

Project Name

Mercer County Courthouse Geotechnical Investigation

Client

Mercer County Improvement Authority (MCIA)

Services Provided

- Geotechnical investigation, analysis and recommendations for site redevelopment
- Recommendations for different foundation systems for the multi-story building

Project Description

The site is currently occupied by an active multi-story garage and a seven-story criminal detention center, which is slated for demolition. Different utilities underlie the site, including high temperature water lines (steam lines). MCIA is proposing to build a new criminal courthouse building, with a footprint of approximately 29,000 square feet. The building would have a full basement and a partial sub-basement. The anticipated maximum column and wall loads are 1,650 kips and 3 kips per linear foot, respectively, and a portion of the site will be utilized for on grade parking. SAI was retained by the MCIA to perform the geotechnical services for the proposed new building.

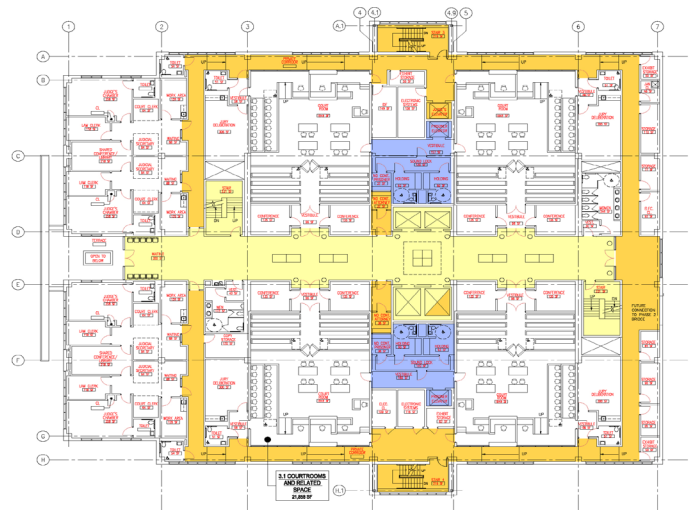
Approach

SAI commenced its geotechnical subsurface investigation by performing Standard Penetration Test (SPT) borings and test pits. Due to the presence of several utility lines along one of the streets, it was necessary to perform a soft dig to determine the placement of any utilities at the proposed boring locations in order to avoid them. The borings extended to depths ranging from 28.5 to 37 feet below existing grades. In all borings the drilling was terminated due to auger refusal. Five- to ten-foot long rock cores were obtained from the underlying Wissahickon bedrock formation to assess their quality. The test pits ranged in depth from 6 to 8 feet below grade and were performed along the building's exterior wall to determine the depth of the existing building foundation, as well as the quality of the fill material.

The subsurface investigation indicated that the site is characterized by a 6- to 11-foot thick layer of miscellaneous fill material. This material is underlain by alluvial sandy/gravelly deposits with cobbles of the Trenton Gravel formation that extend to the top of residual soils from the underlying mica schist bedrock. This is further underlain by bedrock at relatively shallow depths. Test pits indicated that the bottom of the exterior wall footings range from approximately 3 to 9 feet below grade. Laboratory testing was performed on recovered soil and rock samples to determine their quality and strength.

Based on the architecture drawings, SAI estimated that up to 15 feet of excavation will be required in the basement area. The bottom of the basement will lie within the zone of the alluvial deposits and residual soils. The basement floor level will be approximately 3 to 8 feet below groundwater.

Recommendations and requirements to perform open-cut excavation, shored excavation, and dewatering were provided. Soil parameters to perform slope stability analyses, design of temporary supporting systems



and basement walls were also provided. The effect of the chosen excavation system on nearby structures and utilities was taken into consideration.

SAI assessed several foundation designs, including shallow and deep foundation systems. SAI provided different recommendations for supporting both types of foundations.

Based on the results of SAI's subsurface investigation, CBR and Modulus of Resilience values of the sub-grade soils were evaluated. A flexible bituminous pavement (Superpave) was designed, using materials specifications based on the latest New Jersey Department of Transportation (NJDOT) Standards.

SAI prepared a Geotechnical Report for the Client to summarize the analyses and recommendations being made. That report included:

- Preparation and execution of a subsurface investigation plan consisting of soil borings and test pits;
- Preparation of boring logs and subsurface cross-sections to indicate the characteristics and thickness of the different soils and rocks encountered on site, as well as the groundwater elevation at the time of drilling;
- Performance of laboratory testing to determine the physical and mechanical properties of the different soils strata and rock formations;
- Recommendations as to the most suitable foundation system and floor slabs support system;
- Recommendations of various design parameters, including bearing pressure and modulus of subgrade reaction;
- Evaluation of anticipated settlement;
- Recommendations of earthwork for site preparation, including the suitability of reusing existing site soils, specifications for imported soils for structural support, and compaction requirements;
- Recommendations for excavation procedures and earth pressure parameters for temporary shoring/ excavation support systems;
- Evaluation of the need for a groundwater management and dewatering system;
- Recommendations regarding earth pressure parameters for the design of basement and subbasement walls;
- Performance of pavement designs for on-grade parking; and
- Recommendations for Seismic Coefficients according to International Building Code (IBC).

[Project Impacts](#)

Based on SAI's recommendations, the Client's structural engineer designed the building's shallow foundation system, basement, and sub-basement walls, taking into consideration the high groundwater levels. The Mercer County Courthouse is currently under construction.