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# Florida Department of Transportation Research Geo-statistical Deep Foundation Software

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## Current Situation

A deep foundation is essential to supporting a bridge's structure. Long, narrow piles—typically made of concrete and steel—are driven into the ground and serve as the foundational support of a bridge. As piles are driven, the soil shifts, resulting in “spatial variability” – piles stop at differing points in the soil, undermining the foundation's structure.

While there are general considerations for measuring spatial variability, each site is different. The Florida Department of Transportation needed a geotechnical site measurement software that produces site-specific considerations when laying deep foundations for bridge support.

## Research Objectives

The objectives of this project were twofold: 1) to update GeoStat—the current geotechnical design software used by FDOT—to include site-specific considerations and 2) to hold demonstration sessions on using the updated software for in-house personnel as well as consultants.

## Project Activities

First, the University of Florida research team applied cone penetration test (CPT) analysis and measuring while drilling (MWD) in GeoStat. The program's capabilities were expanded to let users select different empirical methods to predict pile axial capacities and read and analyze files of results obtained from respective pile axial calculations. The team also added a method error technique that analyzes part of the total uncertainty within the calculations. By adding these capabilities, engineers could more feasibly incorporate Geo-statistical phenomena into bridge foundation design applications.

The team then updated the GeoStat interface and user manual. Next, the team conducted quality assurance of the software, with a focus on the newly implemented enhancements, and then verified the software.

Finally, the team created technology transfer materials to disseminate to FDOT engineers and consultants and held a half-day web-based technology transfer event which included live usage of the updated GeoStat software for an example-driven pile project.

## Project Conclusions and Benefits

FDOT engineers are better equipped to build uniform deep foundations which, in turn, should lead to more appropriate costs being allocated across various stages of the bridge design process.

For more information, please see [fdot.gov/research](https://fdot.gov/research).



*A UF research team updated existing deep foundation software with capabilities to determine spatial variability onsite.*