

### Project Name

Geotechnical Evaluation of Landfill Closures in the Meadowlands

### Client

WCD Consultants

### Services Provided

- Design of capping systems for different landfills
- Evaluation of integrity of existing sheet piling systems
- Evaluation of effects of construction on adjacent structures, including slope stability and settlement
- Preparation of Construction Drawings and Technical Specifications for landfill closure
- Evaluated the feasibility of installing solar collection systems on top of closed landfills



### Project Description

According to the NJDEP, there are 6 existing, partially-closed landfills in the Meadowlands area of New Jersey that need to be closed completely. These landfills cover a total area of approximately 180 acres. SAI was retained by WCD Consultants to perform the evaluation and design of the different engineering controls that need to be constructed as part of the closure activities. These systems include leachate collection, gas management, stormwater management, containment (cut-off wall), and capping.

### Approach

SAI began the project with a site reconnaissance to assess the current state of the landfills. This effort involved the following tasks:

- evaluation of the integrity of the constructed portions of the various engineering controls;
- analysis and design for the additional or modified engineering controls;
- analysis of the stability of the side slopes of the landfills;
- analysis of the stability and settlement of existing nearby structures, in light of proposed construction activities (primarily two 72-inch aqueduct pipes and NJ Transit main line tracks); and
- monitoring the lateral and vertical movement of the landfills' side slopes and along existing structures.

In some areas, processed dredge material (PDM) was placed to act as a low permeability layer. SAI evaluated the integrity of that material, using Standard Penetration Test (SPT) borings to collect undisturbed Shelby tube samples. To determine the soil physical characteristics, Atterberg Limits, Gradation Analysis, and Natural Moisture content tests were conducted. Soil permeability was evaluated by conducting the Flexible Wall Permeameter Test on undisturbed Shelby Tube samples. All tests were performed according to ASTM Standards.



SAI also designed different cap systems for the different landfills. The cap system includes a low permeability barrier layer, utilizing PDM or geomembrane. It also includes a drainage layer, using natural sand or geocomposite.

Several aspects of the landfills were analyzed to ensure their performance and stability. Global slope stability and veneer stability of the cover soils and geosynthetics were performed. The slope stability analysis was performed using the computer program X-STABL. (This program performs a two-dimensional limit equilibrium analysis to compute the Factor of Safety for a layered slope according to the general limit equilibrium method, Janbu's Generalized Procedure of Slices, Simplified Bishop, and Simplified Janbu.) In addition, the veneer stability of each component of the linear system was evaluated, including the stability of the geomembrane/subgrade soil interface and the geocomposite/geomembrane interface, using the interfacial friction angle between the different materials.

To ensure the performance and stability of existing adjacent structures, slope stability and settlement analyses were performed. Anticipated additional stresses in nearby pipes caused by differential settlement were also addressed.

Finally, SAI addressed the feasibility of using the closed landfills to support installations of solar panels to generate electricity for the area. A decision on the solar panels has not yet been reached.

### [Project Impacts](#)

This project is ongoing. However, upon its completion, SAI will have helped the state of New Jersey resolve a decades-old environmental problem, and will once again have worked to create developable real estate in one of the most populated areas of the country.

