

Water Crossing

The Old Fashion-Way

Examination Of Options Reveals Trenching Best Solution

by Tonia Jurbin ■ Contributing Editor

The Comox Strathcona Regional District (CSRD) on the east side of Vancouver Island in Canada delivers water to about 50,000 residents including the communities of Courtenay and Comox. In 1982, a 30-inch concrete cylinder watermain was installed to deliver water to Comox and Courtenay by crossing underneath the Tsolum River at a depth of about 6½ feet below the river bed.

The crossing was 3,900 feet upstream of the confluence with the Puntledge River, another major river in the watershed. These two rivers move widely within their floodplain and by 1993 additional bank protection (riprap) was placed along the course of the Tsolum and over the crossing itself. Three above-average floods between 1993 and 2000 caused the migration of the Tsolum to cut itself off at a large bend upstream of the original confluence, effectively shortening the length of the Tsolum by about 1,000 feet and moving the confluence of the two rivers only about 1,900 feet from the crossing. When a river is suddenly shortened by 1,000 feet, it will attempt to adjust itself to a stable gradient and configuration through erosion of the river bed and erosion of the banks.

In 2000, the CSRD recognized that it was only a matter of time before the river would threaten the crossing and, while not at imminent risk of scour, they took a proactive approach and commissioned a study to examine protection options. The study examined six options including; doing nothing (if no money was available), monitoring, moving the watermain under a bridge, increasing the depth of the watermain, building a berm or setback dyke or extending the existing bank protection. The option to extend the riprap at an estimated cost of \$110,000 (Canadian) was adopted by the CSRD, but unfortunately they were unable to acquire permission from the Department of Fisheries & Oceans. The CSRD settled on 'increasing the depth of the crossing' at a much higher cost and a higher potential impact to the river.

Koers & Associates Engineering Ltd. of Parksville, BC, was called to assist the CSRD with the detailed design of what would now cost the district about \$1.6 million (Can-



dian), roughly 15 percent of which would be spent on dewatering alone.

Why not trenchless?

The obvious question was why not go with a trenchless technique? Chris Downey, project manager for Koers explains. "We explored going deeper with a tunnel boring machine (TBM) but it was deemed too expensive at about \$3,000/meter (\$935/foot Canadian) for only about 200 meters (650 feet) of the job."

Alignment restrictions also made boring impractical because of turning restrictions for TBMs. "We also looked at horizontal directional drilling (HDD), but the rock was very porous and the risk of frac out (drill-

ing mud breaking through to the river) was high. For HDD to work we would have had to go as deep as 8 meters (25 feet) below the river bed to hit competent bedrock." Land constraints on the west side of the crossing also made trenchless techniques less attractive as a large BC Hydro structure and a sod farm are located roughly where the exit pit would have been. A good old-fashioned trenching job was finally tendered in the spring of 2006.

The scope of the job included installing about 1,650 feet of new pipe, some 460 feet of which would be installed 16 to 18 feet below grade with the remaining 1,180 feet being installed at traditional depths of 7 to 9 feet to invert. The tie-in at the valve chamber at the east end of the job, and the tie-in

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at the river crossing were also part of the contract.

The project schedule was driven by community concerns over the shut-offs that would be required for the tie-ins, and by the fisheries window (July 15 - Sept. 15) within which there could be no work in the river or the riparian zone. To decrease the water demand, sprinkler bans were in place during the tie-in work at both ends of the job. The tie-in at the east end was less complicated as it occurred during a lower water usage period where the shutdown of the main would not impact the system. On the west side, however, there was a greatly reduced supply during the tie-in work that lasted about 26 hours.

Dewatering

The contractor started by cutting a two meter (6½ feet) excavation ditch around the worksite before the dewatering contractor was brought on site. To bring the water table down from six to 17-feet below original, 200, two-inch diameter, 25-foot long PVC pipe well points with 5-feet of slotted screen were installed by placing them in six-inch steel open-ended casings that were driven into the ground by water pressure and

later removed as the PVC well points were placed. The well points were connected to a 460 foot long, 12-inch diameter header pipe that pumped water away from the site at a rate of about 3,000 - 4,000 gallons per minute. Keith Stewart, construction manager for Upland Excavating Ltd. of Campbell River explains, "The biggest challenge on this job was the dewatering system that took about 10 days to install."

Canadian Dewatering of Surrey, BC, is often a fixture at sites that face challenging water issues and they were a part of this project as well. "After the initial installation, Upland maintained the system and Canadian Dewatering was called in to remove it approximately a month later," Stewart said. "We started in late June when the flows were low and worked until August when the job was complete - except for the final tie-in, but we had to wait till the demand was down before the CSRD could shut off the water so we could finish."

Stewart continues, "The original tender called for the 30-inch pipe to be replaced with 36-inch welded steel pipe, but the day before the tender closed, based on discussions with contractors the CSRD allowed for an alternate design using ductile iron

pipe. Fortunately, we had put in a price for both alternatives. Even though the savings was only about \$20,000, for us it meant we wouldn't have to sub out the welding." Since you can't go straight from concrete cylinder to ductile iron, there were some challenges at the valve chamber where they had to jack hammer away at the existing thrust block and the concrete cylinder pipe to expose the steel cylinder. They used a welded section to transition to the new ductile iron pipe.

Also included in this contract was placing about 700 yards of riprap protection along the pipeline. An environmental monitor was on site part time for the duration of the job. The DFO was satisfied with the alternate design, and other than improvement of the riparian zone through thoughtful planting, no other habitat compensation was required at project completion.

Downey sums up the success of the job by giving credit to the other parties, "We were happy with the contractor because he was diligent, a good communicator and he gave us lots of warning about when his work would affect the community. The owner was also proactive and cooperative as they were prepared to authorize the funds to do the job right." ■

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