

Kingston Power Plant Ash Pond Failure Incident

AECOM Suggested Work Scope & Schedule
for
Geotechnical Root Cause Failure Analysis

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Ash Pond Failure Incident

Assessment Goals

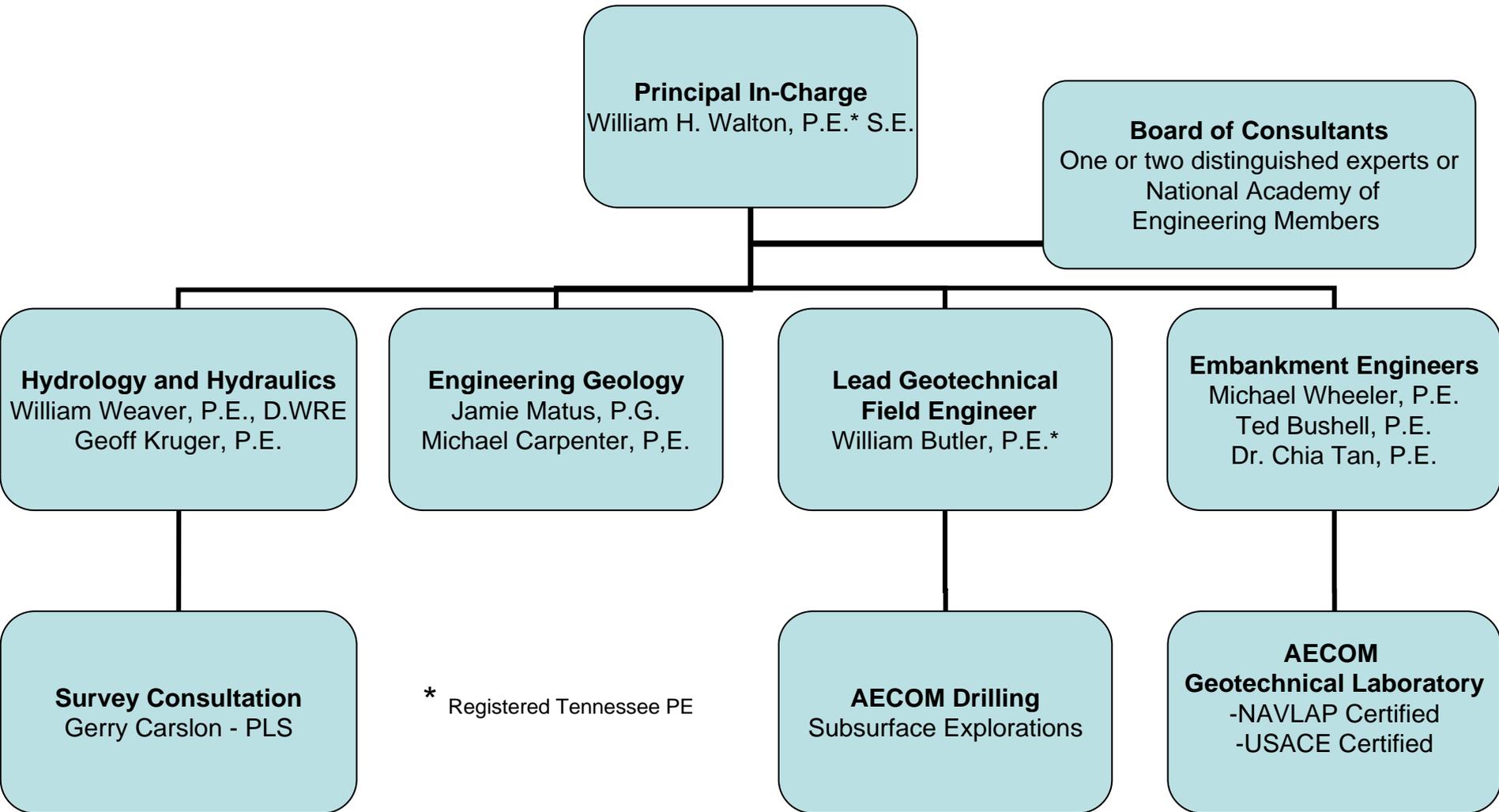
There are three basic issues that need to be addressed immediately:

1. A brief assessment of the past status of the areas of concern including: what was the design, how were the areas loaded, what concerns may arise and how were they addressed (Geotechnical).
2. A quick assessment of the present conditions and the possible causes using probable failure mode analyses (Geotechnical).
3. A quick assessment of the fate and transport of materials released into the environment, including any ground, air or water impacts (Environmental).

AECOM SPECIALITY PRACTICES GROUP GEOTECHNICAL SERVICES

- 200+ Geotechnical Engineers, Geologists, Technicians, & Drillers supporting North American Projects
- Includes staff from STS, DMJM-Harris, EarthTech, UMA, ENSR, and Metcalf & Eddy
- Full service laboratories and drilling services
- Offices throughout North America
- AECOM has 41,000 employees worldwide

PROJECT GEOTECHNICAL TEAM



AECOM Draft Scope of Services

Kingston Ash Pond

- 1. Order background information for site and surroundings, such as topographic maps and historical aerial photographs. Obtain rainfall, river flow, and hydrologic data from Tennessee DE&C, USGS, NOAA and NWS. Obtain available flood studies from FEMA.**
- 2. Assemble team of water resource, geotechnical, and geologic engineers. Travel to site, determine protocols for safe observation, walk the site and also make observations from the air.**
- 3. Visit with key TVA engineers, officials and operators to learn their understanding of the facts.**
- 4. Lead a Probable Failure Modes Analysis (PFMA) with TVA engineers and operators familiar with the ash pond.**
- 5. Review pond operating plan, pond and containment dike design documentation, historic soil borings, project hydraulic studies, pond inflows, and pond outlet design. Compile TVA's existing operating data and project drawings. Assist TVA to inventory and index project data.**
- 6. Prepare specifications for conventional topographic surveys and photogrammetric mapping of ash pond, to Emory River extending to the Tennessee River. Request or commission new aerial photography. May need ash pond and Emory River bathymetric surveys to assess sediment depth; AECOM would provide specifications.**
- 7. Prepare an exploration and sampling plan at the containment dike failure area and at relic areas of intact dikes and unfailed flyash mounds. (AECOM has the rotary drilling equipment to perform remote geotechnical and geologic explorations, geologic mapping, and laboratory analyses in the AECOM business unit that was formerly STS.)**
- 8. Prepare an ash sludge sampling plan for sediment within and nearby/downstream of the ash pond. Establish protocols for chain of custody and use accredited laboratories.**
- 9. Perform analyses and then prepare a draft Root Cause Failure Analysis report.**

Root Cause Failure Analysis

- Probable Failure Modes Analysis (PFMA) will investigate the possibility of:
 - Overtopping due to high pool from unusual storm
 - Overtopping due to blocked spillway
 - Overtopping by mud wave from ash pile slough
 - Excessive river erosion or scour at toe of dike
 - Foundation instability due to sliding
 - Internal dam slough or slide
 - Excessive seepage or internal erosion
 - Static or seismic liquefaction

Preliminary AECOM Schedule

- Site Visit and Interviews 1/6 to 1/9/09
- File Review 1/7 to 1/17/09
- PFMA at TVA 1/15 to 1/16/09
- Specifications for Explorations 1/12 to 1/17/09
- Field Explorations and Surveys 1/20 to TBD
- Laboratory Testing 1/26 to TBD
- Root Cause Failure Analyses 2/2 to TBD
- Reporting Issue Draft - TBD

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AECOM References

- **Silver Lake Dam Failure, Michigan**
 - Foley & Lardner – James Caragher (414) 297-5502
 - UPPCo - Robert Meyers (906) 485-2419
- **Clark Landfill Failure, Indiana**
 - Jones Day - David Kutik (216) 586-3939
 - Squire Sanders - Dale Papajcik (216) 479-8479
- **I93 Tunnel Leak in Boston, Massachusetts**
 - Massachusetts Turnpike Authority - Helmut Ernst (helmut.ernst@mta.state.ma.us)

AECOM Forensic Experience

As described in US Corps of Engineers Form 255

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT <i>(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)</i>		20. EXAMPLE PROJECT KEY NUMBER 8
21. TITLE AND LOCATION (City and State) Silver Lake Root Cause Analysis and Consequential Damage Assessment, Marquette, Michigan	22. YEAR COMPLETED	
	PROFESSIONAL SERVICES 2003	CONSTRUCTION (if Applicable) N/A
23. PROJECT OWNER'S INFORMATION		
a. PROJECT OWNER Upper Peninsula Power Company	b. POINT OF CONTACT NAME Robert Meyers	c. POINT OF CONTACT TELEPHONE NUMBER (906)485-2419
24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT (Include scope, size, and cost) In May of 2003, a dike failure at the Silver Lake Storage Basin in Marquette County, Michigan resulted in the uncontrolled release of 8 billion gallons of water into the Dead River. STS was retained to assist with the evaluation of the Root Cause of the failure and collection of data for downstream damage assessment. STS' diverse product lines provided Upper Peninsula Power Company (UPPCO) with a single vendor source for a variety of services related to the analysis. STS surveyed the basin using traditional and aerial methods and integrated the geospatial data into a Geographic Information System (GIS) for ease of data management. STS also performed geotechnical and geological evaluations of the soil conditions in the area of the breach. Our hydrologists quantified the rainstorm event, calibrated runoff models, and modeled the breach event to assist with the root cause failure assessment. Services provided include: Geotechnical Evaluation, Geological Assessment, Surveying, Mapping, Geographic Information Systems (GIS), Hydrology Analyses, Hydraulic Analyses and Wind-wave Setup Analyses.		
Note: AECOM acquired STS in 2007		

AECOM Forensic Experience cont.

F. EXAMPLE PROJECTS WHICH BEST ILLUSTRATE PROPOSED TEAM'S QUALIFICATIONS FOR THIS CONTRACT <i>(Present as many projects as requested by the agency, or 10 projects, if not specified. Complete one Section F for each project.)</i>		20. EXAMPLE PROJECT KEY NUMBER 7
21. TITLE AND LOCATION <i>(City and State)</i> ISG Forensic Engineering and Repermitting for Steel Industry Landfill Failure, East Chicago, IN	22. YEAR COMPLETED	
	PROFESSIONAL SERVICES ongoing	CONSTRUCTION (if Applicable) ongoing
23. PROJECT OWNER'S INFORMATION		
a. PROJECT OWNER ISG	b. POINT OF CONTACT NAME Jim Flannery	c. POINT OF CONTACT TELEPHONE NUMBER (219) 391-2571
24. BRIEF DESCRIPTION OF PROJECT AND RELEVANCE TO THIS CONTRACT <i>(Include scope, size, and cost)</i> The Clark Landfill was used by LTV Steel (now International Steel Group) to dispose of many industrial mill wastes with the primary volume composed of Basic Oxygen Furnace (BOF) dust. In 1997 during regrading of the landfill to achieve closure grades, a foundation base failure and slope movement toward a water supply flume occurred. The slope movement nearly cut off the Lake Michigan 240 MGD water supply to the mill. LTV hired STS Consultants, Ltd. (STS) for the forensic work and initially GAI Consultants of Pittsburg for the landfill closure repemitting work. STS assisted with the forensic work to determine the cause of failure and based on STS' IDEM permitting experience also assisted and served as the design engineer for the repemitting activities. STS also served as the damages cost expert. STS initially installed slope inclinometers and piezometers instrumentation to understand the cause of the failure. This instrumentation specifically defined the foundation and slope failure scarp (surface), the continuing rate of slope movement and a back-calculated soil shear strength at the time of failure. Both peak and remolded shear strengths were determined by field and laboratory testing programs in our own lab with corroboration by three university research centers. The test data revealed that the landfill likely failed due to excessive high porewater pressures and under- consolidated shear strengths that were inadequate to maintain slope stability for the proposed closure grades and provide a minimum factor safety of 1.5 as required by IDEM regulations. STS developed a flume dredging program, partial flume buttress fill, new closure grading plan and armored (stone) cover barrier system. The new closure design was developed to achieve a factor safety of 1.3 despite the shear strength of the foundation soils below the landfill being badly damaged by the catastrophic slope movements. The closure plan was also developed as a staged implementation plan to strategically achieve adequate shear strength for each subsequent stage of closure construction.		

Note: AECOM acquired STS Consultants Ltd. in 2007

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AECOM Experience with Waste Ponds

- Ash Pond, Sludge Pond and Tailings Basin Design, Operational Planning, Performance Monitoring, and Construction Quality Management
- Geotechnical Engineering
- Hydraulic/Hydrology Studies and Spillway Designs
- Infrastructure Design and Construction Quality Management
- Pumping Systems
- Reclamation Design and Closure
- Environmental Studies, Permitting, and Monitoring
- Geophysical Studies
- Database Management System and GIS System Development
- Forensic Studies on Failed Earthen Structures

Sludge and Flyash Pond Retention Dams Experience

- Paper Waste Ponds
- Coal Flyash Ponds
- Clients:
 - Mead Westvaco
 - Domtar
 - Frazer Inc.
 - Packaging Corp. (PCA)
 - Georgia Pacific
 - Appleton Coated Inc.
- Clients:
 - WE Energies
 - WPS

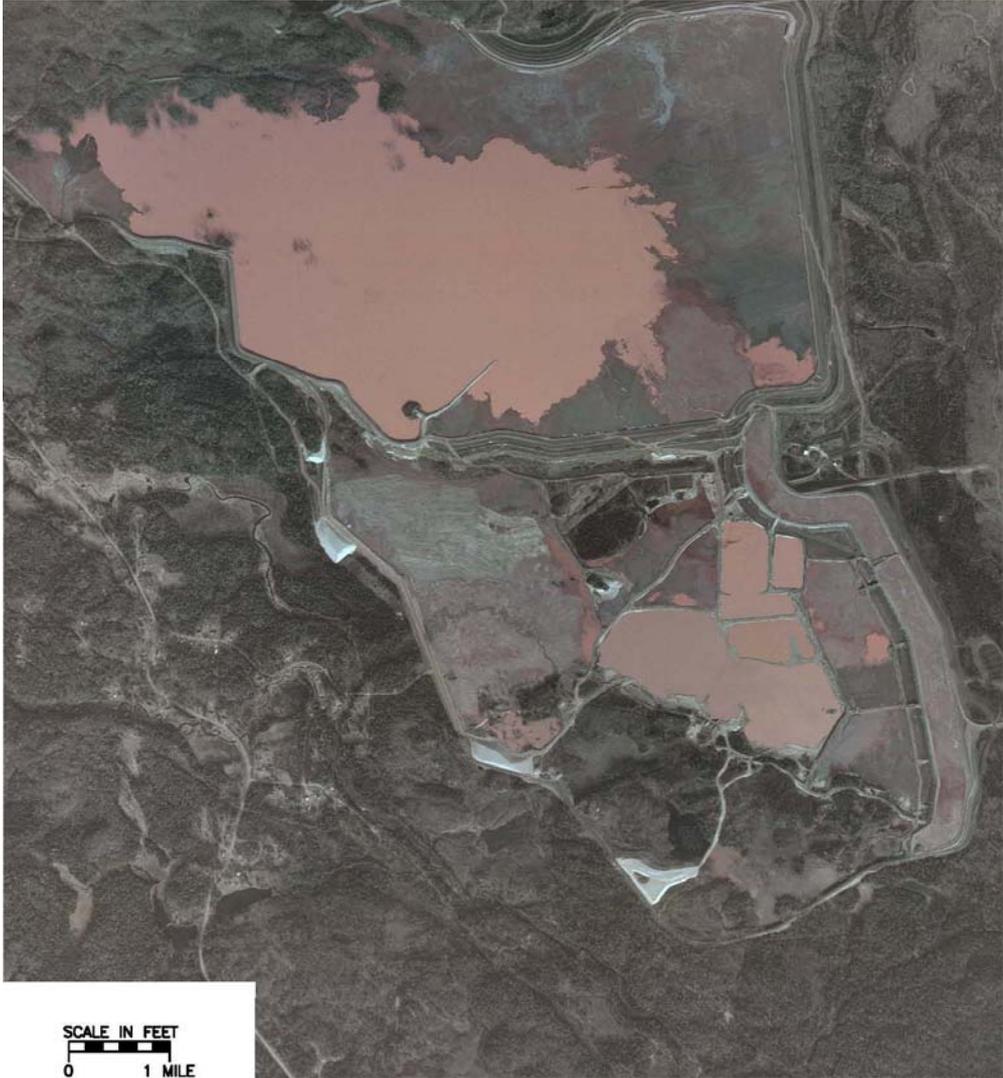
Tailings Dam Pond Experience

AECOM has successfully provided innovative mining and sediment holding pond solutions for more than 50 years in the Midwest US and Canada for facilities ranging from 1,000 to 3,000 acres in size as well as for dams up to 160 feet high. We have extensive experience with tailings impoundments and provide fully integrated engineering and environmental services aligned with the objectives of our mining clients.

Tailings Impoundments Clients include:

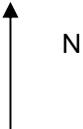
- Cleveland Cliffs Mining Services**
- Tilden Mine**
- Empire Mine**
- United Taconite**
- USS Minntac**
- USS Keetac**
- Wabash**
- Hibbing Taconite**
- Circored Trinidad**

Mine Tailings Pond Experience Example



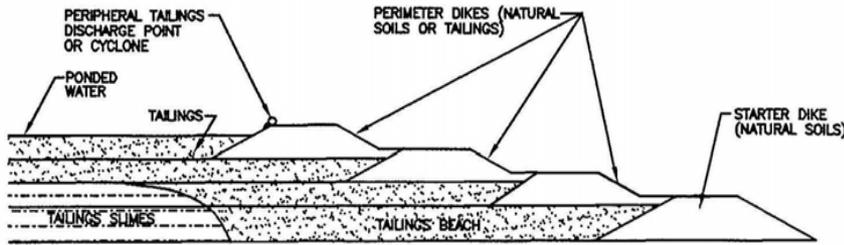
Gribben North and South Tailings Basins, Michigan, operated by Cleveland Cliffs.

STS (now AECOM) has 25 years' experience in design for Cleveland Cliffs at this site.

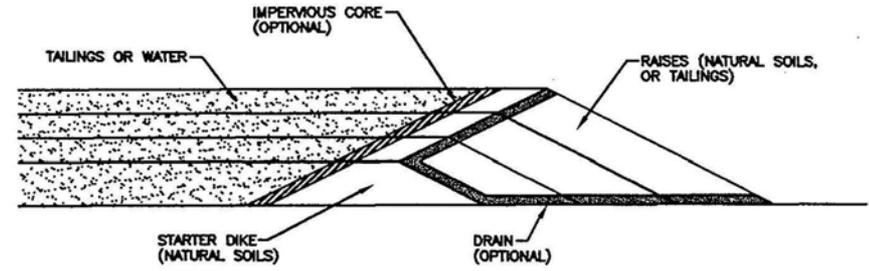


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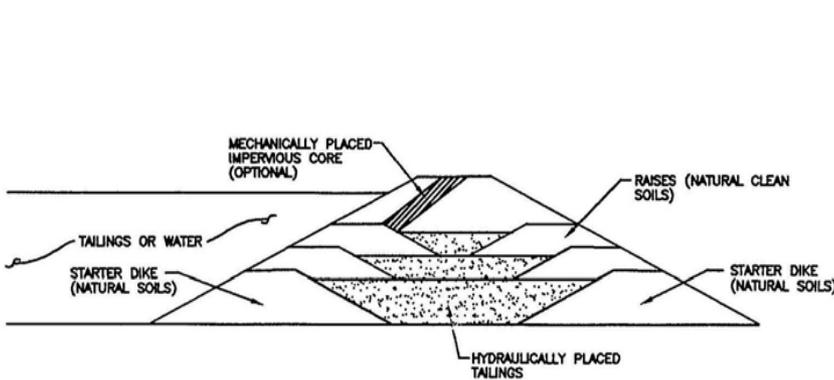
Waste Ponds and Tailings Dam Types



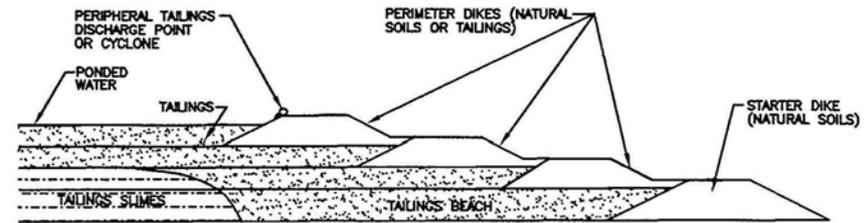
UPSTREAM METHOD (A)



DOWNSTREAM METHOD (B)



HYDRAULIC CORE METHOD (B)



UPSTREAM METHOD (A)

Summary

- The AECOM team comprises seasoned engineers experienced in significant forensic investigations, understands the urgency of your project and is ready to mobilize immediately.
- The AECOM team has more than 50 years of geotechnical dam design experience involving waste pond and tailings projects for disposal of flyash, paper sludge and iron ore tailings.
- AECOM geotechnical engineers, environmental engineers and scientists have worked for Federal Agencies and Utilities on essential structures.