FISH FRIENDLY DESIGN FOR A WATERCOURSE CROSSING

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View of the outlet end of the damaged corrugated hanging culvert.

Improperly installed and damaged culverts, which are commonplace in Western Canada, can alter water flow patterns, create a hindrance to fish passage, and cause damage to aquatic habitat. Replacement of inadequate watercourse crossing infrastructure with fish friendly technology supports natural fish movement and habitat conservation.

SITE DETAILS AND OBJECTIVES

The project site was located in a forested area of west-central Alberta and contained a small permanent fish bearing stream flowing through a metal culvert beneath a roadway. This stream crossing was non-compliant with regulatory guidelines as the inlet and outlet ends were hanging, there was active stream bank erosion, the culvert had partially collapsed, and there was no substrate in the culvert to support fish passage. The objective was to replace the existing culvert with a modular, open bottom culvert system to provide habitat characteristics closely emulated in a natural streambed, and improve stream habitat and fish movement.

REGULATORY CONSIDERATIONS

The water crossing had to be repaired and restored in accordance with the Alberta Environment and Parks (AEP) Codes of Practice for Watercourse Crossings (AEP, 2013). Monitoring of stream turbidity during construction was conducted in accordance with the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines for the Protection of Aquatic Life (CCME, 1999).

CULVERT TECHNOLOGY AND WATERCOURSE CROSSING REPAIR

An Enviro-Span polymer resin modular culvert system was chosen to replace the existing corrugated steel culvert. This system utilizes an open bottom arch design to support the road subgrade and emulate natural stream flow. Construction and reclamation activities were completed outside of the ‘restricted activity’ period for this fish bearing stream.

The running surface and subgrade of the overlying road were removed to expose the original culvert. Steel plate coffer dams were installed to isolate construction activities from the existing stream while the original culvert was used to maintain water flow during construction. A new streambed was constructed alongside the existing culvert and wooden poles were placed horizontally on either side to act as footings for the open bottom modular culvert. Each section of

Installation of the replacement system (left), and a view of the outlet end of the newly installed modular culvert (right).

the new culvert was placed on top of the horizontal support poles and locked into place using connectors. Once the culvert was assembled and the alignment was complete, a layer of nonwoven geotextile was draped over the structure and the culvert was covered with the original roadbed material. The stream flow was introduced to the new culvert, the damaged culvert was removed, and the road surface was replaced. Following construction, adjacent ditch lines were reclaimed to allow natural water run-off from the road surface and the native vegetation was re-established. Minimal turbidity was detected during culvert replacement.

CONCLUSIONS

Earthmaster successfully repaired and reclaimed the non-compliant watercourse crossing. While maintaining stream flow, the damaged steel culvert was replaced with an open bottom modular culvert system. The reclaimed watercourse crossing stabilized the adjacent stream banks and beds, improved the crossing alignment, and enhanced the stream characteristics and fish habitat within and adjacent to the crossing.

The advantages of an open bottom culvert system are that is much easier to install than a steel culvert, the structure is non-metallic and non-corrosive, it can curve with the natural shape and gradient of the stream, the open bottom allows for natural stream bed characteristics to accommodate fish passage, and the culvert can be re-used, if desired.

REFERENCES

AEP (Alberta Environment and Parks), 2013. Code of Practice for Watercourse Crossings, made under the Water Act and the Water (Ministerial) Regulation), Public Lands Act. Alberta Queen's Printer. Edmonton, Alberta.

CCME (Canadian Council of Ministers of the Environment), 1999 or as amended. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment. Winnipeg, Manitoba.