Abstract

The Second Tacoma Narrows Bridge, Tacoma, WA. This mile long suspension bridge was constructed 200 feet south of the existing Tacoma Narrows Bridge. Gerard Buechel, President of Shannon & Wilson, served as Project Manager for the Parsons Transportation/HNTB Design Team in performing geotechnical engineering studies for design of the bridge and approach structures. Explorations for the project included drilling marine borings in over 150 feet of water that extend up to about 200 feet below mudline. Pressuremeter testing and Oyo suspension logging of the soils were performed to evaluate the material properties of the foundation materials. The deep water, significant tidal changes, and extremely fast currents that approach 10 knots complicated the explorations. The results of the explorations were used to develop foundation recommendations for the two towers that support the bridge. Each tower is located in about 150 feet of water, approximately 1,000 feet from the shorelines. Initially, large diameter driven piles, drilled shafts, and caisson foundations were evaluated to support the towers. Conceptual level recommendations were developed for all three foundation types. Based on these studies, caissons were selected to support the towers. The anchorages for the new bridge required 80- to 115-foot-deep excavations that were located along the steep marginally stable hillsides that abut the Tacoma Narrows. Hillside stability was evaluated and recommendations were provided for design of the anchorages as well as the excavation support system. Soil-structure interaction analyses using the finite difference computer program FLAC were performed to model the resistance and movement of the anchorages and towers. Shannon & Wilson also performed seismic ground motion studies for use in design of the bridge. This included reviewing the seismicity of the area, performing probabilistic seismic hazard analyses (PSHA), and developing both earthquake time histories and ground motions for design of the bridge. This effort included evaluating the impacts of the Cascadia Subduction Zone event using logic tree and finite-fault simulations.