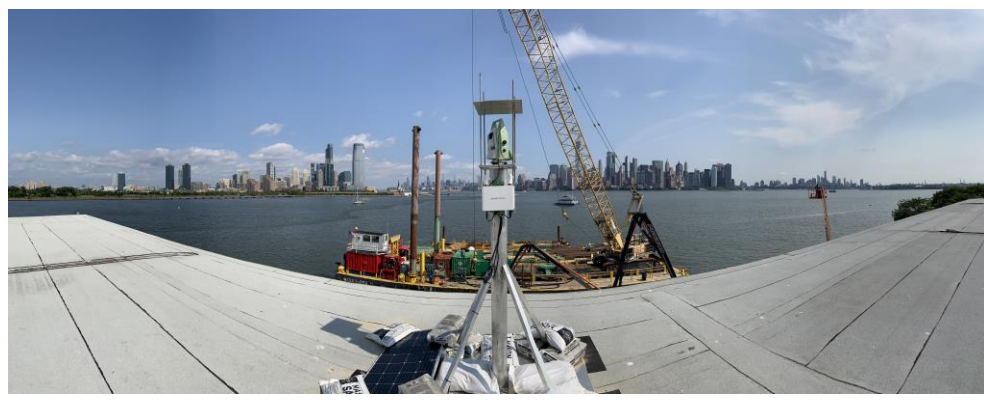


# Ellis Island Seawall Construction Monitoring

New York Harbor

## Project Highlights

- Historic site with detailed project specifications
- Publicly accessible museum and National Park infrastructure had to remain open during work
- Instrumentation designed for quick demobilization and remobilization to follow client's work
- Cloud based instrumentation and monitoring
- Client saved an estimated \$1.5 million during construction



*Total station deployed during seawall repairs*

**Challenge:** Ellis Island is a historic site under the ownership of the National Parks Service. The island's original seawall is over a century old and was experiencing cracking, erosion, and displacement. Rehabilitation of over 3,000 feet of seawall supporting the perimeter of the island was to be completed in eight separate design sections, while keeping the facility open to the public, including ferry traffic. The project scope included repairing the existing timber pile fender system, improving public ferry slips, replacing or repairing the perimeter seawall by installing king pile walls, sheet pile walls, and combi-walls outboard of the existing bulkhead structure, and preventing future erosion by installing Armor Stone beneath the access bridge.

Due to the historic nature of the work site, the specification for repair was rigid and detailed, increasing the cost and technical challenge for GZA's client, Weeks Marine. By necessity, work would need to be done near historical buildings and public access points.

**Solution:** GZA designed a flexible instrumentation package that included: Automated Total Stations (ATS); Deformation Monitoring Prisms; Automated Vibration Monitors; Automated Displacement Monitors; Acrylic Crack Gauges; and Inclinometers. These automated systems were deployed in each of the eight work zones to monitor movement of existing structures.

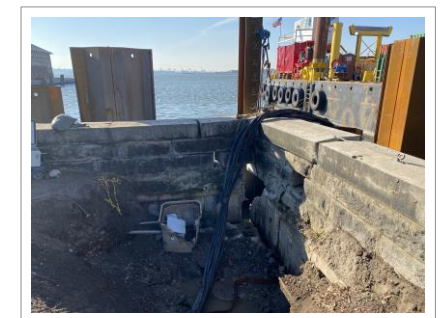
GZA installed and monitored approximately 250 Deformation Monitoring Points (DMPs) along the sea wall and on existing buildings. DMPS were installed every 15 feet along the seawall. Six Automated Displacement Gauges were installed to monitor movement between the granite block wall and the footing of the existing covered walkway. 21 manual acrylic crack gauges were placed on existing cracks located on historical buildings to monitor any deformation.

Lateral movement monitoring was required on existing piles supporting the access bridge during stone installation. GZA installed inclinometer casing to 10ft below mudline and Week's Marine divers strapped the casing to the existing piles. Manual monitoring of the inclinometers during stone placement was performed by the contractor and reviewed by GZA.

**Benefit:** GZA's instrumentation design and cloud-based monitoring capabilities enhanced workplace safety while offering more flexibility for the client's crew and reducing project costs. GZA estimates the client saved \$1.5 million using automated instrumentation compared to manual monitoring over the course of the project.



*Existing historical structure*



*Existing seawall during sheet pile installation*