Brigantine Connector

Atlantic City, New Jersey, USA

During the construction of the 2,900-ft-long tunnel/depressed roadway section of the Atlantic City-Brigantine Connector, a shallow penetrating dewatering system ensured a dry excavation while minimizing offsite groundwater drawdown.

The project

The 2.4-mile-long Brigantine Connector connects the Atlantic City Expressway with the marina district of Atlantic City, NJ, and Brigantine Island. To alleviate community noise concerns where a portion of the connector alignment would pass through a residential area, the design of the new highway included a deep cut-and-cover tunnel. The approximately 2,900-ft-long tunnel/depressed roadway section, which runs directly alongside the Penrose Canal, required excavation up to 35 ft. With groundwater at approximately five feet below working grade, dewatering was required throughout the excavation and construction process.

The challenge

Site soils through which excavation would take place consisted of a shallow but extensive compressible meadow mat, clean beach sands down to a depth of approximately 60 ft, a lower permeability silty sand stratum, and a deeper, highly permeable coarse sand and gravel aquifer beneath. The presence of the compressible meadow mat layer posed concerns regarding potential settlement along the connector alignment because of widespread groundwater lowering outside of the excavation limits. Therefore, it was imperative that the dewatering system installed would limit drawdown outside the excavation support system and minimize offsite effects.

The solution

Keller worked with clients to develop a solution using the excavation support in combination with a shallow penetrating dewatering system that would ensure a dry excavation while minimizing offsite groundwater drawdown. The design consisted of:

- Driving steel sheeting to a depth of 60 ft on either side of the excavation to key into the underlying lower permeability silty sand stratum
- Installation of an interior system of 100 shallow penetrating wells that would terminate several feet above the toe of the excavation support but not penetrate through the silty sand.

Driving the sheet piling deeper than would normally be required for the depth of excavation provided a partial groundwater cut-off and reduced the amount of natural inflow into the excavation area. Limiting the depth of penetration of the dewatering system to the depth of the perimeter sheeting substantially limited the volume of offsite groundwater drawdown yet adequately dewatered the deep interior excavation to 28 ft below sea level. The effectiveness of the design approach was verified early on with several aquifer pumping tests.

A crane-supported hole puncher and casing were used to jet each well to the design depth within the steel sheet piling on either side of the excavation. The wells were constructed with a 6-in. diameter slotted well screen that could accommodate a wide range of submersible pumps. Depending on the depth of the excavation, the wells were spaced 30 to 60 ft apart. Surface discharge piping conveyed the pumped water into the adjacent canal.

The system operated continuously throughout the 16-month excavation and construction period. The excavation subgrade was kept dry while negligible drawdown was measured outside of the excavation at the depths of the meadow mat compressible layer. No settlement or damage to nearby structures was observed.

Project facts

Owner(s)
South Jersey Transportation Authority

Keller business unit(s)
Keller

Main contractor(s)
Yonkers Contracting & Granite Construction JV

Engineer(s)
URS Grenier Consultants, Golder Associates, and Schlessinger Associates

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Infrastructure
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Dewatering

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