

New Waterline Requires Use of Multiple Trenchless Technologies

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A new project has been commissioned in the Pacific Northwest to provide a water supply pipeline that, when completed, will stretch more than five miles in length just north of Seattle. The pipeline will cross the Snohomish River, Union Slough, Steamboat Slough and Ebey Slough, all of which will require trenchless construction. The project also includes over a mile of sliplining an existing pipe, and over a mile of open cut construction along landlocked portions of the alignment.



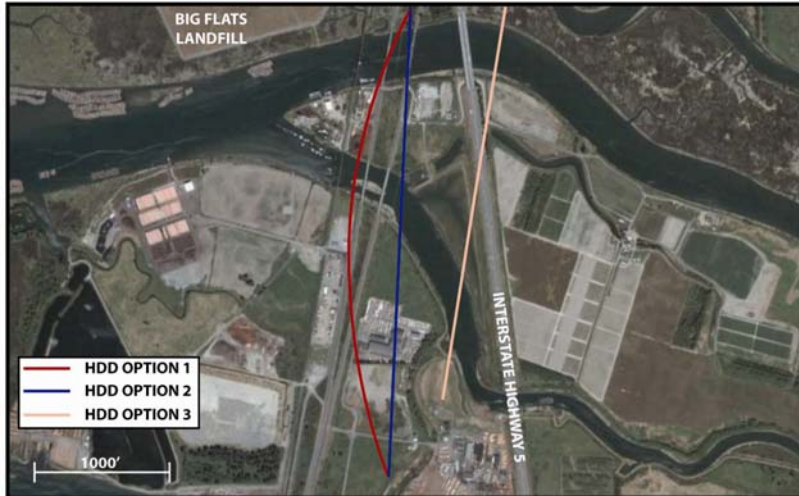
Crossing the numerous waterways which fall along the project alignment creates several challenges for selecting the preferred alignment, the method of trenchless construction, and the chosen method's implementation. For example, the Snohomish River crossing consists of a 1,550 foot crossing which could be performed as either a horizontal directional bore or a microtunnel. Microtunneling provides a more versatile option for the pipeline installation with space for additional capacity which could be added to the carrier pipe at a later time, but can also prove costly with shaft construction in an area of high groundwater and soft soils. A large HDD bore offers a more rapid installation alternative without the difficulties and costs associated with shaft construction, or the risks of microtunneling in soils that may have obstructions, but poses a greater risk of hydrofracture under the Snohomish River and does not allow for future increases

in capacity without additional boring – a proposal which may be considered risky once the new pipe is brought on line.

Alignment selection is complicated by the presence of high quality tidally influenced wetlands, major highways and a closed municipal landfill. Further complicating the construction scene is the listing of the Puget Sound Chinook Salmon and Bull Trout as threatened species under the Endangered Species Act in June 2005. The listing necessitates additional care in handling the boring operation (particularly regarding bentonite drilling fluids) and restrictions for when construction can take place to reduce the threat to annual spawning runs. The crossings of Steamboat, Union, and Ebey Sloughs pose similar problems ranging from pipeline construction adjacent to a closed municipal landfill to potentially drilling under an active interstate highway bridge. To finalize the design, careful risk analysis will be needed for each crossing as well as considerable input from the Water Pipeline Board and other stakeholders regarding future plans for growth and construction. Review of all this information will be necessary before settling on a method which provides an appropriate factor of safety, schedule of construction, and flexibility for future pipeline system upgrades.

While the numerous channel crossings on the pipeline necessitate trenchless methods to minimize ecologic disturbances, boat traffic disruptions and inconvenience to the public, several segments of the project are being considered for open trench construction. The relatively high risk of trenchless methods is a worthy counterbalance to their numerous advantages in speed and reduced invasiveness.

Currently geotechnical information is being assembled for the trenchless crossings, and alignment options are being considered for each proposed method. As an example of the challenges and complexity that surrounds each crossing, the Steamboat and Union Slough bore had three different directional bore alignments which were considered. The following photo shows three potential alignments for the Steamboat/Union Slough crossing. The alternatives consist of three separate directional bores which split their advantages between easement locations, availability of pipe layout area and technical difficulty of the bore geometry. The crossing is located in the vicinity of the Big Flats landfill, which, while no longer operational may have significant regulatory requirements restricting settlement of slopes, total loading on any top cover over the landfill, and additional care regarding changes in runoff patterns. Surrounding the landfill are premium quality inter-tidal wetlands that restrict work areas, impact



available open cut connections, and would significantly increase the required time for obtaining permits. Any impact to these wetlands will only come after consideration of all other possible alternatives. A straight bore adjacent to State Route 529 would provide ample clearance from the

landfill, but an increased risk of hydrofracture adjacent to bridge footings and additional risk to of impacting soils adjacent to the bridge foundation. Alternatively, permitting near the landfill could be completed only to find that available work space is too restrictive to complete the bore efficiently. The project promises to be challenging in every respect but similarly rewarding when completed.

Montgomery Watson Harza (MWH) and Parametrix (PMX) have joined to provide an exceptional pre-design team for this new pipeline. The team also includes GeoEngineers as the geotechnical consultant, and Staheli Trenchless Consultants (STC) to provide trenchless expertise. MWH will be charged with overseeing coordination of the project, which includes everything from a geotechnical investigation that is currently underway to pipeline hydraulics analysis and wetland mitigation. STC is providing expert trenchless consulting regarding the feasibility, risks, and benefits of trenchless construction throughout the project. They are currently evaluating both microtunneling and HDD alternatives for all the major crossings.