

Structural Integrity Review for CCR Closure Plan Plant Barry Ash Pond Alabama Power Company

Presentation by:

Robert E. Snow, P.E.

D'Appolonia Engineering Div. of Ground Technology, Inc.

May 4, 2020

D'APPOLONIA

Overview of Presentation

- Plant Barry Ash Pond Closure Document Review
- Focus of Review on Structural Integrity
- Site Conditions
- Plant Barry Ash Pond CCR Closure Plan
 - ❖ Pause for questions
- Structural Integrity Criteria & Findings
 - ❖ Pause for questions
- Summary & Recommendations
 - ❖ Questions

Ash Pond Closure Plan

Document Review

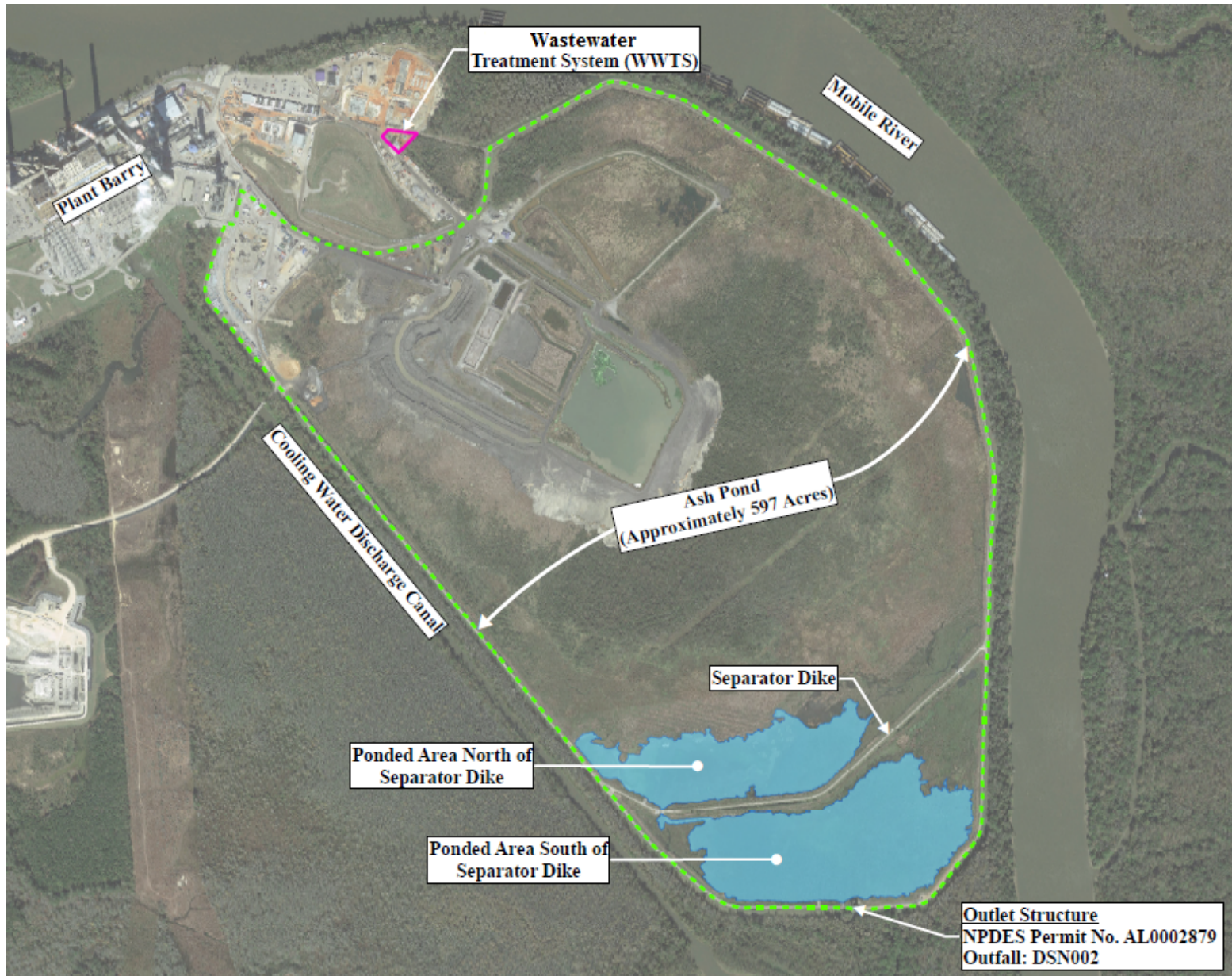
- 2019 Amended Coal Combustion Residual (CCR) Closure Plan for Ash Pond
- Closure Plan Design Drawings (Draft 100% Design, Not for Construction)
- 2019 Plant Barry Ash Pond Dewatering Plan
- 2018 Permit Application for CCR Surface Impoundment
- Exploration, testing, and engineering documents supporting the CCR Closure Plan (non-public documents)

Focus of Review on Structural Integrity

USEPA & ADEM Regulations and Industry Guidance

- Hazard Potential Classification
- Emergency Action Plan
- Structural Stability Assessments
- Operation and Maintenance Plans
- Inspections

Purpose of Independent Review:
Evaluate relevant aspects of the engineering, design, and permitting to identify potential areas of concern or gaps in information that may be important to decision making with respect to structural integrity



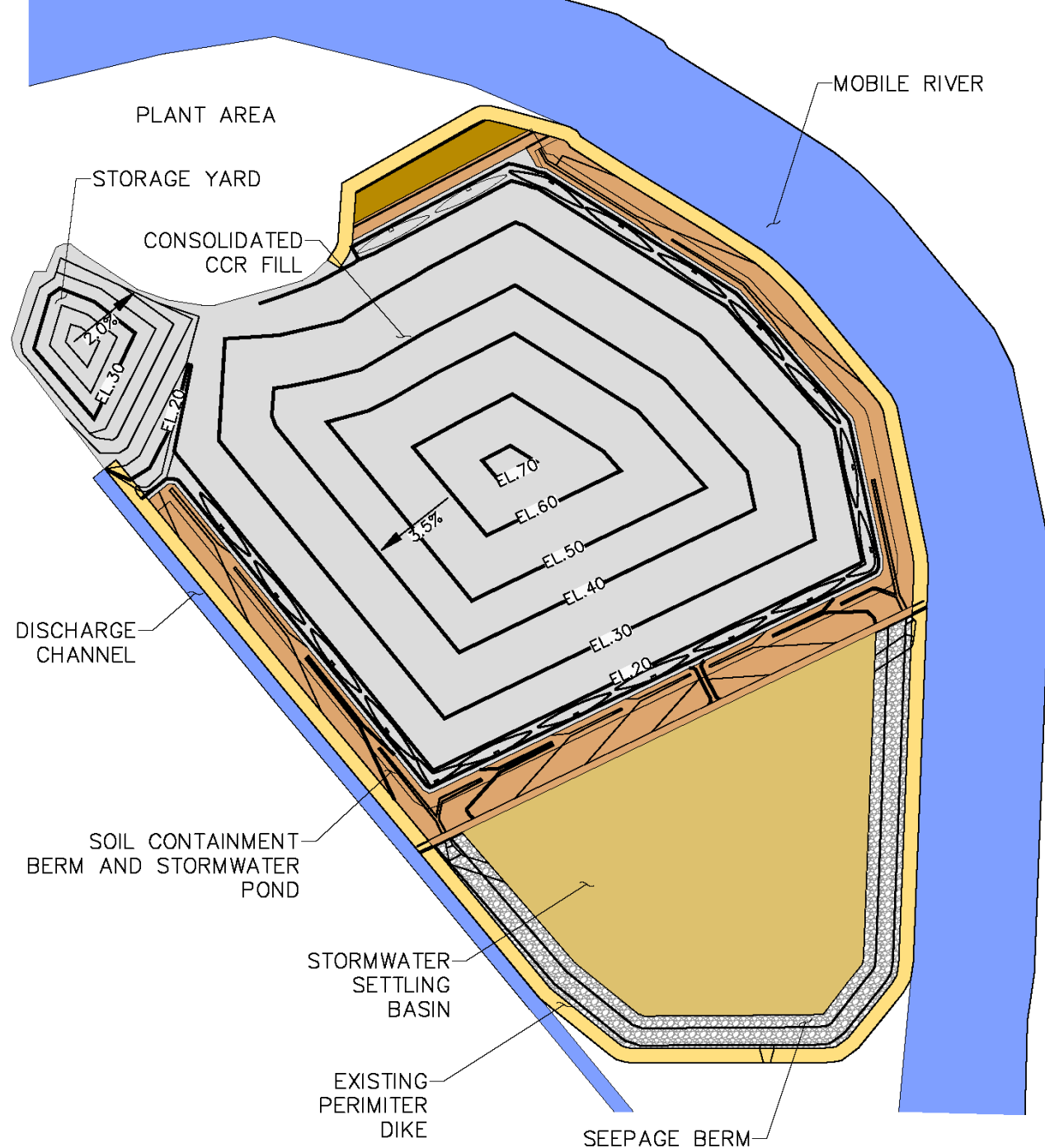
Site Conditions

- 597-acre Ash Pond adjacent the Mobile River
- 21.7 M cubic yards CCR
- CCR typically ~ 20-30' thick, fly ash and bottom ash; generally saturated & loose
- CCR contained by extensive perimeter dike founded on clay
- CCR underlain by sequence of clay and sand layers
- Underlying sand represents semiconfined aquifer that discharges to the Mobile River

CCR Closure Plan

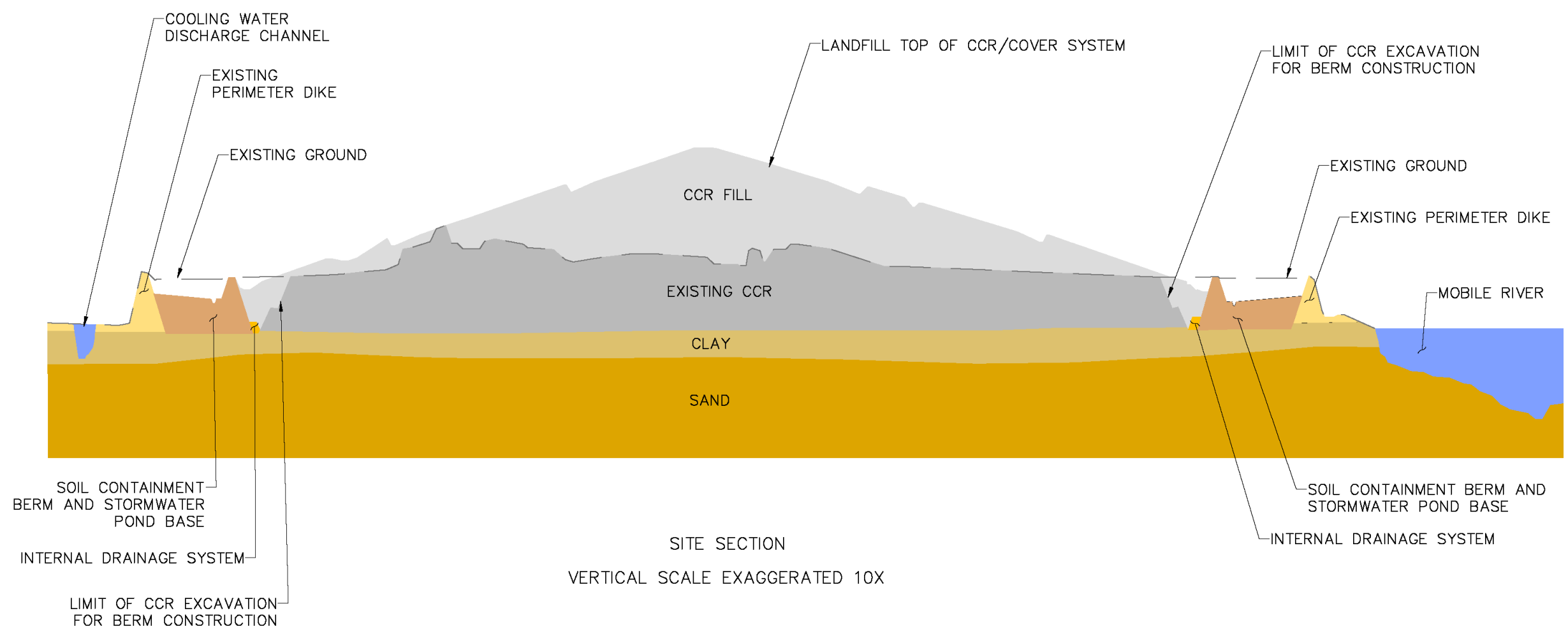
Concept & Elements

- Dewatering & Stabilization
- CCR Excavation
- CCR Removal Verification
- CCR Placement & Containment
- CCR Closure Cover System
- Surface Water & Stormwater Management



CCR Closure Plan

Site Cross Section



CCR Closure Plan

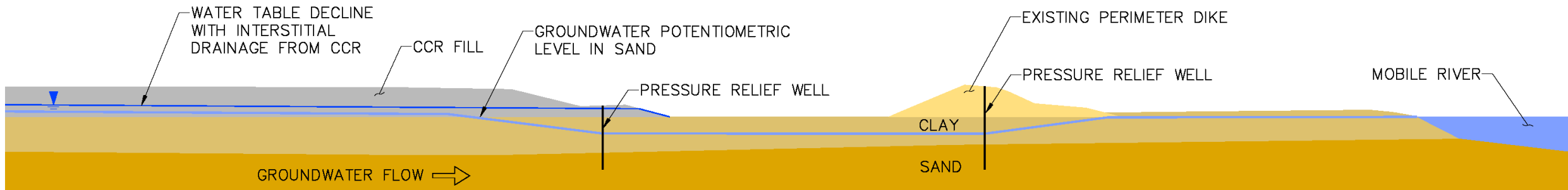
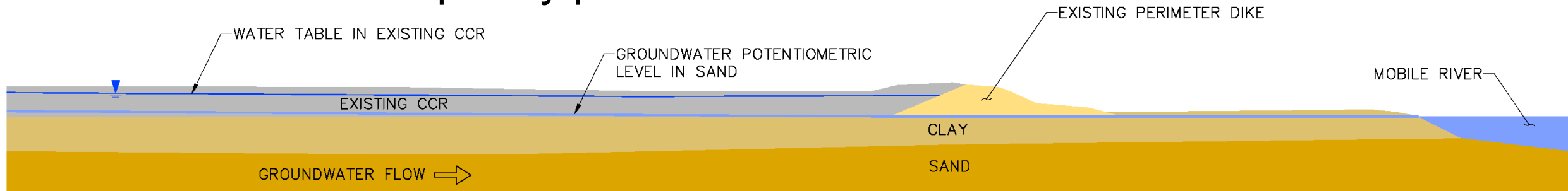
Dewatering & Stabilization

- Removal of free water and reducing the amount of interstitial water within the CCR material by pumping from open pooled areas and sumps
- Contact water will pass through a filter berm to reduce solids content and then pumped to a Wastewater Treatment System prior to discharge
- Dewatering will continue throughout closure and contribute to stabilization during the excavation and removal of CCR material. Other stabilization measures implemented in a sequential fashion include:
 - preloading of areas before CCR removal,
 - bridging lift placement over wet/soft grades for equipment access,
 - pressure relief well operations within the foundation sand sublayer.

CCR Closure Plan

CCR Excavation

- Excavation follows preloading program and geotechnical exploration
- Sequential excavation while continuing to dewater and use of bridging lift
- Installation of temporary pressure relief wells



CCR Closure Plan

CCR Removal Verification

Establish CCR/Clay interface of the Ash Pond prior to excavation:

- Design exploration borings that established bottom of CCR material in Pond
- Additional exploration borings and sampling on 300-foot centers following preloading will employ visual and tactile examination to distinguish the interface
- Cone penetration tests on 100-foot grid following preloading based on penetration resistance/pore pressure measurements to refine the interface

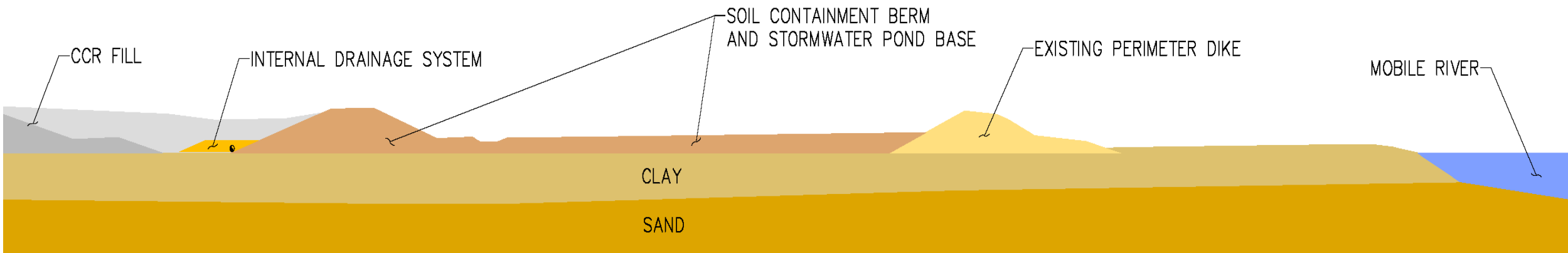
Excavation of CCR to a depth extending 6-inches into underlying clay with GPS guided equipment under Construction Quality Control monitoring plan

Upon achieving CCR removal, sample the subgrade for visual classification with a frequency of 1 sample/acre (~200-foot grid)

CCR Closure Plan

CCR Placement & Containment

- Soil Containment Berm will provide a physical barrier at the consolidated CCR footprint along the east, south, west and a portion of the north perimeter
- Stormwater Pond base will protect clay subgrade and control runoff
- Internal Drainage System on the inside slope of Soil Containment Berm to collect interstitial water from CCR



CCR Closure Cover System

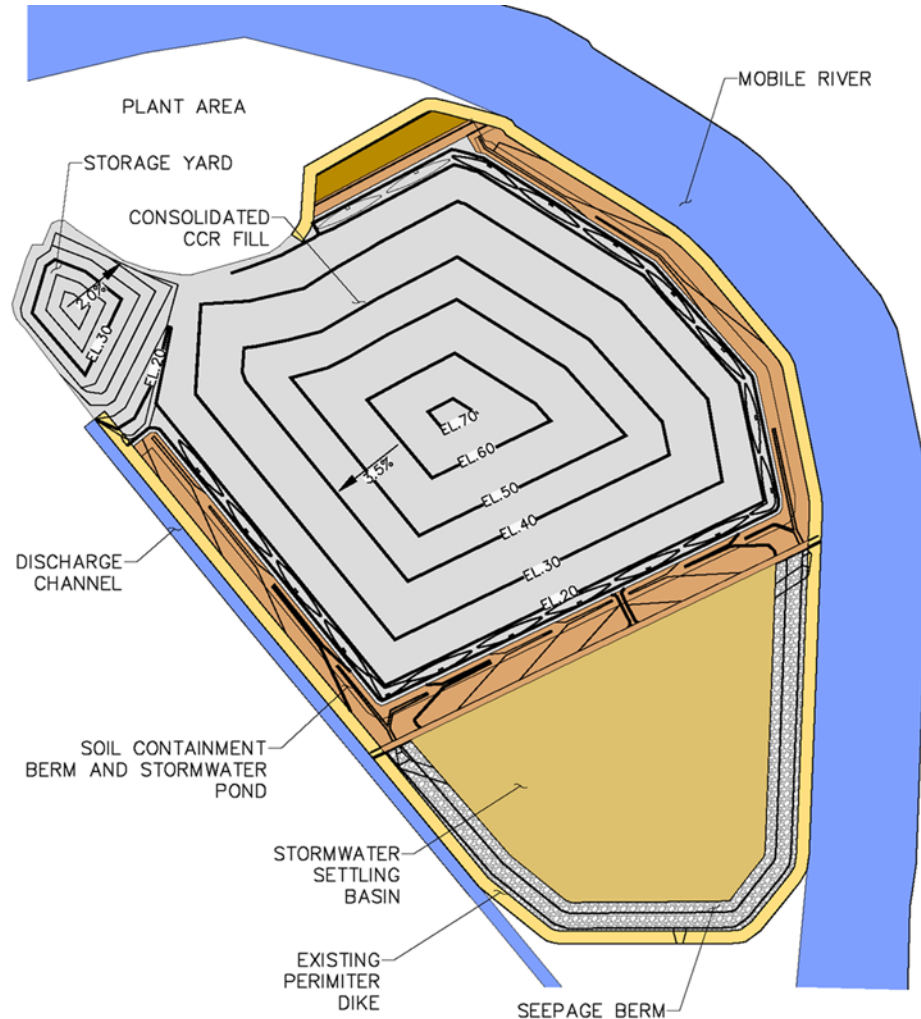


Design Basis:

- Control, minimize or eliminate post-closure infiltration into CCR
- Preclude future impounding probability on consolidated CCR
- Provide measures for slope stability
- Minimize need for further maintenance
- Completed in shortest amount of time consistent with recognized and generally accepted engineering practice

CCR Closure Plan

Surface Water & Stormwater Management



Design Basis

- Contact water collected and treated; stormwater from events less than the 25-year storm retained and treated
- Storm runoff exceeding the 25-year event discharges through the NPDES outfall
- Final grades of 3.5% established with synthetic turf, rock riprap lined channels, and flow energy dissipation structures provide erosion control
- Stormwater settling basin at the south end of the site is maintained

CCR Closure Plan

- Pause for Questions

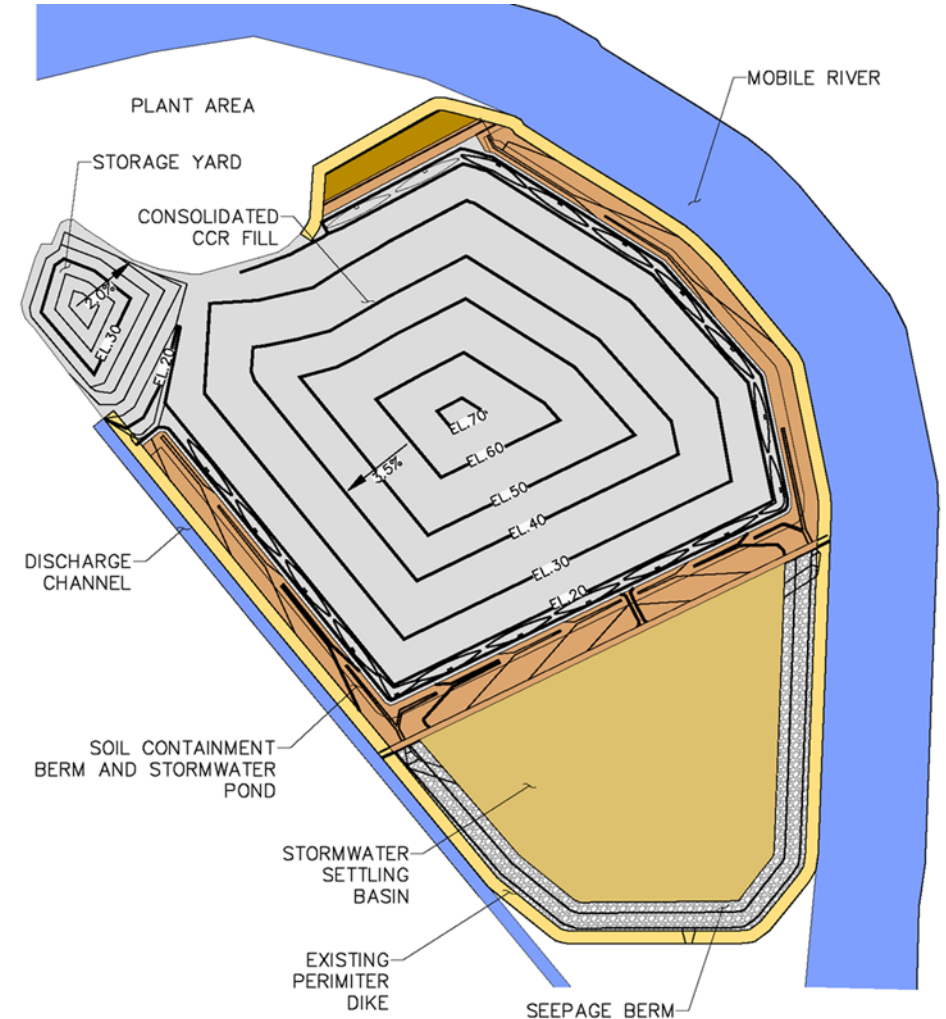
Structural Integrity Review Criteria

- Hazard Potential Classification, Emergency Action Plan
- Structural Stability
 - Slope Stability
 - Settlement
 - Slope Protection
 - Stormwater Management
- Operation and Maintenance Plan
- Inspection

Structural Integrity Review Criteria

Hazard Potential Classification & Emergency Action Plan (EAP)

- Significant Hazard Potential established inflow design flood requirements, which are maintained through closure
- Maintenance of EAP through closure and until reduction in hazard potential classification
- Stormwater settling basin planned for the closed facility will continue as an outfall for discharge, although little water will be retained except during storms



Structural Integrity Review Criteria

Structural Stability

- Slope Stability
- Settlement
- Slope Protection
- Stormwater Management

Structural Integrity Review Criteria

Slope Stability

Facility Components

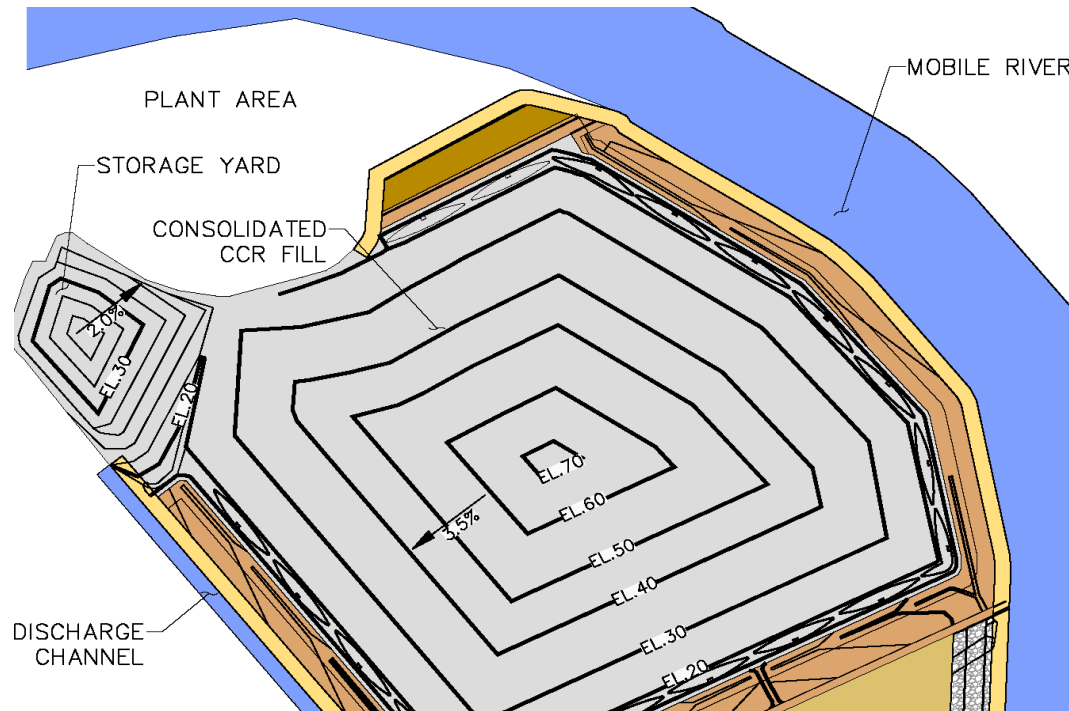
- Perimeter Dikes
- Consolidated CCR Central Area
- Soil Containment Berm
- Final Cover Veneer
- Interim Condition during CCR Removal
- South Stormwater Settling Basin

Stability Cases	Minimum Factor of Safety Criteria
Long term, static loading	1.5
Short term, static loading	1.3
Seismic loading	1.0
Triggering of liquefaction	1.1
Seepage uplift and stability	1.6

Structural Integrity Review Criteria

Slope Stability Findings

- Stability analyses indicate acceptable structural integrity and performance, with a focus on critical areas along the east, south, and west perimeters



Recommendation:

Assess the saturation of CCR and slope stability of the perimeter dike in the storage yard area of the northwest corner, considering that CCR is closed in-place without the soil containment berm and internal drainage system

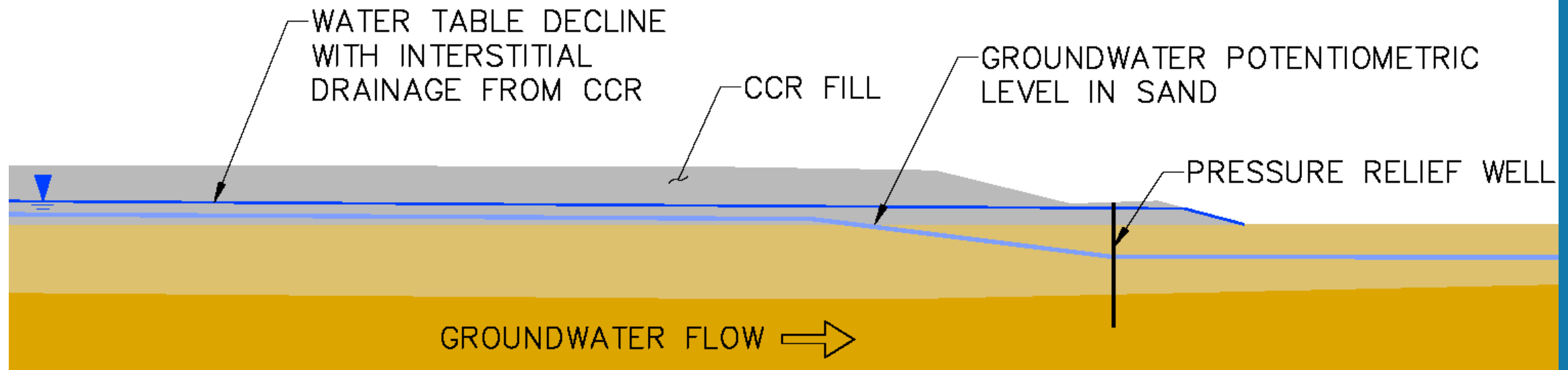
Structural Integrity Review Criteria

Slope Stability Findings

- Dewatering and stabilization of the Ash Pond depends on pumping and removal of surface water and interstitial drainage.

Recommendation:

Geotechnical exploration, instrumentation and monitoring should be performed during closure to confirm the design basis for closure as work proceeds



Structural Integrity Review Criteria

Settlement

Construction grades consider long term settlement to maintain cover and stormwater control structure operation. Settlement analyses and mitigation measures are based on:

- Design exploration & testing of CCR and foundation materials
- Dewatering and stabilization measures
- Preloading program to initiate consolidation and settlement
- Geotechnical exploration to confirm foundation characteristics

Structural Integrity Review Criteria

Stormwater Management & Flood Overtopping Protection

Site Stormwater Runoff

- Contact water retention and treatment for up to the 25-year storm
- Discharge through NPDES outfall for > 25 year storm
- Overtopping protection of Perimeter Dikes for > 1,000 year storm

Riverine Flooding

- Overtopping protection of Perimeter Dikes for > 1,000 year flood

Coastal Storm Surge Flooding

- Overtopping protection of Perimeter Dikes for >> 1,000 year flood

Structural Integrity Review Criteria

Slope Protection Findings

- Cover system on Consolidated CCR Area and Soil Containment Berm includes erosion resistant components
- Stormwater channels and ponds include riprap erosion protection
- Existing vegetation maintained on exterior Perimeter Dike slopes

Recommendation:

Evaluation of the potential for erosion of the exterior of the perimeter dikes due to extreme Mobile River flooding, and consideration of slope protection if warranted

Structural Integrity Review Criteria

Operation and Maintenance Plan

- Construction Best Management Practices
- Fugitive Dust Control Plan
- Surface Water Management
- Goundwater Monitoring Plan
- Recordkeeping and Notification Compliance Procedures
- Procedures for Updating Plans and Assessments

Structural Integrity Review Criteria

Operation & Maintenance Plan Findings

The Closure Plan Recordkeeping and the regulatory agencies require that changes, updates to periodic structural assessments, and inspection reports be submitted and disclosed.

Recommendation

Monitoring of disclosed project records provide an opportunity for public awareness of significant closure plan changes, if they arise, and the periodic updates of structural assessments

Structural Integrity Review Criteria

Inspections

- Weekly inspections is required in the closure plan for appearance of structural weakness and proper operation of all outlet structures
- Annual inspections by a qualified Professional Engineer
- Annual inspection reports document the geometry of the facility and closure progress, instrumentation information, and changes that may have affected the operation or stability, including any appearances of an actual or potential structural weakness

Structural Integrity Review Criteria

Inspections Findings

Inspection reports should include any appearances of an actual or potential structural weakness, and document other changes that may have affected the stability or operation

Recommendation

Inspection reports should continue to be disclosed and include information on geotechnical instrumentation, monitoring, and interpretation, along with inspection observation, to confirm conclusions of structural assessment

Structural Integrity Review Criteria

- Pause for Questions

Summary & Recommendations

Acceptable structural integrity and performance is demonstrated by CCR Closure Plan procedures, design, and engineering analyses. Supplemental analyses, exploration, instrumentation and monitoring programs are recommended to confirm conditions.

Structural Assessment Recommendations for Alabama Power

- Analyze stability and establish structural performance of storage yard in northwest corner
- Supplement post-dewatering and preloading geotechnical exploration with CCR saturation & shear strength characterization
- Incorporate geotechnical instrumentation and monitoring program into closure plan

Summary & Recommendations

Slope Protection Recommendation for Alabama Power

- Evaluate potential for erosion of exterior of perimeter dikes due to Mobile River flooding, and consideration of slope protection if warranted

Hazard Potential Classification & Emergency Action Plan Recommendations for Alabama Power

- Pursue reevaluation of hazard potential classification upon completion of the closure plan to demonstrate risk reduction
- Relative to the EAP, continue to perform annual review and updating during closure, with scheduled meetings with emergency management agencies concerning scope and responsibilities of parties. Document meeting participation, topics reviewed, and training or exercise activities.

Summary & Recommendations

Recommendations for MBNEP

- Monitor project records that are disclosed including closure plan updates, periodic structural assessments, and inspections during closure to check progress and confirm conditions
- Review inspection reports that are disclosed for information on geotechnical instrumentation, monitoring and interpretation along with inspection observation to support structural assessment
- Check that the EAP is updated as conditions change with closure implementation, and scheduled meetings with emergency management agencies are conducted with documentation on participants, topics reviewed, and training or exercise activities.

Robert E. Snow, P.E.

D'Appolonia Engineering

701 Rodi Road

Pittsburgh, PA 15235

resnow@dappolonia.com

D'APPOLONIA