

# SCS ENGINEERS



## Best Management Practices for Coal Ash Storage Facilities

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# Outline of Presentation

- The Fundamentals of Moist Coal Ash Basin Management and Design
- Overview of What is Working Well
- Explanation of Coal Ash Strength Properties
- Dry and Moist Ash Handling and Landfilling
- Recommendations for BMPs

# Common Coal Ash Storage and Disposal Methods

- Controlled structural fills for coal ash
- Moist ash processing and dewatering basins
- Dry ash storage and landfills
- Moist ash storage and landfills
- Continual push towards reuse

# The Fundamentals

## Effective Moist Coal Ash Basin Management and Design

- Design for the geotechnical properties of coal ash – slope stability and seepage design
- Build Smart - exterior structural berms, soil/soil foundations, ash interior dikes only
- Design flow control of water inside and out
- Conduct regular dam inspections

# The Fundamentals (con't)

## Effective Moist Coal Ash Basin Management and Design

- Operations plans for ash and water removal
- Maintain freeboard and storage capacity
- Adequate redundancy of critical features

**NOTE:** The vast majority of Southeast electric utilities are already following the Fundamentals.

# What Are We Doing Right?

- Conducting regular dam safety inspections.
- Extensive slope stability, and foundation evaluation and design
- Triple Bottom Line – Creates a natural incentive for good business, and a strong environmental compliance culture
- Making a shift toward better, more efficient ash handling methods
- Always looking for ways to improve

# Things We Could Do Better

- Take the time to **learn** from the lessons provided by recent failures. Wait for the TVA failure investigation reports
- Make the transition to better coal ash handling methods based on good science and good management
- Avoid tendency to react and over regulate – this approach will cause the problems to migrate somewhere else

# Geotechnical Properties of Coal Ash Material

- Vary from site to site depending on coal source and coal combustion method
- Unit weight: ranges from 45 to 85 pcf
- Ash is a silt size particle that is very susceptible to changes in water content
- Strength properties of coal ash are difficult to determine



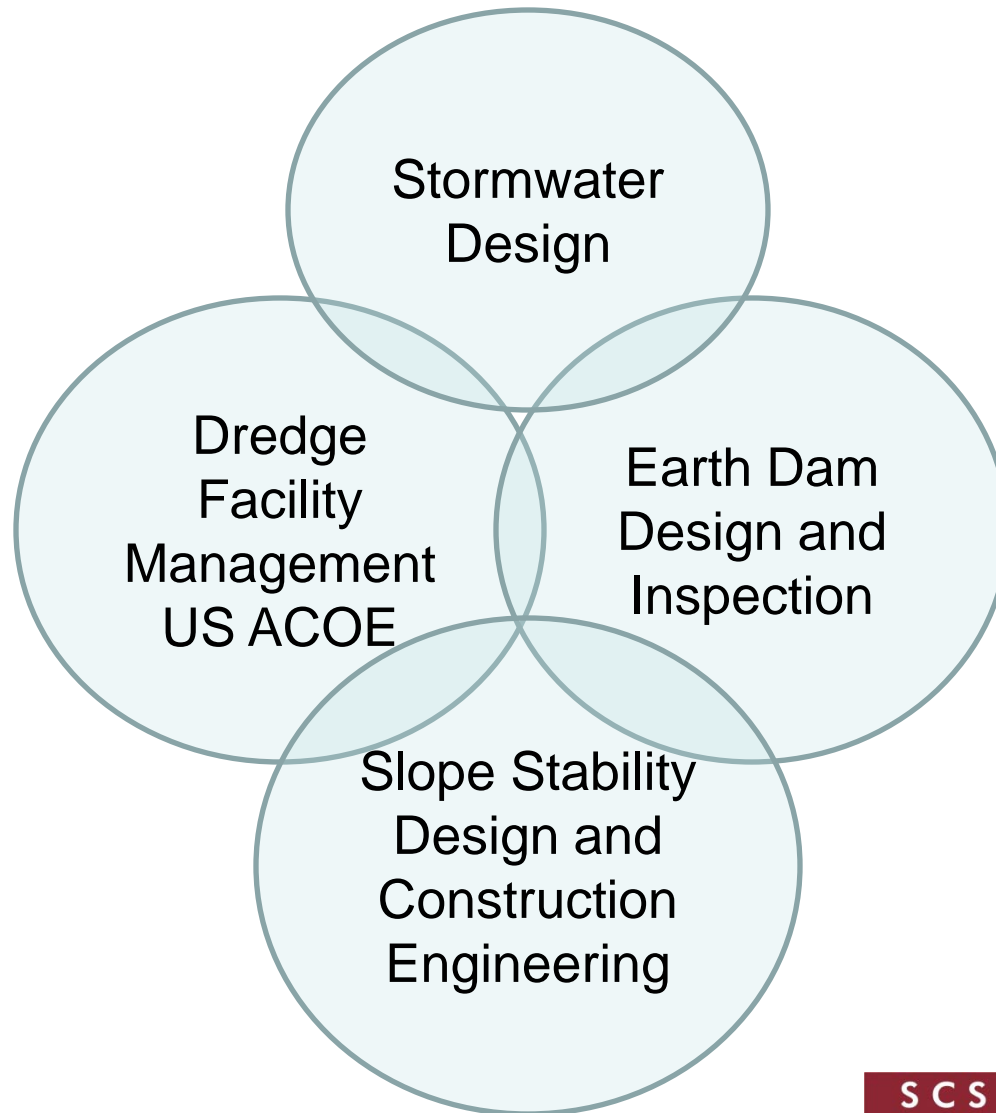
# Build Smart – Geotechnical Common Sense

- Conduct extensive slope stability analysis with adequate third party review
- Limit use of estimated soil strength properties – confirm with lab or in-situ testing
- Design seepage and water control features into coal ash storage facilities
- Redundant features including engineered soil embankments around perimeter of site

NOTE: Most Southeast utilities are already “building smart” by conducting extensive geotechnical evaluations.

# Effective Coal Ash Basin Management

## A Balanced Engineering Approach



# Dam Safety Inspections – Continue to Trust, but Verify

- Methods for dam inspections are well understood, and effective for identifying early problems
- Extensive State and Federal dam safety checklists evaluate outlet structures, seepage conditions, overtopping, and impacts due to erosion
- Dam safety inspections are working well – expand to include design principles

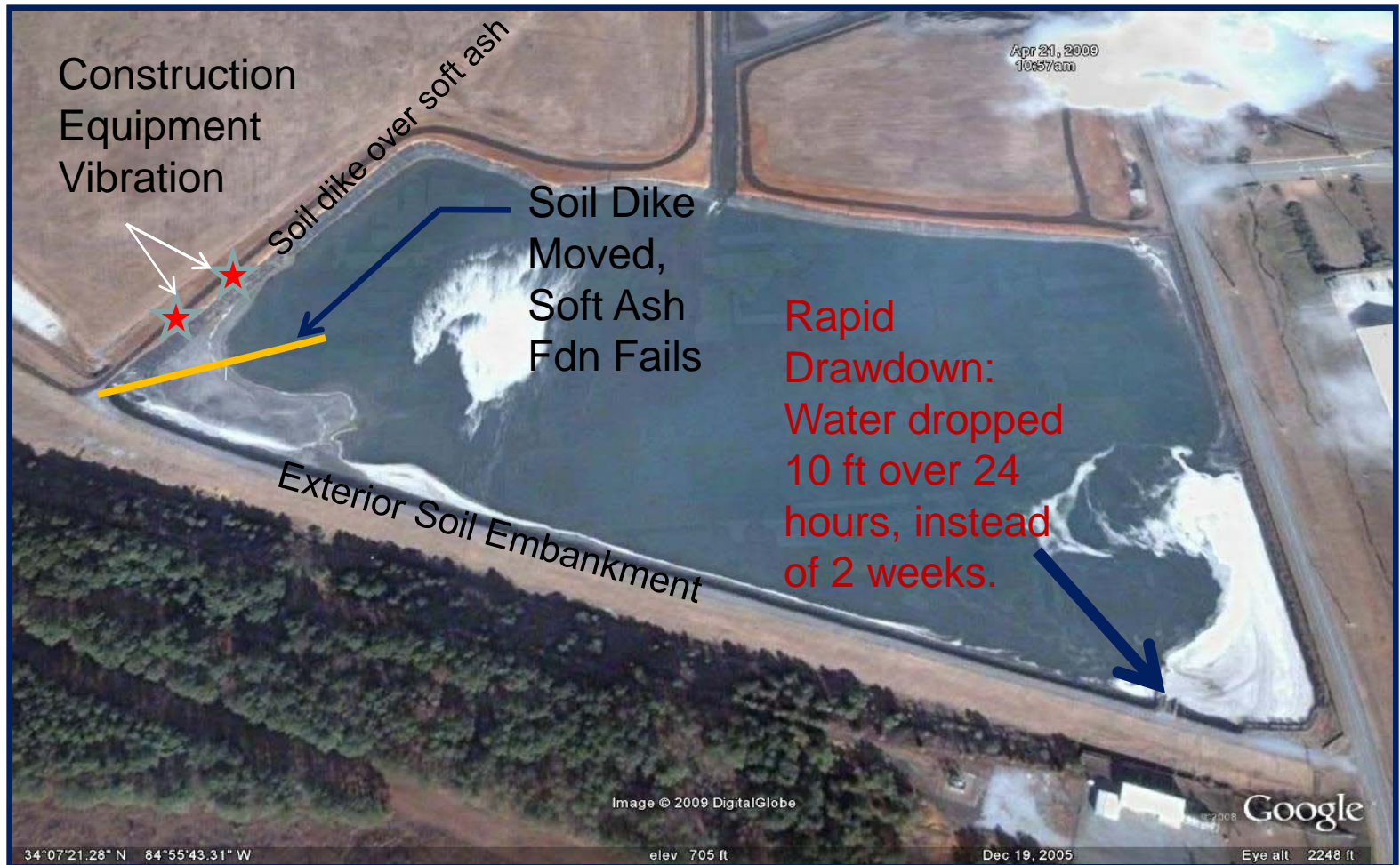
Most Southeast utilities already have an extensive dam safety inspection program for the ash basins that exceed Federal guidelines.

# Coal Ash is Susceptible to Rapid Changes in Water Content

- Coal ash drains like a silt material
- It is lighter than most soils
- It can be subject to a rapid buildup in porewater pressure
- Rapid drawdown near and within coal ash embankments can be problem

# Case Study No. 1

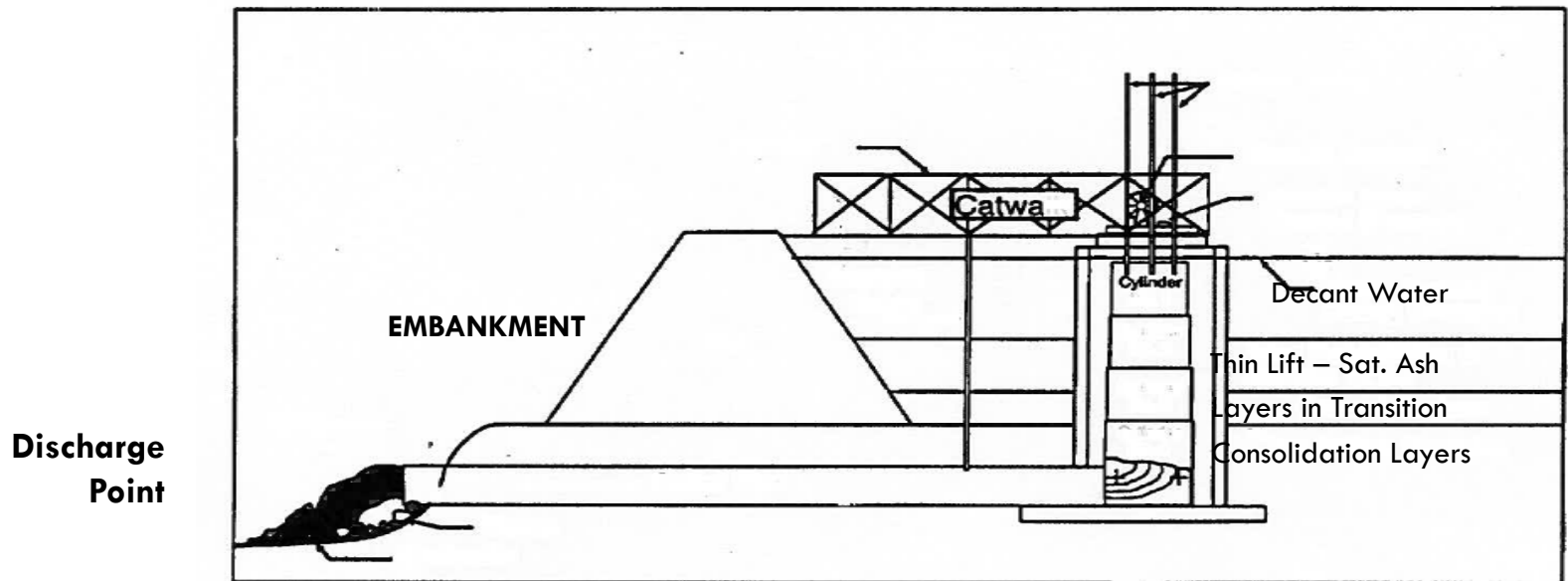
## Rapid Drawdown Dike Failure



# Ash Basin Operations Plans

- Controlling stormwater and near surface water is imperative for effective ash basin management
- Weirs and spillways for surface water control. Standard ACOE methods for dredge facilities
- Subsurface drains for near surface water seepage control
- Plan for high precipitation and high ash production events

# Weir and Thin Lift Placement from a Typical Dredge Facility



# Adequate Redundancy in Design and Operation

- Go back to the Fundamentals
  - Overlap geotechnical, operations, stormwater and dam safety design
  - Exterior berms – engineered soils, high enough for freeboard and storage capacity
  - Annual dam inspections
  - Third party engineering and outside peer review

Most Southeast utilities already follow the principles of “redundancy” for the design and operation of coal ash basins.



# Consider Dry Coal Ash Processing and Disposal

- Some facilities remove coal ash dry for reuse or disposal in offsite landfills  
Transition from moist to dry is expensive.
- Main advantage is that coal ash remains dry and leaching of constituents is minimized
- Dry coal ash must still be disposed in onsite or offsite landfills and other regulated facilities
- Dry coal ash requires dust control and can require re-wetting prior to compaction

# Dry Ash Collection Process

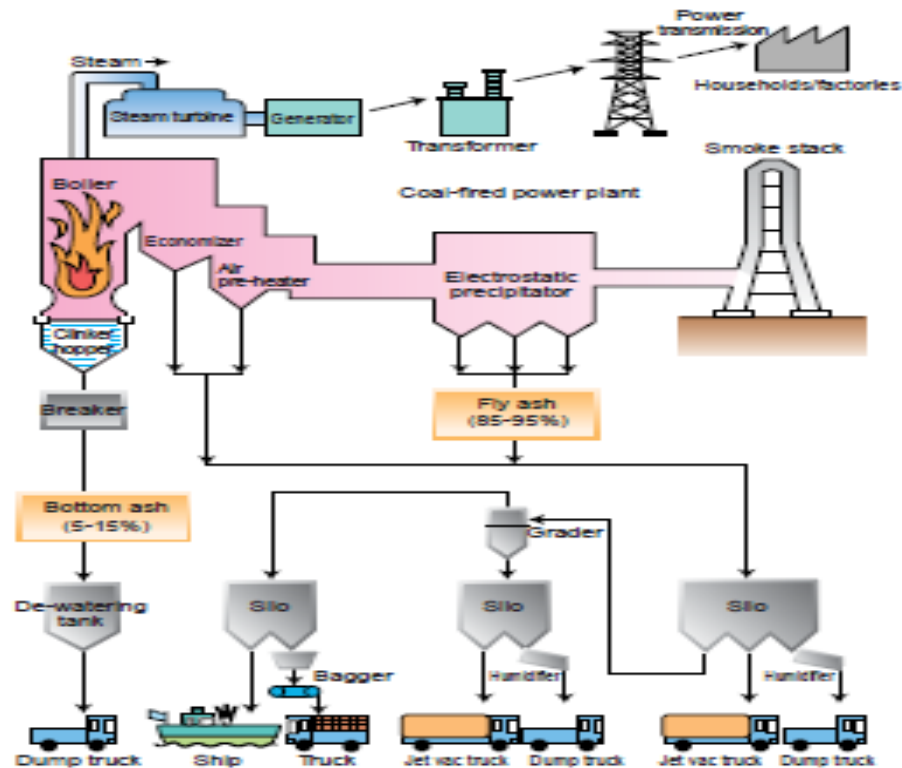


Fig. 1 Coal ash generation from a pulverized coal-fired boiler  
Source: Japan Fly Ash Association

# Coal Ash Landfills

- Advantages
  - Can provide better protection of groundwater
  - Control of leachate and stormwater runoff
  - Consistent and time-tested method for solid waste disposal
- Disadvantages
  - Permanently impacts land
  - Minimizes potential for reuse
  - Long term post closure care



# Recommendations for BMP of Coal Ash Basins and Landfills

- Focus on the Fundamentals
- Continue regular dam safety inspections
- Continue and expand geotechnical stability evaluations
- **Learn** from utilities who are not having problems
- **Learn** from the recent struggles of others
- Do not be too quick to react and over regulate. Good regulation takes time.

# Summary and Conclusion

- Geotechnical engineering is an essential part of coal ash storage facility design
- Parameters used for coal ash strength and stability can vary from site to site
- Continue dam safety inspections
- The industry is in the midst of rapidly changing regulatory environment
- Conclusion: Take the time to review and understand coal ash facility design principles.

