

Guidelines for controlled activities

Watercourse crossings

The design and construction of watercourse crossings and ancillary works, such as roads, should consider the potential impacts of the crossing structure on waterfront land. Crossings have the potential to disrupt the hydrologic, hydraulic, and geomorphic functions of a watercourse affecting flows, bed and bank stability as well as the ecological values and functions of the riparian corridor (refer to the Department's *Guidelines for controlled activities – Riparian corridors*).

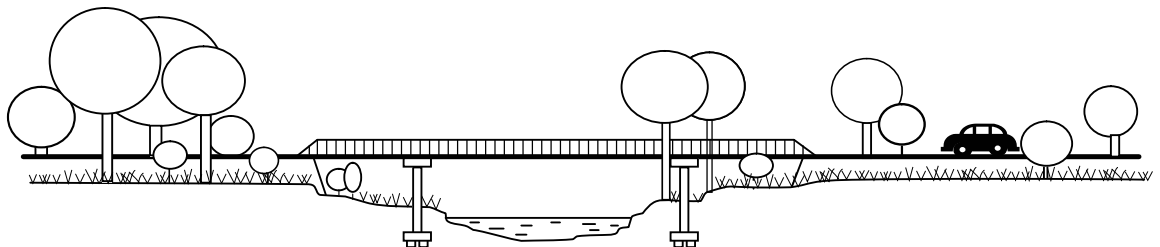
Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie. the bed and a distance inland of 40 metres from a river, lake or estuary.

This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

In order to minimise the effects of structures on the hydrologic, hydraulic and geomorphic functions of a watercourse, the Department recommends crossings be designed and constructed in order to maintain the integrity of the existing channel as well as being sympathetic with the ecological values of the watercourse and its riparian corridor.

Bed level crossings or bridges which fully span the watercourse channel provide the best opportunities for maintaining these channel functions, as illustrated in Figure 1. However, alternative structures such as box culverts which can achieve equivalent riparian corridor functions may also be considered.

Figure 1. Bridge crossing over watercourse and riparian corridor



The design and construction of crossing structures should consider, but not be limited to, the following design principles:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*.
- The design and construction of crossings should consider the full width of the riparian corridor and riparian corridor functions, including accommodating fully structured native vegetation.
- The design and construction footprint and extent of disturbances proposed within the riparian zone should be minimised.
- Maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse.
- If a raised structure or an increase in the height of the bed is proposed then proponents must demonstrate that the structure will not have a detrimental effect on the natural hydraulic, hydrologic, geomorphic and ecological functions.

- Maintain natural geomorphic processes:
 - accommodate natural watercourse functions
 - maintain the natural bed and bank profile
 - do not inhibit the movement of sediment and woody debris
 - do not increase scour and erosion of the bed or banks in any storm events
 - avoid locating structures on bends in the channel
 - where existing bed degradation occurs, address bed degradation to protect the structure and restore channel and bed stability.
- Maintain natural hydrological regimes; that is:
 - accommodate site hydrological conditions
 - do not alter natural bank full or floodplain flows or increase water levels upstream
 - do not change the gradient of the bed (except where necessary to address existing bed and bank degradation)
 - do not increase velocities by constricting flows (eg. filled embankments on approaches).
- Protect against scour; that is:
 - provide any necessary scour protection, eg. rock rip-rap and vegetation
 - scour protection of the bed and banks downstream of the structure should extend for a distance of either twice the channel width or 20 metres whichever is the lesser
 - if cutting into banks, protect cuttings against scour.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation, mulching, weed control and maintenance in order to adequately restore the integrity of the riparian corridor.

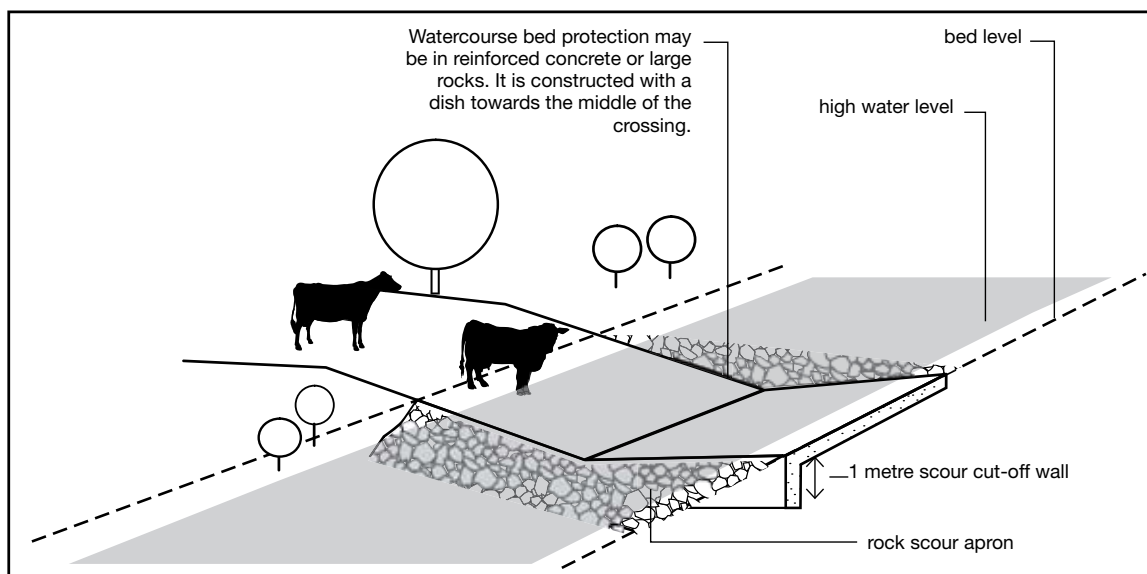
Additional considerations for design of bridges

- Ideally, bridges shall be elevated and span the riparian corridor.
- Avoid locating bridge piers or foundations within the main channel of the watercourse.
- The bridge design **must be certified** by a suitably qualified engineer.

Additional considerations for design of causeways

- The deck of the crossing shall be at the natural bed elevation.
- The crossing shall have a vertical cut-off wall on the downstream side of the crossing to a minimum depth of 1 metre and minimum width of 100 mm.
- Approaches to the crossing should be sealed and incorporate appropriate roadside drainage, eg. stabilised table drains where necessary.

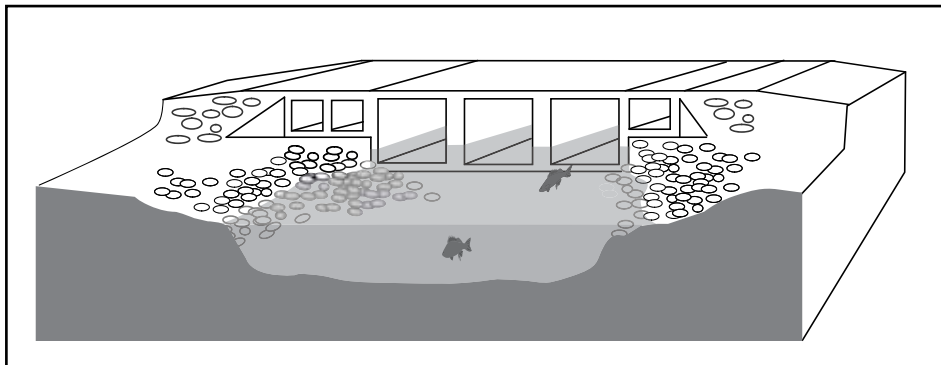
Figure 2. Splash crossing for livestock and vehicles



Additional considerations for design of culverts

- Box culverts are preferred to pipes.
- Align culverts with downstream channel.
- Incorporate elevated 'dry cells' and recessed 'wet cells' with the invert at or below the stable bed level.
- The culvert design **must be certified** by a suitably qualified engineer.

Figure 3. Road crossing allowing fish passage



When seeking approval to construct crossing structures information detailing the above requirements should be submitted to the Department for assessment. Additional information may also be required and may include but not be limited to:

- detailed design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing the proposed structure relative to existing and proposed bed and bank profiles and water levels. The cross section should extend to the landward limit of the identified riparian corridor.
- crossing design plans should include a location plan, plan view, elevation view and cross-section of the proposed crossing structure
- a report detailing pre and post construction hydraulic conditions. The report should address, bank full discharge, velocity, tractive force or shear stress, afflux (Modified RTA method is acceptable), Froude and Manning 'n', relative to the proposed structure.
- plans showing extent and designs of permanent bed and bank stabilisation works necessary for scour protection (see Department's *Guidelines for controlled activities – In-stream works*)
- a Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*
- a Site Management Plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, etc
- costing of all works (ie materials, labour) and stages of works (eg crossing construction, rehabilitation)
- other relevant approvals, eg. development consent.

Further information

If you require more information about controlled activity approvals please contact your local DWE office or visit our website www.dwe.nsw.gov.au

Important notes

DWE has prepared these guidelines in good faith. In the case of any inconsistency between the guidelines and the controlled activity approval or legislation, the controlled activity approval or legislation will prevail to the extent of that inconsistency.

Nothing in these guidelines is taken to authorise a controlled activity. These guidelines are designed to provide information to assist in the design of any development or work that constitutes a controlled activity and the preparation of an application for a controlled activity approval. Users are advised to seek professional advice and to refer to the legislation and any relevant approvals, as necessary, before taking action in relation to any matters covered by the guidelines.

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