

REINHOLD ENVIRONMENTAL®



2022 Reinhold/PCUG Round Table Presentation

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Unique Solutions to CCR and ELG Compliance

Chloe Grabowski, PE





01 **The Challenge**

02 **Case Study 1 – Bottom
Ash**

03 **Case Study 2 – Coal Pile
Runoff**

04 **A Stepwise Approach to
Compliance**

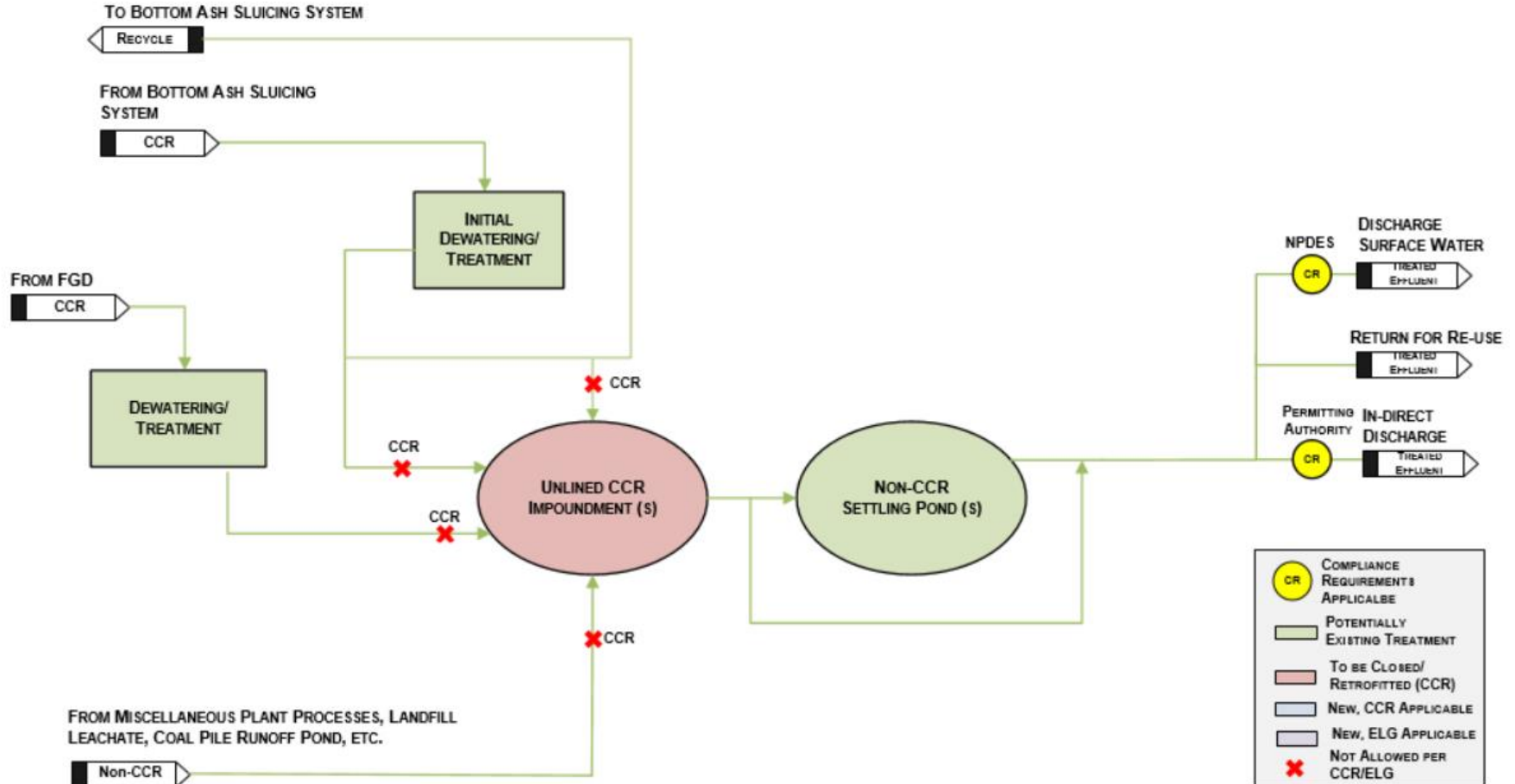
05 **Key Takeaways**

The image features two large, dark brown puzzle pieces interlocking in the center. The background is a soft, warm sunset or sunrise sky with a bright sun partially obscured by the puzzle pieces, creating a lens flare effect. The overall color palette is warm, with oranges, yellows, and soft pinks.

01

The Challenge

Wastewater Streams Typically Impacted



BA Purge Requirements are Plant Specific

- Purge Volume and Limits are Established by Permitting Authority
 - Based on professional judgement
 - Applicants to provide information to permitting or control authority by October 13, 2023
 - In some cases, existing treatment may be sufficient
 - In other cases, additional treatment may be required
- **So, how do we find out what are requirements are?**

Work the Steps to Find Out...

- What are Allowable Purges?
 - Precipitation event >10-year-24-hour storm volume
 - Regular inflow of other, non-BA wastewater
 - Maintaining water chemistry
 - Necessary maintenance
- What is the necessary allowable purge for my system?
- Is the necessary allowable purge <10% of the primary active wetted BA system volume?
 - For continuously purge, % is determined through direct comparison of volumes
 - For intermittent purge, % is determined by comparing the volumes after adjusting for the expected purge frequency



This image was captured pre-COVID-19

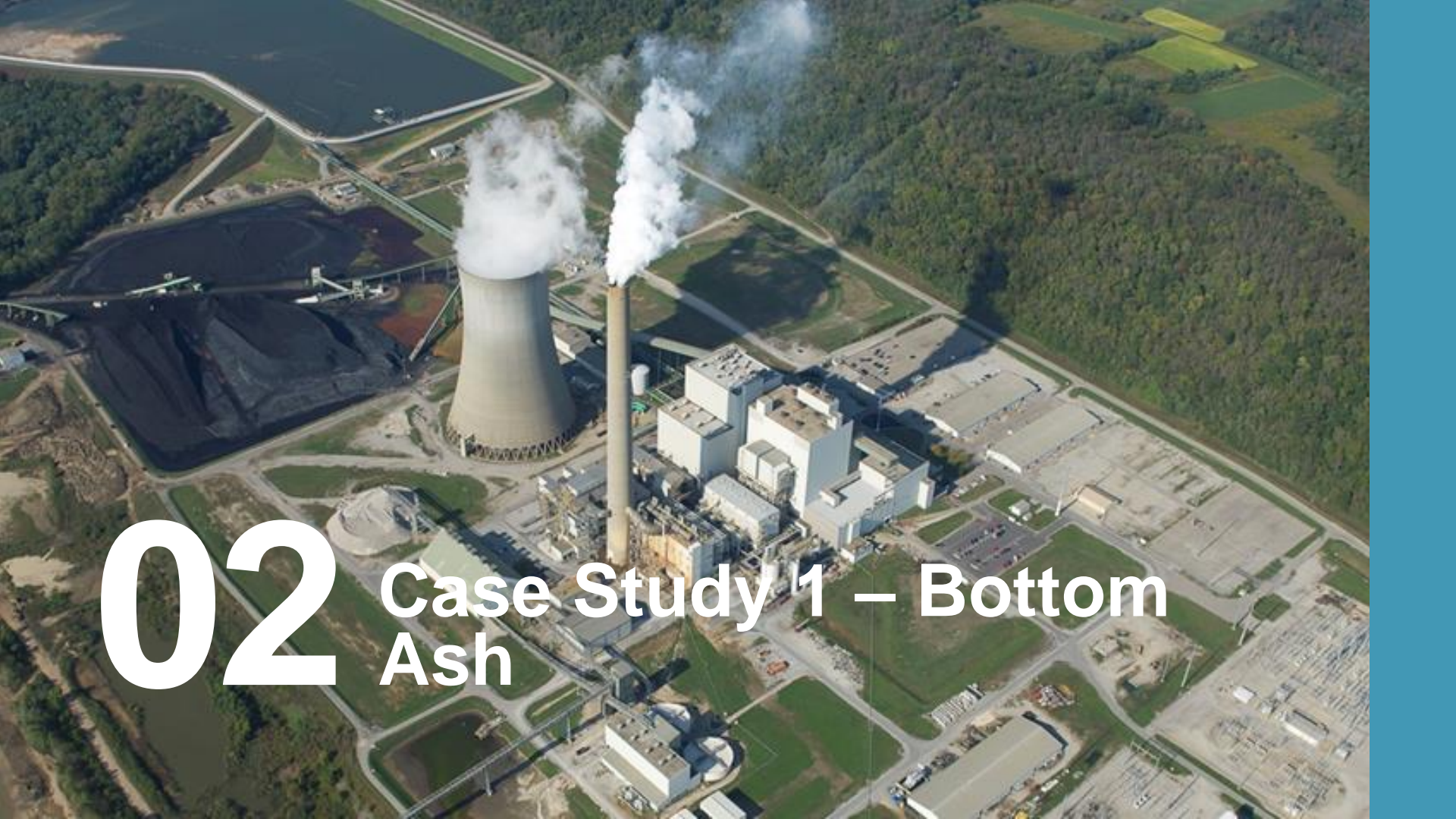
Facility Challenges

- Management and treatment of plant wastewater flows
- Looming shutdown dates
- Cost constraints
- Staff reduction
- Space limitations and site constraints
- Equipment procurement

Compliance Dates are Driven by Permit Renewal

- “ASAP” compliance date determined by permitting authority, earliest date is October 13, 2021
- Direct and indirect discharges, except for BATW and FGD – December 31, 2023
- Indirect discharge – NLTD October 13, 2023 (Pre-treatment Standards for Existing Sources, PSES)
- Direct discharges – NLTD:

Subcategory	FGD	BA Transport Water
Generally Applicable	December 31, 2025	
High Flow (>4 Mgal/day after recycle) , provide info. to permitting authority by October 13, 2023	December 31, 2023	Not Applicable
LUEGUs (CUR<10%) , file NOPP by October 13, 2021 (update annually)	December 31, 2023	Immediately, once incorporated into permit. BMP plants not later than Dec. 31, 2023
PC3 EGU (December 31, 2028) , file NOPP by October 13, 2021 (update annually)	Immediately, once incorporated into permit	
VIP , file NOPP by October 13, 2021 (update annually)	December 31, 2028	Not Applicable



02 Case Study 1 – Bottom Ash

Overview

Drivers:

- CCR/ELG Regulations
- Closure of Ash Surface Impoundment

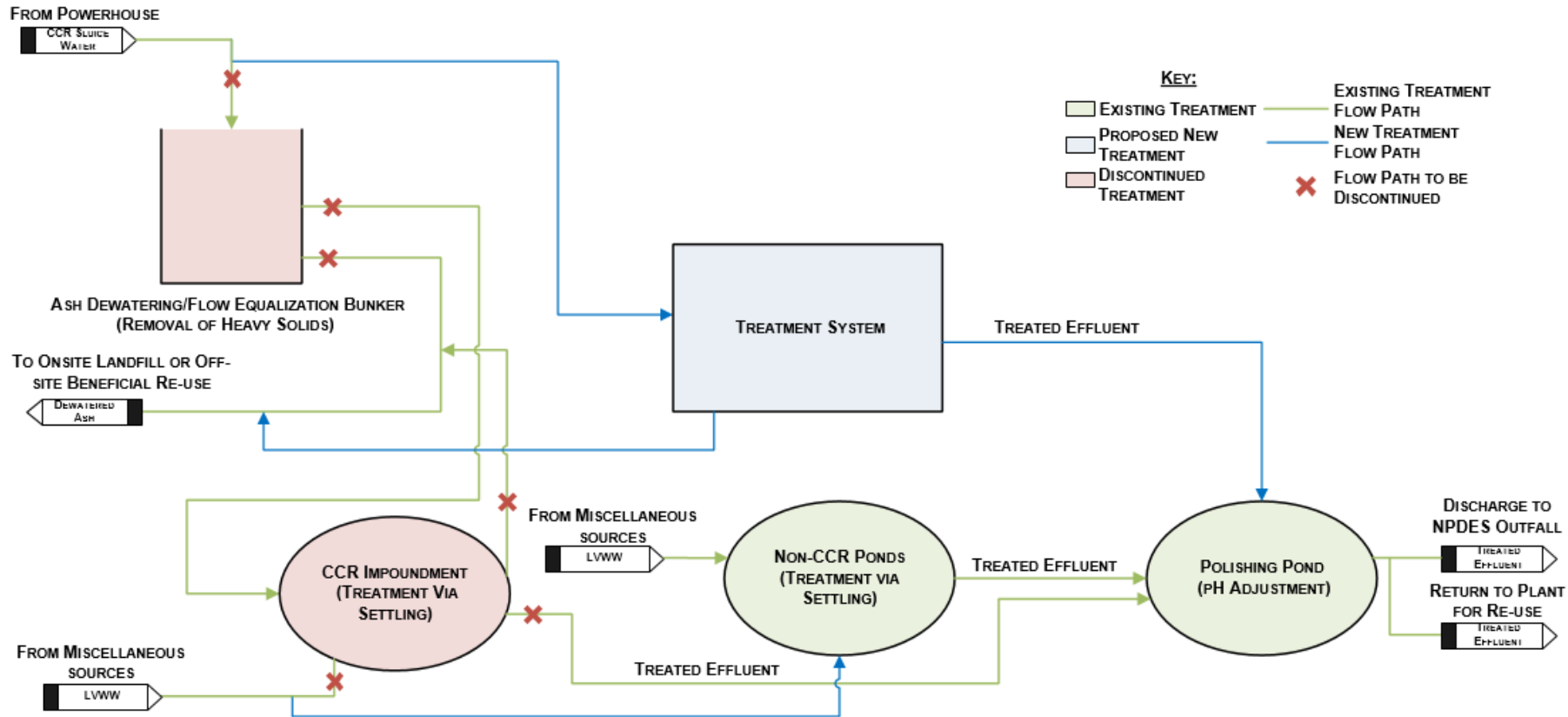
Goals:

- Management and Treatment of:
 - BATW by April 11, 2021
- Achieve NPDES Outfall Limits

Parameter	TSS	pH	Oil & Grease
Monthly Average	≤ 30 ppm	6.0 – 9.0	≤ 15 ppm
Daily Max	≤ 100 ppm		≤ 20 ppm



Existing Conditions and Required Modifications

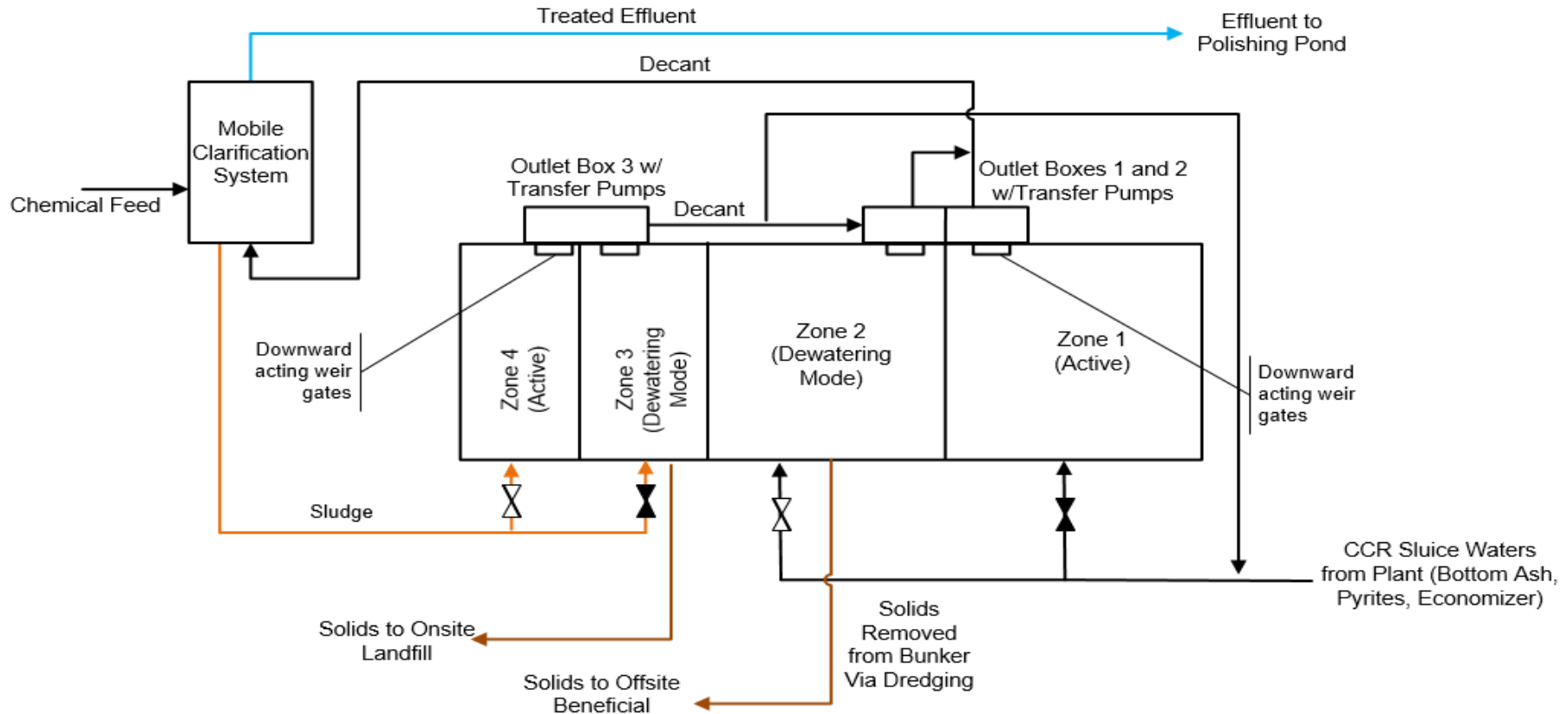


Sluicing Operations

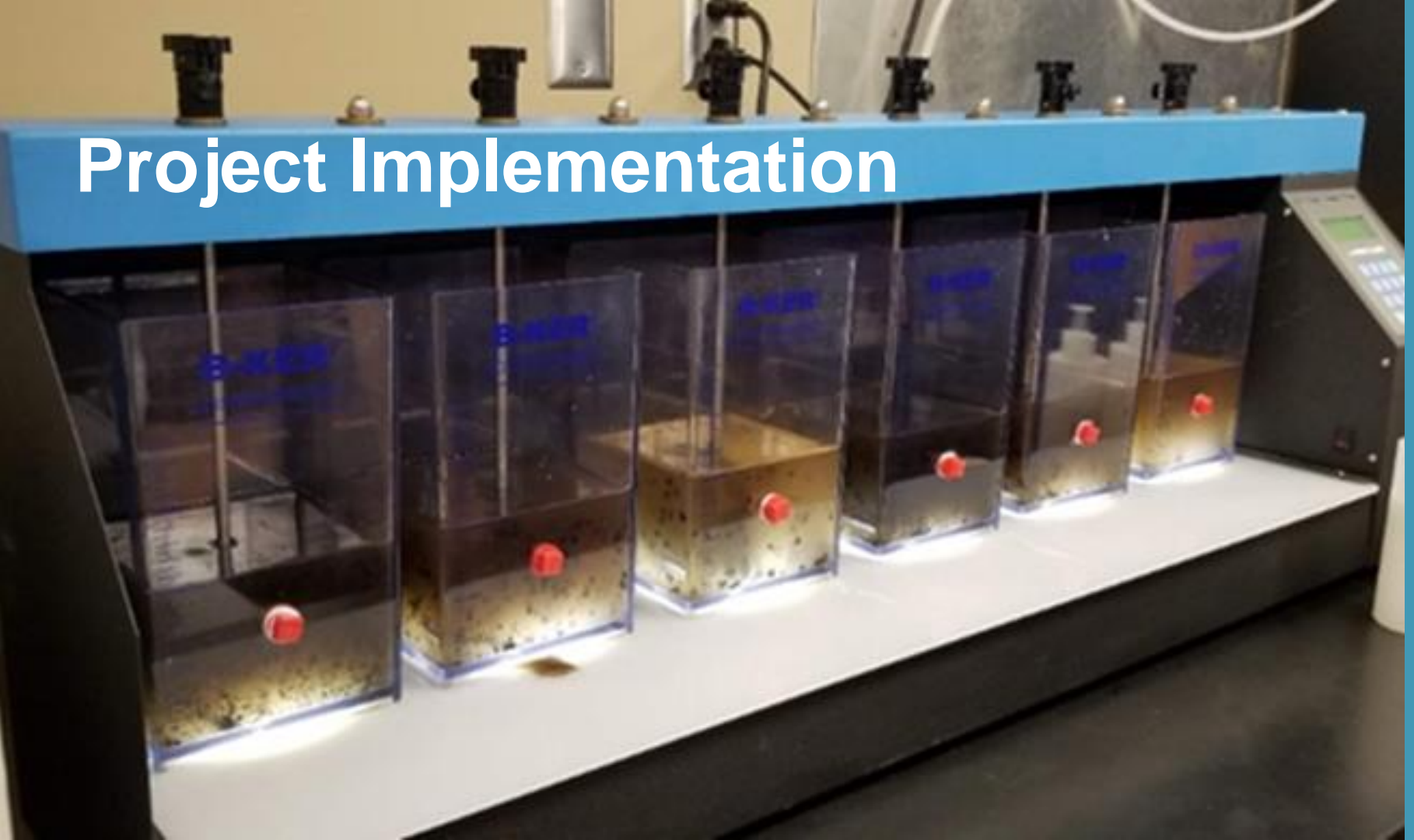
- **Sources**
 - Bottom Ash
 - Economizer Ash
 - Pyrites
- **Flow Rates**
 - 100 to 300 gpm (continuous)
 - 1,000 to 3,000 gpm during sluicing
- **Duration**
 - 1 to 8 hours to sluice both units per 12-hour shift
- **Water Quality**
 - 100 to 3,000 mg/L TSS
 - 2500 tons/month of wet solids is generated



Treatment Approach – Hybrid System



Project Implementation



<i>Description</i>	<i>Planned</i>	<i>Actual</i>
Decision to Implement Hybrid System for BATW		Mid-October 2020
Submit Permit Modification	Early November 2020	Achieved
Finalize Design Basis for Treatment	Mid-November 2020	Proceeded w/o Final Design Basis
Issue Bid Package for Hybrid Treatment Equipment	End of November 2020	Mid-December 2020
Award Vendor of Hybrid Treatment Equipment	End of December 2020	End of January 2021
Decision to Implement Full Temp. System for BATW**	Not planned	End of January 2021
Issue PO to Vendor of Treatment Equipment	Early January 2021	Mid-February 2021
Receipt of Flow Meter Data	Mid-November 2020	Mid-January 2021
Receipt of Vendor Information	Mid-January 2021	Mid-March 2021 (Full Temp. System)
Issue IFC Package for Hybrid Treatment	Early February 2021	End of February 2021 (Initial)
Issue IFC Package for Full Temp. System	Not planned	Mid-March 2021
Permit Issued	Mid-March 2021	Achieved
Start-up/Commissioning of Full Temp. System	Mid-April 2021	Mid-June 2021 (Full Temp. System)
Start-up/Commissioning of Hybrid System	Early-April 2021	End of August 2021

So...



Preliminary Design

- **Determining Sluicing Flow Rates**
 - In some cases, easier said than done!
- **Permitting Roadblocks**
 - Use of approved chemicals are critical issues
- **Location Selection**
 - Can significantly complex a project

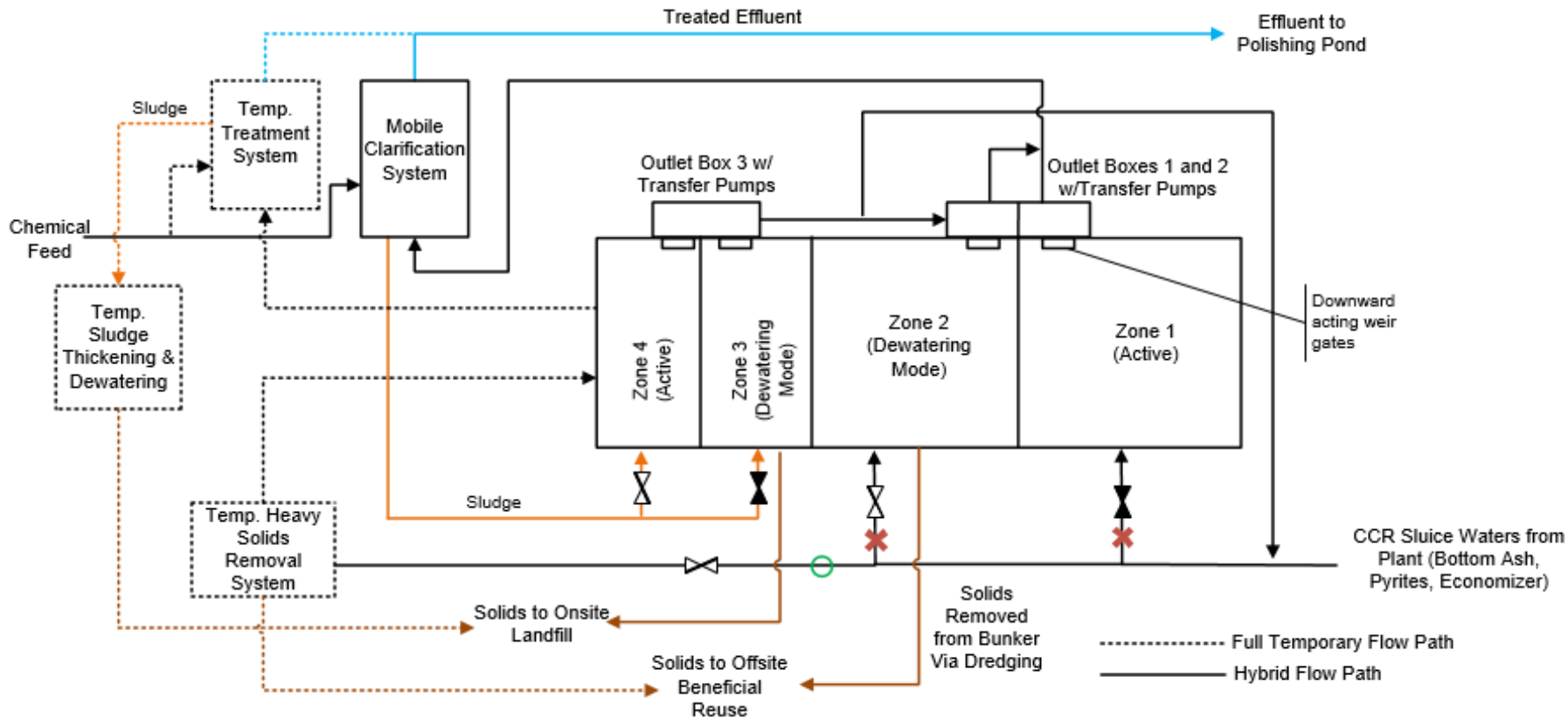


Procurement

- Institutional Paralysis
- Early Involvement
- Establish a Decision Timeline
- Firm Vendor Commitments
- Understand Vendor Capabilities
- Establish BOP Requirements Early On...
- Clear Definition of Roles and Responsibilities (DOR)
- Create a DOR matrix and maintain it!

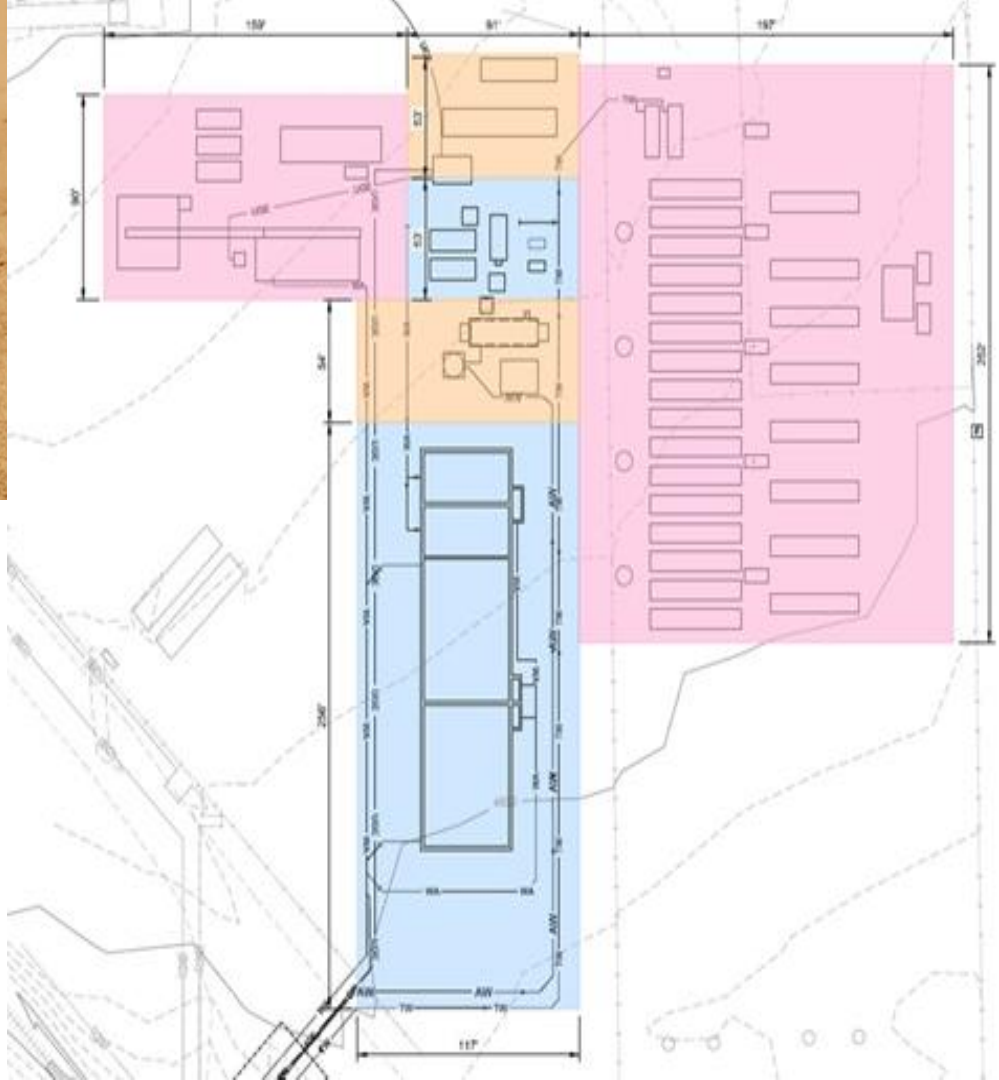


Modified Flow Path for Full Temporary System





Footprint Comparison



Design and Construction

- Involve Contractor Early On
- Communication is Key
- Establish Equipment Delivery Requirements and Dates
- Don't Assume that Equipment will be Available
- Plan for Weather Delays



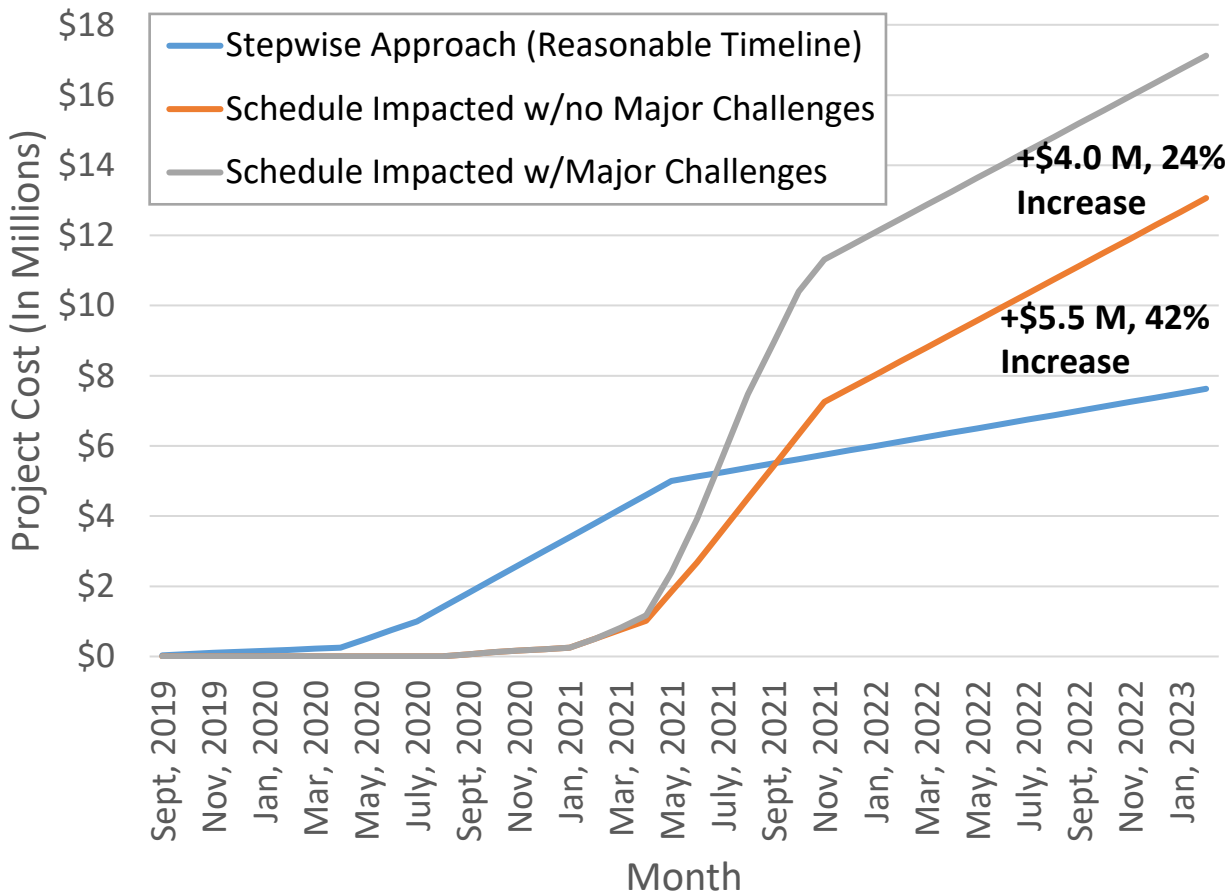
Start-up & Commissioning

- **Leaking Pipe, Fittings, Valves**
 - Check all connections
 - Inspect equipment before shipping and installation
- **Pipe Supports**
 - Temporary piping needs to be supported!
- **Suction Pressure**
 - Pay attention to proposed design changes that may on the surface seem like a no-brainer
- **Chemical Dosing**
 - An increase in influent solids does not equate to a proportional increase in chemical
- **Solid's Build –up**
 - Turbulence is required to keep solids suspended





The Cost of Waiting



This Does Not Exist!

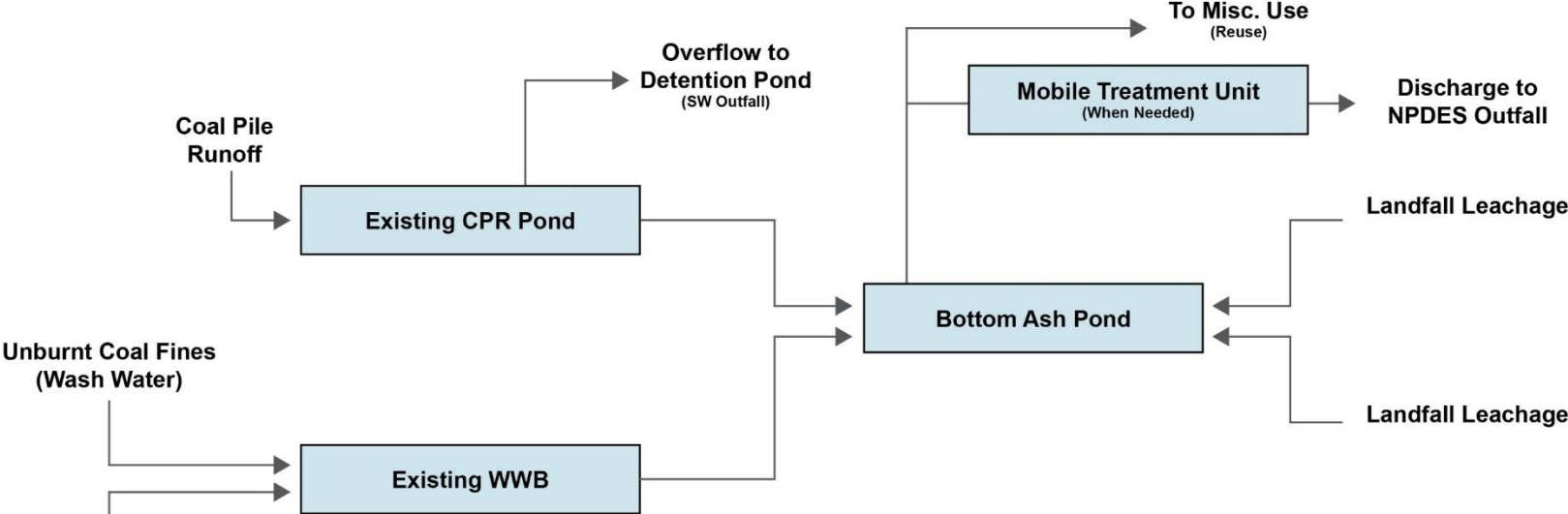


A large pile of coal dominates the middle ground, showing signs of erosion with dark, gullied channels. In the background, a tall, white, cylindrical smokestack rises against a cloudy sky. The foreground features a concrete barrier and some green vegetation on the right side.

03

Case Study 2 – Coal Pile Runoff

Project Overview



NPDES Outfall Limits

Parameter	TSS	pH	Oil & Grease
Monthly Average	≤ 30 ppm	6.0 – 9.0	≤ 15 ppm
Daily Max	≤ 100 ppm		≤ 20 ppm

Take-aways from Treatability Testing

- Treatment of CPR and unburnt coal fine streams required chemical addition
- Mixing is key to treatment of CPR
- LVWW may be treated via gravity settling (most cases)
- LVWW affects the CPR treatability – treating separate recommended



Coal Pile Operation and Management

Observations

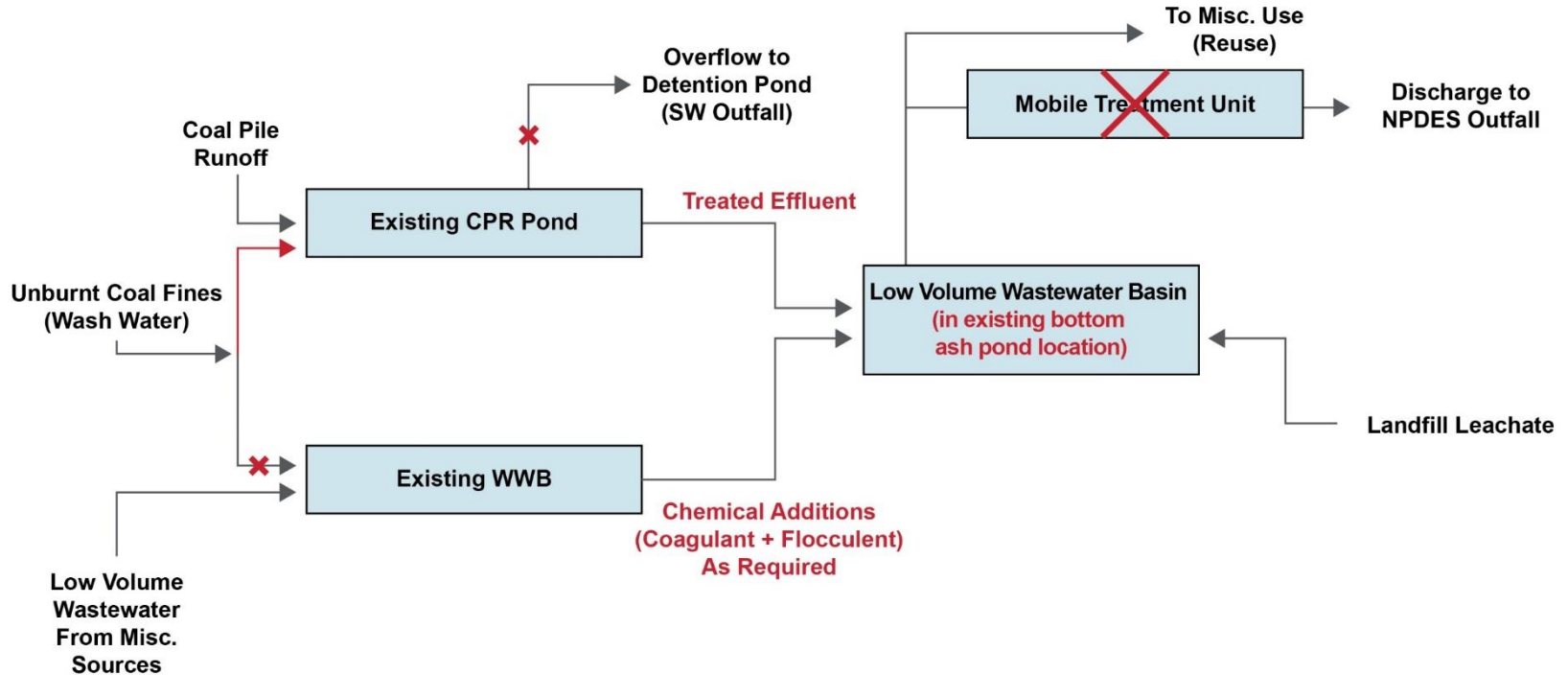
- Proximity of residual coal to edge of the coal pile
- Coal fines being easily transported into stormwater collection system during rainfall events

Mitigation Options

- Installation of physical barrier
- Re-establishment of vegetative buffer zone

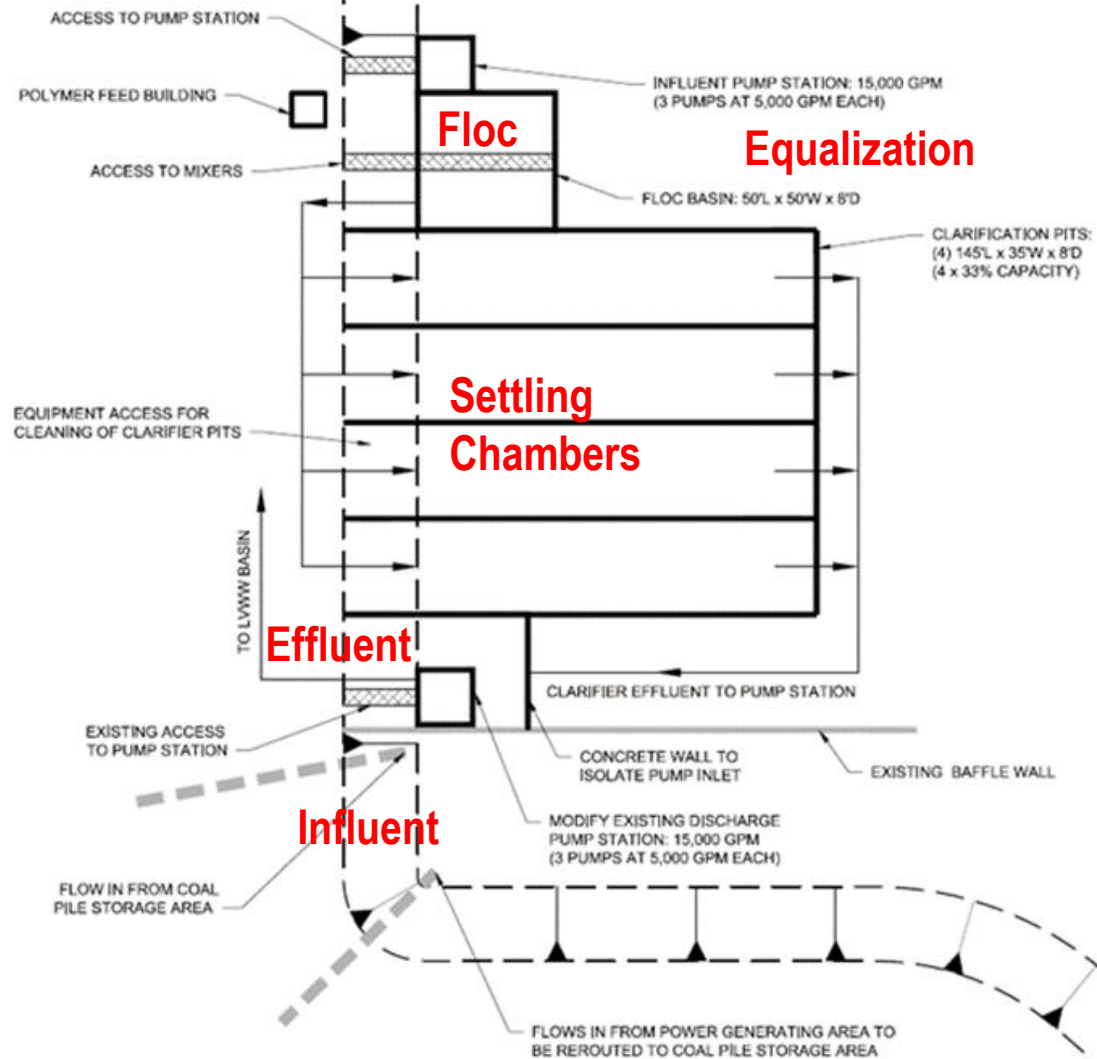


Approach Overview

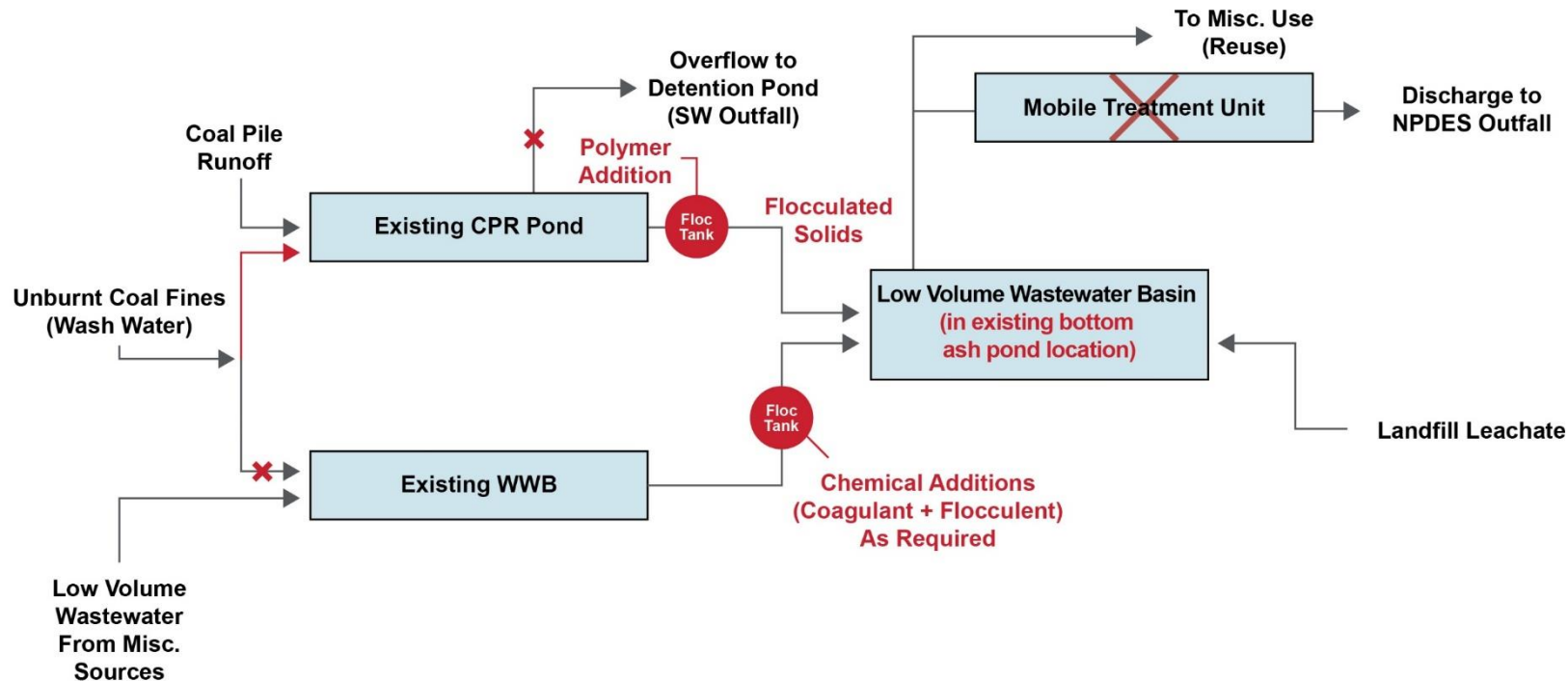


- CPR – Treat using polymer flocculation
- WWB – Have provisions in place to add a coagulant and polymer for treatment as needed

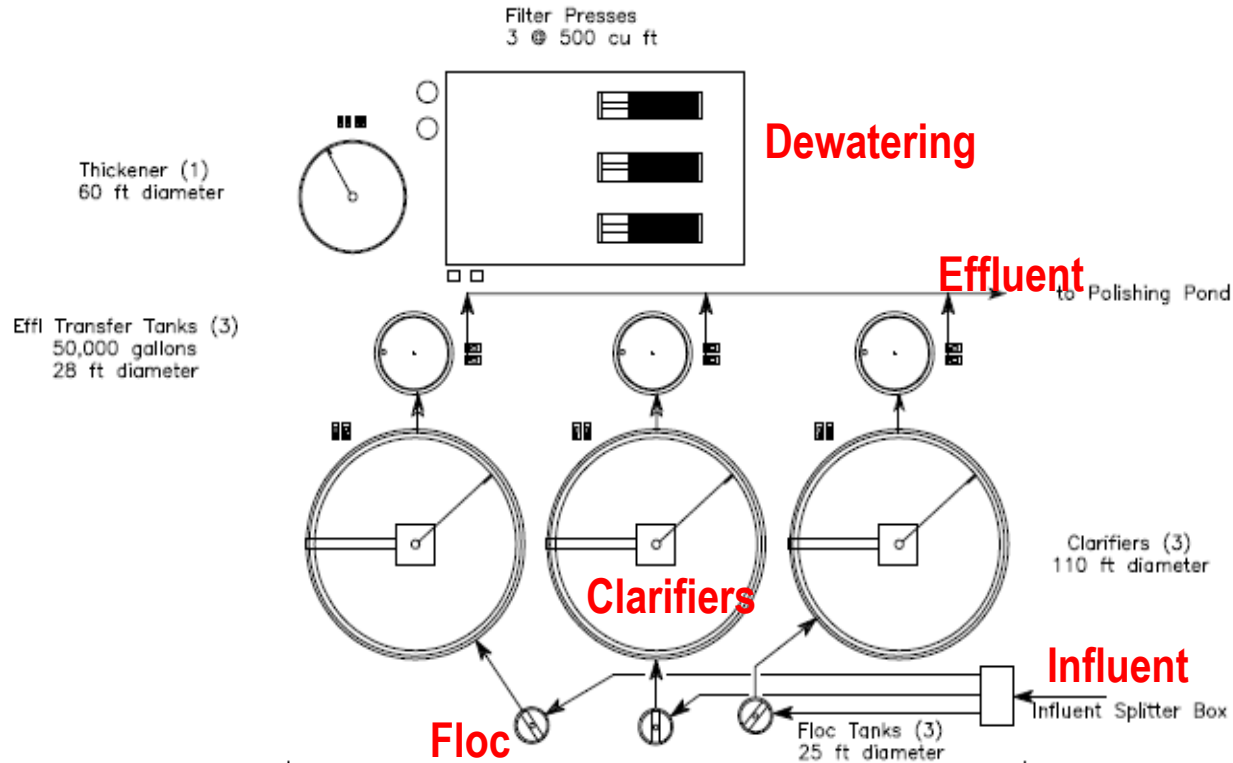
Alternative 1 – Modify Existing Coal Pile Runoff Pond



Alternative 2 – Installation of Flocculation System



Alternative 3 – Installation of Conventional Treatment System



Comparison of CPR Treatment Alternatives

Description		Order of Magnitude Capex Cost for Installation
Alternative 1	In-pond Treatment (Settling Chambers)	\$ 4.7 M*
Alternative 2	Flocculation System	\$ 4.0 M*
Alternative 3	Conventional Treatment System	\$28 M*

*2018 Pricing

Note: Costs presented are for comparison only



05 Stepwise Approach to Compliance

Stepwise Compliance Approach

1. Identify Your Team

2. Define Issue

3. Plan Approach

4. Develop & Evaluate Solutions

5. Obtain Regulatory Approval

6. Implement Plan

- Include all stakeholders
 - Operations, maintenance, engineering, permitting, compliance
- Need senior management champion
- Identify/Include 3rd parties
 - Chemical suppliers
 - Consulting engineers
 - Subject matter experts
 - Equipment vendors

Stepwise Compliance Approach

1. Identify Your Team

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6. Implement Plan

- Compliance review
- Existing systems evaluation
- Flow and water quality characterization
- Predictive modeling
- Site-specific constraints

Stepwise Compliance Approach

1. Identify Your Team

2. Define Issue

3. Plan Approach

4. Develop & Evaluate Solutions

5. Obtain Regulatory Approval

6. Implement Plan

- Establish goals and drivers
- Establish implementation timeline
- Identify compliance solutions to evaluate
- Identify operating strategy
- Prepare risk matrix
- Establish evaluation criteria

Stepwise Compliance Approach

1. Identify Your Team

2. Define Issue

3. Plan Approach

4. Develop & Evaluate Solutions

5. Obtain Regulatory Approval

6. Implement Plan

- Develop Solutions

- Conceptual design details

- Lifecycle costs

- Risk matrix

- Implementation Schedule

- Evaluate Solutions

- Select Solution

- Obtain management approval

Stepwise Compliance Approach

1. Identify Your Team

2. Define Issue

3. Plan Approach

4. Develop & Evaluate Solutions

5. Obtain Regulatory Approval

6. Implement Plan

- Start the conversation early
- Determine submission strategies
 - Informal conversations before formal submittal
 - Minimize surprises
- Tracking, Planning, Risk Index
 - Track key agreements, dates, etc.
 - Plan submittals well in advance – should be complete and checked
 - Track open issues/unknowns that may impact timelines

Stepwise Compliance Approach

1. Identify Your Team

2. Define Issue

3. Plan Approach

4. Develop & Evaluate Solutions

5. Obtain Regulatory Approval

6. Implement Plan

- Equipment procurement
- Detailed design
- Construction
- Start-up and commissioning

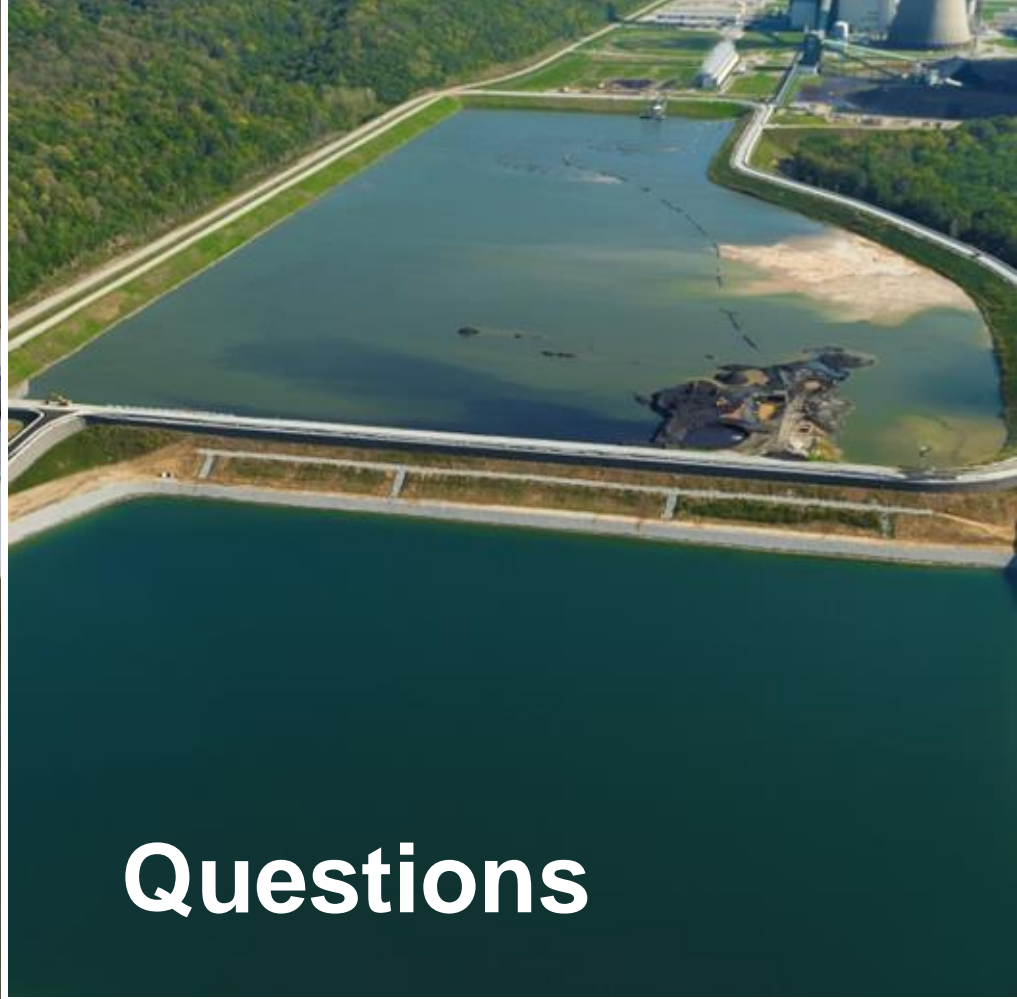


04 Key Take-Aways



Key Take-Aways

- **Temporary treatment systems can be a lifeline**
 - Not always off the shelf
 - Quick and easy to install – not quite
 - Not cost effective for rental periods >1 to 2 years
- **Upfront investment and early decision making can save millions...and sleepless nights**
 - Establish team early
 - Establish goals and drivers
 - Information is essential to decision-making and mitigating risks down the road
 - Involve stakeholder early
- **Don't let up on the gas!**
 - Keep moving
- **Luck is not a plan**



Questions