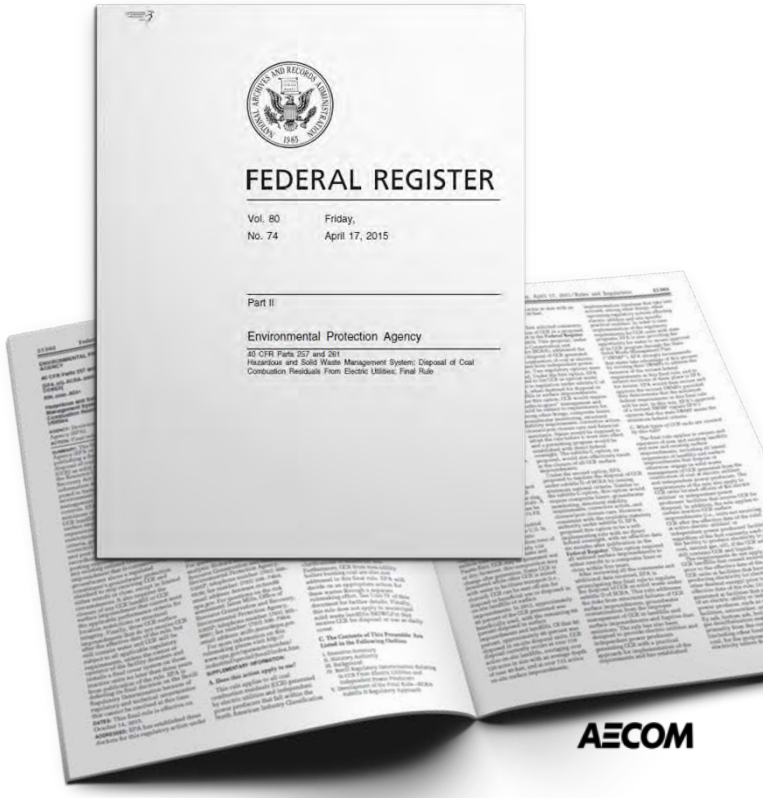
Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Review causes of failure | EPA Site Assessments | **CCR Rule**

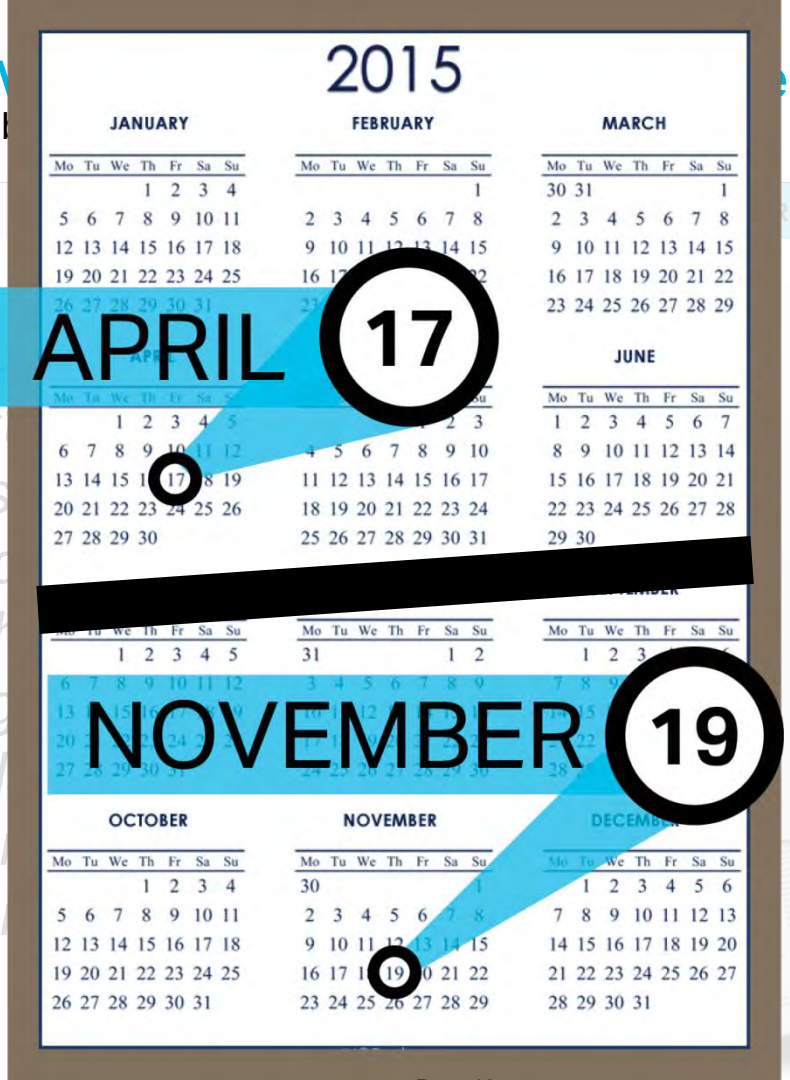
"This rule addresses the risks from structural failures of CCR surface impoundments, groundwater contamination from the improper management of CCR in landfills and surface impoundments and fugitive dust emissions."



Perception of CCR M… …e CCR Rules

CCR impoundments are unstab…

Review causes of failure …Rule



FEDERAL REGISTER

Environmental Protection Agency

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Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

Continual efforts to assess CCR units proves to find safe, stable structures.

Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

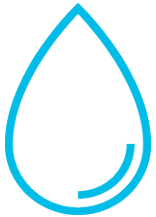
2016

October

Safety factor

2017

October 2017-July 2018



Ground water

2018

October

Location restrictions

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Perception of CCR Management at the onset of the CCR Rules

CCR impoundments are unstable based on today's standards?

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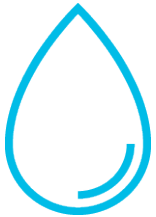

Ground water

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October

Location restrictions

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Perception of CCR Management at the onset of the CCR Rules

Beneficial use

Prior to 2009, EPA promoted beneficial use (C2P2)

Encapsulated vs unencapsulated discussion is borne

Concerns arose over “other” uses not managed well

Causes a decrease in the rise of beneficial use

SEE SURVEY

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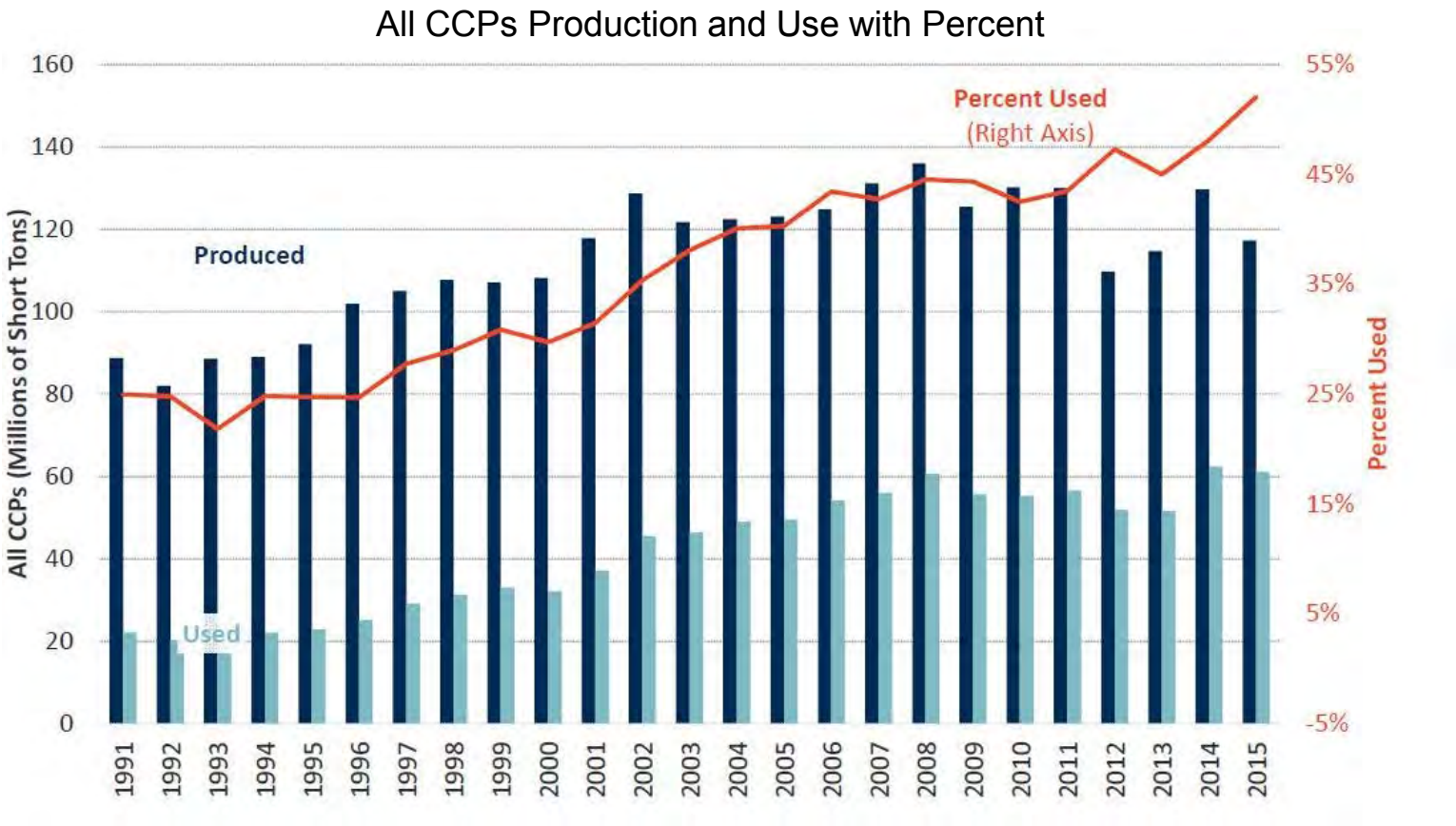
Perception of CCR Management at the onset of the CCR Rules

Beneficial use



Perception of CCR Management at the onset of the CCR Rules

Beneficial use

Beneficial use was difficult and pending regulatory action stalled successful growth.

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Perception of CCR Management at the onset of the CCR Rules

There will be exceptions

- **Ponds, beneficial use applications, and more.**
- **But so far, they are few!**

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Now

What is the reality of CCR management today?

CCR Units by the Numbers

2009

676 surface impoundments at **240** facilities

2012

653 impoundments; ~300 landfills **>32,000** acres or **50** square miles

2016

497 impoundments **>22,000** acres or **35** square miles

- **Reduction of ~25% in number and ~30% in area**
  - **Definitions in final rule**
  - **Closed ponds**

What is the reality of CCR management today?

CCR Units by the Numbers

35 square miles is slightly bigger than St Thomas Island (31.2 mi2)

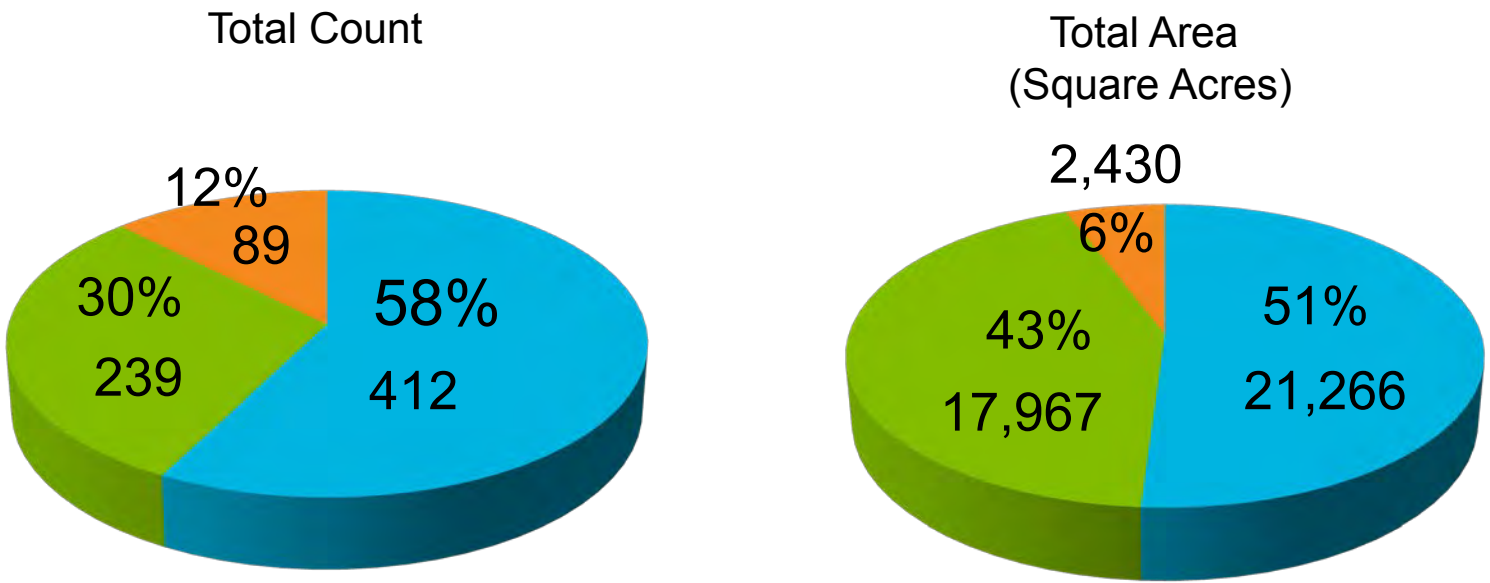
2016

497 impoundments

35 square miles

What is the reality of CCR management today?

CCR Units by the Numbers



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What is the reality of CCR management today?

What does the layout of CCR units really look like?

2016 figures:

Landfills

450,031,622 cu yd

100x

the volume of concrete in the Hoover Dam

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What is the reality of CCR management today?

What does the layout of CCR units really look like?

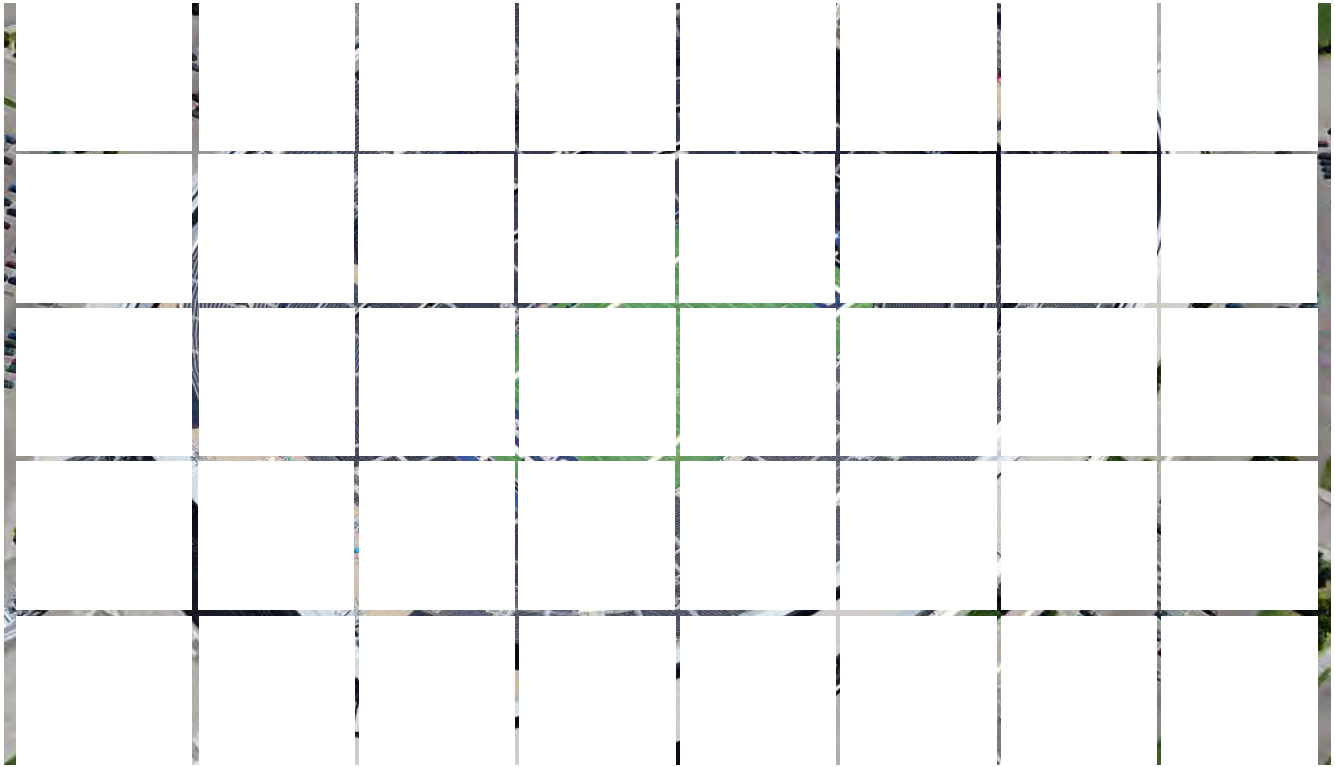
2016 figures:

Surface impoundments

1,068,038,423 cu yd

SI would fill the new Dallas Cowboys Stadium—the largest in the NFL—over

277x



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What is the reality of CCR management today?

What does the layout of CCR units really look like?

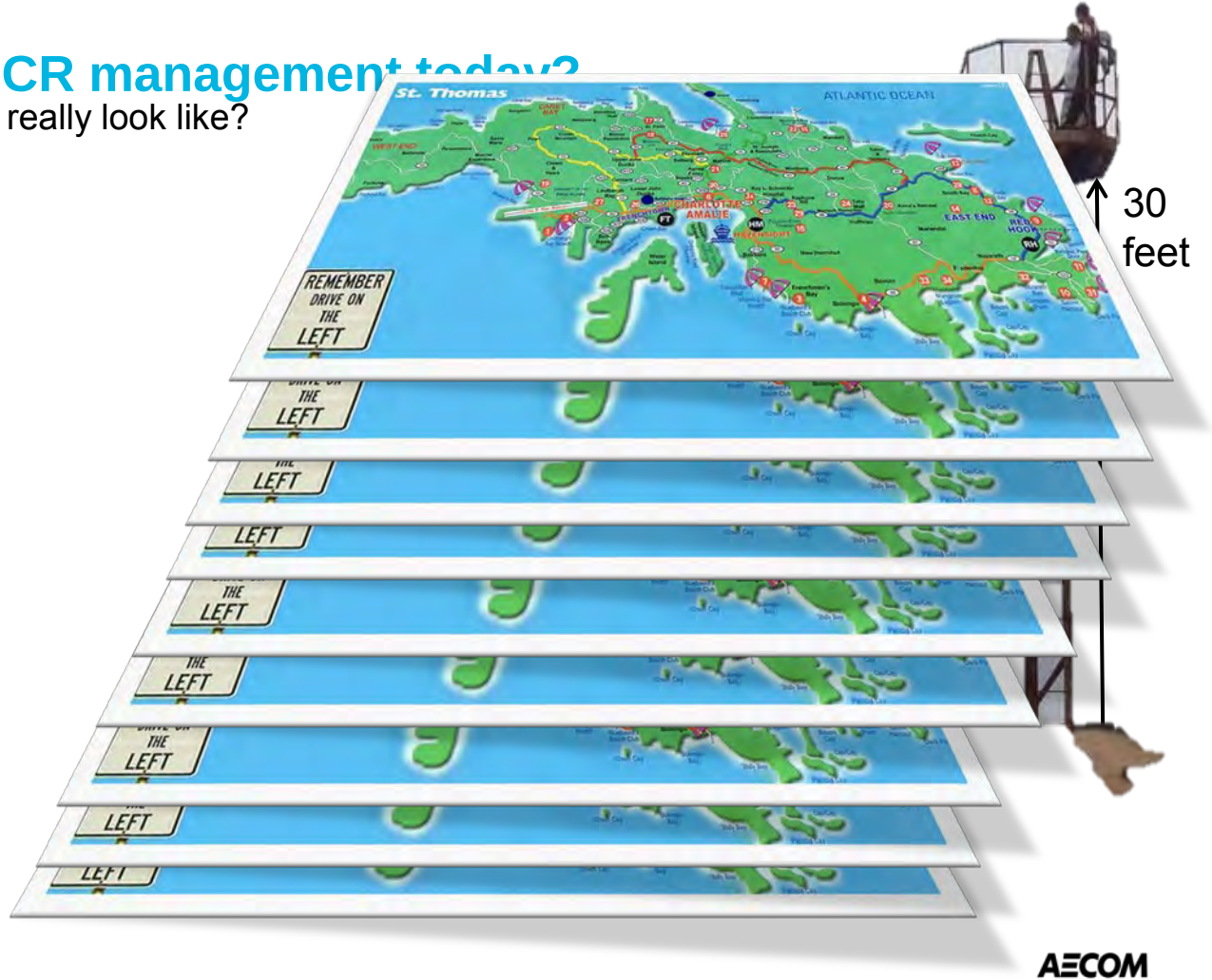
2016 figures:

Surface impoundments

1,068,038,423 cu yd

…would fill the overall footprint (22,000 acres) for SIs to a thickness of

30 ft



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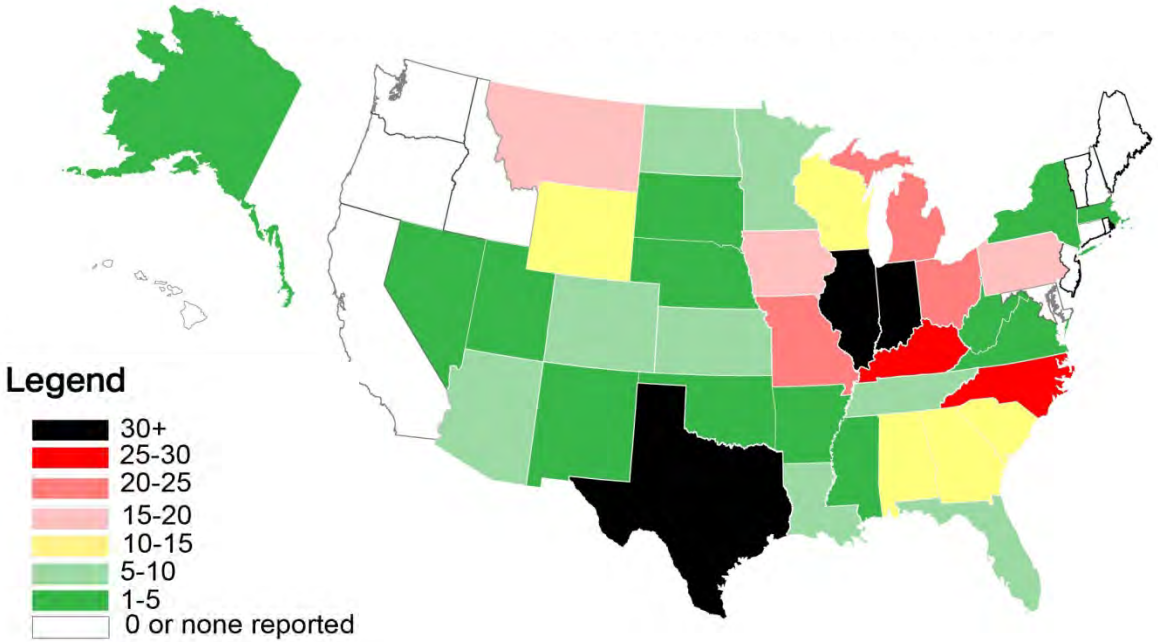
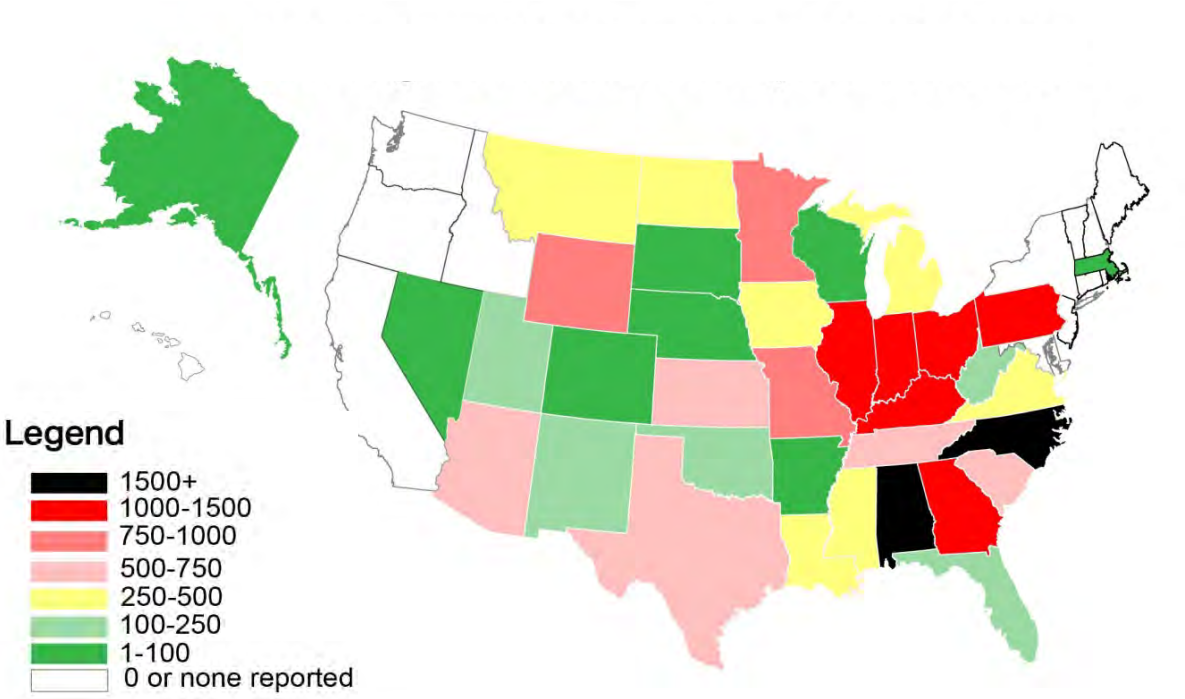


Count of surface impoundments		
Rank	**State**	**Count**
1	Texas	38
2	Indiana	35
3	Illinois	31
4	Kentucky	26
5	North Carolina	25
6	Missouri	22
7	Ohio	22
8	Michigan	21
9	Iowa	17
10	Montana	15

Heavy focus in the Midwest based on number.

What is the reality of CCR management today?

What does the layout of CCR units really look like?



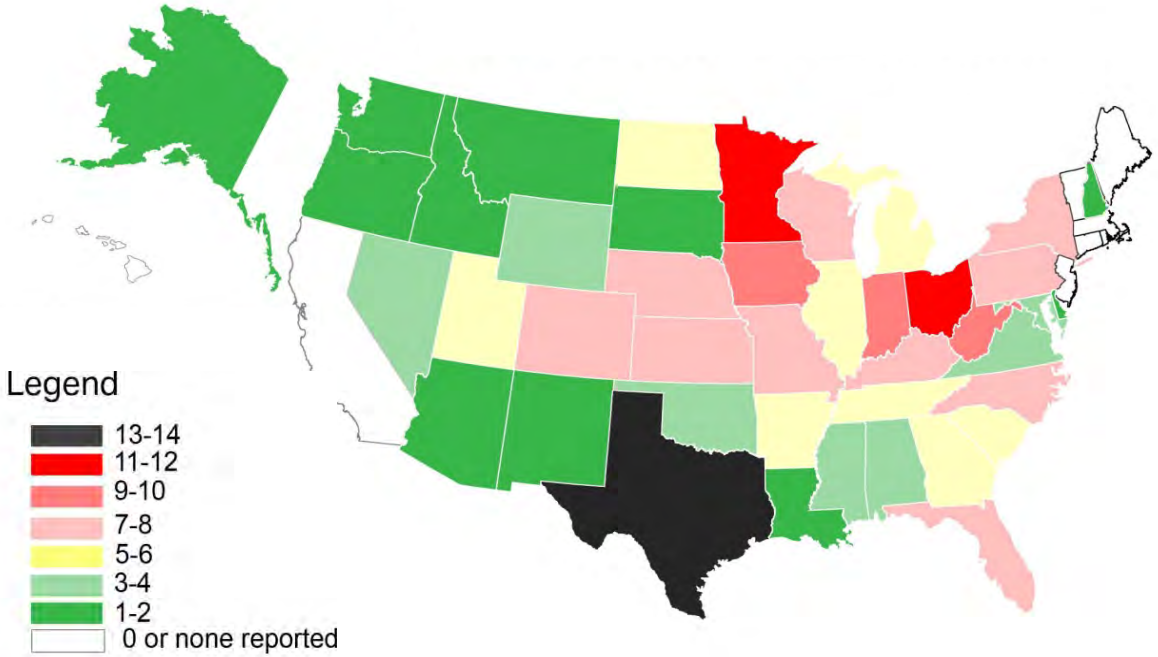
Acreage of surface impoundments		
Rank	**State**	**Approx Acres**
1	Alabama	2300
2	North Carolina	2000
3	Illinois	1460
4	Kentucky	1410
5	Georgia	1390
6	Indiana	1250
7	Ohio	1200
8	Pennsylvania	1180
9	Missouri	890
10	Wyoming	870

Heavy focus in the Midwest again.

Note that Texas and other states dropped off…many but relatively small ponds.

What is the reality of CCR management today?

What does the layout of CCR units really look like?

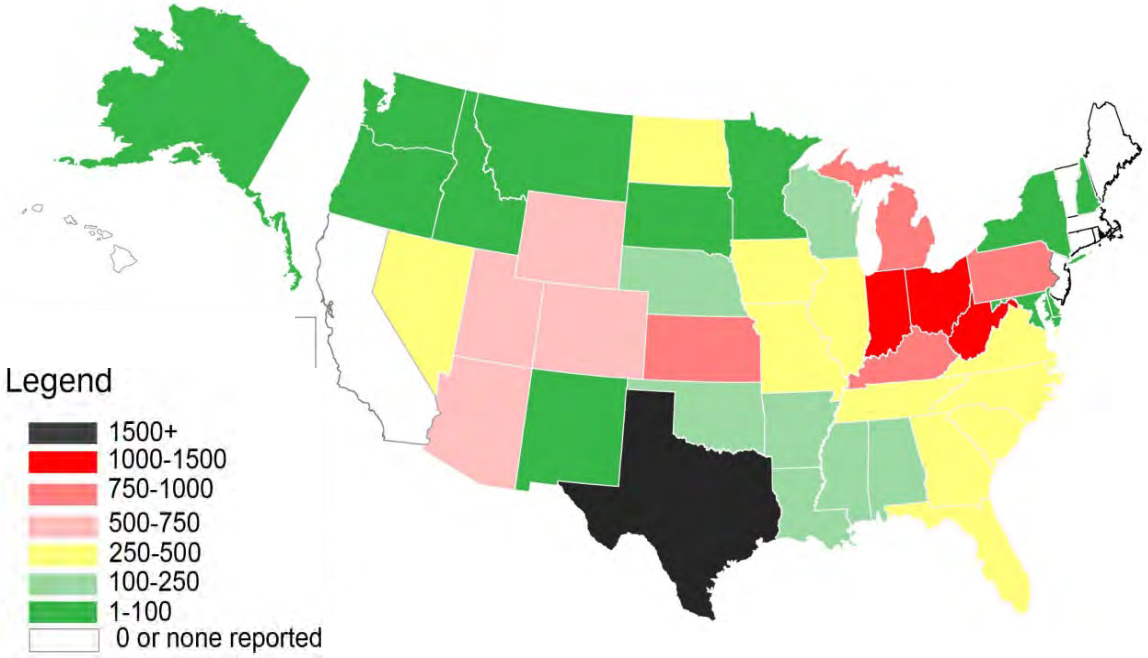


Concentration of landfills		
Rank	**State**	**Count**
1	Texas	14
2	Minnesota	11
3	Ohio	11
4	Indiana	9
5	Iowa	9
6	West Virginia	9
7	Kentucky	8
8	North Carolina	8
9	Pennsylvania	8
10	Wisconsin	8

Heavy focus in the Midwest based on number and Texas.

What is the reality of CCR management today?

What does the layout of CCR units really look like?



Acreage of landfills		
Rank	**State**	**Approx Acres**
1	Texas	2330
2	West Virginia	1430
3	Indiana	1250
4	Ohio	1060
5	Kentucky	970
6	Pennsylvania	920
7	Kansas	810
8	Colorado	750
9	Arizona	730
10	Utah	700

Heavy focus in the Midwest again.

But the southwest shows a strong landfill footprint.

What is the reality of CCR management today?

Fugitive dusts plans have been put in place

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What is the reality of CCR management today?

CCR Units now have signs

What is the reality of CCR management today?

Weekly/annual site inspections

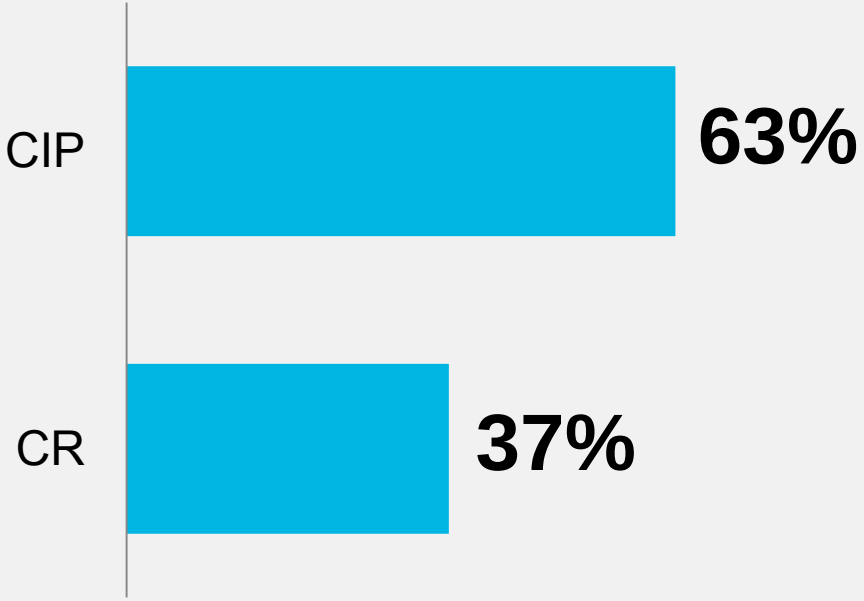
More structure has been established

Issues that exist are being identified sooner

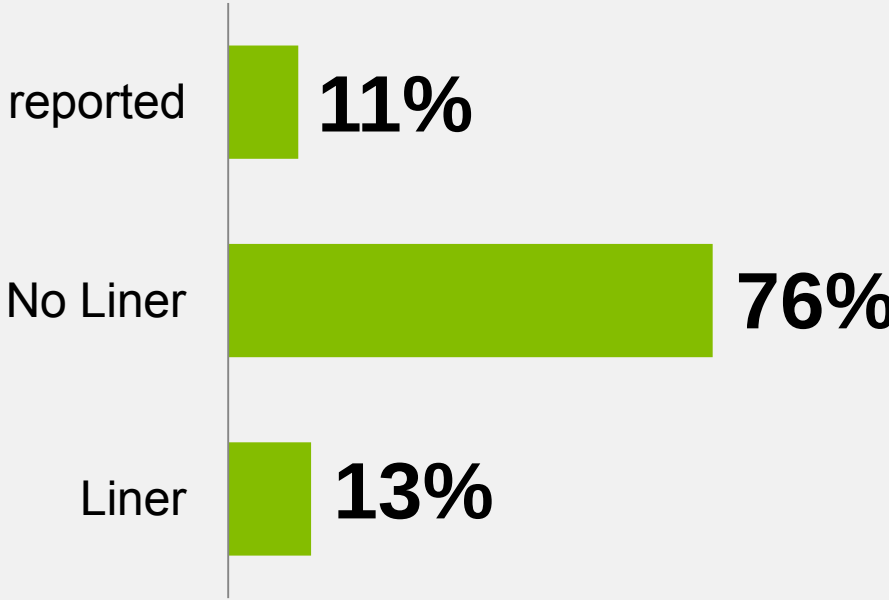
What is the reality of CCR management today?

Lined impoundments

How are they closing?



Does it have a liner?

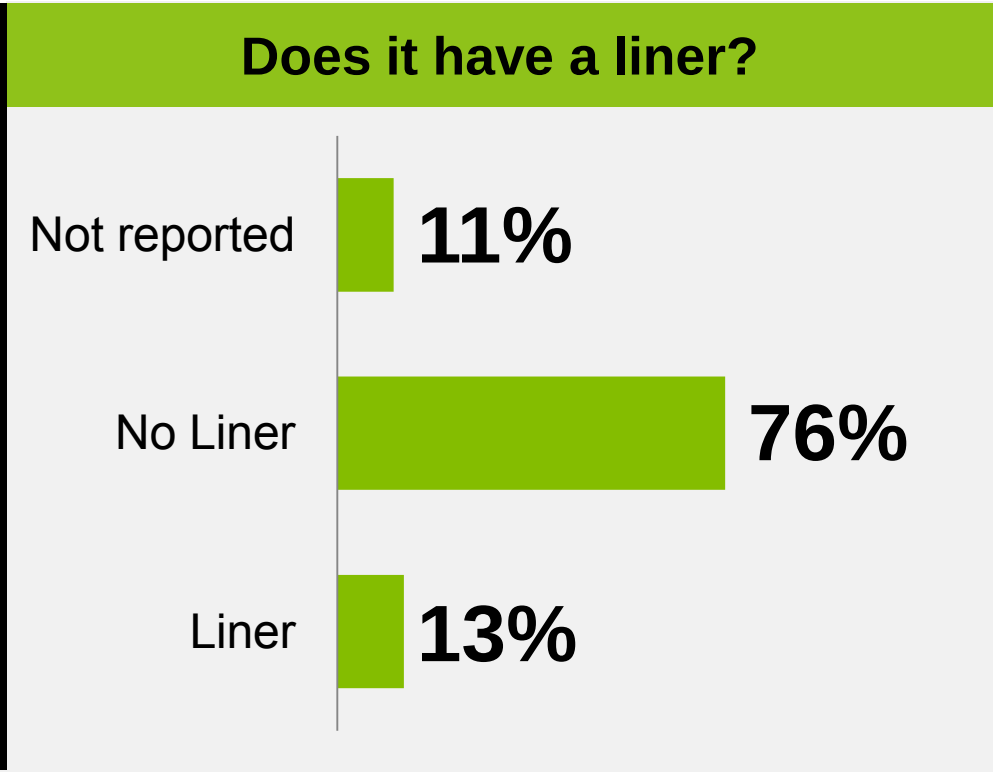


- Includes only surface impoundments that reported closure type

What is the reality of CCR management today?

Lined impoundments

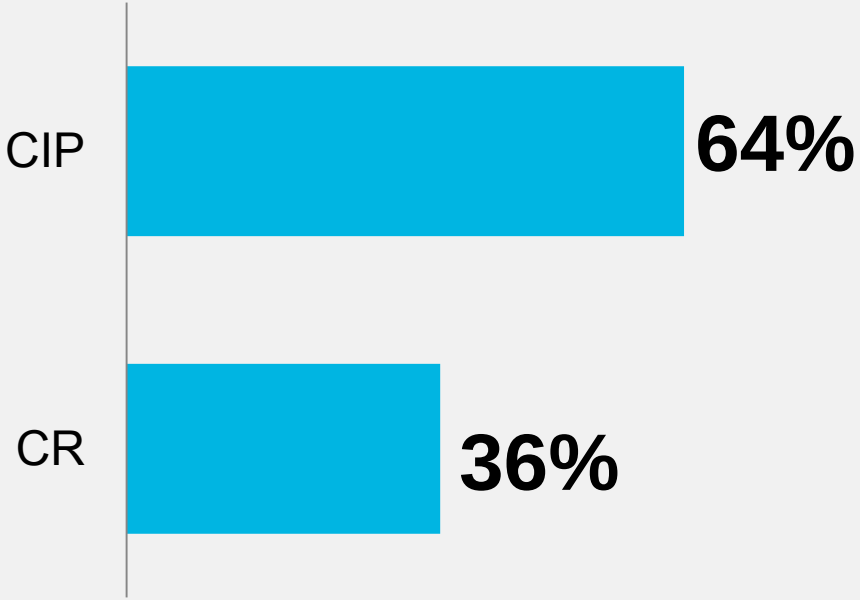
Only 13% of surface impoundments are certified as lined!



What is the reality of CCR management today?

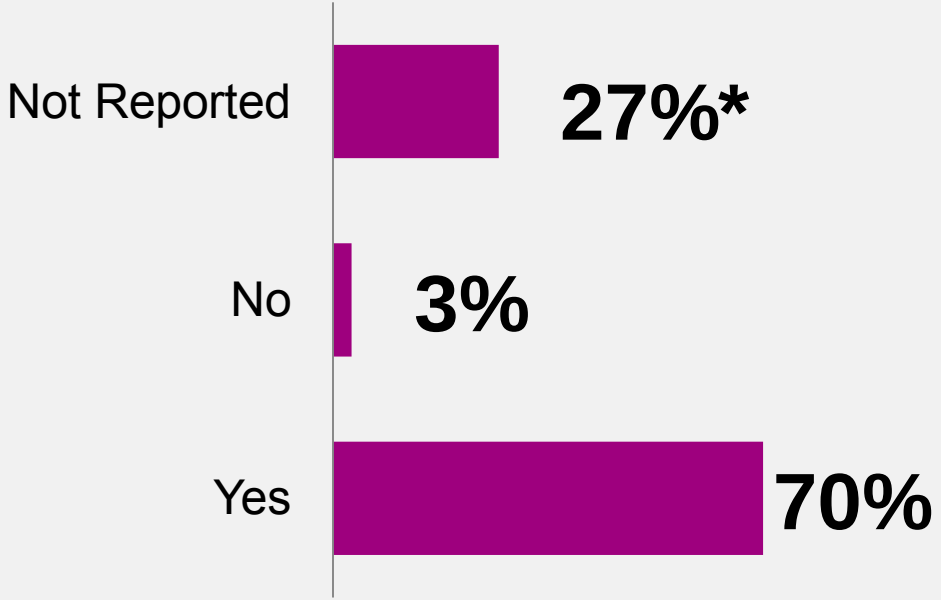
Surface Impoundments Safety factor

How are they closing?



– Only includes the 3% that do not meet safety factors

Does it meet or exceed safety factors?

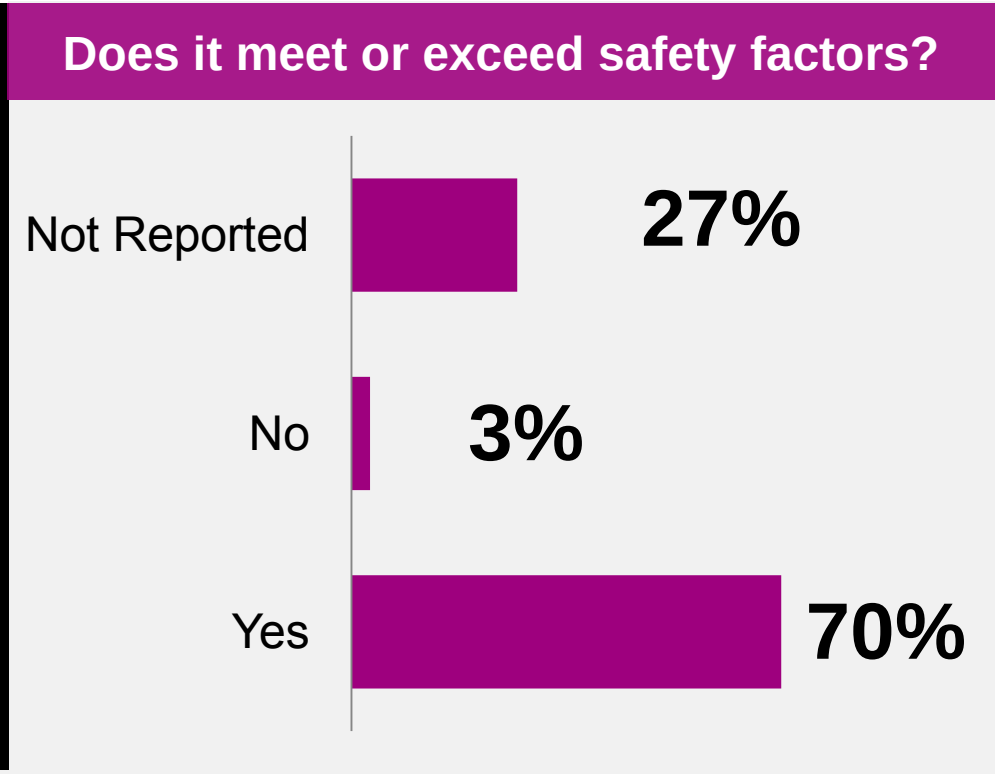


* Likely due to incised SI or similar constraints

What is the reality of CCR management today?

Safety factor

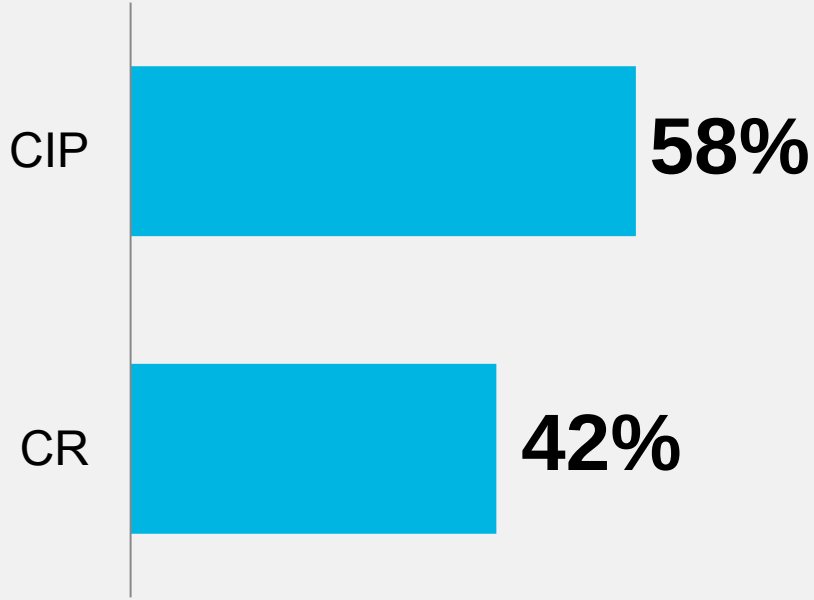
That is only 11 surface impoundments that are closing due to safety factors!



What is the reality of CCR management today?

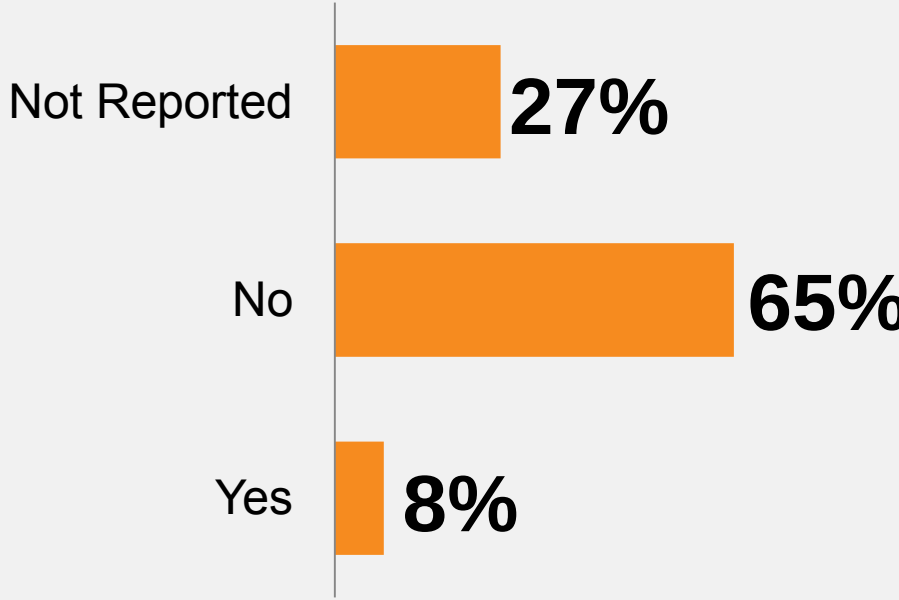
Structural integrity

How are they closing?



- Only includes surface impoundments that reported structural deficiencies

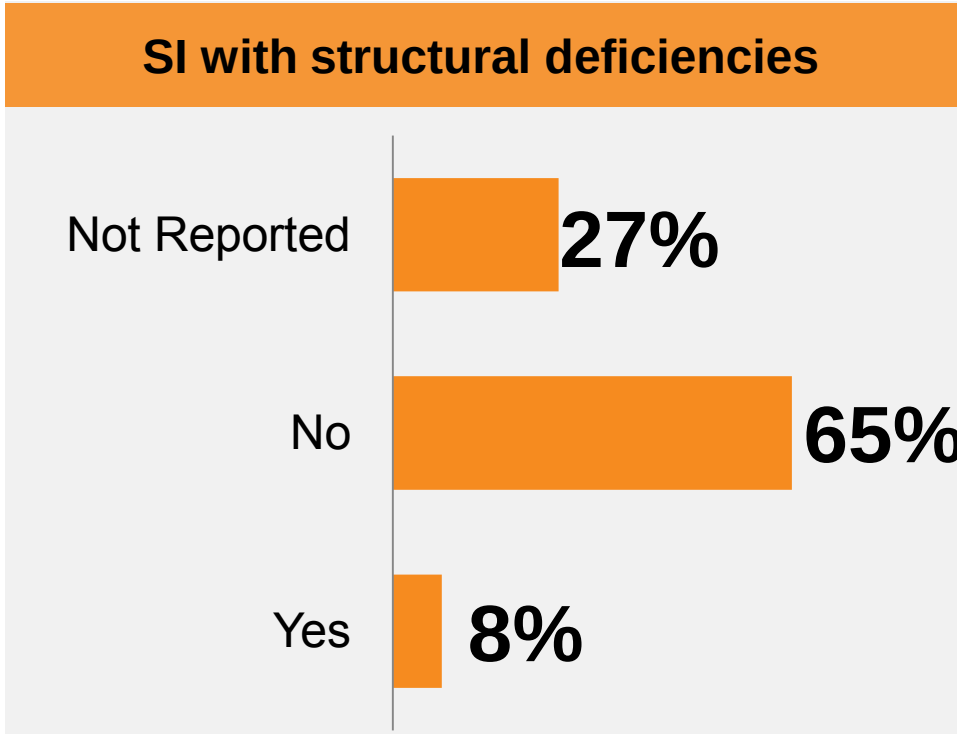
SI with structural deficiencies



What is the reality of CCR management today?

Structural integrity

Only 8% of surface impoundments have noted deficiencies!



What is the reality of CCR management today?

Is the EPA done…what is coming next?

Before Trump EPA era

Court case by petitioners… pending

Motion to Remand → Leading to a revised Rule

ELG Rules

What is the reality of CCR management today?

Is the EPA done…what is coming next?

After Trump EPA era

Court case by petitioners…
still pending

Motion to Remand & revised Rule…
still pending

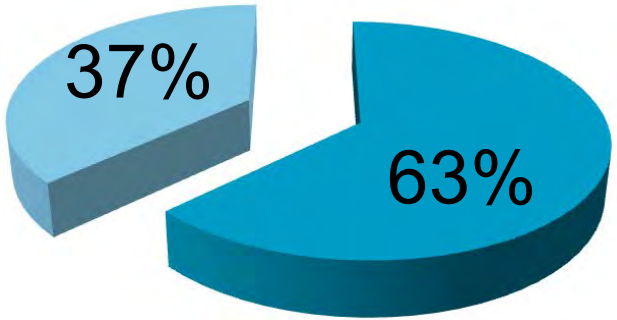
ELG Rules…
STAYED and being reconsidered

What does tomorrow hold for CCR units?

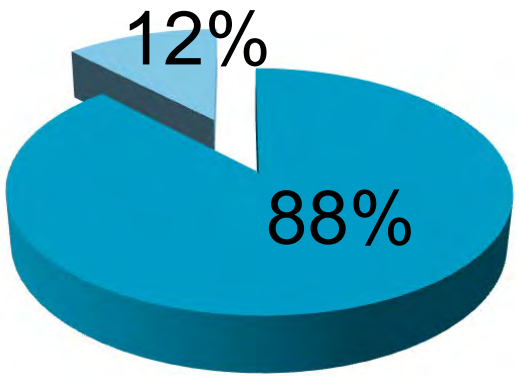
Closure: CR vs CIP

CIP
CR

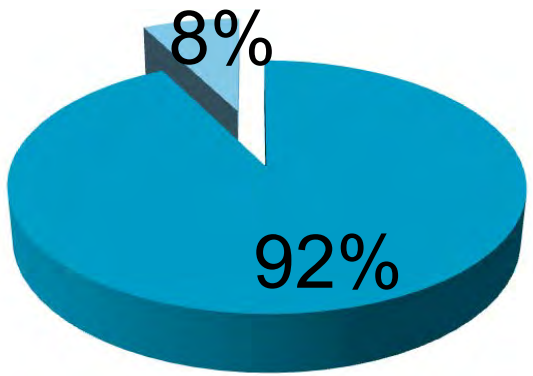
By Count



By Area (acres)



By Volume (cu.yd.)



Including only Surface Impoundments that reported a closure type

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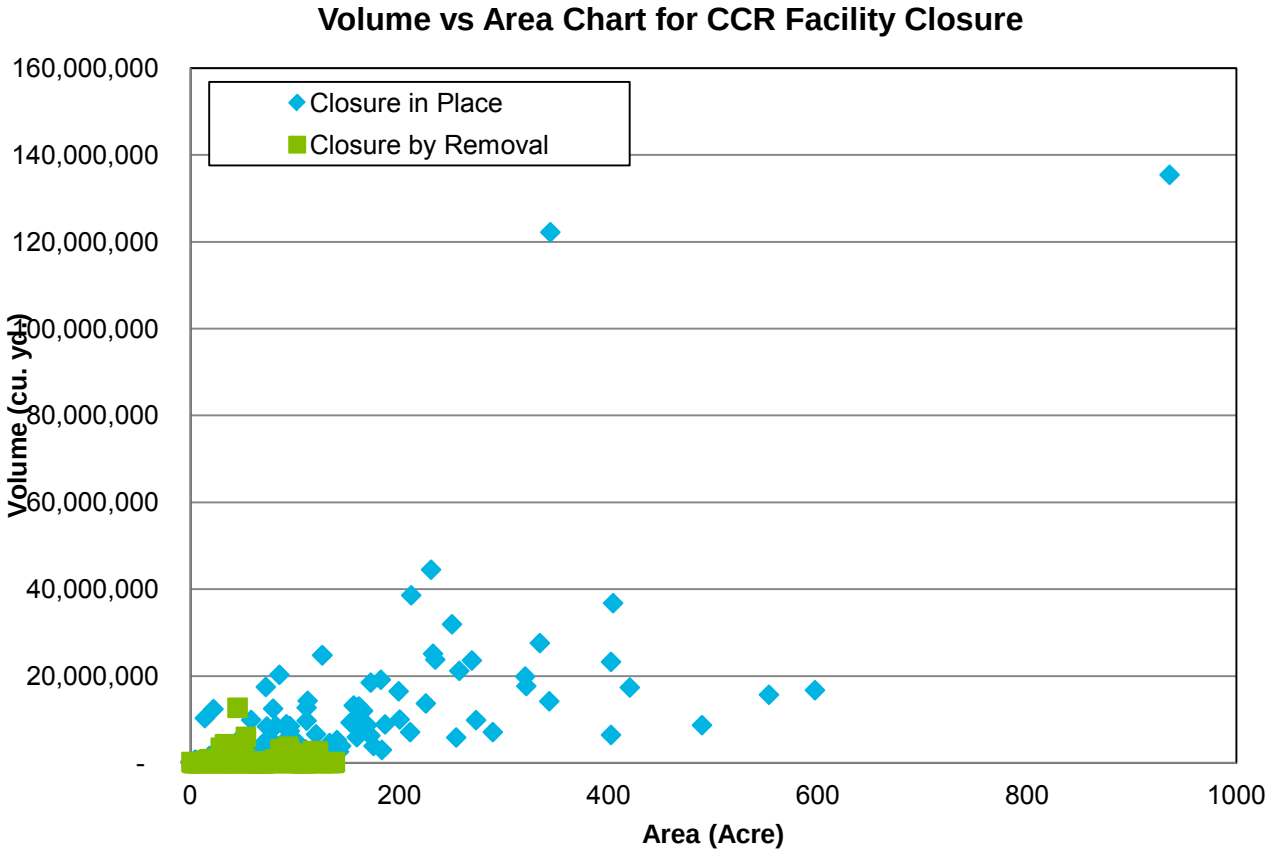
What does tomorrow hold for CCR units?

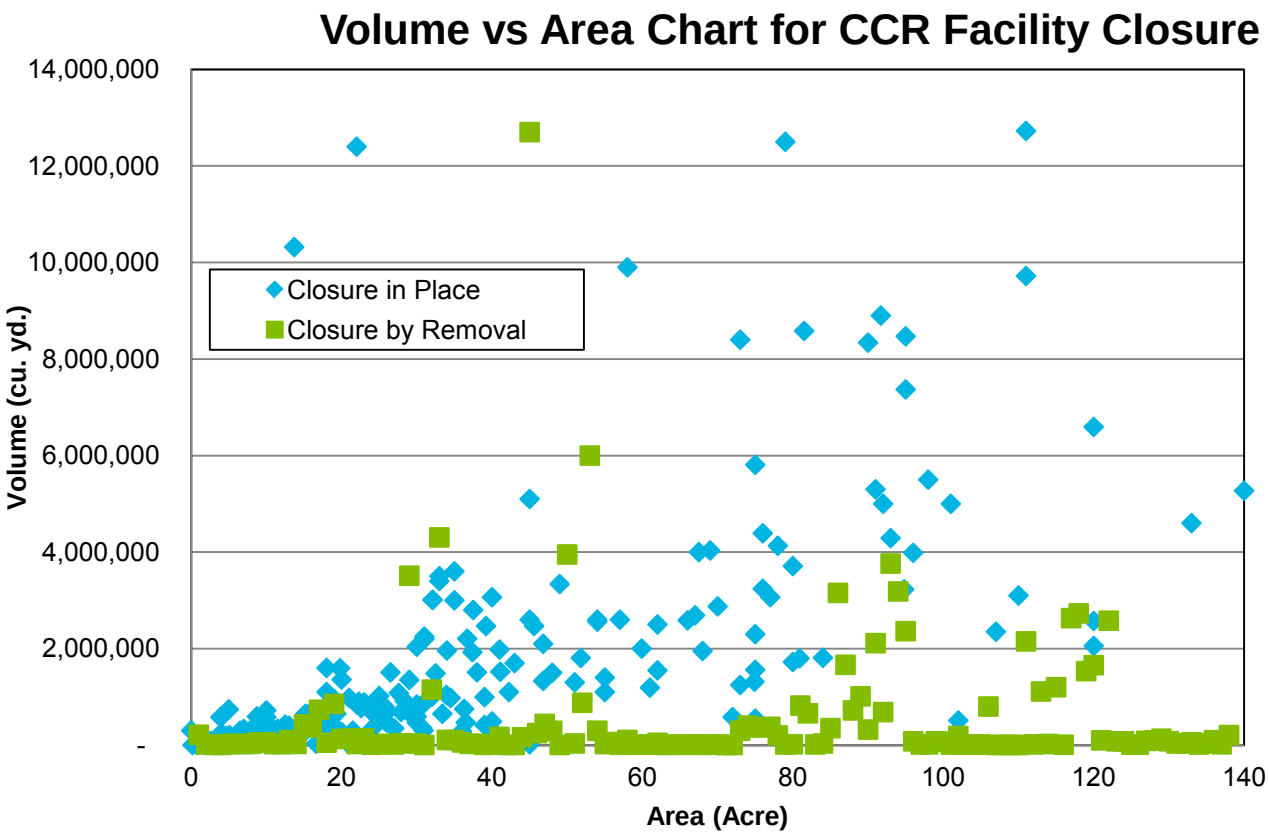
Maximum Volume vs Area – Overall Industry



Observations:

What does tomorrow hold for CCR units?

Maximum Volume vs Area – CR Ponds



Observations:

- Majority of the low volume ponds are CR
- Above 1,000,000 CY, there is a decline in number of CR
- Majority below 200,000 CY
- Ponds less than 140 acres

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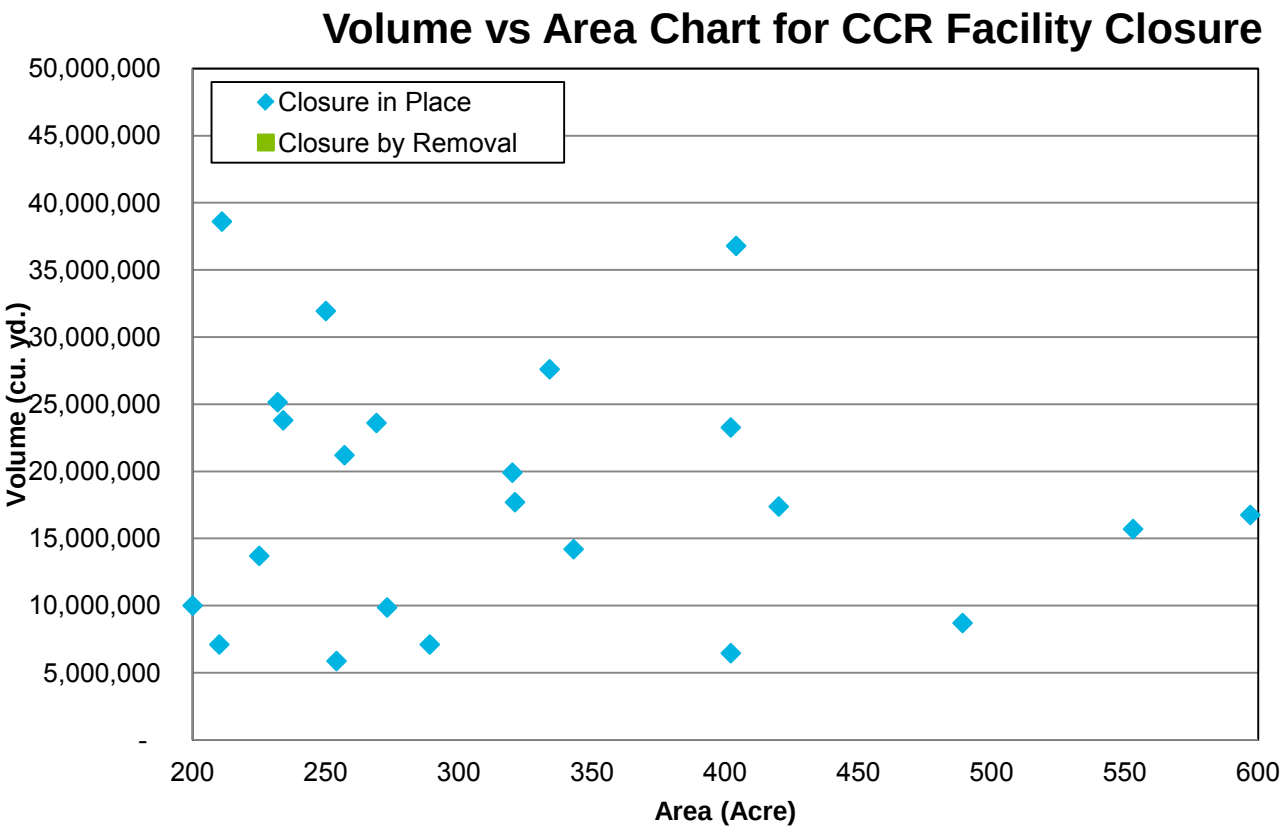
What does tomorrow hold for CCR units?

Maximum Volume vs Area – Large Ponds



Observations:

- All of the large ponds are CIP
- Total "Estimate of Maximum Volume of CCR" varies
- Some of these ponds may become hybrid (CR and CIP) closures

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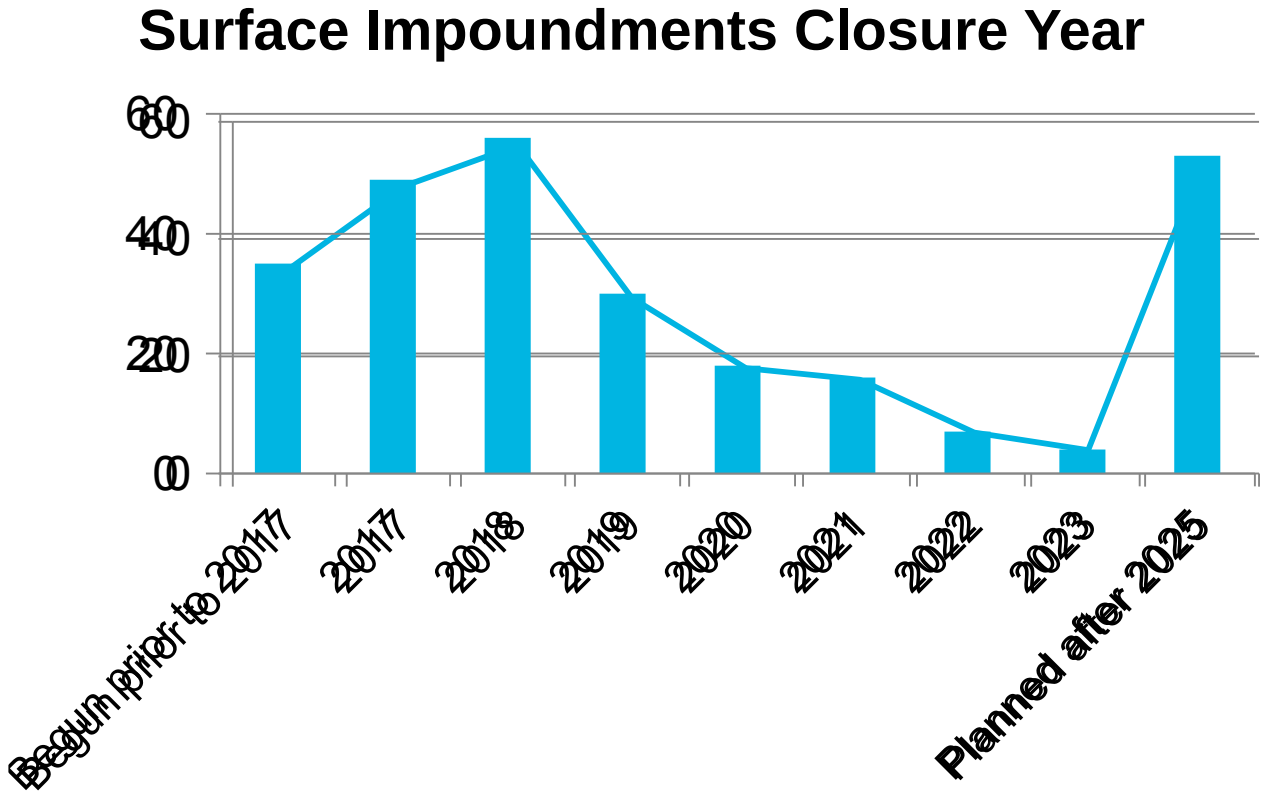
What does tomorrow hold for CCR units?

Projected Pond Closures



Closure observations:

- Only 66% of impoundments are accounted for
- Most number of impoundments closing in 2017-19 (~33%)
- 9% have started closure before 2017

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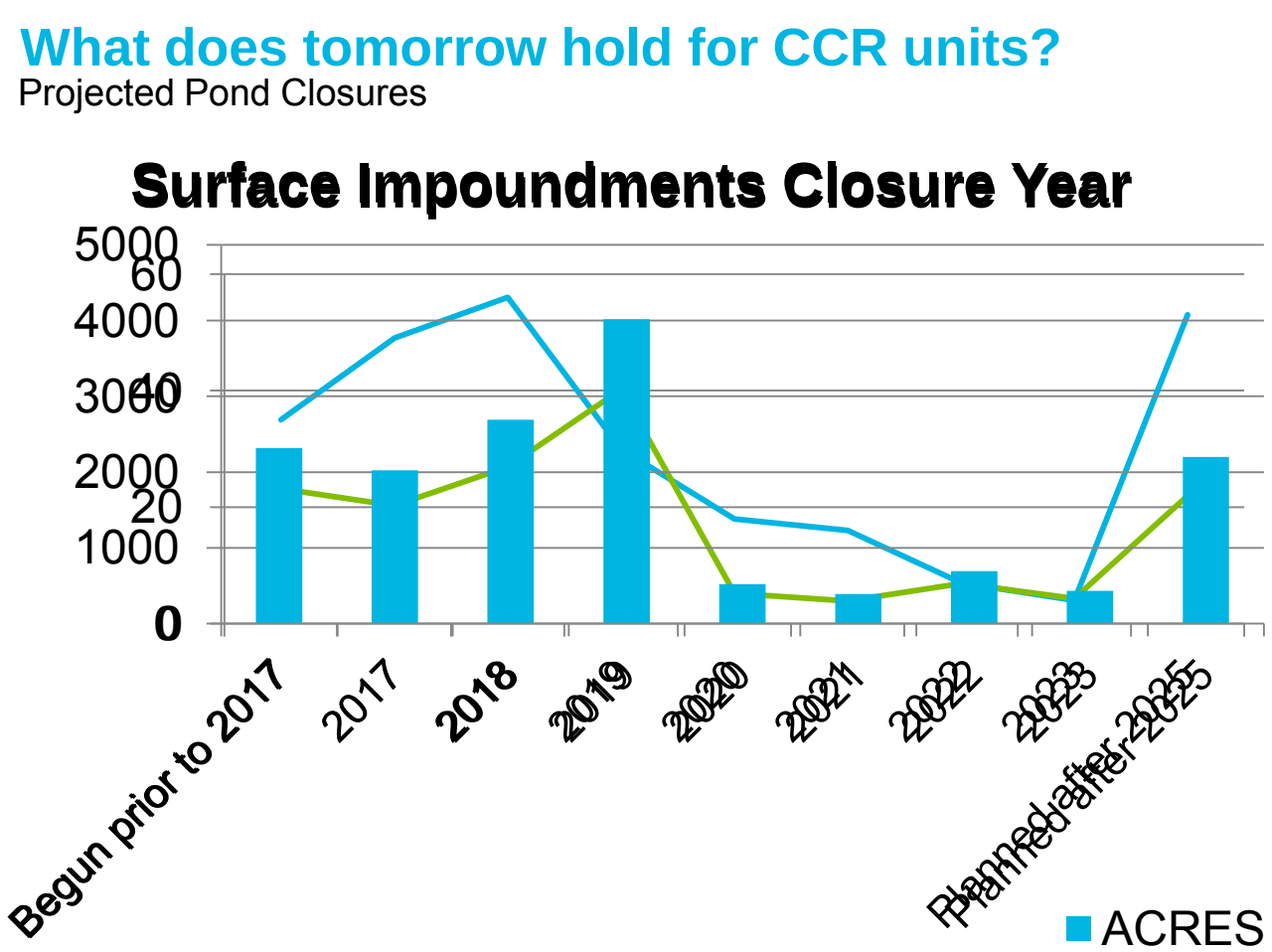
What does tomorrow hold for CCR units?

Projected Pond Closures



Closure observations:

- Only 66% of impoundments are accounted for
- 60% of the pond acres will be starting closure by 2020.
- Avg pond closure
  - Before 2020 → 65 acres
  - After 2020 → 45 acres

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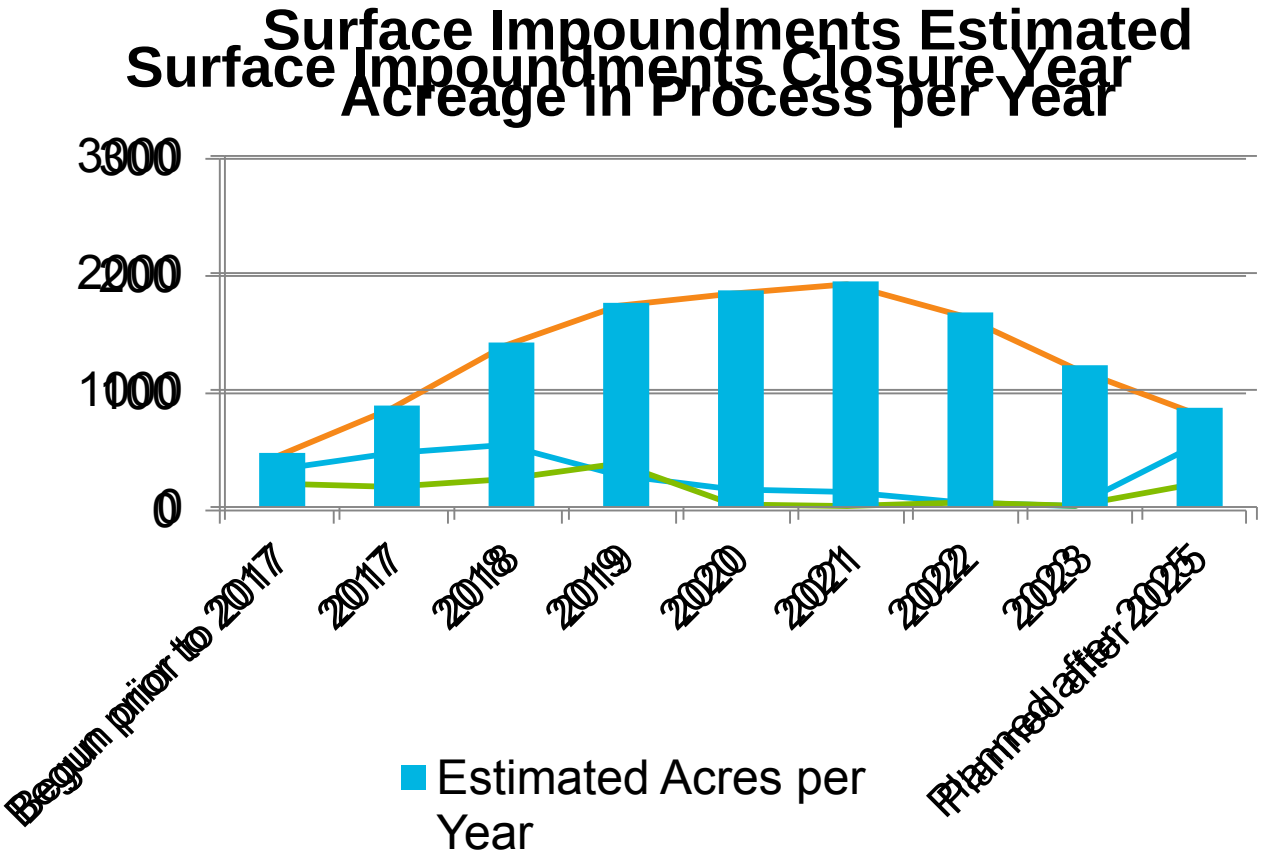
What does tomorrow hold for CCR units?

Projected Pond Closures



Closure observations:

- Only 66% of impoundments are accounted for
- By projecting the number of acres per year, the curve looks more of a bell shape

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The future of CCR management — how will it change?

Focus on Next Issues for Ponded CCPs

Overview of the process

Key Considerations

What is the goal?

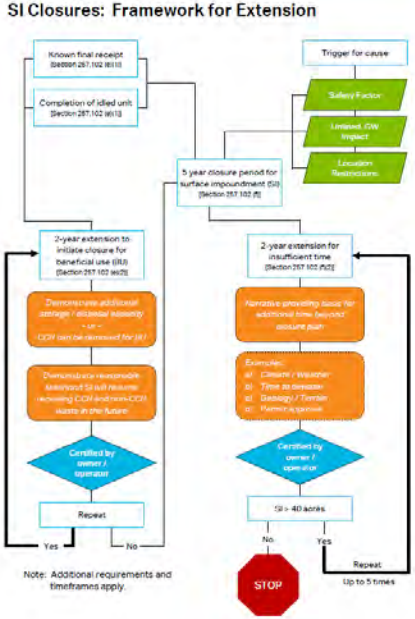
- Prolong operating life
- Extend closure period

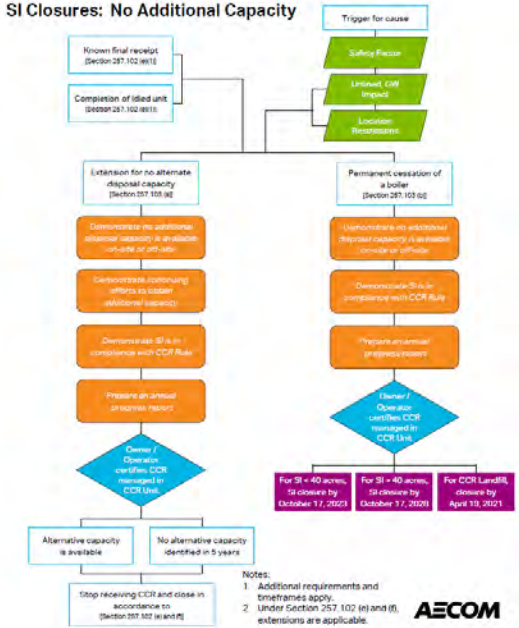
Is the impoundment operating?

- Non-CCR waste streams
- Beneficial use

What is the cause for closure (with respect to the closure triggers)?

- End of life
- Closure for cause (which one)





Need to begin assessment of extensions!

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Focus on Next Issues for Ponded CCPs

Review overall approaches and seek ways to improve

Review compliance calendar

Review approach to closure (contractor)

Consider interaction with ELG rules

Operational improvements

Review overall approaches and seek ways to improve

Review compliance calendar

Review approach to closure (contractor)

Consider interaction with ELG rules

Operational improvements

Focus on Next Issues for Ponded CCPs

Value Engineering

Costs
- Evaluate Costs
- Reassess Cash Flow

Schedules
- Accelerate closure
- Consider impact to other activities

Innovative and creative solutions
- Assess different cap systems
- Evaluate grading and closure approach
- Evaluate alternative below cap fill materials
- Consider moving ash before or during operations
- Operate to close
- Stockpile material for later beneficial use

(Re)Assess Strategy

Evaluate other compliance requirements with other agencies

Save money – beneficiate and increase ash marketing
- Assess new applications
- Consider beneficiation
- Measurable goals through corporate policies
- Subsidize beneficial use

Overall strategy improvements
- Optimize plant operations
- Seek major improvements with minor efforts

Focus on Next Issues for Ponded CCPs

Review overall approaches and seek ways to improve

Review compliance calendar

Review approach to closure (contractor)

Consider interaction with ELG rules

Operational improvements

Focus on Next Issues for Ponded CCPs

Prequalify contractors

Define overall approach

Contracting mechanism

(target price, integrated delivery, etc)

Integrate with design

(and incorporate construction reviews)

Ponded ash dewatering

Risk Reduction

- ✓ Eliminates “Claims Contracting”
- ✓ Removes Resource Concerns
- ✓ Manages Future Regulatory Changes
- ✓ Improves Innovation Implementation
- ✓ Anticipates Risk ID/Mitigation measures
- ✓ Increases Cost Certainty
- ✓ Reduces Delivery Strategy “Flaws”
- ✓ Improves Project Quality and Safety

Integrated Delivery Increases Certainty of Desired Outcome

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Focus on Next Issues for Ponded CCPs

Review plans and verify they comply in scope and schedule

Assess for improved solutions

Consider if changes need to be documented in compliance documents

Focus on Next Issues for Ponded CCPs

Comply with the compliance requirements

Improve consistency in the fleet

Improve operations to avoid "mis-management of CCRs" (Site audits)

Develop O&M Manuals

Training of staff

Review overall approaches and seek ways to improve

Review compliance calendar

Review approach to closure (contractor)

Consider interaction with ELG rules

Operational improvements

Focus on Next Issues for Ponded CCPs

Surface water

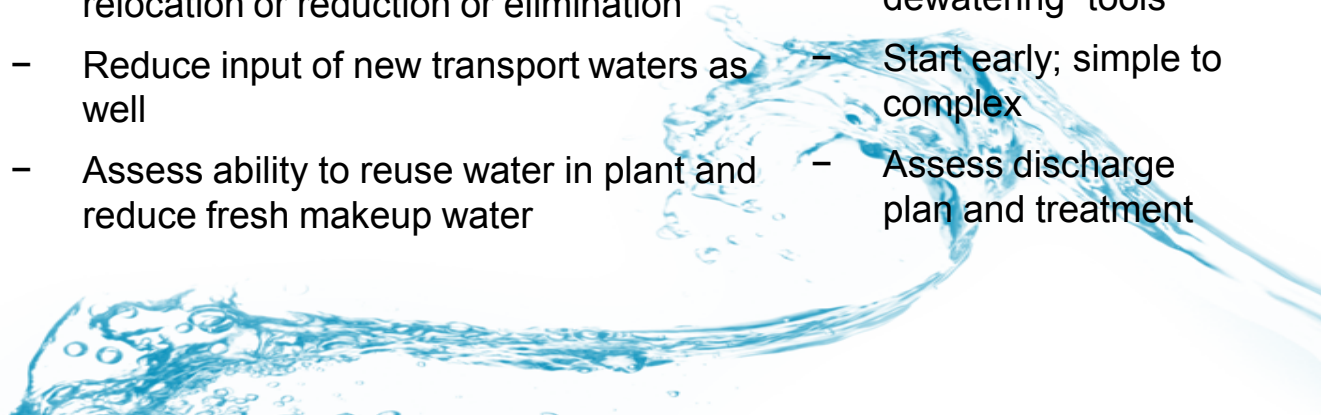
- Develop plans to reduce inflow of surface water
- Discuss methods to address
  - Redirect
  - Collect and discharge
  - Other

Free water

- Need to lower and remove
  - Optimize plant's water balance
  - Assess NPDES permit
  - Other means of removal (POTW, Treatment, etc.)
- Assess additional low volume waste water streams and begin plans for relocation or reduction or elimination
- Reduce input of new transport waters as well
- Assess ability to reuse water in plant and reduce fresh makeup water

Pore water

- Dewatering plans needed, develop an approach
- Assess site conditions and response to dewatering "tools"
- Start early; simple to complex
- Assess discharge plan and treatment



Focus on Next Issues for Ponded CCPs

Assess current practices (with on site visit)

- Identify/verify containerized CCR pile(s)
- Avoid storage of CCRs
- If CCR is a “product”, establish written guidelines to not invalidate the approach
- Establish procedures for dealing with off spec material

Explore new options

(ponded or new material)

- Improve the quality and consistency
- Assess market demand
- Evaluate other benefits (REE)

Complete the BU documentation as “required” by the rule

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Focus on Next Issues for Ponded CCPs

Extensions for pond closures	Strategy and planning	Water management	Beneficial use	**Groundwater / remediation**	Legal and public responses

Begin assessing anticipated results

Evaluate remediation alternatives

Consider early technical, legal and other factors

Get Prepared!

Focus on Next Issues for Ponded CCPs

Identify a core response team

Assess risk to determine management approach

Monitor actions/activities of others

Summary

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Seize the Opportunity

Opportunity to stay ahead of compliance

- Planning will lead to proactive behaviors
- Compliance requires continual focus
- Address areas of repairs or improvements

Opportunity to improve CCR management

- Reassess overall strategies and align
- Improve operations, beneficial use, water management, and more
- Anticipate and resolve issues…proactive behaviors

Opportunity to transition away from wet disposal

- Identify and plan for challenges in closure
- Planning ahead in fleet wide closure
- Push for cost savings, innovation, and improved delivery

Maximizing opportunity requires continual focus and effort

Questions?

Thank you!