

Emergency Dredging to Recover Ash

Kingston Fossil Plant

Kingston, Tennessee

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Summary

In the 1950's Tennessee Valley Authority (TVA) constructed a series of fossil fuel electric generating units at a site near Kingston Tennessee. The site is located near the confluence of the Emory and Clinch Rivers with the Tennessee River and is in the upper pool of the Watts Bar hydropower dam.

Coal Combustion Residue (ash) from the plant was sluiced with water into a pond constructed in shallow water of the hydropower dam pool using clay for the embankment. The pond embankment was raised twice by the upstream construction method reaching a total height of approximately 50-feet. In the 1980's as the pond reached capacity, the accumulating ash was removed from a settling basin by hydraulic dredging and placed into a pile on top of the original pond. The pile was raised four times by the upstream construction method and by 2008 had reached a height of approximately 80-feet above the filled surface of the original pond.

In the early morning of December 22, 2008, a slope failure in the ash pile caused static liquefaction of the pile with approximately 2/3 of the pile volume leaving the pile. When the flow stopped, approximately 3 million cubic yards of ash was filling the main thalweg of the Emory River.

As an early emergency response to the failure, TVA constructed a rock dike to solid ground across the ash flow near where it entered the Emory River. This separated the ash in the River from ash above normal water elevation.

The ash in the river was a serious restriction to flow in the river and its removal to reopen the thalweg of the Emory River was consider time-critical by TVA and the regulating governmental agencies.

Since hydraulic equipment was available at the site, the initial action was to start with hydraulic equipment on opening the main thalweg of the river. Because the equipment was sized for ash pond work, the equipment was considered to be too small to open the river quickly and the work by the equipment was used to pilot the process of separating the ash from the water in an efficient matter.

Based on the pilot work it was found that a 2000-foot long settling trench with removal by excavators could settle and remove more than 60% of the sediment at flows up to 10,000 gpm. The remainder of the sediment would be captured in the existing settling pond.

During the pilot operation, a contract for meeting the time-critical removal goal of the USEPA (main river thalweg open before spring of 2010 flood season) was made through the competitive bid process. Severson Environmental Services was contracted to open the channel by February 1, 2010. Severson proposed to use a 20-inch cutterhead dredge and a 14-inch cutterhead dredge to accomplish the work.

The main thalweg of the channel was restored to its pre-slide depth of 30-feet by the deadline and Severson then undertook final removal actions in the Emory River through the end of May 2010 to complete the emergency removal activities overseen by USEPA Region IV.

Lessons Learned

1. Concurrence of the parties to the emergency work must be developed and agreed to at a pace that is much faster than a normal environmental dredging project.
2. Means and methods for pursuing the work must match the capabilities and equipment that is readily available.
3. A good understanding of the properties and handling characteristics of the material being removed by dredging must be available or developed quickly.
4. The use of pilot operations to establish operational characteristics is to be encouraged even if it is doubtful that the pilot operation is at the correct scale required to meet the time goals.

Conclusions and Recommendations

1. The USEPA emergency action process is flexible and provides a good mechanism for reaching agreement quickly.
2. The TVA was experienced with hydraulic means and methods and some of the equipment needed was already available on the site or very nearby. Making use of these resources accelerated the response.
3. TVA and contractor resources had a qualitative understanding of the handling characteristics of the ash. More quantitative detail was not available and had to be developed early in the emergency response.
4. Pilot operations are valuable in understanding what will happen at the production scale dredging needed to meet the time critical goals of the emergency.