TVA Kingston Coal Ash Dredge Cell Failure

December 22, 2008

TENNESSEE
Sounds good to me

Issues worth noting about facility

- Age/construction of site
- Inspection track record for site
- Prior operational problems

Permitting History

- Initially operated as a settling pond.
- In the early 1990s, TN DSWM became aware that pond had been operated in a manner that resulted in a pile of dredged ash being stored in pond exceeding the elevation of the free water surface, and requested a closure plan be submitted. Closure plan was actually submitted in 1995.
- TVA subsequently requested a permit be issued for a Class II landfill, to be located within a portion of the existing pond, and with waivers/variances. The initial permit was issued in 2000.
- In 2006, a request for a lateral/vertical expansion was approved, also to be located within a portion of the existing pond, and with waivers/variances.

Stability Requirements under TN regs:

1200-1-7-.04(2)(u) requires that Class I and II landfills not be located within 200 ft of a fault which has had displacement within the Holocene time frame (e.g., the past 10,000 to 12,000 yrs)

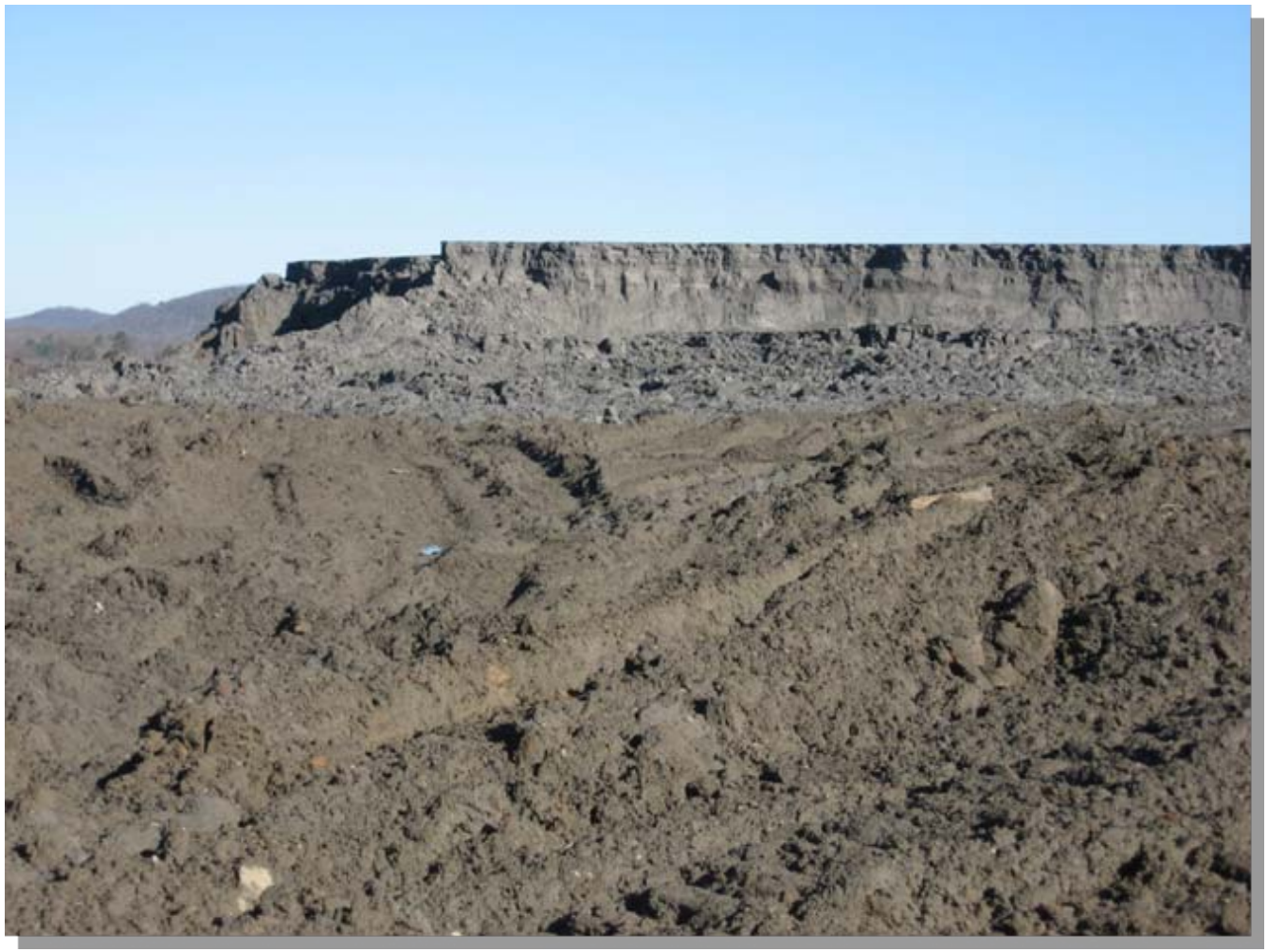
1200-1-7-.04(2)(v) requires that Class I and II landfills not be located in Seismic impact zones unless the O/O demonstrates that the facility is designed to resist the maximum horizontal acceleration from the design seismic event.

1200-1-7-.04(2)(w) requires that Class I and II landfills located in an unstable area must demonstrate that engineering measures have been incorporated into the design of the disposal facility to ensure that the integrity of the structural components of the landfill will not be disrupted.

Description of Incident

- 60 Acres of 84 acre dredge cell failed
- 5.4 MM cubic yards of material involved
- Covered 300 acres
- 40 residences were impacted by ash deposits or water surge
- 3 houses were damaged and are uninhabitable


40



Immediate Response Activities

- Relocation of Directly Impacted Neighbors
- Securing Immediate Vicinity
- Restoring utilities to immediate vicinity (electricity on 12/24/2008, Water and gas on 12/28/2008)
- Restoring 3,000 ft of Rail Accessibility (accomplished on 1/5/2009)

January 12, 2009 Commissioner's Order

- Required submittal within 20 days of all information potentially relevant to the catastrophic failure
- Perform a comprehensive review of the structural integrity for *all* TVA coal ash facilities within the state using independent RPEs, etc.
- TVA provide full support for TDEC's initial assessment of impacts from the ash release
- Submit a Corrective Action Plan within 45 days

Requirements of the Corrective Action Plan

- Plans for extensive sampling, remediation, and restoration of all natural resources damaged by the release
- A monitoring plan for air and water during the cleanup process
- A plan to protect public and private DW sources
- A short and long term ash management plan for KIF ash
- A plan for addressing any health or safety issues posed by the ash
- Pay all costs associated with TDEC oversight of the remediation

TDEC Divisions involved in Response

- Water Pollution Control
- Air Pollution Control
- Solid Waste Management
- Division of Remediation
- Radiological Health

Other State/Local Agencies involved

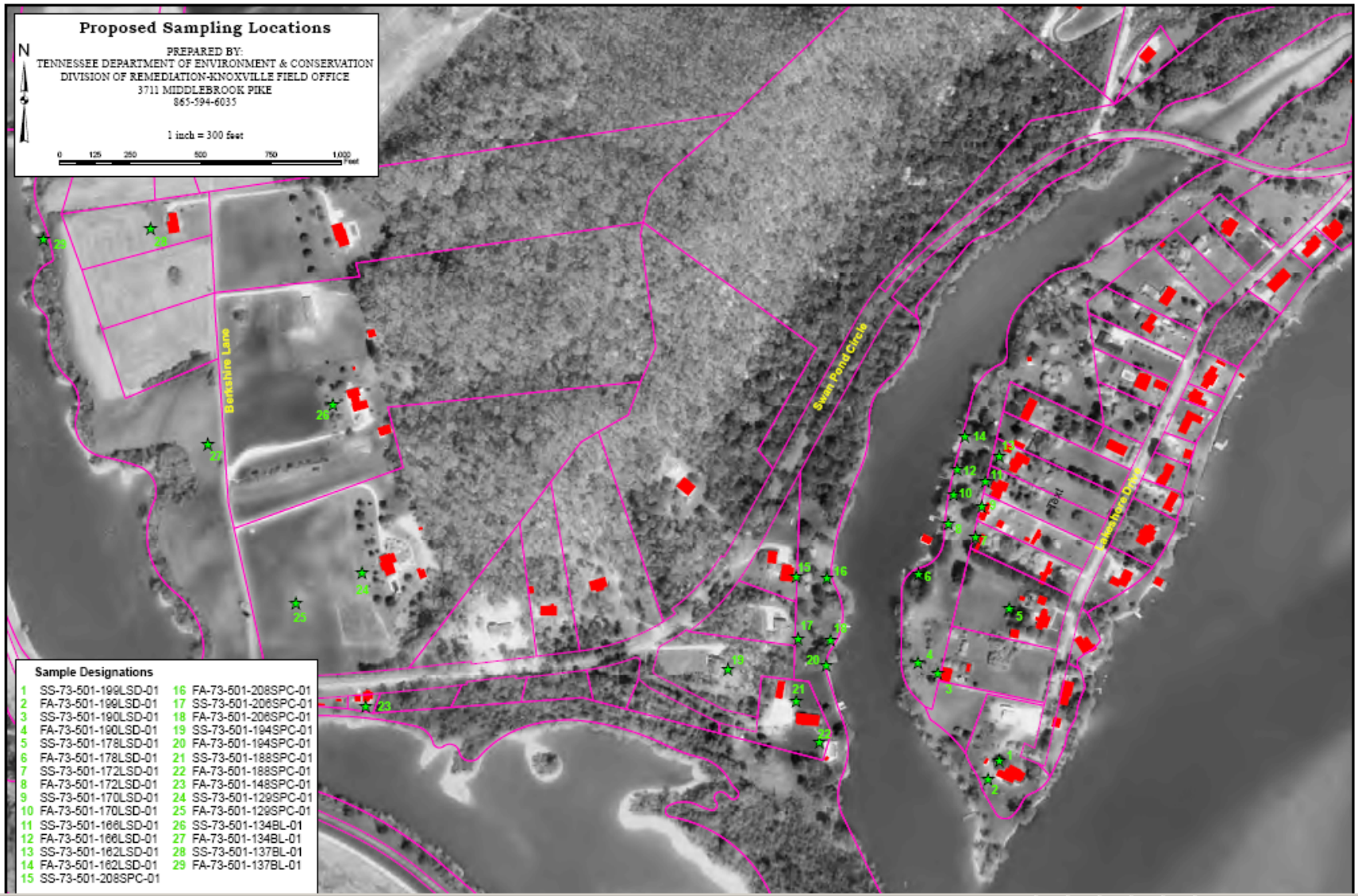
- TEMA
- TWRA
- TDH
- Roane County EMA

TDEC efforts thus far

Sampling

- Soil Sampling from properties directly affected by release
- POTW raw and finished water sampling (ongoing)
- Drinking water well sampling within a 4 mile radius
- PM 10/PM 2.5 air monitoring is ongoing

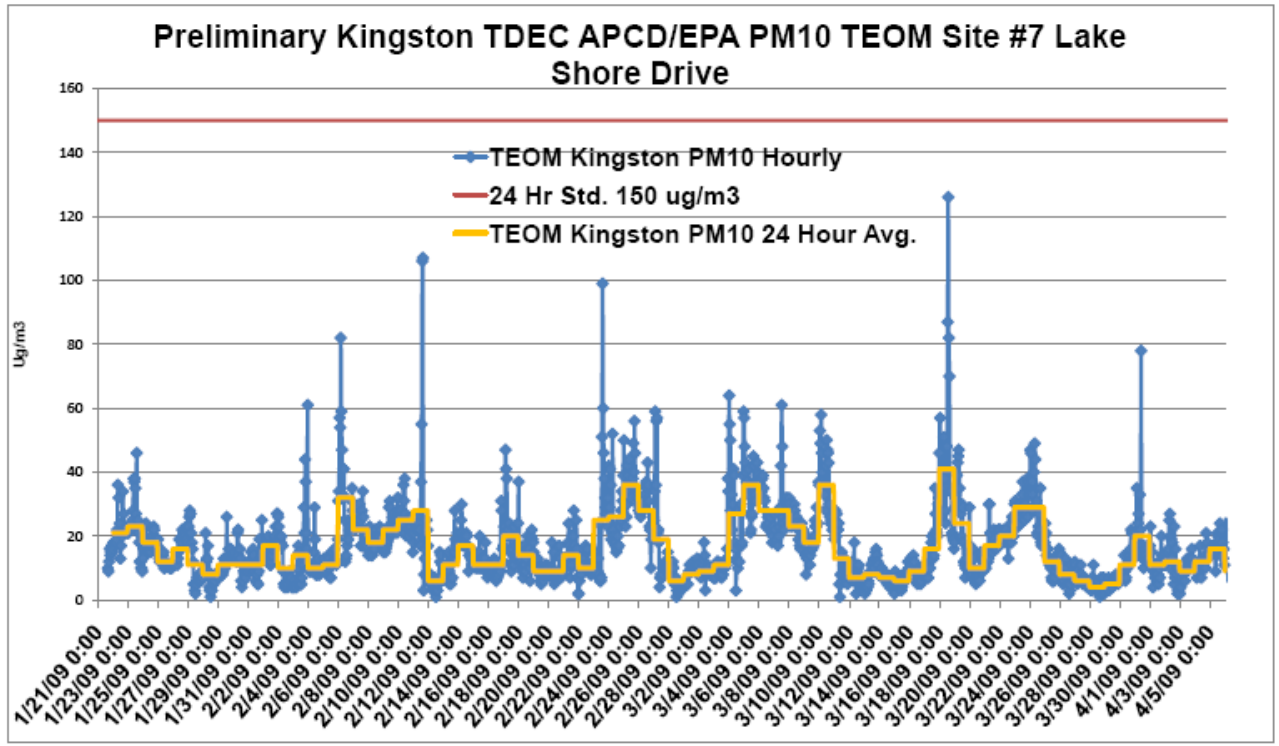
TDEC is maintaining a small on-site presence for the duration of the response action



TEST: ICP-MS		METHOD: EPA 200.8				
ANALYTE	**RESULT**	**UNITS**	**MDL**	**MQL**	**ANALYZED BY:**	**DATE**
Arsenic	U	µg/L	0.93	5	M Pattanayek	4/1/2009
Barium	28	µg/L	2.5	5	M Pattanayek	4/1/2009
Beryllium	U	µg/L	0.11	1	M Pattanayek	4/1/2009
Cadmium	U	µg/L	0.41	1	M Pattanayek	4/1/2009
Chromium	U	µg/L	2.0	5	M Pattanayek	4/1/2009
Cobalt	0.11J	µg/L	0.04	1	M Pattanayek	4/1/2009
Lead	0.12J	µg/L	0.10	1	M Pattanayek	4/1/2009
Manganese	10	µg/L	0.42	1	M Pattanayek	4/1/2009
Selenium	U	µg/L	1.3	5	M Pattanayek	4/1/2009
Thallium	0.09J	µg/L	0.03	1	M Pattanayek	4/1/2009
Vanadium	U	µg/L	3.4	5	M Pattanayek	4/1/2009

TEST: Mercury		METHOD: EPA 245.1				
ANALYTE	**RESULT**	**UNITS**	**MDL**	**MQL**	**ANALYZED BY:**	**DATE**
Mercury	U	µg/L	0.13	0.2	A Wilson	3/31/2009

J - Estimated value between MDL and MQL
MDL - Method Detection Limit
MQL - Method Quantitation Limit
U - Undetected



TVA's Actions thus far

Airborne Particulate Control

- Undisturbed portion of site and exposed dike walls have been treated with a vinyl acrylic emulsion
- Exposed spilled Ash has been seeded and fertilized
- Other areas of exposed ash being kept wet

TVA's Actions thus far (Cont'd)

Stabilization of Ash in River

- Construction of submerged weir to reduce/eliminate migration of submerged waste (615 ft long, completed 1/5/2009)
- Construction of 1750 foot long dike to retain sludge in Emory river embayment (completed in early March, 2009)
- Managing flows of Emory and Tennessee Rivers by controlling releases from Melton Hill, Watts Bar and Fort Loudon dams

Restoration of River/embayment

- Developed a plan for creating a dewatering area adjacent to existing dredge cells
- Installed 17,000 wick drains and a gravel drainage layer over area
- Will be dewatering in “Ball Field” area, temporarily storing in as yet unconstructed Gypsum storage area, prior to disposal
- On 3/19/2009, began pumping ash sludge from River for processing


KOMATSU
PC400LC


CAT

Management of recovered ash residues

Currently investigating any and all prospects for off-site disposal, for remedial wastes, as well as short and long term management of as-generated wastes

So far, a little over a million cubic yards have been removed from the embayments. Around 2.4 million yards remain in the water. The bulk of materials shipped off-site have gone to an Alabama landfill.

Looming Problems

- Upcoming “wet” season
- Legacy contaminants in pre-spill river sediments
- Pending regulation of CCW on federal level
- Litigation

May 11, 2009:

TVA and EPA signed an agreement on site clean up. EPA essentially assumed the lead oversight role.

June 25th, 2009:

AECOM "Root Cause" report is released (at a cost of around $3 million). Full report size ~1,500 pages. The gist of which places the physical cause of the failure on a unique combination of 4 factors:

1. Fill Geometry (upstream-constructed dike configuration on sluiced ash foundation).
2. Increased fill rates
3. Soft foundation soils (weak, sensitive silt and slimes foundation prone to creep).
4 Loose, wet ash (susceptible to collapse if subjected to rapid loading or rapid displacement).

July 28th, 2009

TVA OIG releases their 110 page report on TVA's ash management practices and the Root Cause of Failure Analysis by AECOM

Not on the TVA.gov website related to the Kingston Release: http://oig.tva.gov
You have to drill down two levels to find the page

Interesting quotes from the OIG report:

"On the June 25, 2009 TVA press conference to deliver AECOM's root cause analysis report. Bill Walton of AECOM appeared for his company and COO Bill McCollum represented TVA at the press conference. The presentation was tightly scripted to avoid any discussion of management errors at TVA."

- *Page 12*

Interesting quotes from the OIG report:

"TVA's CEO delegated the scoping of the root cause analysis to the OGC, which resulted in a scope that severely limited the value of AECOM's work. Litigation strategy seems to have prevailed over transparency and accountability."

- *Page 4*

Interesting quotes from the OIG report:

"OGC through their attorneys arranged for a contract between TVA and with AECOM Technology Corporation (AECOM)…" … "The OGC by contract and verbal instruction…" "The essence of the direction given to Bill Walton, the chief consultant for AECOM, precluded AECOM from reviewing the (1) standard of practice used by TVA or their consultants for the design and construction of the ash ponds and dredge cells; (2) fate and transport of potential ash and possible contaminates from the cells into the environment; (3) design of remedial construction measures to clean and restore the Kingston site; (4) designs and operations at other TVA wet dredge cell disposal sites."

Page 1, and echoed, nearly verbatim again on page 16, and followed up with the statement:

Interesting quotes from the OIG report:

"In our opinion, the defined limitations in scope precluded AECOM from (1) reviewing or judging the management practices of TVA in conjunction with the design, construction or operation of TVA ash ponds; (2) determining fault for the Kingston Spill; and (3) judging TVA employees or contractors."

Interesting quotes from the OIG report:

"In June 2004, Worley Parson reported on the results of a slope analysis it performed at TVA's request related to the design of an upward expansion of the Kingston coal pond… Parsons noted the existence of an approximately 7- to 10-foot thick layer of loose ash immediately overlaying the clay soil beneath the ash pond. Parsons further noted that this layer of loose ash may undergo liquefaction under certain circumstances, including a seismic event. Parsons stated that the probability of this occurring was "extremely low". However, they then stated that methods of predicting liquefaction have proven to be "insufficient" and, therefore, recommended that TVA take measures to improve drainage in the ash pond." *Page 19*

Interesting quotes from the OIG report:

TVA contracted Geosyntec to perform an engineering peer review of, among other things, the Parsons stability analysis. This was done, according to a manager at TVA “because of questions about the quality of the Parsons’ study.” Geosyntec reported its findings to TVA in November of 2004. “ In its report to TVA, Geosyntec concluded that the “potential for liquefaction should be estimated and, depending on the results of this estimate, a liquefaction analysis may be required. If the site is expected to liquefy then ground improvement techniques neet to be implemented. In addition, Geosyntec questioned certain aspects of the stability analysis performed by Parsons and made recommendations pertaining to its stratigraphy, design material/soil property, slope stability evaluation, and veneer stability analysis.”

TVA did not follow the Geosyntec recommendation. *Page 19/20*

Interesting quotes from the OIG report:

OIG's consultant, Marshall Miller, determined that the Geosyntec findings should have caused modification of the proposed expansion's design to a more stringent configuration. *Page 20*

On June 1, 2004 TVA submitted an expansion application to TDEC. This application contained the Parson's report, but not the Geosyntec report. A permit was issued in September of 2006, and included the language "Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Commissioner, it shall promptly submit such facts or information." *Page 21*

TDEC received the report from TVA as part of their 65,000 page submittal as a result of the January 12, 2009 Commissioner's order.

September 14th, 2009

TVA announces that it will contribute $40 million in economic development funds for locally identified projects.

September 18th, 2009

TVA performed a high sulfur coal test burn that visible particular emissions from one of its stacks. Neighbors were not amused. The test burn was terminated.

October 1st, 2009

EPA, TDEC and TVA will hold a public meeting to field questions from the public concerning TVA coal ash and the cleanup efforts.


CLEAN
COAL?