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Fish Friendly, Cost Effective Bridge Replacement for BC MOT

OWNER	B.C Ministry of Transportation (MOT)
CONTRACTORS	VSA Highway Maintance Ltd., Newport Structures Ltd.
LOCATION	McDonald Creek/Highway 6 crossing
TECHNICAL DETAILS	Bridge-Plate / Multi-Plate

The B.C. Ministry of Transportation (MoT) was faced with the challenge of improving fish passage through the McDonald Creek/Highway 6 crossing, via an existing 3.4 m diameter Armco Multi-Plate Round Pipe structure installed in 1969.

McDonald Creek is one of the most important fish stream habitats in the Arrow Lake Water- shed. It is home to Bull trout and Kokanee salmon that spawn in relatively large areas upstream of the creek crossing.

The Ministry evaluated two bridge options:

- Clear Span Bridge, 18 m span by 9 m wide

- Armtec's Bridge-Plate Arch, 11.5 m span by 26.48 m long

After a design and cost review, the MoT and VSA Highway Maintenance Limited (VSA) selected the Armtec Bridge-Plate Arch structure proprietary design and installation monitoring package. Woods & Associates Ltd. were retained to design cast-in-place footings, qualify the subgrade and to conduct materials testing (compaction testing and concrete testing). Instead of diverting the creek water through a diversion pipe, VSA disassembled the existing Multi-Plate components above the waterline, thereby transforming the structure into a flume. Large rocks were added to this flume to reduce velocities and create resting areas for the fish.

The Bridge-Plate was assembled by Newport Structures Limited. Bridge-Plate has the stiffest corrugation profile in the industry. Newport installed the Bridge-Plate Arch with partially pre-assembled rings, which when bolted into place, did not require internal support from sizing cables or struts. This feature was critical to minimizing distrubance to the creek running continuously below the arch structure.

To provide a subdrain under the critical backfill, VSA installed perforated 200 mm diameter BOSS 1000 HDPE pipe with filter sock along the cast-in-place footing. Non-woven geotextile was then placed at the footing elevation to add scour protection and under portions of the critical backfill to add reinforcement.

Following installation of the critical backfill to 2 metres above the footings, VSA removed the Multi-Plate flume and strategically placed boulder clusters along the length of the crossing inside the Bridge-Plate Arch Structure. To main-tain the pool habitat at the down- stream end of the structure, a rock vortex weir was then constructed in conjunction with rip-rap protection to control the outlet elevation.

Armtec personnel provided start-up assistance during plate assembly and continuous on-site monitoring of the back-fill process during the project. This service also included providing recommendations on issues such as construction staging and liaising with contractors, consultants and approving agencies. Reports on construction progress were provided on a regular basis.

In addition to saving the MoT approximately 50% over a clear span bridge, the McDonald Creek Bridge-Plate Project provided the first example of using a 30 year old Armco structure as a temporary fish friendly flume – this technique provided uninterrupted fish passage for the duration of the project.

"Armtec's on-site assistance was critical to the success of the project"

Russ Crawford, P.Eng., VSA Maintenance Ltd.

"The Armtec Bridge-Plate went together very well – productivity wise it was great!"

Gary Simson, Newport Structures Ltd.

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