National Energy Board | Office national de l'énergie

How do pipelines cross rivers and streams?

Diversion of watercourse during trenching

Ever wondered how a new pipeline crosses a river or stream? For companies, selecting a watercourse crossing method is an exercise in striking a balance among geotechnical, environmental, and economic considerations to reach the most balanced solution.

The National Energy Board (NEB or Board) reviews all proposed activities with water crossings for potential impacts to the environment, including fish and fish habitat. If a Fisheries Act authorization may be required the NEB forwards the proposal to Fisheries and Oceans Canada. The company planning the activity will also need to obtain all other permits, which vary by province, for the proposed activity.

Potential aquatic impacts are assessed prior to construction and include changes to habitat structure and cover, sediment concentrations, water temperature, food supply, and fish migration. Increased sediment poses the greatest risk to the productive capacity of watercourses and can be particularly harmful to fish egg incubation. Timing windows are determined for each watercourse based on the species present to reduce risks during the most vulnerable life stages of fish.

Two primary watercourse crossing methods are trenchless and trenched crossings.

Trenched techniques affect the watercourse bed and banks and are typically referred to as either "wet open-cut" or "isolation" techniques. During an open-cut installation, the pipe trench is excavated and

Quick Facts

The key steps in trenched crossing construction are:

- Site preparation – includes right of way surveying, clearing and possible diversion of watercourse.
- Timing – typically undertaken when stream flows are at seasonal lows to minimize impacts on water quality, plant and animal life.
- Construction – includes trench excavation, laying pipe and ditch backfilling.
- Reclamation – includes bed, riverbank area and slope reclamation as required.

backfilled using either a backhoe or dredging equipment in the stream channel. Wet open-cut crossings are undertaken in a flowing stream and typically result in some degree of short-term, increased sedimentation downstream. Isolation techniques, on the other hand, separate the construction activities from stream flow using high volume pumps, dams, culverts, or other methods to divert stream flow around the trench excavation and pipe installation.

Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

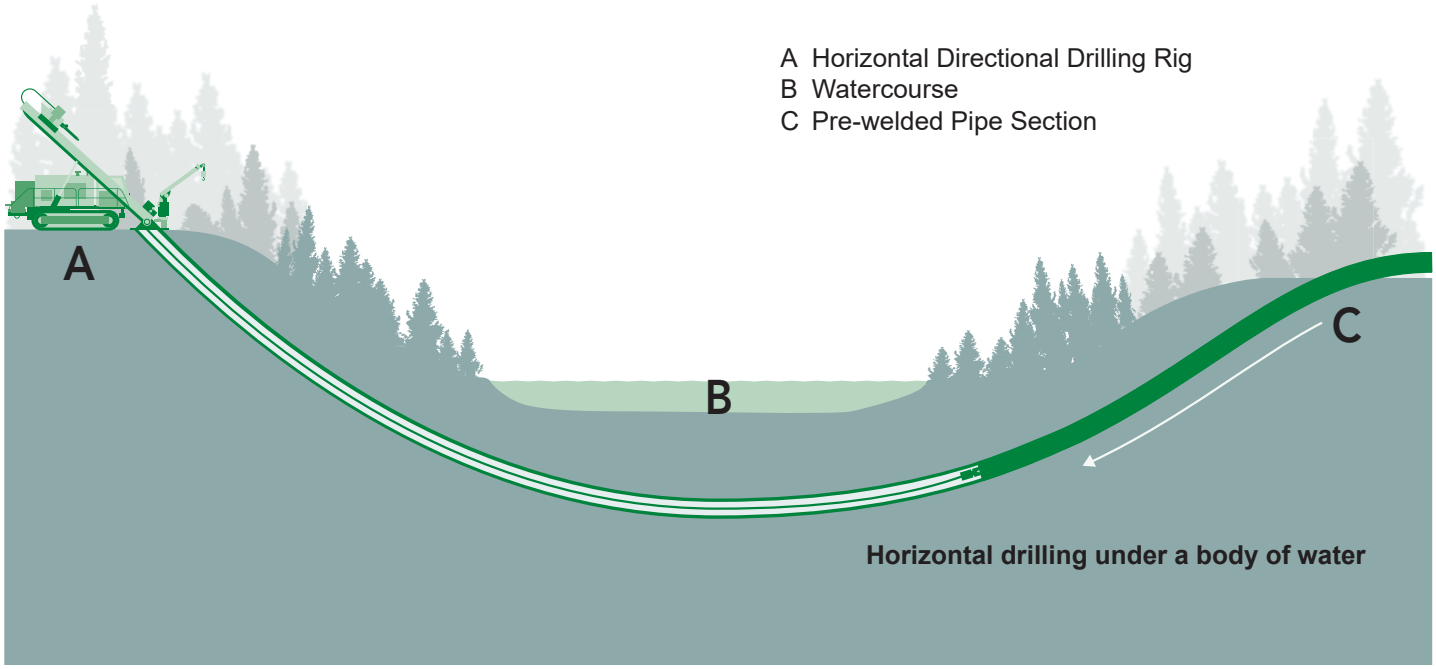
Before the construction area is de-watered, fish are rescued from within the isolated area and returned to the watercourse immediately downstream of the worksite. The construction area is then de-watered, excavated, the pipe is laid in place and backfilled.

Once the bed and banks of the watercourse are reestablished the diversion is removed and water is returned to the channel. Reclamation is done to stabilize the disturbed area and restore vegetation along the banks.

Trenchless techniques require limited or no in-stream construction and so cause little to no disturbance to the watercourse bed and banks. The most common type of trenchless crossing is a Horizontal Directional Drill (HDD). HDD can be used to avoid congested or environmentally sensitive areas such as large or sensitive waterbodies.

HDD installation starts with pilot hole being drilled along the predetermined drill path. The drill string is pulled back through the bore hole to enlarge the diameter of the drill hole. Pipe is welded into a string that is slightly longer than the length of the drill and is coated with abrasion resistant covering and pretested to ensure pipeline integrity. Once the bore hole has been widened to the appropriate diameter, the pipe string is pulled through.

Trenchless watercourse crossings must consider a number of factors, including the width of the channel and topography of the river valley, suitable locations for entry and exit pads, disturbance associated with the pads, pipe bending radius, stresses associated with pulling the pipe through the drill bore, geotechnical conditions, site reclamation prospects, and relative life-cycle costs.



Horizontal drilling under a body of water