Beneficial Use Case Study

Engineered Fill Using Recycled Coal Combustion Products

Coal Combustion Product Type
Fly Ash

Project Location
North Georgia

Project Participants
Environmental Protection Agency, Georgia Power Company, Georgia Environmental Protection Division, Georgia Department of Transportation, Southern Company Services

Project Completion Date
2012

Project Summary
As part of an effort to foster the beneficial use of coal fly ash, a project was developed to demonstrate the safety and effectiveness of using fly ash in a large highway fill application. Longer-term goals were to support regulatory and statutory changes in Georgia to allow ash use in future commercial fill applications—thereby reducing the need for landfills, land consumption, and depletion of natural resources.

Project Description
The demonstration consisted of building a research test section of a coal combustion engineered fill on a new highway construction project. Ash (31,000 tons) was rolled and compacted to Georgia Department of Transportation (GDOT) standard specifications for roadway fill application. The compacted ash height extended 10 to 12 feet across the section. Normal fill material (sand, silt, clay, rock) was placed above the ash in lifts and compacted to at least 95% of the maximum laboratory dry density. Material within one foot of the pavement was also required to be free of rock fragments and compacted to 100% of maximum laboratory dry density.

GDOT conducted tests to confirm that compacted fly ash would meet specifications required for roadway fill application prior to the project. These tests included soil classification in accordance with GDOT and AASHTO classification systems and remolded, unconsolidated, undrained triaxial compression testing. Tests were also performed on the in-place material, including classification and in-place density using the sand cone method and nuclear gauge.

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To monitor any settlement, dipping, or rutting in the roadway and along the median and shoulders of the fly ash fill section, a high-definition laser scanner (HDLS) was used. Scanning was first done in July 2011, and a scan was performed every three months over the next year. The HDLS operates by taking many shots (scans) very quickly, forming the same framework as a digital camera image but in three dimensions and comprising millions of dot pixels in order to form a three-dimensional point cloud. An HDLS lidar scan was also conducted along an area with normal fill. There were no abnormalities noted in the test section based on the HDLS.

Geotechnical evaluations conducted showed that fly ash is an acceptable substitute for commercial fill applications such as a roadbase fill.

- No discernible differences from a geotechnical standpoint were noted in tests conducted on the fly ash section and normal fill sections.
- Soils and rock in the area contained overlapping concentration ranges—in some cases higher concentrations—for many trace elements compared to the fly ash used in the test.
- Statistical exceedances above background concentrations tended to be rare, isolated events that did not represent trends. They generally showed good correlation with total iron concentrations, suggesting a naturally occurring source.