



**Construction Method:** EPB Tunneling

**Project:** Ballard Siphon Replacement Project, King County WWTD

**Location:** Seattle, Washington

**Date:** 2006-2013

**Job Scope:**

- ❖ Feasibility Assessment
- ❖ Comprehensive Risk Register
- ❖ Geotechnical Baseline Report
- ❖ EPB Segmental Lined Tunnel Design

**Project Description:**

Working as a specialty tunneling sub-consultant, Staheli Trenchless Consultants performed a feasibility assessment for the replacement of two existing 36-inch diameter wood stave siphons under the Washington Ship Canal that were in imminent danger of failing and releasing sewage into the canal. After a comparison study of several alternatives, STC worked with County staff and the consultant team to develop a design solution that included sliplining the existing siphons and designing a 1,980-foot, 85.5-inch segmental lined tunnel beneath the Ship Canal. By using the existing siphon barrels as the primary siphon and constructing an overflow siphon (as opposed to constructing two new siphons – a primary and an overflow), the County was able to save several million dollars in project costs.



STC prepared a comprehensive risk register for the project to determine the lowest risk construction alternative. A risk workshop was held with the County and consulting team where risks were identified, quantified, and a level of risk tolerance was established for the County. From this workshop, a preferred tunneling method emerged. Risk mitigation measures were then identified and quantified. These risk mitigation measures were incorporated into the design. The segment-lined tunnel was designed as an Earth Pressure Balance (EPB) tunnel from an 85-foot shaft to a 130-foot shaft. STC prepared a Geotechnical Baseline Report, allocating construction risk between the Owner and the Contractor prior to the bid that would be used as the determination of a differing site condition during construction.



**Reference:** Ade Franklin, King County WWTD (206) 684-1293