Performance of an EPB-TBM beneath the Sacramento River and Levees on the Lower Northwest Interceptor Project, Sacramento, CA, USA

Wally Chen  
*Parsons Brinckerhoff Construction Services, Sacramento, CA, USA*  
Matthew Crow  
*Kellogg Brown and Root, Pasadena, CA, USA*  
David Young  
*Hatch Mott MacDonald, Pleasanton, CA, USA*  
Steve Norris  
*Sacramento Regional County Sanitation District, Sacramento, CA, USA*

**Abstract:**  
Two 610 m (2,000 ft) long tunnels were driven through water bearing silts, sands and clays beneath the Sacramento River using a 4.59 m (15.1 ft.) diameter Earth Pressure Balance Tunnel Boring Machine (EPBM). The precast concrete segmentally lined and grouted tunnel was driven at 6% grades beneath the river flood protection levees, buildings, roads, a railroad and adjacent to a Freeway Viaduct. Continuous automatic data recording of TBM operation and field inspector's records, accompanied by monitoring surface displacement points, inclinometers, piezometers and tunnel convergence were used to obtain information. The paper explains the reasons for specific tunneling specifications controlling tunnel construction in order to meet the project constraints including local environmental and regulatory requirements. The paper will also present a summary of data to demonstrate the tunneling performance in the different ground conditions encountered.

**Keywords:** settlement management; ground heave; balance of face pressures; varying soil types; silts, sands, and clays; encountering man-made features of significance; clay stickiness; groundwater levels; hazardous gases; Lovat EPB-TBM.