Constructed Ditch
FACTSHEET

BRITISH COLUMBIA
Ministry of Agriculture, Food and Fisheries

Drainage Management Guide - No. 8 in series

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SEDIMENT CONTROL

Sediment and erosion control is a critical necessity to ensure protection of fish and other aquatic species when undertaking any maintenance activity. The *Fisheries Act* prohibits the deposit or release of a deleterious (toxic) substance to fish-bearing waters. In high concentration, sediment is a deleterious substance as elevated levels of sediment can cause significant harm to fish and fish habitat.

Sediment in a watercourse can disrupt many of the life processes of fish and other aquatic life. Sediment related impacts can include:

- Injury or death. Sediment can clog or abrade fish gills causing suffocation or tissue damage.
- Inability to feed. Since fish are visual feeders, sediment in water can impair their ability to forage for food.
- Infill habitat. Sediment may settle in pools or riffle habitats. This may impact salmonid egg viability or may affect food and nutrient sources by covering benthos (bottom-dwelling organisms) upon which fish depend for food.
- Increased wear on mechanical equipment or other machinery. Sediment can also cause plugging of irrigation intake screens.

Sediment and erosion control measures should be in place both during and after works that have the potential to cause sedimentation of a watercourse. For the protection of aquatic habitat, discharge or runoff water from a site should not exceed 25 mg/l total suspended solids above the level of receiving waters during normal dry weather operation. During adverse weather conditions works should be suspended.

In many circumstances it may be necessary to divert or pump water around the work site (i.e. conduct work in isolation of water flow) to prevent sedimentation of a watercourse or to work within a watercourse.

The purpose of this Factsheet is to provide guidance on sediment and erosion control measures. A number of methods of sediment and erosion control are described. The information is provided for general reference and these methods are not the only acceptable methods available.

Prior to undertaking any work for Sediment Control, refer to the following Factsheets in this series:

- Factsheet No. 1 *Federal Fisheries Act and Watercourse Maintenance*
- Factsheet No. 2 *Agricultural Watercourse Classification*
- Factsheet No. 3 *Agency Contact Requirements for Constructed Ditch Maintenance*

Surface Erosion Controls

Vegetative Erosion Controls

When works are undertaken streamside and not in-stream, a good erosion control mechanism is a vegetated buffer between the area of works and the stream. Better protection is provided by increasing the streamside protection buffer.

Works which may result in exposed earth should be undertaken in dry conditions wherever possible. Where exposed earth or sediment may be adjacent to a watercourse, controlling erosion can be as simple as eeding as soon as possible to prevent sediment entry into the watercourse during precipitation.

Figure 1 Even a small vegetative buffer is better than no buffer in reducing potential for erosion.

Mulching or Mats

Spreading straw or hay mulch over exposed soils may be an effective temporary measure to control erosion. Mulch can help reduce the erosive energy of rainfall such that agricultural soil, manure or sediment is not transported to a watercourse. Since some mulch can suppress the regeneration or growth of desired plants, they should only be used when recommended by a professional in an overall plan.

Where large areas of exposed soils are present on unstable slopes, coco-matting may be considered. This may also be a technique used when works are completed late in the season if seed not established.

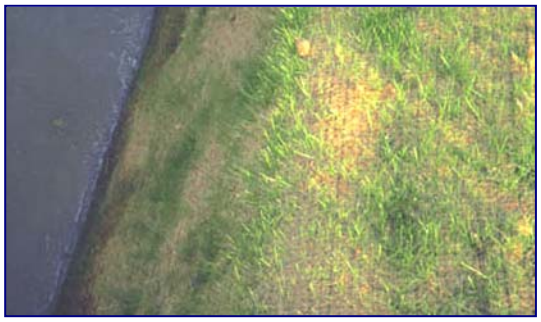

Figure 2 Coco-matting Placed Over Exposed Soil to Reduce Erosion

Silt Fencing

Silt fencing may be an appropriate sediment control mechanism after drainage maintenance works are completed. It is generally recommended that ditch spoil is placed above the top of bank where its re-entry to a watercourse will not occur. If it is placed where its entry to a watercourse is possible then silt fending should be considered in addition to seeding.

When installing a silt fence, the bottom of the filter material must be trenched into the ground, See Figure 3 for details.

After a rain event inspect the silt fence. A build up of 30 cm or more should be removed from the edge of the fence.

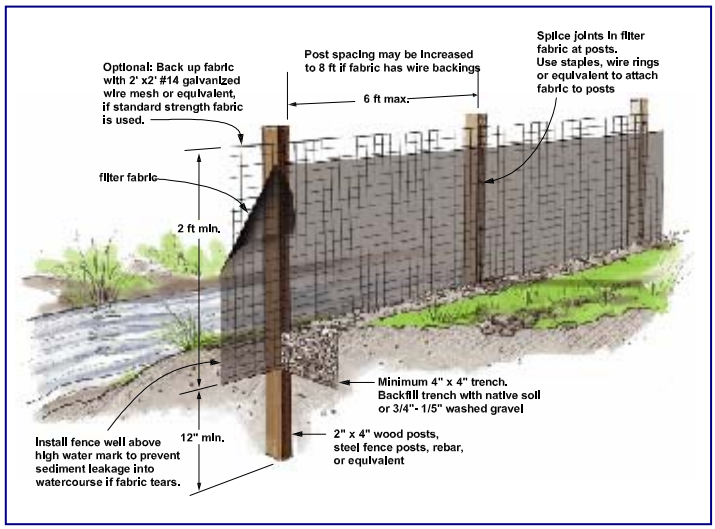

Figure 3 Proper Design and Installation of a Silt Fence

Temporary Instream Sediment Controls for Low Flows

Outlet Blocking

An easy method of sediment control is to block the ditch outlet using plywood or a 'plug' of clean material (e.g. gravel) at the outlet. Anything used to block an outlet must be removed once the work is completed, and should not be in place from November to June of any year.

For removal of the temporary blockage, re-release of water into the channel should be done gradually, and only once sediment has settled out of the water and the water is clear.

Check dams are structures that provide a small barrier to water flow, behind which water is temporarily ponded allowing sediment to settle out. Check dams can also be used to isolate small work areas and to prevent sediment laden water from being transported downstream. Check dams should only be used in ditches that have small amounts of ponded water very low flows.

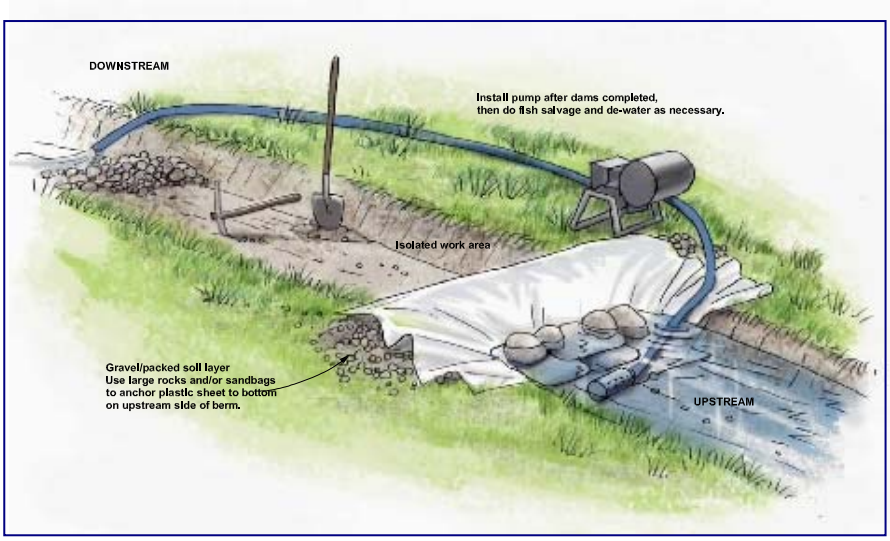

Figure 4

Temporary Check Dam

Isolation and Diversion Techniques for Instream Work.

When working in a ditch that has flowing water, the work area should be isolated and the water diverted around the work area.

Isolation of water flow may be undertaken using several different methods. The method chosen should be appropriate for the amount of flowing water in the watercourse. Several accepted methods for water flow isolation are described below.

- Irrigation gates or other instream structures.
- Blocking an instream culvert.
- Constructing a coffer dams

In all cases a temporary diversion channel must be constructed that routes the flow around the work site.

Cofferdams

Cofferdams are used to isolate a section of watercourse from flowing water. Materials for cofferdams should be selected based on ease of maintenance and complete removal following construction activities. The dam may be made of:

- rock,
- sand bags,
- wood,
- sheet metal,
- gravel or earthen plug.

If water is flowing in the ditch, cofferdams may be used in combination with other methods such as clean water bypasses and/or pumps.

Wood or sheet metal dams must be anchored into the banks of the ditch to prevent seepage and erosion around the edges of the dam, see Figure 6.

During construction, inspect the dam. Extra material (for example, more sandbags) should be kept on site to raise the dam if water behind the dam threatens to spill over into the work area. Immediately repair any gaps, holes or scour around the dam to prevent failure.

Upon completion of maintenance works, the structure should be removed gradually to prevent sediments from moving downstream or erosion from occurring.

Figure 5

Diversion Channel with Pipe to Reduce Erosion

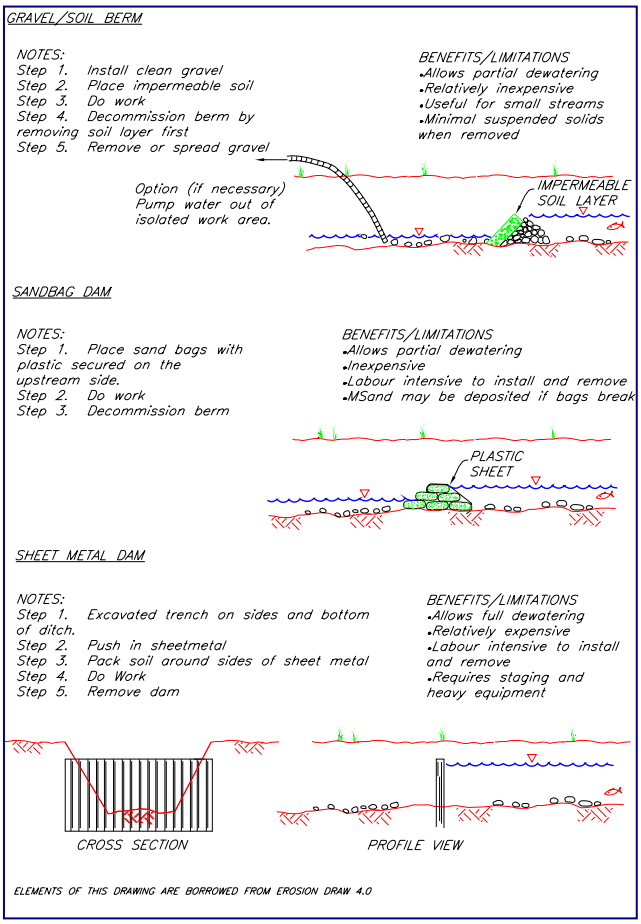

Figure 6 Isolation Techniques for Instream Works

Channel Diversions

Channel diversions are used where it is possible to redirect the water flow temporarily around the section of the ditch where work is being conducted.

A stream diversion is a temporary bypass through a pipe or a flume may be used if there is enough grade for gravity flow. An excavated channel is also an option, although it is more labor intensive and can generate large amounts of sediment. See Figure 7 for examples of channel diversions.

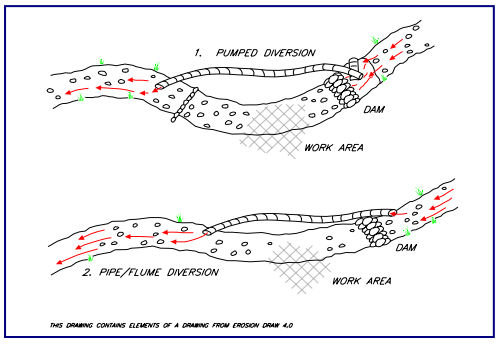

Figure 7 Stream Diversion Techniques

Pumped Diversion

The pumped diversion is suitable for intermittent and low flow streams that can be pumped. Pump capacity must be sufficient to handle the flow in the ditch. Temporary dams are constructed upstream and downstream of the work area.

Advantages of a pumped diversion include:

- Downstream sediment transport can almost be eliminated.
- De-watering of the work area is possible.
- Pipes can be moved about to allow construction operations.
- Increased flows can be managed by adding more pumping capacity.

Some disadvantages of a pumped diversion include:

- Flow volume is limited by pump capacity.
- Requires 24-hour monitoring of pumps.
- Sudden rain could overtop dams.
- Minor in-stream disturbance to install and remove dams.
- Erosion at pipe outlet.

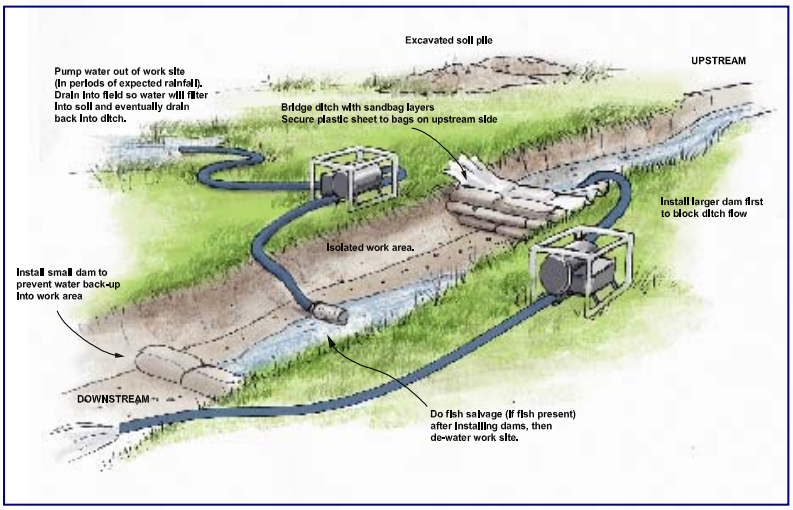

Figure 8 Typical Pumped Stream Diversion

Source: Dave Tattam

Figure 9 Pumping Over Temporary Clay Dam

Bypass Flumes

A bypass flume can be constructed out of a heavy pipe that is large enough to handle the water flow in the watercourse. See Figure 5 for an example of a bypass flume.

Advantages of excavated channels and flumes are:

- Isolates work from water flow and allows dewatering
- Can handle larger flows than pumps

Disadvantages of excavated channels and flumes are:

- Channels must be protected from erosion
- Flow diversion and then re-direction with small dams causes instream disturbance and sediment. In stream silt fences should be used if sedimentation is occurring. See Figure 10.

Figure 10 Temporary Silt Fence

Contact Information

For further information on sediment or erosion control or to complete works using isolation or diversion techniques beyond those outlined herein, contact with agencies is required. See Factsheet No. 19 in this series, *Agency Contacts for Environmental Issues*.