

Isolation Barriers

INSTREAM PRACTICES

Flow Control	✓	No Channel Flow	✓	Dry Channels	
Erosion Control		Low Channel Flows	✓	Shallow Water	✓
Sediment Control		High Channel Flows	✓	Deep Water	✓

Symbol IB



Photo 1 – ‘Aqua Barrier’ inflatable isolation barrier



Photo 2 – Sediment fence isolation barrier

Key Principles

1. Isolation barriers may or may not incorporate sediment trapping capabilities. Typically the barriers are impervious, thus requiring separate sediment treatment measures to deal with site de-watering activities.

Pre-Design Data Collection

Observations to be made during the initial site inspection include:

- Suitable anchor points for the any floating barriers both instream and along the bank.
- Location of launching and retrieving points for the barrier. This may involve the use of a boat, truck, winch, launch ramp, or crane.
- identification of the overbank catchment area likely to contribute stormwater runoff into the isolation area, and potential options for managing this lateral inflow.
- Location of any stormwater outlets discharging near the work area. It is not recommended for flow diversion barriers to enclose stormwater outlets unless appropriate design measures are taken to account for the inflows generated by the outlets.
- Indication of tidal range (if data is not already available within tide charts).
- Ascertain the channel profile and water depths (if not already available from marine survey).
- Estimate channel discharge and stream velocity. Stream velocity will likely vary across the channel, so as a minimum, estimate the flow velocity at 1/4, 1/2 and 3/4 channel width.
- Ascertain typical wave heights, including waves generated by boat traffic.
- Determine the primary bed material, e.g. clay, sand, gravel.
- Identify any protected or ‘non-disturbance’ areas.
- Assess fisheries requirements, including preferred months in which works can occur, and months when instream works cannot occur.
- Consideration should also be given to the collection of water samples for the determination of the pre-disturbance water quality.

Design Information

Refer to manufacturer's advice for the design and installation of commercial flow diversion systems.

Design information on *Floating Silt Curtains* is provided within a separate fact sheet.

The most effective placement methods for flexible isolation barriers are:

- a semicircle or U-shape configuration around the disturbance (Figure 1);
- a circle or elliptical shape encircling the disturbance (Figure 2).

It is generally **not** recommended for a flexible isolation barrier to be placed across the full width of a watercourse channel.

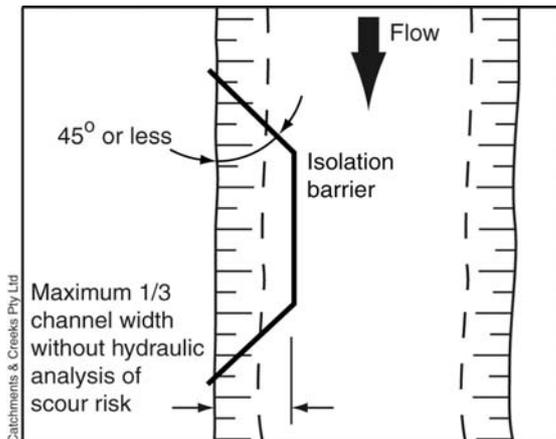


Figure 1 – Isolation of bank disturbance

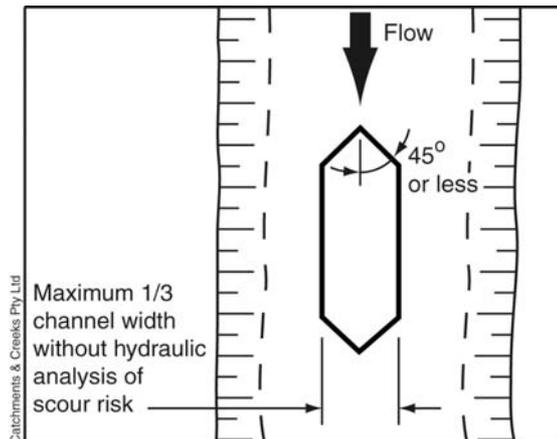


Figure 2 – Isolation of mid-channel disturbance

Ideally avoid isolating more than 30% of the effective channel width during periods when stream flows are possible. However, if appropriate hydraulic analysis is performed on the adverse effects of potential stream velocity increases, then it may be possible to isolate a larger proportion of the channel width.

The 'effective' stream width does not include backwater areas, i.e. those areas that do not significantly contribute to the conveyance of stream or flood flows.

In tidal waters, an assessment must be made of the expected change in the peak tidal flow velocity (flood and ebb), and the likelihood of channel erosion prior to nominating the maximum extend of channel isolation.



Photo 3 – Floating silt curtain



Photo 4 – Sheet piling used to form a dry work area with the floating silt curtains used as a sediment containment system

Table 1 provides comments on various issues that should be considered for various stream flow conditions.

Table 1 – Design options depending on degree of base flow within the stream

Condition	Comments
No flow (dry creek)	<ul style="list-style-type: none"> Minor flow bypassing can be achieved with the use of cofferdams with either pumped or gravity bypass line. A temporary sidetrack crossing may be used as a cofferdam.
No flow but permanent pools	<ul style="list-style-type: none"> Fish passage requirements may exist that may prevent the use of cofferdams and flow bypassing.
Minor base flow (wet creek)	<ul style="list-style-type: none"> Fish passage requirements are likely to exist that may prevent the use of cofferdams and flow bypassing. Minimum hydraulic capacity of a temporary watercourse crossing should equal the stream's base flow rate. Choice between piped flow bypass or isolation barrier is likely to depend on flow rate and fish passage requirements.
Significant base flow	<ul style="list-style-type: none"> Use an isolation barrier to isolate instream works from the stream flow (Figure 3 & 4).

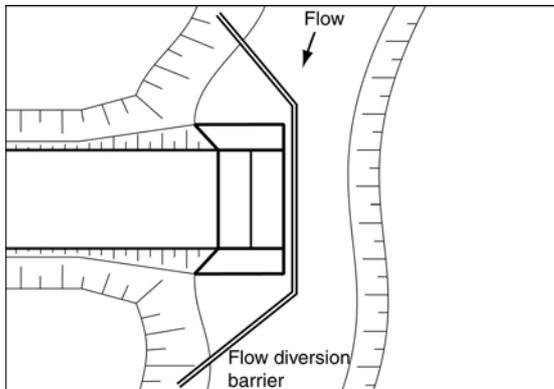


Figure 3 – Stage 1 of culvert construction using an isolation barrier

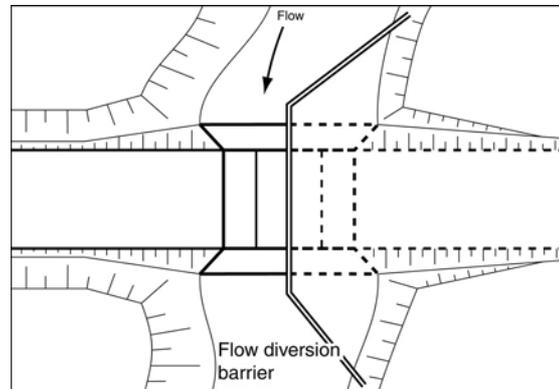


Figure 4 – Stage 2 of culvert construction

Various types of impervious isolation barriers exist, including rubber dams, braced sheeting, sheeting piling and fill embankment (Figure 5 to 8).

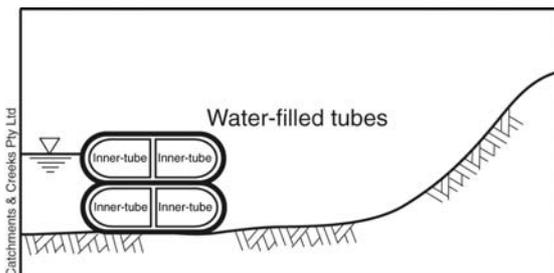


Figure 5 – Polyethylene tubes (rubber dams) filled with water

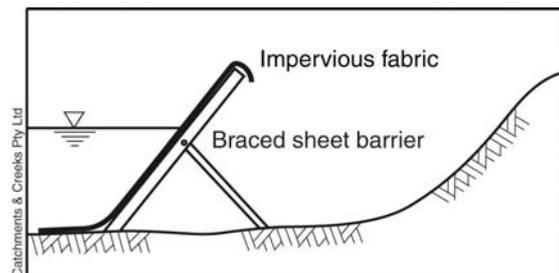


Figure 6 – Braced sheeting

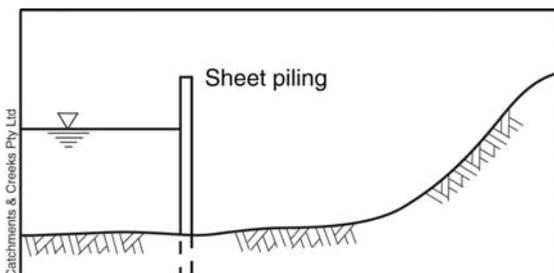


Figure 7 – Sheet piling

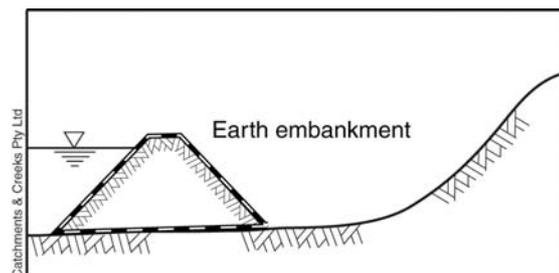


Figure 8 – Earth embankment (constructed behind sheeting piling or during low water level)

Description

Isolation barriers may consist of either a pervious or impervious barrier placed around an instream work area, or other soil disturbance, to separate instream disturbances from stream flows.

Impervious barriers are typically constructed using either an earth bund or sheet piling. Pervious barriers may consist of sediment fabric for shallow water sites, or prefabricated silt curtains for deepwater sites.

Purpose

Used to form either a wet or dry instream work area isolated from flowing waters, and to bypass stream flows around a disturbance.

Primarily used to minimise sediments displaced by passing stream flows.

Most isolation barriers also provide a quiescent water body around the work area to promote the settling of suspended sediments.

Limitations

Generally used on wide bed streams, but can also be used in narrow streams during dry weather conditions.

Generally unsuitable for high velocity streams, unless sheet piling is used.

Pervious barriers can have limited control over turbidity levels.

Advantages

Isolation barriers can be more effective than cofferdams if there is significant flow within the stream.

When used during dry weather, an impervious isolation barrier can significantly reduce the release of sediment and turbidity.

A number of commercial products exist.

Disadvantages

Earth bunds can be over-topped by significant stream flows possibly causing damage to the bunds and sediment loss.

Pervious barriers are generally ineffective for turbidity control.

If inappropriately designed, or if unexpectedly high channel flows occur, the isolation barrier may initiate erosion along the opposite channel bank.

Special Requirements

A temporary downstream instream sediment barrier is often required while the isolation barrier is being installed and removed.

Avoid isolating more than 30% of the channel width without detail hydraulic analysis on erosion risks.

Materials

- Earth fill: non-dispersive earth free of organic debris. Emerson's Aggregate Class 6, 7 or 8.

Installation

Method of installation may vary significantly from barrier system to barrier system. The following is provided as a general guide.

1. Prior to commencing any works, obtain all necessary approvals and permits required to conduct the necessary works including permits for the disturbance of riparian and aquatic vegetation, and the construction of all permanent or temporary instream barriers and instream sediment control measures.
2. Refer to approved plans for location, extent, and installation details. If there are questions or problems with the location, extent, or method of installation contact the engineer or responsible on-site officer for assistance.
3. If there is flow within the watercourse or drainage channel at the time of installation of the isolation barrier, then take appropriate measures to minimise the release of sediment during its installation. Such measures should only be installed if considered appropriate for the local conditions, and only if their installation is judged to provide a net overall environmental benefit.
4. Where practicable, divert all overbank stormwater runoff from the adjacent construction site onto stable, undisturbed, vegetated areas adjoining the watercourse so as to minimise the direct discharge of sediment-laden water into flowing channel waters.
5. To the maximum degree practicable, construction activities and equipment should not operate within open flowing waters.

6. Ensure clearing and excavation of access paths and the banks and bed of the watercourse are limited to the minimum practicable.
7. If dispersive, highly unstable, or highly erosive soils are exposed, then priority must be given to the prompt stabilisation of all such areas.
8. Clear the location for the isolation barrier, clearing only what is needed to provide access and install the barrier. Avoid clearing or disturbing the land until all necessary downstream sediment traps are in place.
9. Remove any cleared organic matter or debris from the channel and dispose of it properly. Do not use organic matter or debris to form any earth bunds.
10. If the isolation barrier is to be construct with compacted fill, the sides of the earth bund must be no steeper than a 2:1 (H:V) slope. To assist in the eventual removal of all materials used in the construction of an earth-based isolation barrier, a protective layer of geotextile filter cloth (preferably in the form of a single sheet) should be placed over the channel prior to installation of the barrier. If more than one sheet of fabric is required, overlap the fabric by at least 600mm.
11. Stabilise all disturbed areas with vegetation, erosion control blankets, rock or by other suitable means. The minimum rock size placed within the waterway channel should be 200mm.

Maintenance

1. While construction works continue on the site, inspect the isolation barrier prior to forecast rainfall, daily during extended periods of rainfall, after runoff producing rainfall, or otherwise on a weekly basis.
2. Ensure that barrier is stable and undamaged.
3. Dispose of any excessive sediment or debris deposits in a manner that will not create an erosion or pollution hazard.
4. Repair any places in the isolation barrier that have weakened or that have been subjected to damage from inflows or overtopping water.
5. If a bypass floodway exists, check the floodway is stable and capable of operating a its design capacity.

Removal

1. The isolation barrier must be removed as soon as possible after it is no longer needed.
2. If excessive sediment or debris has collected around the barrier, then remove such material before the barrier is removed, and dispose of such material properly.
3. If there is flow within the watercourse or drainage channel at the time of removal of the isolation barrier, then take appropriate measures to minimise the release of sediment during its removal. Such measures should only installed if considered appropriate for the local conditions, and only if their installation is judged to provide a net overall environmental benefit.
4. Ensure any channel water contained within the enclosed channel area is suitably treated before either the water is discharged from the enclosure or the isolation barrier is removed.
5. If it is not feasible to wait for adequate settlement of suspended sediments, then where practicable, pump the sediment-laden water to an off-stream de-watering sediment control system for treatment. This treatment area should ideally be located at least 50m from the channel.
6. Starting from the upstream end, remove all materials used to form the isolation barrier and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
7. Restore the watercourse channel to its original cross-section, and smooth and appropriately stabilise and/or revegetate all disturbed areas.