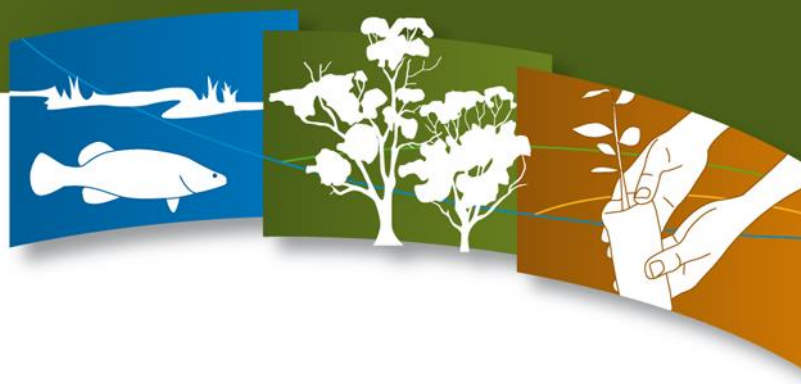
Works on Waterway Guidelines
Stream Deviation



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Introduction

Realignment or deviation of streams is sometimes undertaken to facilitate urban development, new road infrastructure or mining development. The length of works could be less than one hundred metres to several kilometres.

It would be advisable that the proponent discuss the project at the concept stage with the CMA and other authorities such as DELWP and Aboriginals Victoria, before submitting an application for the works. Specialist geomorphological advice will be needed to support diversion applications on all Class 1 and 2 streams or any stream where the course will be altered by 25 % or more within the applicant's property.

Potential Waterway Issues

The potential impacts of stream deviations are varied and will depend on the scale and location of the project and include the following:

- Shortening the stream length will increase the stream grade and erosion potential.
- Longer streams may lead to sedimentation.
- Lengthening the stream will reduce its hydraulic capacity due to the flatter gradient.
- There would be a loss of established environmental values in the waterway.
- Responsibility for the future management for the new stream course.

Assessment Criteria

Hydraulic Capacity

The channel and floodplain capacity of the new waterway reach is to be hydraulically equivalent to the original reach for a range of flows up to the 1% AEP flood flows. Where the overall stream is significantly lengthened, the new waterway may need to be larger than the original to maintain essentially the same water level in the stream upstream of the works. If the stream is shortened, then stabilisation works may be required to maintain the same bed grade.

The hydraulic assessment will depend on the scale of the works. For very minor deviations such as to suit a new road crossing, a waterway physically the same as existing would be acceptable. For major deviations the applicant should submit the hydraulic design report with the application for assessment (Table 1).

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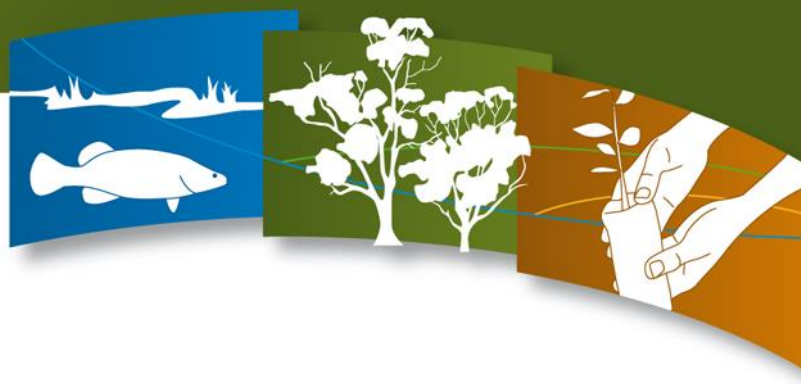

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Fish Passage

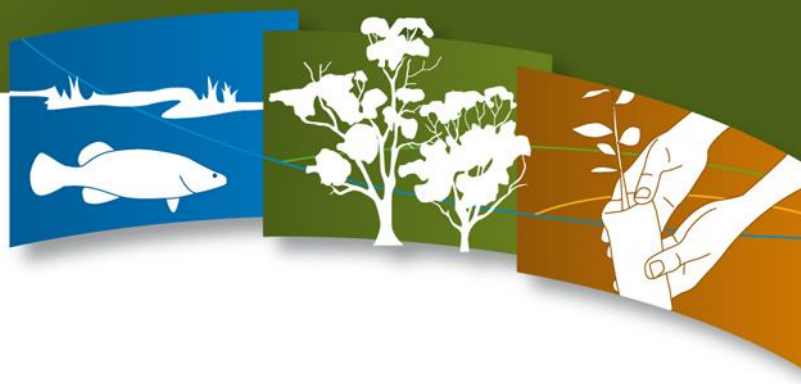
Connectivity through a waterway has been identified as an essential component of healthy fish populations as it allows for access to important spawning, dispersal, feeding, refuge, juvenile and adult habitats. Stream barriers such as culvert crossings, can result in a loss of connectivity and has been attributed to the decline in many native fish species in Australian waterways (O'Connor, Stuart & Campbell-Beschorner, 2017).

Table 1 Minimum preferred structures for Fish Passage.

Classification	Stream Characteristics
Class 1 - Major fish habitat	Large named permanently flowing stream. Aquatic vegetation present. Known fish habitat.
Class 2 – Moderate fish habitat	Smaller named permanently or intermittent flowing stream. Aquatic vegetation present. Known fish habitat.
Class 3 – Minimal fish habitat	Named or unnamed watercourse with intermittent flow.
Class 4 – Unlikely fish habitat	Named or unnamed stream with flow during rain events only.

Physical Requirements

- The new course to provide for low flows and flood flows up to the capacity of the natural channel.
- Bed grade to be similar to the existing bed grade. A rock chute may be needed to maintain suitable bed grades.
- Batters of banks should be designed to mimic natural stable batters on the existing waterway. This can be achieved by providing variation in slopes and benches to provide diversity of habitats for flora and fauna. Batters to generally be a maximum of 1(v):2(h), except where excavation is through rock. A slope stability analysis by a geotechnical consultant is required where the depth of cut exceeds 5 metres.
- Berms to be constructed where the depth of cut exceeds 5 metres.
- The entry and exit points to the original waterway to provide a smooth transition.



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- The design to provide for maximum retention and protection of existing vegetation in both new and old courses.

Local Drainage

If the depth of cut exceeds 5 metres, catch drains should be located along the top of cuts and directed to suitable drainage points to direct runoff away from the batters. Catch drains are to be stabilised using grass or rock to suit local conditions.

Berms are to be graded away from the top of the batter to avoid concentrated flow down the batters and longitudinally to inlets to piped or lined drains to convey runoff down the batter to the new stream.

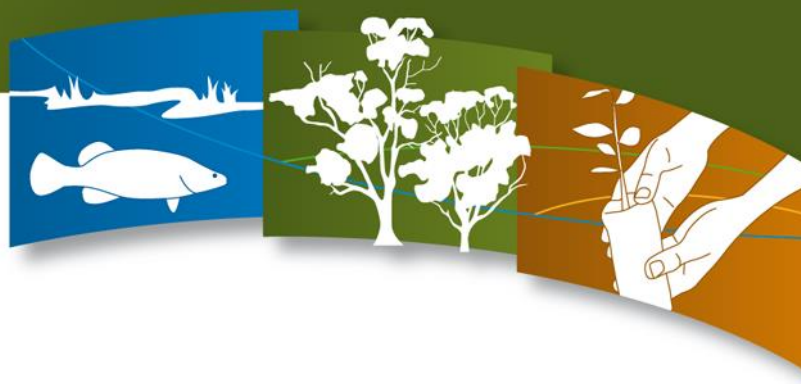
Watertable

The works should not cause a significant change to the existing watertable regime.

Stream Restoration

The rehabilitation plan should attempt to mimic the natural values of the stream reach upstream and downstream and in time provide a net gain to the ecological values of the stream. The requirements are as follows:

- Variability in physical characteristics to reflect the original characteristics and create a natural appearance by inclusion of a meandering course with variable bed depth.
- Pool/riffle sequences to be restored.
- Provision for fish passage for a wide range of flows and during the construction period.
- Stream bed to be covered in similar material as the original bed, ie. silt, sand or rock.
- Stream banks to be topsoiled using the original topsoil on the site.
- The banks and floodplain to be revegetated using indigenous grasses, plants and trees.
- Large woody debris to be placed and secured in the stream to at least the same density as occurs naturally in adjoining reaches.
- Reach to be fenced to restrict stock access.
- Methods to re-establish the native vegetation at the site and otherwise rehabilitate the site including stabilisation of access roads.



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Abandoned Waterway

The methodology for treatment of the original course is to be defined. In general remnant trees shall be protected at all times.

References

J. O'Connor, I. Stuart, R. Campbell-Beschorner (2017) Guidelines for fish passage at small structures. Arthur Rylah Institute for Environmental Research Technical Report Series No. 276. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

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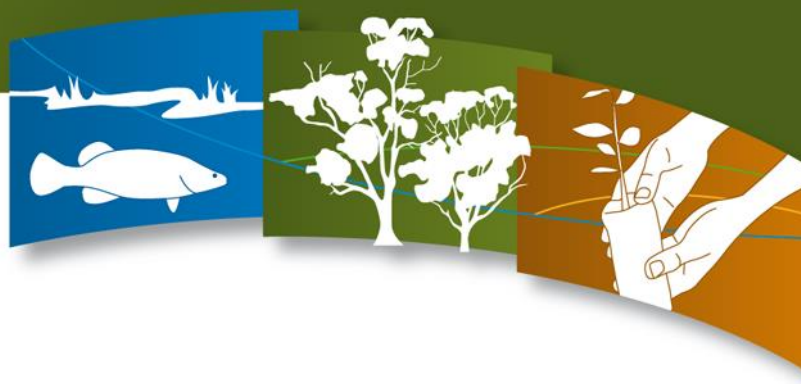

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Works and Environmental Management Plan

A works plan for all deviations is required to be submitted by the applicant. This is assessed to ensure the works are appropriate from a stream process perspective and that the works will be carried out in an acceptable manner. The works plan should identify:

- Pool/riffle sequences to be restored.
- The construction methods;
- Details of any licenses /permits/ approvals required and proposals to comply with any attached conditions, (e.g. existing Planning permit, EPBC Act approval, Extraction License);
- Methods to avoid blocking fish passage and flows during and after construction;
- Methods of supervision and instruction of construction staff in relation to site environmental management requirements;
- The timing and staging of all works associated with the deviation;
- The extent of vegetation clearing;
- The treatment of the original waterway;
- Methods to control erosion and sedimentation;
- Methods to control dust from associated works;
- Methods to protect water quality from machinery operations; and
- Methods to re-establish the native vegetation at the site and otherwise rehabilitate the site including stabilisation

Maintenance Program

Flows should preferably enter the deviation after a reasonable grass cover has become established on the bank areas of the deviation to minimise potential soil loss. The works should be inspected at 3 monthly intervals and after significant flow events. Any damage to the deviation and structures shall be promptly restored.

Future Responsibilities

The future responsibilities for the deviation must be resolved as part of the assessment and would be determined on a case by case basis.