Accepted development requirements for operational work that is constructing or raising waterway barrier works

Effective: (Draft for consultation)

Queensland Government

This publication has been compiled by Fisheries Queensland, Department of Agriculture and Fisheries.

The Department of Agriculture and Fisheries proudly acknowledges all First Nations peoples (Aboriginal peoples and Torres Strait Islanders) and the Traditional Owners and Custodians of the country on which we live and work. We acknowledge their continuing connection to land, waters and culture and commit to ongoing reconciliation. We pay our respect to their Elders past, present and emerging.

Summary

When operational work that is constructing or raising **waterway barrier works** complies with the requirements in this document, the operational work is authorised as **accepted development**.

These **accepted development** requirements are designed to allow self-assessment. It is the user's responsibility to comply with the requirements.

A **waterway** is defined as a river, creek, stream, watercourse, drainage feature or inlet of the sea, refer to s.4, schedule dictionary of the *Fisheries Act 1994*. The *Queensland waterways for waterway barrier works* mapping and user guide, will help to identify **waterways**.

This document does not:

- address other legislative requirements for development, such as other **development** triggers or the need for other authorisation e.g. tenure under the *Land Act 1994*, **development approvals** under the *Planning Act 2016*, *Queensland Heritage Act 1992* or *Marine Parks Act 2004* etc. These must be obtained separately if required.

Accepted development may only occur in a place where a person or entity has a lawful right to undertake that work. As such, it is the responsibility of the proponent to obtain tenure or otherwise meet requirements to lawfully access land where **accepted development** is proposed.

If **development** involves operational work that is the removal, destruction or damage of a **marine plant**, operational work completely or partly within in a declared fish habitat area or a material change of use that is aquaculture, refer to the **accepted development** requirements for:

- the removal, destruction or damage of marine plants
- work that is completely or partly within a declared fish habitat area
- material change of use that is aquaculture.

If the proposed work does not comply with the **accepted development** requirements, the work is not **accepted development**. Work that is not **accepted development** is **assessable development** and requires **development approval**:

- Contact the State Assessment and Referral Agency (SARA) to obtain pre-lodgement advice involving relevant agencies[1]. This will include the Department of Agriculture and Fisheries.
- Find out how to submit a development application, including how to use the online preparation and lodgement system MyDAS2.

[1]Note, not all state development triggers are captured through the SARA process, e.g. works in a marine park.

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1 Version control

Version	Date	Comment
1	3 July 2017	Transition (including some minor changes) from previous self-assessable codes (WWBW01, WWBW02) into accepted development requirements to align with the release of the *Planning Act 2016.*
1.1	14 September 2017	Minor change to temporarily revert to previous provisions for retro-fitting of inverts and re-sleeving of culverts under the self-assessable code until 1 July 2018.
1.2	15 December 2017	Update of departmental names due to Machinery of Government changes. Removal of link for online notification. Link is expected to go live in 2018 and will be included in subsequent version.
1.3	1 October 2018	Revision of work types for retro-fitting of inverts and re-sleeving of culverts and inclusion of online notification.
2.0	TBC	Guidance for using this document where waterways are not displayed on the mapping layer. Includes provision for some bridges that are waterway barrier works as accepted development in amber and green waterways. Updating of numbering system for work types. Includes new section for remediation works. Revision of temporary waterway barrier works. Includes minimum requirements for lengthening of culverts. Includes requirement to roughen culvert inverts and aprons on green waterways when at bed level. Includes depth of cover requirement for culverts on amber and green waterways. Removal of hydraulic modelling and associated requirements when 'commencing full flow' for options 1 and 2 on culverts in red waterways. Removal of floodgate maintenance/replacement. Removal of online notification and updated notification forms. Reformatting of existing culvert maintenance provisions into separate work types. Guidance to find declared disaster areas and minor amendments to that section. Restriction on use of gabion mattresses in certain situations. Minor amendments to glossary. Updated and new figures.

2 How to use this document

When operational work that is constructing or raising **waterway barrier works** complies with the requirements of this document, the work is **accepted development**. This document is reviewed periodically and may be amended. Always ensure you are using the current version.

Requirements

Make sure you read and understand the requirements and specific work types:

- Section 4: Requirements for all work (notification, site access and standards)
- Section 5: New work (**bridges, culvert crossings, bed level crossings, low level crossings, dams** and **weirs**)
- Section 6: **Maintenance (culvert crossings** and **bed level crossings**)
- Section 7: Temporary **waterway barrier works**
- Section 8: Remediation (**pile fields**, nib walls, retrofitting baffles, interim rocked fish ramp, partial and full width interim rock ramp fishways, floor baffles, **rock chutes** and partial barrier removal)
- Section 9: Amendments to **accepted development** requirements for recovery during, and immediately following, **disaster situations** declared under the *Disaster Management Act 2003.*

Information to help guide you will appear like this throughout the document.

Glossary

The Glossary in section 10, defines key terms used in this document. Terms not in the glossary may be defined in the *Fisheries Act 1994* (Fisheries Act) or the *Planning Act 2016* (Planning Act).

Resources

Resources referred to in this document will help you to comply with the requirements.

The following legislation is available at legislation.qld.gov.au:

- *Fisheries Act 1994*
- Fisheries (General) Regulation 2019
- *Planning Act 2016*
- Planning Regulation 2017.

Queensland waterways for waterway barrier works mapping is available at:

- Development Assessment Mapping System (DAMS)
- Queensland Globe
- Queensland Spatial Catalogue (QSpatial).

Note: This mapping must be used in conjunction with the *Queensland waterways for waterway barrier works spatial data layer: User guide.*

The reference to waterways as grey, purple, red, amber and green in this document, refers to their mapped colour on the Queensland waterways for waterway barrier works mapping. The colour of waterway where the works are proposed must be known in order to determine which section(s) of this document to comply with.

Where waterway barrier works are proposed on a waterway that is present on ground but not displayed on the Queensland waterways for waterway barrier works mapping, the works can be conducted under these accepted development requirements in that waterway as follows:

1. If it is tidal it is treated as a tidal (grey) waterway; or
2. If it flows into a tidal waterway it is treated as though it is the colour of the nearest upstream mapped waterway, or if there is not a mapped upstream waterway it is an amber waterway; or

3. If it drains directly to a freshwater wetland or waterway it is treated as though it is the colour of the nearest upstream mapped waterway, or if there is not a mapped upstream waterway it is green.

If uncertain whether the feature that is not displayed on mapping is a waterway seek waterway advice.

Contacts and further information

For more information, including questions about technical matters, visit fisheries.qld.gov.au, email planningassessment@daf.qld.gov.au or call 13 25 23.

3 Introduction

This document is prepared under the Planning Act and the Fisheries Act and specifies the **accepted development** requirements for operational work that is constructing or raising **waterway barrier works**.

The meaning of **waterway barrier works** is provided in the schedule dictionary of the *Fisheries Act 1994* and is defined as a **dam**, **weir**, crossing, fill or other complete or partial barrier within a **waterway** if the barrier limits fish access to, or movement within, a **waterway**. They can be permanent or temporary structures. For more information, refer to waterway barrier works.

Works must comply with all requirements in this document to be **accepted development**. If it does not comply, the **works**, by default, are **assessable development**. It is an offence against the Planning Act to carry out **assessable development** without a **development permit**. Penalties apply.

Free movement of fish along **waterways** and into other connected wetlands is an essential requirement for many fish species that naturally occur in Queensland. Fish require movement at adult, juvenile and larval stages. Some fish move between fresh and salt water for access to feeding and breeding habitats, and for refuge. Others traverse large distances in marine, estuarine and riverine environments for protection and dispersal opportunities.

Unimpeded movement of fish within Queensland **waterways** is vital to sustain healthy fish stocks. Thousands of **waterway barrier works** such as **dams** and **culvert crossings**, have been built within **waterways** throughout Queensland, and the loss of access to **fish habitat** has caused a decline in the distribution of native fish populations. It is therefore essential that the construction of new, or raising of existing, **waterway barrier works** are designed to provide adequate fish passage.

4 Requirements for all work

4.1 Notification

Notification forms in section 11 must be completed and submitted to Fisheries Queensland, Department of Agriculture and Fisheries (DAF) by email to acceptedevelopment@daf.qld.gov.au.

A map of the location of the **works** and photographs must be submitted with the pre-works and post-works notification forms and all sections of the relevant notification forms must be completed in full. Appendix 3 provides further information on how to take the photos.

For entities undertaking a program of **works**, a single pre-works and post-works notification can be made for the **waterway barrier works**. Note restrictions for temporary **waterway barrier works** in section 7.

Pre-work notification

Notification must be submitted prior to, but no more than 20 business days before work commences.

Note: You do not need to wait for a reply to commence your work.

Post-works notification

Post-works notification must be submitted within 15 business days of the completion of the **works**.

4.2 Site access

Sites where **accepted development** is occurring must be open for inspection by Fisheries Queensland staff during business hours, during **works** and on request.

4.3 Standards

The following standards apply under these **accepted development** requirements:

1. Minimise disturbance to the waterway bed and banks e.g. use geofabric as a work base or construct a work platform above the substrate.
2. Avoid or minimise impacts to areas containing aquatic vegetation.
3. Ensure the least volume of soil or sediment is disturbed.
4. Limit the use of machinery within waterways and use machinery no larger than that required for the purpose.
5. Undertake work at times that minimise disruption to fish migration and the flowering and fruiting of marine plants.
6. Avoid complete bunding of a waterway where possible to maintain a flow path and fish passage (e.g. staging works or creating a temporary diversion, etc.)
7. Manage works to avoid fish stress. Signs of distress in fish may include gasping at the water surface, rapid breathing, rolling or lethargy. If fish in distress are noticed, take immediate action to remove or remediate the cause of stress.
8. New permanent waterway barrier works, other than remediation works under section 8, must not be located on meanders or bends of **waterways**.
9. Do not commence **works** during times of **elevated flow**.
10. When replacing an existing **waterway barrier work**, completely remove the obsolete **waterway barrier work** within four weeks of the completion of the replacement **works**.

11. Remove spoil from **waterways** and **fish habitats** except where **spoil** is deliberately used for re-profiling to restore bed and banks to natural profiles.
12. Construction material used is clean, free of contaminants, and will not wash away and increase sediment loads in downstream waters.
13. Prevent erosion from occurring and prevent sediment from entering the **waterway**.
14. The roots of vegetation may only be removed where deep excavation is required.
15. Avoid the creation of ponded water levels that would result in the death of riparian vegetation and/or **marine plants**.
16. Screen pumping infrastructure to avoid entrainment of fish.
17. Minimise the risk for fish to become trapped or stranded upstream, within, or between **waterway barrier works**.
18. If fish become trapped by the **works**, immediately implement fish salvage activities in accordance with the guidelines for Fish salvage.
19. Report any fish kills immediately on 1300 130 372 and advise that **works** are occurring under this document. Take immediate action to identify and remove the cause of fish kills.
20. Where any part of the **waterway** bed or banks adjacent to the **works** has been altered by the **waterway barrier works**, restore and/or rehabilitate the site so that:
    - stability and profiles of the bed and banks are re-instated to natural **waterway** profiles and stability within 5 business days of the completion of the **works**.
    - the **waterway** bed is retained or reconstructed with **substrate** comparable to the natural **substrate** size and consistency.
    - site conditions are returned to a state that allows rapid re-establishment of native vegetation and cover; or native species are replanted to re-establish the natural plant community.
21. Any person(s) engaged or employed to carry out **works** under these **accepted development** requirements must:
    - be provided with a full copy of this document; and
    - be provided with a full copy of any notification forms submitted under section 4.1.
22. With the exception of **pile fields**, all **waterway barrier works** are maintained to meet these **accepted development** requirements for the life of the structure.
23. All temporary **waterway barrier works** require notification. Temporary waterway barriers e.g. sediment control measures, that are associated with other work types within this document, must meet the requirements in section 7 or will require a **development approval** under the Planning Act.
24. The disturbance of Acid Sulfate Soils (ASS) should be avoided in environments than contain sensitive species. All material used in the **works** are ASS free and potential ASS free or have been treated to accepted standards to prevent movement of sediment, runoff and leachate to **fish habitats**.[2]
25. In the event that the **works** cause disturbance or oxidisation of acid sulfate soil, the affected soil must be treated and thereafter managed (until the affected soil has been neutralised or contained) in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil management

[2] Refer to the most updated version of the *Queensland Acid Sulfate Soil Technical Manual*.

guidelines. Where ASS treatment is required, any bunding may require additional authorisation for **waterway barrier works**.

4.3.1 Additional standards for tidal waterways:

26. Work in unbunded tidal areas is to occur within two hours either side of low tide.
27. Other than **spoil** deliberately used for re-profiling to restore bed and banks to natural profiles, remove spoil from **tidal land**.

5 Requirements for new work

5.1 New or replacement bridges

This section lists the requirements for **accepted development** including the duration, dimensions and design for new, raised, or replacement **waterway barrier works** that are **bridges**.

The construction of new, or replacement of existing **bridges** on tidal (grey), purple and red **waterways** is not **accepted development**. Where these are **waterway barrier works**, this is **assessable development** and requires a **development approval** under the Planning Act. It is recommended to seek pre-lodgement advice in this instance. For best practice **bridges** that are not **waterway barrier works**, refer to Works not considered waterway barrier works.

Requirements for all new or replacement bridges

- All **bridges** are inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage
- For the life of the crossing, relative elevation levels of the **waterway** bed **scour protection** and the **waterway** bed must be retained so that there are no drops in elevation at their respective joins

5.1.1 Constructing, raising or replacing a bridge on amber and green waterways

Construction duration

- **Works** within the **waterway** commence and finish within 360 calendar days

Bridge dimensions and design for single span bridges (Figure 1)

- The **bridge spans** a minimum of 90% of the **main channel** width
- Abutments and abutment revetment **works** are outside of the 90% span of the **main channel** width
- Abutment protection **works** are roughened
- No **scour protection** is placed on the bed of the **waterway** upstream, downstream or under the structure

Bridge dimensions and design for multi-span bridges (Figures 2 and 3)

- The **bridge** spans a minimum of 90% of the **main channel** width
- Abutments and abutment revetment **works** are outside of the 90% span of the **main channel** width
- Piles are outside of the **low flow** channel
- Abutment revetment **works** are roughened

Roughening can include, but is not limited to:

- rocks
- coarse broom finish
- shotcrete.

- **Scour protection** is at or below the natural **bed level** and does not alter the profile of the **low flow** channel
- **Scour protection** does not extend more than 20m upstream or downstream beyond the footprint of the **bridge** (Figure 3)

5.2 New or replacement culvert crossings

The requirements for using pipe culverts for new or replacement culvert crossings will be reviewed prior to the next update of this document. This may result in either discontinuation of pipe culverts being permitted as accepted development, or alternative requirements for pipe culverts. Culvert crossings comprised of box culverts minimise impacts to fish passage because they typically have a greater aperture width at bed level and less fill between cells than pipe culverts.

This section lists the requirements for **accepted development** including the duration, dimensions and design for new or replacement **waterway barrier works** that are **culvert crossings**.

The construction of new, or replacement of existing culverts crossings on tidal (grey) **waterways** and purple **waterways** are not **accepted development**. This is **assessable development** and requires a **development approval** under the Planning Act.

This section does not apply to **duplications. Duplications** are **assessable development**.

Requirements for all new or replacement culvert crossings

- Culverts are kept free of blockages in order to retain fish passage
- Where aprons and **waterway** bed **scour protection** are incorporated on red, amber and green **waterways**, the design complies with work type 5.2.4

5.2.1 Construction of new or replacement culvert crossing on a red waterway

Construction duration

- **Works** within the **waterway** commence and finish within 180 calendar days

Culvert crossing dimensions and design

All new and replacement **culvert crossings** (single or multi-celled) meet the following culvert dimensions and design:

- The combined width of the **culvert cell aperture(s)** spans a minimum of 100% of the **low flow** channel width (Figures 4 and 5)
- The culvert is installed at a gradient no steeper than the **waterway bed gradient**
- New **culvert cells** are aligned parallel (within 10°) to the direction of water flow to minimise turbulence
- The upstream wingwalls (where incorporated) and outermost culvert sidewalls, have baffles.
- Baffles are as follows:
    - Installed to a minimum of 95% of the vertical extent of the culvert sidewalls with a gap of no greater than 30 mm at the bottom (Figures 6 and 8)
    - Installed on the upstream wingwalls on both banks to the height of the upstream **obvert** or the full height of the wingwall (Figure 6)
    - Maximum 150 mm horizontal protrusion (width) into the flow (Figures 7 and 8)
    - Maximum 10 mm thick **leading edge** (Figure 7)
    - Within 1.2m upstream and downstream of the upstream culvert inlet, baffles are spaced at twice the horizontal protrusion (width) of the baffle (i.e. maximum 300 mm centres) (Figure 6)

- Throughout the rest of the structure, baffles are spaced at 4 x horizontal protrusion (width) of the baffle (i.e. maximum 600 mm centres) (Figure 6).

- In addition to the above requirements, the **culvert crossing** meets one of the three **culvert crossing** configurations below:

Culvert crossing configurations

Option 1 (Figure 9)

- The combined width of the **culvert cell aperture(s)** spans a minimum of 75% of the **main channel** width
- The **obvert** of the **culvert cell(s)** is a minimum of 600 mm above the commence to flow water level (or **bed level**, for ephemeral **waterways**)
- the **depth of cover** is no greater than 750 mm
- All culverts in the crossing are set at a minimum of 300 mm below **bed level** unless installed on bedrock, where the natural bed surface is maintained through the culvert

Option 2 (Figure 10)

- The combined width of the **culvert cell aperture(s)** spans a minimum of 75% of the **main channel** width
- The **obvert** of the **culvert cell(s)** is a minimum of 600 mm above the commence to flow water level (or **bed level**, for ephemeral **waterways**)
- The **depth of cover** is no greater than 750 mm
- At least one culvert in the crossing is set a minimum of 300 mm below **bed level**, unless installed on bedrock where the natural bed surface is maintained. This **culvert cell**:
  - Has a minimum width of 1200 mm for a box culvert or 1500 mm diameter for a pipe culvert
  - Has an **obvert** no lower than the **obvert** of the highest **culvert cell** in the **culvert crossing**, except where slab links are incorporated and the **obvert** of the slab link barrel is no higher than the top of the adjacent box culvert
  - Is aligned with the **low flow** channel of the **waterway**.
- All other culverts in the crossing are:
  - at or below **bed level**
  - roughened throughout the culvert **invert** to approximately simulate natural bed conditions.

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. **Invert** roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

Option 3 (Figures 11-13)

Option 3 may be beneficial to use for red mapped **waterways** that are shallow and wide in nature and where it is likely to be unfeasible to construct **culvert cells** across 75% of the **main channel** width.

- The maximum **deck height** of the crossing is 1200 mm at the lowest point of the natural **waterway** bed (Figures 11-13)
- All culverts are installed a minimum of 300 mm below **bed level** unless installed on bedrock where the natural bed surface is maintained (Figures 11-13)
- The **obvert** of the **culvert cell(s)** is a minimum of 300 mm above the commence to flow water level (Figure 12), or **bed level**, for ephemeral **waterways** (Figure 13)
- The **depth of cover** is no greater than 300 mm (Figures 11-13)
- The crossing incorporates a minimum combined culvert **aperture width** of 3.6 m (Figures 11-13)
- The crossing incorporates at least one culvert with a minimum width of 1200 mm for a box culvert (Figures 11-13) or 2 x 900 mm diameter pipe culverts
- Adjacent to each bank (Figures 12 and 13), or **bankside** culverts if the culverts are located adjacent to the bank (Figure 11), construct a **rock chute** on the downstream side of the **culvert crossing**
- **Rock chutes** (Figures 11-13)
    - Are not constructed from **gabion** mattresses
    - Are constructed at a slope no steeper than 1 in 20 (5% grade)
    - Have a minimum width of 3 m (Figures 12 and 13), or the combined **culvert cell aperture width** and **rock chute** width spans 100% of the **main channel** width (Figure 11)
    - Adjoin the road surface on the downstream side of the crossing
    - Extend from the road surface downstream into the **waterway** to a level that is no higher than half-way between **bed level** and the culvert **obvert.**

5.2.2 Construction of new or replacement culvert crossing on an amber waterway

Construction duration

- **Works** within the **waterway** commence and finish within 360 calendar days

Culvert crossing dimensions and design

All new and replacement **culvert crossings** (single or multi-celled) meet one of the following options AND the additional requirements below:

Option 1

- The combined culvert **aperture width** spans 100% of the **low flow** channel width (Figures 4 and 5)

AND

- The combined culvert **aperture width** is a minimum of 2.4m (Figure 14)

Option 2

- The combined culvert **aperture width** spans 100% of the **main channel** width

Additional requirements (Figure 14)

- All **culvert cells** are installed at or below **bed level** (Figure 14)
- The **obvert** of the **culvert cell(s)** is a minimum of 300 mm above the commence to flow water level (Figure 14), or **bed level**, for ephemeral **waterways**
- **Depth of cover** is no more than 500 mm (Figure 14)
- Where the cell is installed at less than 300 mm below **bed level**, the culvert **invert** must be roughened throughout to approximately simulate natural bed conditions, unless installed on bedrock where the natural bed surface is maintained. Where the cell is installed 300 mm or more below **bed level**, no roughening is required on the culvert **invert** (Figure 14)
- The culvert must be installed at no steeper gradient than the **waterway bed gradient**
- New **culvert cells** must be aligned parallel (within 10°) to the direction of water flow to minimise turbulence

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. **Invert** roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

5.2.3 Construction of new or replacement culvert crossing on a green waterway

Construction duration

- **Works** within the **waterway** commence and finish within 360 calendar days

Culvert crossing dimensions and design

All new and replacement **culvert crossings** (single or multi-celled) meet one of the following options AND the additional requirements below.

Option 1

- The combined **culvert cell aperture width** spans a minimum of 100% of the **low flow** channel width (Figures 4 and 5)

AND

- Has a minimum (combined) culvert **aperture width** of 1.2m (Figure 15)

Option 2

- Has a combined culvert **aperture width** that spans 100% of the **main channel** width

Additional requirements

- All **culvert cells** must be installed at or below **bed level**
- The **obvert** of the **culvert cell(s)** must be a minimum of 300 mm above the commence to flow water level (Figure 15), or **bed level**, for ephemeral **waterways**
- **Depth of cover** is no more than 500 mm (Figure 15)
- Where the cell is installed at less than 300 mm below **bed level**, the culvert **invert** must be roughened throughout to approximately simulate natural bed conditions (Figure 15), unless installed on bedrock where the natural bed surface is maintained. Where the cell is installed 300 mm or more below **bed level**, no roughening is required on the culvert **invert**
- The culvert must be installed at no steeper gradient than the **waterway bed gradient**
- New **culvert cells** must be aligned parallel (within 10°) to the direction of water flow to minimise turbulence

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. **Invert** roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

5.2.4 Aprons and waterway bed scour protection on red, amber and green waterways

Where aprons are incorporated:

- They are not steeper than the **waterway bed gradient**
- Abut culvert **inverts** (including buried culverts) and the **waterway** bed or **scour protection** at the same level to ensure that there is no drop in elevation at the join (Figure 16)
- Where aprons are at **bed level**, they are roughened throughout to approximately simulate natural bed conditions.

Where waterway bed scour protection is incorporated:

- It is no steeper than a 1 in 20 gradient or the natural **waterway bed gradient**, whichever is steeper
- It incorporates a **low flow** channel
- Uses clean rocks (minimal fine material), at least 100 mm diameter. Rocks larger than 300 mm are backfilled with smaller rock
- Rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher)
- It abuts the apron (including buried aprons) at the same level to ensure that there is no drop in elevation at the join (Figure 16)
- The **waterway** bed must abut the **scour protection** or the apron at the same level to ensure that there is no drop in elevation at the join (Figure 16)
- **Gabions** must only be used for **scour protection** where both the apron and the **gabions** are below **bed level** and backfilled with sediment.

5.3 New or replacement bed level crossings or low level crossings

This section lists the requirements for **accepted development** including the duration, dimensions and design for new or replacement **waterway barrier works** that are **bed level crossings**.

The construction of new or replacement **bed level** or **low level crossings** on tidal (grey) **waterways** is not **accepted development** and is **assessable development** requiring a **development approval** under the Planning Act.

Requirements for all new or replacement bed level or low level crossings:

- All **bed level** or **low level crossings** must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage.

5.3.1 Construction of new or replacement bed level crossing on a purple or red waterway

Construction duration

- **Works** within the **waterway** commence and finish within 180 calendar days

Bed level or low level crossing dimensions and design

All new and replacement **bed level** or **low level crossings** meet the following dimensions and design AND one of the two crossing configurations below:

- The **bed level** or **low level crossing** is no greater than 15 metres wide in an upstream/downstream direction (not including **waterway** bed **scour protection**) (Figure 17)
- New **bed level** or **low level crossings** are aligned perpendicular (within 10°) to the water flow
- Where the **bed level**, or **low level crossing** including **rock chutes**, is constructed using rocks:
    - use clean rocks (minimal fine material) that are an equivalent or larger size than the natural bed material at the site, and at least 50 mm diameter. Where rocks used are larger than 300 mm they are to be backfilled with smaller rock
    - the surface is to be left rough and not to be over compacted (e.g. track-rolled finish or rougher).

Bed level or low level crossing configuration

The **bed level** or **low level crossing** configuration meets one of the following options:

Option 1 – bed level crossing

- The lowest point of the **bed level crossing** is at the lowest point of the natural **waterway** bed (pre-construction), within the footprint of the proposed crossing (Figure 18)
- There is a height difference of at least 100 mm from the lowest point of the crossing to the edges of the **low flow** section of the crossing (Figure 18)
- If the crossing is constructed from concrete or introduced rock: outside of the **low flow** channel, the level of the crossing must be at or below the level of the natural **waterway** bed at any given point (Figure 18a)
- If the crossing is constructed from natural bed material: outside of the **low flow** channel, the remainder of the crossing must be at or below the highest point of the natural **waterway** bed (Figure 18b)

Option 2 – low level crossing

- The **deck height** of the **low level crossing** can be built up to a maximum of 300 mm above the lowest point of the natural **waterway** bed (pre-construction), within the footprint of the proposed crossing (Figures 19 and 20)
- Where the **low level crossing** incorporates a **low flow** channel, it is to be constructed in-line with the natural **low flow** channel (Figure 19a)
- All **low level crossings** incorporate a **low flow rock chute** (Figures 19b and 20b) that is:
  - Constructed on the downstream side of the crossing
  - In-line with the natural **low flow** channel
  - constructed at a slope no steeper than 1 in 30 (3.3% grade)
  - Spans 100% of the **low flow** channel width.
- Adjacent to each bank, construct a **bankside rock chute** (Figures 19b and 20b) that is:
  - constructed on the downstream side of the crossing
  - constructed at a slope no steeper than 1 in 30 (3.3% grade)
  - a minimum of 3 m wide each or spans 100% of the **main channel** width.
- Where concrete is the construction material for the crossing, then the surface of the crossing must be roughened for the width of each **rock chute**

Roughening of **bed level crossings** should replicate natural **waterway** bed conditions. Roughening breaks up laminar flows and reduces velocities and can include:

- coarse broom finish
- shotcrete
- exposed aggregate.

5.3.2 Construction of new or replacement bed level or low level crossing on an amber or green waterway

Construction duration

- **Works** within the **waterway** commence and finish within 360 calendar days

Bed level or low level crossing dimensions and design

All new and replacement **bed level crossings** meet the following dimensions and design AND one of the two crossing configurations below:

- The **bed level** or **low level crossing** is no greater than 15 metres wide in an upstream/downstream direction (not including **waterway** bed **scour protection**) (Figure 17)
- New **bed level** or **low level crossing**s are aligned perpendicular (within 10°) to the water flow
- Where the **bed level crossing** is constructed using rocks:
  - use clean rocks (minimal fine material) that are an equivalent or larger size than the natural bed material at the site, and at least 50 mm diameter. Where rocks used are larger than 300 mm they are to be backfilled with smaller rock
  - the surface is to be left rough and not to be over compacted (e.g. track-rolled finish or rougher).

Bed level or low level crossing configuration

The **bed level** or **low level crossing** configuration meets one of the following options:

Option 1 – bed level crossing

- The lowest point of the **bed level crossing** is at the lowest point of the natural **waterway** bed (pre-construction), within the footprint of the proposed crossing (Figure 18)
- There is a height difference of at least 100 mm from the lowest point of the crossing to the edges of the **low flow** section of the crossing (Figure 18)
- If the crossing is constructed from concrete or introduced rock: outside of the **low flow** channel, the level of the crossing must be at or below the level of the natural **waterway** bed at any given point (Figure 18a)
- If the crossing is constructed from natural bed material: outside of the **low flow** channel, the remainder of the crossing must be at or below the highest point of the natural **waterway** bed (Figure 18b)

Option 2 – low level crossing

- The **deck height** of the **low level crossing** can be built up to a maximum of 300 mm above the lowest point of the natural **waterway** bed (pre-construction), within the footprint of the proposed crossing (Figures 21 to 24)
- Where the **low level crossing** incorporates a **low flow** channel, it is to be constructed in-line with the natural **low flow** channel (Figures 21 and 23)
- All **low level crossings** incorporate a **low flow rock chute** (Figures 21-24) that is:
    - constructed on the downstream side of the crossing
    - In-line with the natural **low flow** channel
    - Constructed at a slope no steeper than 1 in 30 (3.3% grade)
    - Spans 100% of the **low flow** channel width.
- Adjacent to one bank, construct a **bankside rock chute**[3] (Figures 21b and 22b) that is:
    - constructed on the downstream side of the crossing
    - constructed at a slope no steeper than 1 in 30 (3.3% grade)
    - a minimum of 3 m wide or 100% of the **main channel** width.
- Where concrete is the construction material for the crossing, then the surface of the crossing must be roughened for the width of each **rock chute**

Roughening of **bed level crossings** should replicate natural **waterway** bed conditions. Roughening breaks up laminar flows and reduces velocities and can include:

- coarse broom finish
- shotcrete
- exposed aggregate.

[3] This requirement does not apply for green waterways. Refer to Figures 23 and 24.

5.3.3 Waterway bed scour protection for new or replacement bed level or low level crossings on purple, red, amber and green waterways

Where waterway bed scour protection is incorporated (Figure 25):

- It abuts the surface edge of the crossing at the same level to ensure that there is no drop in elevation at the join. If the crossing is set below **bed level,** then the surface of the **scour protection** must also be below **bed level**
- It abuts the **waterway** bed at the same level to ensure that there is no drop in elevation at the join
- It is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper
- It incorporates a **low flow** channel
- Use clean rocks (minimal fine material), at least 100 mm diameter. Where rocks used are larger than 300 mm they are to be backfilled with smaller rock
- Rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher).

5.4 New or replacement dams and weirs

This section lists the requirements for **accepted development** including the duration, dimensions and design for new, raised, or replacement **waterway barrier works** that are **dams** or **weirs**.

Constructing, raising or replacing a **dam** or **weir** on tidal (grey), purple, red and amber **waterways** is not **accepted development** and is **assessable development** requiring a **development approval** under the Planning Act. **Dams** are not to be used for the purposes of managing storm water.

Requirements for all new or replacement dams and weirs:

- All **weirs**, **dams**, and associated spillways constructed or replaced must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage
- For the life of the structure, relative elevation levels of the structure and associated spillway requirements must be retained to ensure that adequate resting pools are provided where required, and there are no vertical drops in elevation where the spillway channel enters the natural **waterway** bed.

5.4.1 Constructing, raising or replacing dams or weirs on green waterways

Construction duration

- **Works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Spillway design

- A spillway channel is incorporated into the design of all **weirs** and **dams** on the downstream side. It can be located to the side (Figures 26, 28 and 29) or centrally located (Figure 27)
- The spillway channel has a continuous slope, with no sudden vertical drops in the face of the spillway
- There is no vertical drop in elevation where the spillway channel enters the natural **waterway** bed

For **weirs** and **dams** with a height equal to, or less than 3 metres above the **waterway bed level** (Figures 26 and 27):

- the spillway channel has a maximum grade of 5% (1 in 20 slope)
- is concave in shape.

For **weirs** and **dams** with a height greater than 3 metres above the **waterway bed level** (Figures 28 and 29), the design incorporates a spillway channel and adheres to one of the following options:

Option 1 (Figure 28) – the spillway channel:

- is rock-lined
- concave in shape
- constructed on a maximum grade of 5% (1 in 20 slope)
- has a minimum width of 3 metres
- incorporates 3 m diameter pools at 20 m intervals along the channel
- the **invert** of the pool is a minimum of 300 mm depth below the bed of the channel.

Option 2 (Figure 29) – the spillway channel:

- is rock-lined
- concave in shape
- constructed on a maximum grade of 2.5% (1 in 40 slope)
- has a minimum width of 3 metres.

Where cattle are present, fencing off the spillway is recommended to protect the fish passage element of the design from erosion and degradation.

6 Requirements for maintenance of an existing lawful work

6.1 Maintenance of an existing culvert crossing that is a lawful work

This section lists the requirements for **accepted development** including the duration, dimensions and design for **maintenance** of **waterway barrier works** that are **culvert crossings**.

This section does not apply to **duplications**.

Requirements for the maintenance of all culvert crossings:

- All **culvert crossings** must be kept clear of blockages through a regular inspection program in order to retain fish passage. For the life of the **culvert crossing**, relative levels of the culvert **invert**, apron and **scour protection** and the **waterway** bed must be kept so that there are no drops in elevation at their respective joins
- **Scour protection** cannot be maintained where the drop between the culvert **invert** and the downstream **bed level** is equal to or greater than 1m. In this instance remediation as per section 8 is recommended
- **Maintenance works** within tidal **waterways** must adhere to the additional standards for tidal **waterways** in section 4.3.1.

Maintenance works within tidal **waterways** are likely to require the removal, destruction or damage of **marine plants**. This must be authorised under the **accepted development** requirements for operational work that is the removal, destruction or damage of **marine plants**; or will require a **development approval** under the Planning Act.

Maintenance of existing culvert crossings and associated infrastructure in tidal (grey), purple and red waterways

Duration

- For work types 6.1.1 – 6.1.5, **maintenance works** within the **waterway** must commence and finish within a maximum time of 180 calendar days.

6.1.1 Maintenance of aprons and waterway bed scour protection in tidal (grey), purple and red waterways

Where aprons and/or waterway bed scour protection is installed/replaced/modified as part of **maintenance** activities:

- Aprons abut culvert **inverts** (including buried culverts) and the **waterway** bed or **scour protection** at the same level to ensure there is no drop in elevation at the join (Figure 16)
- **Waterway** bed **scour protection** abuts the apron (including buried aprons) at the same level to ensure there is no drop in elevation at the join (Figure 16)
- The **waterway** bed abuts the **scour protection** or the apron at the same level to ensure that there is no drop in elevation at the join (Figure 16)
- Where aprons are at **bed level,** they are roughened throughout to approximately simulate natural bed conditions
- Aprons are installed at a gradient no steeper than the **waterway bed gradient**

- **Gabions** must only be used for **scour protection** where both the apron and the **gabions** are below **bed level** and backfilled with sediment.

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. **Invert** roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

Waterway bed scour protection

- Is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper
- Incorporates a **low flow** channel
- Uses clean rocks (minimal fine material), at least 100 mm diameter. Where rocks used are larger than 300 mm, they are to be backfilled with smaller rock
- Ensures the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher).

6.1.2 Maintenance of end walls, headwalls and wingwalls in tidal (grey), purple and red waterways

Replacement of end walls, headwalls and wing walls:

- Does not raise the base of the culvert
- Does not reduce the **culvert cell** cross-sectional area.

6.1.3 Retrofitting inverts to steel culverts in tidal (grey), purple and red waterways

Concrete inverts retrofitted to steel culverts

For tidal (grey) and purple **waterways**, retrofitting **works** are limited to structures that were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**.

For red **waterways**, retrofitting **works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements, including one of the three configurations, for new or replacement **culvert crossings** in work type 5.2.1, with the exception of:
  - burial to 300 mm below **bed level**
  - baffles.

New (raised) concrete inverts:

- are a maximum of 200 mm thick
- are no more than 300 mm above **bed level**
- are roughened
- do not cause a drop in elevation between the new culvert base level and any joins to the natural **waterway** bed, apron, or **waterway** bed **scour protection**.

Where there is a drop between the raised culvert **invert** and the **scour protection** or natural **bed level** on the downstream side, this must be remediated by a ramped apron that is:

- roughened
- no steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper.

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. Roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

6.1.4 Re-sleeving existing culverts in tidal (grey), purple and red waterways

Maintenance works on culverts that are **re-sleeving** can only be undertaken once on any given **culvert cell**.

For tidal (grey) and purple **waterways**, **re-sleeving works** are limited to structures that were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**.

For red **waterways**, **re-sleeving works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements, including one of the three configurations, for new or replacement **culvert crossings** in work type 5.2.1, with the exception of:
  - burial to 300 mm below **bed level**
  - baffles.

Re-sleeving works comply with all of the following:

- The **invert** of the re-sleeved pipe must only be raised the minimum amount practicable
- The cross-sectional area of the combined **culvert cell aperture(s)** is maintained or increased through installation of additional culverts cell(s)
- Additional **culvert cells**:
  - do not result in widening of the natural **waterway**
  - are located within or adjacent to the **low flow** channel
  - are installed at **bed level** and roughened
  - are installed 300 mm below **bed level**.
- The finished **culvert crossing** does not result in afflux impacts greater than that which was existing
- Ensure there are no drops in elevation between the new culvert **invert(s)** and any joins to the natural **waterway** bed, apron, or **waterway** bed **scour protection**
- Where there is a drop between the raised culvert **invert** and the **scour protection** or **bed level** on the downstream side, this must be remediated by a ramped apron that is:
  - roughened
  - no steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper.

- Culvert **invert** and sidewalls of the re-sleeved cell(s) are roughened[4].

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. Roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

6.1.5 Lengthening existing culvert cells on red waterways

Lengthening of **culvert cells** in tidal (grey) and major impact (purple) **waterways** is not permitted under these **accepted development** requirements.

Lengthening **works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements, including one of the three configurations, for new or replacement **culvert crossings** in work type 5.2.1, with the exception of:
  - burial to 300 mm below **bed level**
  - baffles.

Increasing the length of a **culvert cell** (upstream-downstream):

- includes roughening of the new culvert **invert**
- does not result in **duplication** of the existing **culvert crossing**
- does not raise the base of the **culvert cell**
- does not reduce the **culvert cell** cross-sectional area of the existing culvert configuration.

Maintenance of existing culvert crossings and associated infrastructure in amber and green waterways

Duration

- For work types 6.1.6 – 6.1.10, **maintenance works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

6.1.6 Maintenance of aprons and waterway bed scour protection in amber and green waterways

Where aprons and/or **waterway** bed **scour protection** is installed/replaced/modified as part of **maintenance** activities:

- Aprons abut culvert **inverts** (including buried culverts) and the **waterway** bed or **scour protection** at the same level to ensure there is no drop in elevation at the join (Figure 16)

[4] Where existing arch culvert(s) are re-sleeved, the invert is not required to be roughened where the culvert invert is not modified; and the structure otherwise complies with the re-sleeving requirements.

- **Waterway** bed **scour protection** abuts the apron (including buried aprons) at the same level to ensure there is no drop in elevation at the join (Figure 16)
- The **waterway** bed abuts the **scour protection** or the apron at the same level to ensure that there is no drop in elevation at the join (Figure 16)
- Where aprons are at **bed level** they are roughened throughout to approximately simulate natural bed conditions
- Aprons are installed at a gradient no steeper than the **waterway bed gradient**
- **Gabions** must only be used for **scour protection** where both the apron and the **gabions** are below **bed level** and backfilled with sediment.

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. **Invert** roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

Waterway bed scour protection:

- Is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper
- Incorporates a **low flow** channel
- Uses clean rocks (minimal fine material), at least 100 mm diameter. Where rocks used are larger than 300 mm, they are to be backfilled with smaller rock
- Ensures the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher).

6.1.7 Maintenance of end walls, headwalls and wingwalls in amber and green waterways

Replacement of end walls, headwalls and wing walls:

- does not raise the base of the culvert
- does not reduce the **culvert cell** cross-sectional area.

6.1.8 Retrofitting inverts to steel culverts in amber and green waterways

Concrete inverts retrofitted to steel culverts

For amber and green **waterways**, retrofitting **works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements for new or replacement **culvert crossings** in work type 5.2.2 (for amber **waterways**) or 5.2.3 (for green **waterways**).

New (raised) concrete inverts:

- are a maximum of 200 mm thick
- are no more than 300 mm above **bed level**

- are roughened
- do not cause a drop in elevation between the new culvert base level and any joins to the natural **waterway** bed, apron, or **waterway** bed **scour protection**.

Where there is a drop between the raised culvert invert and the **scour protection** or natural **bed level** on the downstream side, this must be remediated by a ramped apron that is:

- roughened
- no steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper.

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. Roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

6.1.9 Re-sleeving existing culverts in amber and green waterways

Maintenance works on culverts that are **re-sleeving** can only be undertaken once on any given **culvert cell**.

For amber and green **waterways**, **re-sleeving works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway** barrier **works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements for new or replacement **culvert crossings** in work type 5.2.2 (for amber **waterways**) or 5.2.3 (for green **waterways**).

Re-sleeving works comply with all of the following:

- The invert of the re-sleeved pipe is only raised the minimum amount practicable
- The cross-sectional area of the combined culvert **aperture(s)** is maintained or increased through installation of additional culverts cell(s) unless the invert is raised no more than 100 mm from the existing invert level
- Additional **culvert cells**:
  - do not result in widening of the natural **waterway**
  - are located within or adjacent to the **low flow** channel
  - are installed at **bed level** and roughened
  - are installed 300 mm below **bed level**.
- The finished **culvert crossing** does not result in afflux impacts greater than that which was existing
- Ensure there are no sudden drops in elevation between the new culvert invert(s) and any joins to the natural **waterway** bed, apron, or **waterway** bed **scour protection**
- Where there is a drop between the raised culvert invert and the **scour protection** or **bed level** on the downstream side, this must be remediated by a ramped apron that is:

- roughened
- no steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper.

- Culvert **invert** and sidewalls of the re-sleeved cell(s) are roughened[5].

Roughening should replicate natural **waterway** bed conditions. It breaks up laminar flows, reduces velocities and helps retain sediments. Roughening can include, but is not limited to:

- grouted pebbles/rocks
- anchored rocks/pavers
- coarse broom finish
- shotcrete.

6.1.10 Lengthening existing culvert cells on amber and green waterways

Lengthening **works** are limited to structures that:

- were built under a **development approval** for operational **works** that is constructing or raising **waterway barrier works**; self-assessable code; or **accepted development** requirements; or
- meet the culvert dimensions and design requirements for new or replacement **culvert crossings** in work type 5.2.2 (for amber **waterways**) or 5.2.3 (for green **waterways**).

Increasing the length of a **culvert cell** (upstream-downstream):

- includes roughening of the new culvert invert
- does not result in **duplication** of the existing **culvert crossing**
- does not raise the base of the **culvert cell**
- does not reduce the **culvert cell** cross-sectional area of the existing culvert configuration.

[5] Where existing arch culvert(s) are re-sleeved, the invert is not required to be roughened where the culvert invert is not modified; and the structure otherwise complies with the re-sleeving requirements.

6.2 Maintenance of an existing bed level crossing or low level crossing that is a lawful work

This section lists the requirements for **accepted development** including the duration, dimensions and design for **maintenance** of **waterway barrier works** that are **bed level crossings**.

Requirements for the maintenance of all bed level crossings or low level crossings:

- **Low level crossings** as described in section 5.3, and **bed level crossings**, can be maintained under these provisions
- **Bed level crossings** and **low level crossings** must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage
- For the life of the crossing, relative elevation levels of the crossing surface level and **waterway** bed **scour protection** and the **waterway** bed must be retained so that there are no drops in elevation at their respective joins
- **Maintenance works** within tidal **waterways** must adhere to the additional standards for tidal **waterways** in section 4.3.1.

Maintenance works within tidal **waterways** are likely to require the removal, destruction or damage of **marine plants**. This must be authorised under the **accepted development** requirements for operational work that is the removal, destruction or damage of **marine plants**; or will require a **development approval** under the Planning Act.

6.2.1 Maintenance of waterway bed scour protection associated with existing bed level crossings and low level crossings in tidal (grey), purple and red waterways

Duration

- **Maintenance works** within the **waterway** must commence and finish within a maximum time of 180 calendar days

Where scour protection is incorporated (Figure 25):

- **Scour protection** must abut the surface edge of the crossing at the same level (this is to ensure that there is no drop in elevation at the join). If the crossing is set below bed level, then the surface of the **scour protection** must also be below bed level.
- The **waterway** bed must abut the **scour protection** at the same level (this is to ensure that there is no drop in elevation at the join)
- The **scour protection** is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper
- **Scour protection** must incorporate a **low flow** channel
- Use clean rocks (minimal fine material), at least 100 mm diameter. Where rocks used are larger than 300 mm, they are to be backfilled with smaller rock
- Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher).

6.2.2 Maintenance of waterway bed scour protection associated with existing bed level crossings or low level crossings in amber and green waterways

Duration

- **Maintenance works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Where scour protection is incorporated (Figure 25):

- **Scour protection** must abut the surface edge of the crossing at the same level (this is to ensure that there is no drop in elevation at the join). If the crossing is set below bed level, then the surface of the **scour protection** must also be below bed level.
- The **waterway** bed must abut the **scour protection** at the same level (this is to ensure that there is no drop in elevation at the join)
- The **scour protection** is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper
- **Scour protection** must incorporate a **low flow** channel
- Use clean rocks (minimal fine material), at least 100 mm diameter. Where rocks used are larger than 300 mm, they are to be backfilled with smaller rock
- Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher).

7 Temporary waterway barrier works

7.1 Construction and removal of temporary waterways barrier works

This section lists the requirements for **accepted development** including the duration, dimensions and design for **waterway barrier works** that are temporary. There are no extensions to timeframes for temporary **waterway barrier works**. Temporary **waterway barrier works** that exceed **accepted development** timeframes become **assessable development**.

Where temporary **waterway barrier works** are associated with other permanent **waterway barrier works** being assessed through a development application, it is recommended that the temporary **waterway barrier works** are applied for concurrently in the development application to allow a holistic assessment of the impacts to **waterways** and fish passage to occur.

Barriers periodically constructed to facilitate the take of water (e.g. sand **dams**) are not permitted under these **Accepted development** requirements.

The following temporary **waterway barrier works** are permitted under this section:

- bunds, coffer **dams**, and other temporary barriers associated with facilitating other authorised **works**
- **waterway** crossings for temporary access, e.g. **culvert crossings**, **bed level crossings**
- Sediment control measures, e.g. silt curtains

The dimensions of the temporary barrier are limited to the minimum required to achieve the purpose of the barrier.

Requirements for all new temporary waterway barrier works

- Each temporary **waterway barrier work** cannot:
  - be removed and reinstalled under these provisions within 360 days of its removal
  - be relocated within 500m upstream or downstream of the **works** site within 360 calendar days where it is associated with the same **works**[6] (project).
- The point above does not apply where:
  - multiple temporary **waterway barrier works** are required for staging purposes; and
  - the total timeframe from installation of the first barrier, to removal of the final barrier, associated with the same **works**[8] (project) does not exceed the duration allowed for the relevant **waterway** colour for a single temporary waterway barrier.
- Notification is to include the number, type and description of temporary **waterway barrier works**

Requirements for *removal* of all temporary waterway barrier works

- If there is more than one temporary barrier in the location, the most downstream barrier must be removed first

[6] The 'same works' includes an ongoing project or aspect of works on a section of a waterway. E.g. where a temporary waterway barrier may be required on one side of a road and subsequently on the other side of the road and within the same waterway.

- All **waterway barrier material** must be removed from within the **waterway** and disposed of at least 50m away from the **waterway**

7.1.1 Construction of temporary waterway barrier works within grey (tidal) waterways

Maintenance works within tidal **waterways** are likely to require the removal, destruction or damage of **marine plants**. This must be authorised under the **Accepted development** requirements for operational work that is the removal, destruction or damage of **marine plants**; or will require a **development approval** under the Planning Act.

Construction and removal duration

- All **works** within the **waterway** must commence and finish within a maximum time of 180 calendar days. This includes construction, operation and removal of the temporary **waterway barrier work**

Waterway barrier work construction and design

- Tidal exchange and flow are not impeded for more than 21 days. Tidal flushing is fully restored for a minimum of 24 hours every 21 days
- Avoid the creation of ponded water levels that would result in the stress and/or mortality of **marine plants**
- **Works** must adhere to the additional standards for tidal **waterways** in section 4.3.1 of this document

7.1.2 Construction of temporary waterway barrier works within purple waterways in eastern drainage basins* that incorporate culverts

***Refer to Figure 30**

Construction and removal duration

- All **works** within the **waterway** must commence and finish within a maximum time of 180 calendar days. This includes construction, operation and removal of the temporary **waterway barrier work**

Waterway barrier work construction and design

- The combined **culvert cell aperture width** spans a minimum of 100% of the **low flow** channel width
- Culverts are aligned within 10° of the direction of water flow
- Ensure the culvert invert and any associated **scour protection** abuts the natural bed level upstream and downstream of the **works** at the same level to ensure there is no drop in elevation at the joins

7.1.3 Construction of temporary waterway barrier works within purple and red waterways that do not incorporate culverts

Construction and removal duration

- All **works** within the **waterway** must commence and finish within a maximum time of 180 calendar days. This includes construction, operation and removal of the temporary **waterway barrier work**

Waterway barrier work construction and design

- Temporary **waterway barrier works** that create a dry **works** space in purple **waterways** must span no more than 50% of the **main channel** width

7.1.4 Construction of temporary waterway barrier works within amber and green waterways

Construction and removal duration

- All **works** within the **waterway** must commence and finish within a maximum time of 360 calendar days. This includes construction, operation and removal of the temporary **waterway barrier work**

8 Remediation works

This section lists the requirements for **accepted development** including the duration, dimensions and design for remediation **works** that include **waterway barrier works**.

Where remediation occurs on or adjacent to existing **waterway barrier works**, the existing barrier should be structurally sound. These work types do not cover modifications or reinforcements to the existing barrier and are designed solely to improve fish passage at the site. Note that a combination of remediation **works** may be appropriate for the site, e.g. floor baffles, nib walls and a rocked fish ramp to remediate shallow depth and perched culverts.

Remediation work associated with existing **waterway barrier work** structures under sections 8.2 to 8.8 does not authorise the existing **waterway barrier work**. Remediation work under sections 8.4 to 8.7, provides authorisation for an interim remediation measure until the existing structure requires replacement, or other changes that would trigger **waterway barrier works**. At this time the existing **waterway barrier works** structure and/or associated remediation treatment will require authorisation under the *Planning Act 2016* and pre-lodgement advice should be sought.

How do I change the barrier in the future?

The following options are available:

1. The existing **waterway barrier work** structure and associated remediation **works** are completely removed, and the natural profiles of the **waterway** are reinstated. If required, a new structure in accordance with current fish passage requirements is authorised under the **accepted development** requirements for operational work that is constructing or raising **waterway barrier works**.
2. The existing **waterway barrier work** structure and associated remediation **works** are completely removed, and the natural profiles of the **waterway** are reinstated. If required, a new structure that meets fish passage requirements at that time, is authorised through a **development approval.**
3. The existing **waterway barrier work** structure is removed and a new **waterway** crossing and existing interim remediation **works** are permanently authorised through a **development approval**.
4. The existing **waterway barrier work** structure is modified or reinforced and it, along with the existing interim remediation **works**, are permanently authorised through a **development approval**.

Note: If options 2, 3 or 4 are chosen, pre-lodgement advice should be sought in relation to the proposed structure. It may be advised, particularly for options 3 and 4, that a new crossing constructed in accordance with best practice fish passage requirements is the most appropriate solution for the site (i.e. options 1 and 2), rather than replacing or modifying the existing crossing and keeping the associated remediation **works** intact.

8.1 New or replacement pile fields to remediate erosion and assist in bank stabilisation

Constructing, **pile fields** in tidal (grey) **waterways** is not **accepted development.** Where these are **waterway barrier works**, this is **assessable development** requiring a **development approval** under the Planning Act. It is recommended to seek pre-lodgement advice in this instance.

Pile fields do not require ongoing maintenance because they are hardwood structures that are designed to become part of the landscape as they accumulate sediment. The requirements for their construction have been drafted to minimise the risk associated with not maintaining them.

8.1.1 Constructing new or replacing pile fields in purple, red, amber and green waterways

Construction duration

- In purple and red **waterways**, **works** within the **waterway** must commence and finish within a maximum time of 180 calendar days
- In amber and green **waterways**, **works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Pile field design

- **Pile fields** are constructed where bank erosion is evident
- A **pile field** extends no more than 30% across the **main channel** width (Figure 31)
- Piles are located outside the **low flow** channel (Figure 31)
- **Pile field** rows are angled in a downstream direction (Figure 31)
- Each pile is no more than 300 mm in diameter (Figure 32)
- Piles are spaced so that gaps between piles are a minimum of 200 mm (Figure 32)
- Piles are driven vertically so that two thirds of the pile length is below the natural bed level (Figure 32)
- Piles are hardwood that have not been treated with chemicals
- Profiles of the **waterway** bed and banks outside of the permanent footprint of the **works** are restored to natural profiles
- Revegetate the banks outside the **main channel**

8.2 Nib walls to direct low flows through culverts

This section allows for the construction of nib walls to direct **low flows** through one or more **culvert cells**. These are often used in situations where there is no dedicated **low flow** channel through the culverts and flows are spread thinly throughout multiple cells. This shallow depth and laminar flow are barriers to fish movement. Nib walls can also be used in conjunction with other remediation **work** types under this document e.g. for partial width rock ramp fishways (8.7.1) and floor baffles (8.8.1), a nib wall may be required to direct **low flows** through the **culvert cell(s)** with the remediation treatment.

Requirements for all nib walls

- Work under this section can be constructed on an existing structure that is authorised for **waterway barrier works** or was constructed prior to 18 December 2009
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- **Gabions** are not used.

8.2.1 Construction of nib walls in tidal (grey), purple, red, amber and green waterways

Construction duration

- **Works** within tidal (grey) purple and red **waterways** must commence and finish within a maximum of 180 days
- **Works** within amber and green **waterways** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

The nib wall:

- Can be constructed on the upstream and/or downstream side(s) of the **culvert crossing** as required (Figure 33)
- is designed to direct **low flows** to align with the **low flow** channel (Figures 33 and 34)
- Is no more than 200 mm high above the culvert invert or apron (Figure 34)
- Is a maximum of 200 mm wide (Figure 33)
- Is constructed of concrete, or hardwood that has not been treated with chemicals.

8.3 Retrofitting baffles in culverts

This section allows for retrofitting of baffles to culvert sidewalls and wingwalls to reduce water velocity and provide resting areas for fish moving upstream through culverts.

Requirements for retrofitting baffles on all existing culvert crossings:

- Work under this section can be constructed on an existing structure that is authorised for **waterway barrier works** or was constructed prior to 18 December 2009.

8.3.1 Retrofitting baffles in tidal (grey), purple, red, amber and green waterways

Construction duration

- **Works** within tidal (grey), purple and red **waterways** must commence and finish within a maximum of 180 days
- **Works** within amber and green **waterways** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

Baffles are:

- Installed to a minimum of 95% of the vertical extent of the culvert sidewalls with a gap of no greater than 30 mm at the bottom (Figures 6 and 8)
- Installed on the upstream wingwalls on both banks to the height of the upstream **obvert** or the full height of the wingwall (Figure 6)
- Maximum 150 mm horizontal protrusion (width) into the flow (Figures 7 and 8)
- Maximum 10 mm thick **leading edge**
- Within 1.2m upstream and downstream of the upstream culvert inlet, baffles are spaced at twice the horizontal protrusion (width) of the baffle (i.e. maximum 300 mm centres) (Figure 6)
- Throughout the rest of the structure, baffles are spaced at 4 x horizontal protrusion (width) of the baffle (i.e. maximum 600 mm centres) (Figure 6).

8.4 Interim rocked fish ramp on existing culvert crossings to improve fish passage up to and through culverts

Removing the existing structure or replacing the culvert with a structure that is not a **waterway barrier work**, or that provides improved fish passage, should be investigated as a first option.

The purpose of this section is to allow installation of a rocked fish ramp on existing **culvert crossings** to provide fish passage up to and through culverts until such time that the existing **culvert crossing** is replaced. The rock is specifically placed to back water up through one or more **culvert cells** to increase depth and reduce velocities throughout the **culvert cell(s)**, thereby improving fish passage through the existing culvert.

This work type is not applicable to **culvert crossings** in tidal (grey) **waterways**.

It is recommended to use this work type in conjunction with work type 8.5.1, particularly where the combined culvert **aperture width** spans the **low flow** channel or less.

Requirements for construction of rocked fish ramp on all existing culvert crossings:

- Work under this section can be undertaken where the culvert invert is no more than 750 mm above the natural bed level in the location where the **rock chutes** are to be constructed (refer to work type below)
- Work under this section can be constructed on an existing structure that is authorised for **waterway barrier works** or was constructed prior to 18 December 2009
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- The remediation **works** are an interim measure until the **waterway barrier work** structure requires replacement or other changes that would trigger **waterway barrier works**. Refer to guidance box, section 8
- The rocked fish ramp is maintained to meet these **accepted development** requirements
- **Gabions** are not used.

8.4.1 Construction of rocked fish ramp in purple, red, amber and green waterways

Construction duration

- **Works** within purple and red **waterways** must commence and finish within a maximum of 180 days
- **Works** within amber and green **waterways** must commence and finish within a maximum time of 360 calendar days.

Dimensions and design

The rocked fish ramp:

- is constructed on the downstream side of an existing **culvert crossing** (Figures 35 and 36)
- abuts the apron or culvert invert at the same level or higher (Figure 35 and 36)
- is installed at a gradient no steeper than 1 in 20 (Figure 36)
- Extends downstream to a level that is at least 300 mm below the base tailwater level, or bed level for ephemeral **waterways** (Figure 36)

- Incorporates a **low flow** channel (Figure 35)
- uses clean rocks
- rocks larger than 300 mm must be backfilled with smaller rock to minimise gaps.

Rocks can be embedded in concrete to prevent water seepage into, rather than over, the rocked fish ramp; and to prevent rocks from washing away in high flows. If concrete is not used as bedding material, mixtures of rock used should promote surface flows suitable to provide fish passage and minimise fish entrapment.

8.5 Interim rocked fish ramp on existing culvert crossings and causeways to improve fish passage up to and over the road surface

Removal of the existing structure or replacement of the culvert with another structure that is not a **waterway barrier work** or provides improved fish passage, should be investigated as a first option.

The purpose of this section is to allow interim **works** on existing low-level **culvert crossings** or **causeways**. This section will ensure that fish passage is provided over the existing **waterway barrier work** when the low-level **culvert crossing** or **causeway** is **overtopping**, i.e. when water is flowing over the top of the structure (road surface). The rocked fish ramp specified, allows fish to move upstream and downstream when the **waterway barrier work** is **overtopping** (Figure 37) but not yet **drowned out** (Figure 38).

This work type is not applicable to **works** in tidal (grey) **waterways**.

Where existing culvert invert(s) are perched, it is recommended to use this work type in conjunction with work type 8.4.1.

Requirements for installation of rocked fish ramp on existing low-level culvert crossings or causeways:

- Work under this section can be undertaken where the road surface of the **culvert crossing** or **causeway** is no more than 1m above the natural bed level in the location where the rocked fish ramp is to be constructed (refer to work type below)
- Work under this section can be constructed on an existing structure that is authorised for **waterway barrier works** or was constructed prior to 18 December 2009
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- The remediation **works** are an interim measure until the **waterway barrier work** structure requires replacement or other changes that would trigger **waterway barrier works**. Refer to guidance box, section 8
- **Gabions** are not used
- Obstructions to fish passage on the deck of the crossing are removed at the location of the rocked fish ramp.

8.5.1 Construction of rocked fish ramps in purple, red, amber and green waterways

Construction duration

- In purple and red **waterways**, **works** within the **waterway** must commence and finish within a maximum time of 180 calendar days
- In amber and green **waterways**, **works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

The rocked fish ramp:

- Is constructed on the downstream side of the existing **culvert crossing** or **causeway** in a location that best addresses the fish movement requirements at the site (e.g. may span the **main channel** width of a **causeway** or be placed adjacent to each bank either side of existing **culvert cells**)
- Abuts the road surface at the same level to ensure there is no drop in elevation at the join on the downstream side (Figures 39 and 40)
- Is constructed on an existing **culvert crossing** or **causeway** where the road surface is no higher than 1m above the natural bed level in the location where the **rock chutes** are to be constructed (Figures 39 and 40)
- Uses clean rocks
- Rocks larger than 300 mm are backfilled with smaller rock to minimise gaps
- Are constructed at a slope no steeper than 1 in 30 (3.3% grade) (Figure 40)
- Extends from the road surface downstream into the **waterway** to a level that is no higher than half-way between the road surface and **bed level** (Figures 39 and 40)
- **Gabion** mattresses are not used.

Rocks can be embedded within concrete to prevent water seepage into, rather than over, the rocked fish ramp; and to prevent rocks from washing away in high flows. If concrete is not used as bedding material, mixtures of rock used should promote surface flows suitable to provide fish passage and minimise fish entrapment.

8.6 Interim installation of full width rock ramp fishways on existing causeways or weirs to improve fish passage over the structure

This section allows for the installation of full-width rock ramp fishways on existing low-level **causeways** or **weirs** that do not have culverts or openings to convey flows. The existing barrier should be structurally sound as this work type does not cover modifications or reinforcements to the existing barrier other than the addition of a fishway on the downstream side.

The purpose of this section is to improve fish passage over existing **causeways** or **weirs**. Construction of a rock ramp fishway on the downstream side of these **waterway barrier works** will improve fish passage when it is **overtopping** (Figure 37).

Overtopping means when water is flowing over the top of the structure (road surface). On these types of **waterway barrier works**, when the structure is **overtopping**, the headwater level is generally higher than the tail water level. The fishway remediates the headloss and provides resting pools for fish moving upstream. It will also provide safer passage for fish moving downstream.

Construction of fishways on tidal (grey), purple and red **waterways** is not **accepted development**.

Requirements for all rock ramp fishways:

- Work under this section can be undertaken on **causeways** or **weirs** that do not have openings and where the upstream fishway exit is no more than 2m above the downstream natural bed level
- Work under this section can be constructed on an existing structure that has **waterway barrier works** approval or was constructed prior to 18 December 2009
- Placement of rocks is minimised and limited to the footprint of the fishway
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- A cross-section and long-section of the proposed fishway in relation to the **waterway** and existing structure is to be provided with the pre-works notification form
- The remediation **works** are an interim measure until the **waterway barrier works** structure requires replacement or other changes that would trigger **waterway barrier works**. Refer to guidance box, section 8
- Temporary **waterway barrier works** (which may include sediment control measures) must meet the requirements of section 7 of these **accepted development** requirements or will require a **development approval** under the Planning Act
- The rock ramp fishway is maintained to meet these **accepted development** requirements.

8.6.1 Construction of rock ramp fishways in amber and green waterways

Construction duration

- **Works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

The rock ramp fishway:

- spans the **main channel** width of the **waterway** (Figures 41 and 42)

- is constructed on the downstream side of an existing **causeway** or **weir** (Figure 41)
- abuts the top of the existing barrier at the same level or higher along its full extent across the **waterway**
- is installed at a gradient no steeper than 1 in 20
- Incorporates a **low flow** channel (Figure 42)
- uses clean rocks at least 100 mm diameter that can be backfilled with smaller rock
- Consists of a series of ridges that are aligned roughly parallel with the existing barrier and are a minimum of 2m apart centre to centre in an upstream/downstream direction (Figure 41)
- Each ridge is made of rock or concrete with large ridge rocks embedded within but placed apart to create slots for fish to pass through (Figure 42)
- Ridge rocks are spaced a minimum of 100 mm apart at the level of the ridge slot crest (Figure 42)
- Ridge rocks are placed so that the ridge slot increases in width from the ridge slot crest to the top of the ridge rock (Figure 42)
- The top of ridge rocks are a minimum of 200 mm above the adjacent ridge slot crest level (Figures 42 and 43)
- In between the ridges are resting pools that are a minimum of 400 mm deep (Figures 42 and 43)
- Minimum resting pool depth must be maintained for at least the width of the **low flow** channel
- Base of the pool is to be rough and simulates natural bed conditions (Figure 42)
- The lowest point of the ridge slot crest controls the water level of the upstream pool (Figure 43)
- The maximum drop between the lowest level ridge slot crest of adjacent ridges is 80 mm (Figure 43)
- Where there are more than four ridge rocks within a ridge the ridge should be made concave to create a low point to concentrate flows towards the **low flow** channel (Figure 42)
- Where ridges are concave, the level of the ridge slot crest at the outermost ridge slot is no greater than 200 mm above the lowest point of the crest (Figure 42)
- All ridge slot crests are a maximum of 150 mm in an upstream / downstream direction (Figure 44)
- The sloping gradient downstream of all ridge slot crests is 45°- 60° (Figure 44)
- Ridge rocks are embedded so they don't dislodge
- Wall rocks can be placed along the edges of the fishway perpendicular to the ridges to contain water and achieve consistent pool depth (Figures 41 and 42)
- Where used, the top of wall rock is a minimum of 200 mm above the level of the nearest ridge slot crest (Figure 43)
- The downstream extent of the fishway abuts the **waterway** bed at the same level to ensure that there is no drop in elevation at the join.

8.7 Interim installation of partial width rock ramp fishways on existing culvert crossings to improve fish passage up to and through culverts

This section allows for the installation of partial-width rock ramp fishways on existing **culvert crossings**. Partial-width means the fishway spans a part of the **waterway**, specifically, the **low flow** channel.

The purpose of this section is to provide fish passage up to and through existing culvert structures that are 'perched' and have a drop between the culvert **invert** and the downstream bed level. When constructed on the downstream side of a **culvert crossing**, construction within the **low flow** channel on the downstream side will allow fish passage to be provided when the culvert commences to flow. Partial width rock ramp fishways remediate the headloss and provide resting pools for fish moving upstream.

Construction of fishways on tidal (grey), purple and red **waterways** is not **accepted development**.

Requirements for all partial width rock ramp fishways:

- Work under this section can be undertaken where the fishway exit is no more than 1m above the downstream natural bed level
- Work under this section can be constructed on an existing structure that has **waterway barrier works** approval or was constructed prior to 18 December 2009
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- A cross-section and long-section of the proposed fishway in relation to the **waterway** and existing structure is to be provided with the pre-works notification form
- The remediation **works** are an interim measure until the **waterway barrier works** structure requires replacement or other changes that would trigger **waterway barrier works**. Refer to guidance box, section 8
- Temporary **waterway barrier works** (which may include sediment control measures) must meet the requirements of section 7 of these **accepted development** requirements or will require a **development approval** under the Planning Act
- The rock ramp fishway is maintained to meet these **accepted development** requirements.

8.7.1 Construction of partial width rock ramp fishways in amber and green waterways

Construction duration

- **Works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

The partial rock ramp fishway:

- Spans the **low flow** channel of the **waterway** (Figure 45)
- **Low flows** are directed through the fishway via:
    - A nib wall on the upstream and/or downstream extent of the structure (refer to section 8.2); or

- **Scour protection** abutting the barrier structure set above the control level of the upstream fishway exit (inlet).

- is constructed on the downstream side of an existing **culvert crossing** (Figure 45)
- abuts the culvert **inverts** or apron at the same level or higher along the extent of the partial width fishway
- is installed at a gradient no steeper than 1 in 20
- Incorporates a **low flow** channel (Figure 45)
- uses clean rocks at least 100 mm diameter that can be backfilled with smaller rock
- Consists of a series of ridges that are aligned roughly parallel with the existing barrier and are a minimum of 2m apart centre to centre in an upstream/downstream direction (Figure 41)
- Each ridge is made of rock or concrete with large ridge rocks embedded within but placed apart to create slots for fish to pass through (Figure 45)
- Ridge rocks are spaced 100 mm apart at the level of the ridge slot crest (Figure 45)
- Ridge rocks are placed so that the ridge slot increases in width from the ridge slot crest to the top of the ridge rock (Figure 45)
- The top of ridge rocks are a minimum of 200 mm above the adjacent ridge slot crest level (Figures 43 and 45)
- In between the ridges are resting pools that are a minimum of 400 mm deep (Figures 43 and 45)
- Minimum resting pool depth must be maintained for at least the width of the **low flow** channel
- Base of the pool is to be rough and simulates natural bed conditions (Figures 43 and 45)
- The lowest point of the ridge slot crest controls the water level of the upstream pool (Figure 43)
- The maximum drop between the lowest level ridge slot crest of adjacent ridges is 80 mm (Figure 43)
- Where there are more than four ridge rocks within a ridge the ridge should be made concave to create a low point to concentrate flows towards the **low flow** channel (Figure 45)
- Where ridges are concave, the level of the ridge slot crest at the outermost ridge slot is no greater than 200 mm above the lowest point of the crest
- All ridge slot crests are a maximum of 150 mm in an upstream / downstream direction (Figure 44)
- The sloping gradient downstream of all ridge slot crests is 45°- 60° (Figure 44)
- Ridge rocks are embedded so they don't dislodge
- Wall rocks can be placed along the edges of the fishway perpendicular to the ridges to contain water and achieve consistent pool depth
- Where used, the top of wall rock is a minimum of 200 mm above the level of the nearest ridge slot crest (Figure 43)
- The downstream extent of the fishway abuts the **waterway** bed at the same level to ensure that there is no drop in elevation at the join
- Rock armouring adjacent to the partial rock ramp fishway may be constructed where required. Where rocks larger than 300 mm must be backfilled with smaller rock to minimise gaps.

8.8 Floor baffles in box culverts

This section allows for the installation of floor baffles in existing **culvert crossings**. For this section, floor baffles are to be installed in **culvert crossings** where the **invert** of all **culvert cells** are set at the same level.

The purpose of this section is to reduce laminar flows and velocity and increase depth through the **culvert cells** during **low flow** conditions. Installation of floor baffles will remediate known barriers to fish passage and assist in providing fish movement through the **culvert cells**.

Requirements for all floor baffles:

- Work under this section can be constructed on an existing structure that has **waterway barrier works** approval or was constructed prior to 18 December 2009
- A person or entity suitably qualified and experienced in fish passage biology and fish passage design and construction must physically oversee the construction of the **works**. Contact details for this person or entity must be provided in the notification forms in section 11. Refer to Appendix 4 for the criteria and capabilities of a suitably qualified and experienced fish passage professional
- Temporary **waterway barrier works** (which may include sediment control measures) must meet the requirements of section 7 of these **accepted development** requirements or will require a **development approval** under the Planning Act
- The floor baffles are maintained to meet these **accepted development** requirements.

8.8.1 Construction of floor baffles within culverts in tidal (grey), purple, red, amber and green waterways

Construction duration

- **Works** within tidal (grey), purple and red **waterways** must commence and finish within a maximum time of 180 calendar days
- **Works** within amber and green **waterways** must commence and finish within 360 calendar days

Dimensions and design

- Floor baffles are placed perpendicular to the direction of water flow (Figure 46)
- Floor baffles are placed within one or more **culvert cells**
- Floor baffles are a maximum of 200 mm high (Figure 47)
- Floor baffles may be constructed from steel or concrete
- Where floor baffles are embedded in concrete, the concrete can be no more than 100 mm high
- Each baffle row contains a minimum of one gap
- Gaps between baffles are a minimum of 100 mm wide (Figures 45 and 46)
- A baffle cannot be more than 150 mm deep in an upstream / downstream direction (Figure 46)
- Where there are multiple rows of floor baffles, gaps in adjacent rows are to be positioned so that they are offset to gaps in the previous row (Figure 46)
- Edges of the gaps can be straight or angled so that the widest part of the angle is on the downstream side (Figure 46).

8.9 Rock chutes for erosion control

This section allows for the construction of **rock chutes** for the purposes of managing erosion, and/or to reduce sediment to downstream **waterways**. **Rock chutes** on **waterways** are not associated with other urban **development**, e.g. for the purpose of managing stormwater runoff.

Construction of **rock chutes** in tidal (grey), purple, red and amber **waterways** is not **accepted development**.

Requirements for all rock chutes:

- Temporary **waterway barrier works** (which may include sediment control measures) must meet the requirements of section 7 of these **accepted development** requirements or will require a **development approval** under the Planning Act
- The **rock chutes** are maintained to meet these **accepted development** requirements.

8.9.1 Construction of rock chutes in green waterways

Construction duration

- **Works** within the **waterway** must commence and finish within a maximum time of 360 calendar days

Dimensions and design

Rock chutes:

- Are no longer than 60m (Figure 48)
- are installed at a gradient no steeper than 1 in 20 gradient (5%) (Figure 49)
- are concave in shape (Figure 50)
- Use clean rocks
- rocks larger than 300 mm must be backfilled with smaller rock to minimise gaps
- Are not located within 40m of an adjacent **rock chute**
- Must abut the **waterway** bed at the upstream and downstream extents at the same level, to ensure that there is no drop in elevation at the join (Figure 49)
- Clean filter material such as geotextile may be incorporated where necessary (Figures 49 and 50).

8.10 Partial removal of existing waterway barriers

This section allows for partial removal of barriers, where complete removal is unfeasible. Barrier removal is appropriate for obsolete structures that no longer fulfil their original purpose or are no longer required. Note that complete removal of a barrier within a **waterway** does not constitute **waterway barrier works**.

Partial removal of barriers assists in restoring connectivity for fish to move, breed, feed and seek refuge. Examples include partial removal of a **causeway** crossing where most of the **waterway** is opened up, or partial removal of **weirs** or tidal bunds.

Partial removal of tidal bunds should create openings large enough to accommodate suitable hydraulic conditions to provide fish passage and to not cause erosion due to **elevated flows**.

It is recommended to consult with impacted stakeholders and understand the impacts before undertaking barrier removal as some barriers can hold back substantial volumes of water and sediments. This work type considers fish movement only and other issues are likely to be present with barrier removal, particularly in tidal areas.

Requirements for partial barrier removal:

- Work under this section can be constructed on an existing structure that has **waterway barrier works** approval or was constructed prior to 18 December 2009
- Temporary **waterway barrier works** (which may include sediment control measures) must meet the requirements of section 7 of these **accepted development** requirements or will require a **development approval** under the Planning Act.

Works within tidal **waterway**s are likely to require the removal, destruction or damage of **marine plants**. This must be authorised under the **Accepted development** requirements for operational work that is the removal, destruction or damage of **marine plants**; or will require a **development approval** under the Planning Act.

8.10.1 Partial removal of tidal bunds

Construction duration

- **Works** within the **waterway** must commence and finish within a maximum time of 180 calendar days

Requirements

Strategic partial removal of the bund at low points ensures the greatest range of tidal inundation is restored and fish do not become stranded on receding tides.

- A person or entity suitably qualified and experienced in coastal ecology and management of acid sulfate soils must physically oversee the **works**. Contact details for this person or entity must be provided in the notification forms in section 11
- Part(s) of the existing tidal bund must be removed (Figure 51) at locations where the natural bed surface both sides of the bund is at the lowest level (Figure 52)
- The finished surface level in the removed sections are made erosion resistant. This may or may not include **scour protection** (Figure 51)
- **Scour protection** does not extend more than 10m beyond the footprint of the section(s) of removed bund and is level with the adjacent natural profiles (Figure 52)

- The finished surface level in the removed section(s) are at the natural bed level both sides of the bund (Figure 52)
- Sediments and potential contaminants are not released into **waterways**
- Spoil is not disposed of on **tidal lands** or within **waterways**
- Potential and actual acid sulfate soils are to be managed in accordance with the most updated version of the *Queensland Acid Sulfate Soil Technical Manual*
- Remove spoil and all material associated with the bund removal from **tidal lands** and **waterways** and dispose at an appropriate licensed facility that accepts this type of waste
- Restore **tidal land** profiles that are temporarily disturbed by the **development** to pre-works profiles

8.10.2 Partial removal of causeways or weirs in red, amber and green waterways

Construction duration

- **Works** within red **waterways** must commence and finish within a maximum time of 180 calendar days
- **Works** within amber and green **waterways** must commence and finish within a maximum time of 360 calendar days

Requirements

As fish move along the banks of the **waterway** where vegetation is present and velocities are generally lower, it is important that the structure and any hardening immediately adjacent to one bank, as a minimum, is removed.

- Part of the barrier must be removed to allow 75% of the **main channel** width to be opened including immediately adjacent to one bank (Figures 53 and 54)
- Adjacent to the bank where the structure has been removed, reprofiling is permitted to regularise the bank of the **waterway**
- The barrier in the section to be removed is to be removed to bed level (Figure 53)
- Sediments and potential contaminants on the upstream side of the barrier are to be managed in accordance with best practice guidelines (e.g. erosion and sediment guidelines)
- **Scour protection** may be placed at or below the natural bed level to restore natural bed profiles including filling any scour holes (Figure 53)
- **Scour protection** does not extend more than 20m beyond the footprint of the section(s) of removed **causeway** or **weir** (Figure 54)

9 Amendments to accepted development requirements for recovery in and immediately following disaster situations declared under the *Disaster Management Act 2003*

These provisions apply to clean up, replacement, and repair **works** (recovery **works**) of existing **lawful works** within a **declared area**. Certain structures that are replaced **like-for-like** are required to be upgraded within two years to meet fish passage standards. Refer to section 9.1 for further information.

These provisions:

- apply to otherwise lawful replacement and/or repair to public and private infrastructure that have been damaged by a **disaster** and occur within a **declared area**
- are in effect for one year from the date of declaration of a **disaster situation**
- apply to all individuals and organisations lawfully undertaking recovery **works** on a **lawful work**
- allow that where recovery **works** have commenced without pre-works notification, notification is to be lodged with Fisheries Queensland, Department of Agriculture and Fisheries, as soon as practicable after the commencement of the recovery **works**
- allow that post-works notification is provided within 20 business days of the completion of the recovery **works**
- allow that normal restrictions on disturbance zones around a structure are relaxed, but only to the extent necessary to undertake the recovery **works** because of the **disaster situation**
- require that any disturbance to **waterways** and **fish habitats** associated with recovery **works** is minimised
- allow that recovery **works** may be undertaken under any tidal or other flow conditions.

A **like-for-like replacement** of infrastructure lost or damaged will comply with the **accepted development** requirements provided the recovery **works**:

- are of an existing **lawful work** and to the pre-**disaster** design criteria and standard
- are in accordance with current engineering standards and requirements / building codes and guidelines as required by legislation
- will reinstate the **lawful work** within the existing footprint and will provide the same function. Where the **lawful work** is a revetment wall or **bridge**, the existing footprint means a similar footprint in relation to the location of the bank alignment post-**disaster**.

Declared **disaster** areas are published in Queensland Government Gazette notices on the Queensland Government Publications Portal.

9.1 Accepted development: Temporary amendments for waterway barrier works following declaration of a disaster situation

In addition to the above allowances/requirements, the following apply for particular types of **waterway barrier works**:

Waterway barrier work	**Temporary amendments**
9.1.1 **Culvert crossings**	**Like-for-like replacement** with the requirement to upgrade fish passage provisions at the **works** within two (2) years of the completion of the **works**. The upgrades must meet the **accepted development** requirements for a new **culvert crossing** as per section 5.2 of this document, or a **development approval** issued under the Planning Act.
9.1.2 Bed level crossings	**Like-for-like replacement** with the requirement to upgrade fish passage provisions at the **works** within two (2) years of the completion of the **works**. The upgrades must meet the **accepted development** requirements for a new bed level crossing as per section 5.3 of this document, or a **development approval** issued under the Planning Act.
9.1.3 **Dams** and **weirs**	Repair and replacement of **dams** or **weirs** must meet the **accepted development** requirements for new **dams** and **weirs** as per section 5.4 of this document, or a **development approval** issued under the Planning Act.
9.1.4 **Bridges**	Repair and replacement of **bridges** that are **waterway barrier works** must meet the accepted development requirements for new **bridges** as per section 5.1 of this document, or a **development approval** issued under the Planning Act.
9.1.5 Fishways	Repair and replacement of fishways should be carried out as soon as practicable in accordance with the existing **development approval**. If no **development approval** exists, authorisation will be required under the Planning Act prior to undertaking **works**.
9.1.6 Temporary **waterway barrier works**	For temporary **waterway barrier works** built for the repair and replacement of flood damaged infrastructure, there is no restriction on the dimensions of the temporary **waterway barrier works**. Temporary **waterway barrier works** may be in place for the durations specified in Section 7.
9.1.7 Other **waterway barrier works**	For all other authorised **waterway barrier works**, replacement and repairs can be carried out on a **like-for-like** basis and within the footprint of the damaged structure.
A person exercising powers under section 77 of the *Disaster Management Act 2003* is considered to be acting lawfully for the purposes of section 123 of the Fisheries Act.	
Works carried out due to an emergency Where **works** are to be carried out due to an **emergency**, the exemptions in section 166 of the Planning Act are applicable. **Works** carried out due to an **emergency** under the exemptions must comply with all relevant provisions of section 166 of the Planning Act.	

10 Glossary

Accepted development is **development** for which a **development approval** is not required. Refer to s.44(4) of the Planning Act.

Aperture is the internal opening (cross-sectional area) of a structure, e.g. culvert aperture. **Aperture width** for box culverts is the horizontal distance between the left and right internal side walls. Aperture width for pipe culverts is taken to be the diameter of the cell.

Assessable development is **development** for which a **development approval** is required. Refer to s.44 (3) of the Planning Act.

Bankside is the side of a structure adjacent to the **waterway** bank.

Barrier material is the material used to construct or raise a **waterway barrier work**.

Bed gradient is the slope, rise or fall of a **waterway**. This is usually dependent on the location along the **waterway**.

Bed level is the lowest point of the natural **waterway** bed (pre-construction) within the footprint of the proposed crossing.

Bed level crossing is a crossing of a **waterway** that does not include **low flow** pipes or culverts and the lowest point of the crossing is constructed at the **bed level** of the **waterway**.

Bridge is a structure spanning a **waterway** with little or no structural components within the **waterway**.

Causeway is a path or road that is raised above the natural bed level and, for the purposes of this document, does not include **culvert cells**.

Culvert cell is a support structure for a crossing over a **waterway**. Common **culvert cell** types include bottomless, box and pipe.

Culvert crossing is a structure that incorporates **culvert cells** for the purpose of providing vehicle or pedestrian access across a **waterway**.

Dam is a structure built for the primary purpose of impounding water.

Declared area means—

- for a **disaster situation** declared under section 64(1) of the *Disaster Management Act 2003*—the **disaster** district, or the part of the **disaster** district, for which the **disaster situation** is declared; or
- for a **disaster situation** declared under section 69 of the *Disaster Management Act 2003*—the State or, if the **disaster situation** is declared for a part of the State, the part.

Refer s.11, schedule dictionary of the *Disaster Management Act 2003*.

Deck height is the height of the road / pavement above the **waterway** bed at the point where a measurement is taken.

Depth of cover is the height of fill measured from the **obvert** of the **culvert cell** to the surface of the road / pavement.

Development is defined in schedule 2 of the Planning Act.

Development approval is:

- A preliminary approval; or
- A **development permit**; or
- A combination of a preliminary approval and a **development permit.**

Refer s. 49(1) of the Planning Act.

Development permit is the part of a decision notice for a development application that authorises the carrying out of the assessable development to the extent stated in the decision notice.

Disaster is a serious disruption in a community, caused by the impact of an event that requires a significant coordinated response by the State and other entities to help the community recover from the disruption. Refer to s.13(1) of the *Disaster Management Act 2003*.

Disaster situation means a **disaster situation** declared under section 64(1) or section 69 of the *Disaster Management Act 2003.* Refer to s.11, schedule dictionary of the *Disaster Management Act 2003*.

Drownout of the structure refers to when the headwater and tailwater levels are covering the structure so that fish passage is unrestricted over the top of the structure.

Duplication means doubling or more than doubling, the length of an existing **culvert cell(s)**.

Elevated flow means flows other than no flow, base flow or **low flow** conditions.

Emergency means an event or situation that involves an imminent and definite threat requiring immediate action (whether before, during or after the event or situation), other than routine maintenance due to wear and tear. Refer to s.166 (8) of the Planning Act.

Fish habitat includes land, waters and plants associated with the life cycle of fish, and includes land and waters not presently occupied by fisheries resources. Refer s.4, schedule dictionary of the Fisheries Act.

Gabion a container consisting of wire netting used to hold rock and stones to stabilise earthworks or prevent erosion.

Invert is the floor of the **culvert cell**.

Lawful work is work that was constructed in compliance with all of the requirements, under any Act, relating to a work of that type at the time of construction. A **lawful work** may be owned by a public or private entity.

Leading edge is the edge of the roughening element that is perpendicular to flow.

Like-for-like means a structure that provides the purpose of the original authorised structure, mainly in the design of the original structure, but may include improved engineering and ecological outcomes.

Like-for-like replacement includes replacement within the footprint of the existing structure, or in the case of revetment walls and bridges, a similar footprint at, and in relation to, the location of the current bank alignment.

Low flow for perennial **waterways** are base flow volumes or levels. **Low flow** for ephemeral **waterways** are commence to flow levels up to the level or volume of a one in one year flow event.

Low level crossing is a crossing constructed in accordance with the requirements in section 5.3 of this document. It does not include a **causeway**.

Main channel is the active component of the flow channel characterised by a distinct change in appearance or structure at the upper limit of the channel such as undercutting, changes in vegetation density, sudden changes in bank slope, boundary levels for water marks, mosses or lichens, changes in sediment particle size. Approximate 63% AEP to 39% AEP. Refer to Appendix 2 for further detail.

Where the **main channel** width is variable, use an average width for the site. See Appendix 2 for examples.

Maintenance is limited to the **works** described in this document.

Marine plant includes:

- a plant that usually grows on, or adjacent to **tidal land**, whether it is living, dead, standing or fallen;
- material of a tidal plant, or other plant material on **tidal land**;
- a plant, or material of a plant, prescribed under a regulation or management plan to be a **marine plant**.

A **marine plant** does not include a plant that is a declared pest under the (a) *Biosecurity Act 2014;* or *(b)* controlled biosecurity matter under the *Biosecurity Act 2014.* Refer s.8 of the Fisheries Act.

Monitoring includes low impact collection of baseline sampling data, survey and investigation **works** associated with the impacts of **development**.

Obvert is the interior top of the **culvert cell**.

Overtopping is when water is overtopping the structure/road surface. During times of overtopping fish passage is likely to be restricted due to a drop in water level over the structure when the headwater level is higher than the tailwater level.

Pile fields are wooden posts or piles, used to redirect flows away from a **waterway** bank with the aim of reducing bank erosion and encouraging sediment deposition at the toe.

Re-sleeving includes lining or sleeving any part of an existing **culvert cell**.

Rock chute is a section of **waterway** bed or channel that has been armoured with rock, generally for erosion protection. Alternatively, a **rock chute** can be constructed within a **waterway**, adjacent to a bank, culvert or **low flow** section of a crossing in order to provide a level of fish passage at the crossing when it is **overtopping** and prior to **drownout**.

Scour protection is a structure installed on the **waterway** bed to prevent or remediate destabilisation and removal of **substrate** by the action of water flows on the **waterway** bed, adjacent to the hard structures of a **waterway barrier work**.

Substrate is the underlying hard or soft surface of sediment, soils, sand, rock or mud.

Tidal land includes reefs, shoals and other land permanently or periodically submerged by waters subject to tidal influence. Refer s.4, schedule dictionary of the Fisheries Act.

Waterway includes a river, creek, stream, watercourse, drainage feature or inlet of the sea. Refer s.4, schedule dictionary of the Fisheries Act.

Waterway barrier works means a **dam**, **weir**, crossing, fill or other complete or partial barrier within a **waterway** if the barrier limits fish access to, or movement, within a **waterway**. Refer to s. 4, schedule dictionary of the Fisheries Act.

Weir is a structure built fully or partially across a **waterway** for the primary purposes of storing or confining water, or regulating water flow.

Works includes building work, operational work, plumbing work and drainage work. Refer to Schedule 2 of the Planning Act.

11 Notification forms for accepted development

11.1 Pre-works notification form for accepted development

This form is to be completed and submitted to Fisheries Queensland, Department of Agriculture and Fisheries prior to, but no more than 20 business days before commencing works (unless works are being undertaken under section 9 of the document). You do not need to wait for a reply to commence your work. Email the completed form to accepteddevelopment@daf.qld.gov.au.

You may be required to obtain approvals from other agencies prior to commencing work.

Contact details of person/organisation undertaking the works	
Name	
Organisation	
Contact address	
Postal address	
Email	
Phone	

For work notified under sections 8.2, 8.4, 8.5, 8.6, 8.7, 8.8 and 10.1.2 of the Accepted Development Requirements, include the contact details of a person or entity suitably qualified and experienced in fish passage biology or coastal ecology and management of acid sulfate soils in the section below.

Contact details of person/organisation undertaking the works	
Name	
Organisation	
Contact address	
Postal address	
Email	
Phone	

Details of the work	
Date works to commence	
Expected timeframe e.g. 270 calendar days	
Lot on Plan	
Street Address	
Lat. / Long. (decimal degrees, GDA2020)	
Name of waterway	
Mapped colour of waterway	

Section and name of work type(s) *Example:* *8.2.1 interim nib walls; and* *8.4.1 interim rocked fish ramp; and* *7.1.3 temporary waterway barrier works*	**New Work** ☐ Work type 5.1.1 ☐ Work type 5.2.1 ☐ Work type 5.2.2 ☐ Work type 5.2.3 ☐ Work type 5.2.4 ☐ Work type 5.3.1 ☐ Work type 5.3.2 ☐ Work type 5.3.3 ☐ Work type 5.4.1 Name of work type: _____. **Maintenance** ☐ Work type 6.1.1 ☐ Work type 6.1.2 ☐ Work type 6.1.3 ☐ Work type 6.1.4 ☐ Work type 6.1.5 ☐ Work type 6.1.6 ☐ Work type 6.1.7 ☐ Work type 6.1.8 ☐ Work type 6.1.9 ☐ Work type 6.1.10 ☐ Work type 6.2.1 ☐ Work type 6.2.2 Name of work type: _____. **Temporary waterway barrier works** ☐ Work type 7.1.1 ☐ Work type 7.1.2 ☐ Work type 7.1.3 ☐ Work type 7.1.4 Name of work type: _____. **Remediation works** ☐ Work type 8.1.1 ☐ Work type 8.2.1 ☐ Work type 8.3.1 ☐ Work type 8.4.1 ☐ Work type 8.5.1 ☐ Work type 8.6.1* ☐ Work type 8.7.1* ☐ Work type 8.8.1 ☐ Work type 8.9.1 ☐ Work type 8.10.1 ☐ Work type 8.10.2 Name of work type/s: _____. **Declared disaster situations** ☐ Work type 9.1.1 ☐ Work type 9.1.2 ☐ Work type 9.1.3 ☐ Work type 9.1.4 ☐ Work type 9.1.5 ☐ Work type 9.1.6 ☐ Work type 9.1.7 ☐ Work type 9.1.8 ☐ Work type 9.1.9

	Disaster name: _____. Date of disaster declaration: _____. Expiry of disaster declaration: _____.
Work size (dimensions), description and option chosen (where relevant) *Example:* *New culvert 5.2.1 – option 1.* *8/ 2400 x 2400 RCBC's with baffles. Main channel width is 24m. Combined culvert aperture width is 19.2m.*	

*Drawings (cross-section and long-section) of the proposed fishway in relation to the existing waterway barrier work structure and the bed and banks of the waterway is required.

Declaration

In submitting this form, I confirm:

- ☐ I have read this document
- ☐ I have understood this document
- ☐ All applicable fields are completed and I acknowledge that an incomplete form will not be registered and the works will not be authorised
- ☐ The work complies with all requirements of the relevant section in addition to the standards and notification requirements of the Accepted development Requirements
- ☐ Site photos are included as per Appendix 3
- ☐ A map of the location of the works is included in this submission
- ☐ The requirements have been made clear to the person/organisation undertaking the works
- ☐ For work undertaken under sections 8.4 – 8.7 of the document, I understand that the restoration works are an interim measure until the waterway barrier structure requires replacement or other changes that would trigger waterway barrier works. At this time the existing barrier and restoration works will comply with one of the four options listed in the guidance box in section 8 of this document.

Contact details of person/organisation notifying	
Name	
Organisation	
Date of notification	
Signature	

You must keep a copy of this completed and signed form, evidence of the notification date and any reference number you are provided. You must be able to provide this information if requested.

11.2 Post-works notification form for accepted development

This form is to be completed and submitted to Fisheries Queensland, Department of Agriculture and Fisheries within 15 business days of the completion of the works (unless works are being undertaken under section 9 of the document and then 20 business days is permitted). Email the completed form to accepteddevelopment@daf.qld.gov.au.

You may be required to obtain approvals from other agencies prior to commencing work.

Reference number for the works	
Contact details of person/organisation that undertook the works*	
Name	
Organisation	
Contact address	
Postal address	
Email	
Phone	

*For work under sections 8.2, 8.4, 8.5, 8.6, 8.7, and 8.8 and 10.1.2 of the Accepted Development Requirements this is to contain the contact details of a person or entity suitably qualified and experienced in fish passage biology or coastal ecology and management of acid sulfate soils.

Details of the work	
Date works completed	
Lot on Plan	
Street Address	
Lat. / Long. (decimal degrees, GDA2020)	
Name of waterway	
Mapped colour of waterway	
Section and name of work type *Example:* *8.2.1 nib walls; and* *8.4.1 interim rocked fish ramp; and* *7.1.3 temporary waterway barrier works*	**New Work** ☐ Work type 5.1.1 ☐ Work type 5.2.1 ☐ Work type 5.2.2 ☐ Work type 5.2.3 ☐ Work type 5.2.4 ☐ Work type 5.3.1 ☐ Work type 5.3.2 ☐ Work type 5.3.3 ☐ Work type 5.4.1 Name of work type: _____. **Maintenance** ☐ Work type 6.1.1 ☐ Work type 6.1.2 ☐ Work type 6.1.3

	☐ Work type 6.1.4 ☐ Work type 6.1.5 ☐ Work type 6.1.6 ☐ Work type 6.1.7 ☐ Work type 6.1.8 ☐ Work type 6.1.9 ☐ Work type 6.1.10 ☐ Work type 6.2.1 ☐ Work type 6.2.2 Name of work type _____. **Temporary waterway barrier works** ☐ Work type 7.1.1 ☐ Work type 7.1.2 ☐ Work type 7.1.3 ☐ Work type 7.1.4 Name of work type: _____. **Remediation works** ☐ Work type 8.1.1 ☐ Work type 8.2.1 ☐ Work type 8.3.1 ☐ Work type 8.4.1 ☐ Work type 8.5.1 ☐ Work type 8.6.1 ☐ Work type 8.7.1 ☐ Work type 8.8.1 ☐ Work type 8.9.1 ☐ Work type 8.10.1 ☐ Work type 8.10.2 Name of work type/s: _____. **Declared disaster situations** ☐ Work type 9.1.1 ☐ Work type 9.1.2 ☐ Work type 9.1.3 ☐ Work type 9.1.4 ☐ Work type 9.1.5 ☐ Work type 9.1.6 ☐ Work type 9.1.7 ☐ Work type 9.1.8 ☐ Work type 9.1.9 Disaster name: _____. Date of disaster declaration: _____. Expiry of disaster declaration: _____.
Work size (dimensions), description and option chosen (where relevant) *Example:* *New culvert 5.2.1 – option 1.* *8/ 2400 x 2400 RCBC's with baffles. Main channel width*	

is 24m. Combined culvert aperture width is 19.2m.	

Declaration

In submitting this form, I confirm:

- ☐ I have read this document
- ☐ I have understood this document
- ☐ All applicable fields are completed
- ☐ The work completed complies with all requirements of the relevant section in addition to the standards and notification requirements of the Accepted development Requirements
- ☐ Site photos are included as per Appendix 3
- ☐ For work undertaken under sections 8.4 – 8.7 of the document, I understand that the restoration works are an interim measure until the waterway barrier structure requires replacement or other changes that would trigger waterway barrier works. At this time the existing barrier and restoration works will comply with one of the four options listed in the guidance box in section 8 of this document.

Contact details of person/organisation notifying	
Name	
Organisation	
Date of notification	
Signature	

12 Appendices

12.1 Appendix 1: Figures

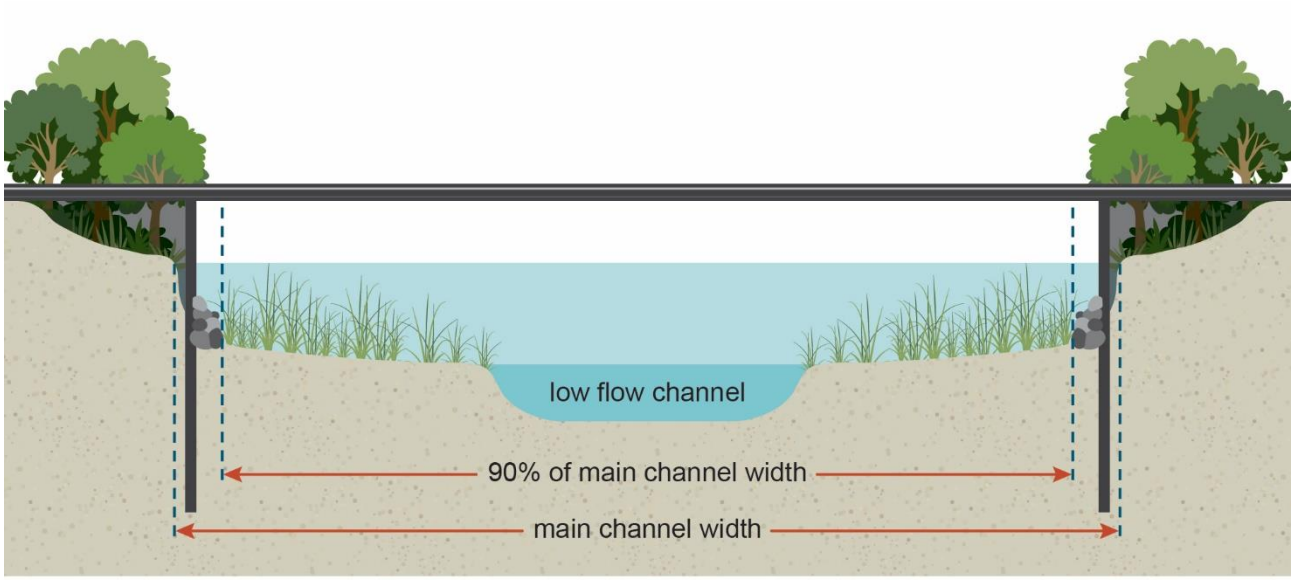

Figure 1. Single span bridge (cross-section of waterway) – amber and green waterways

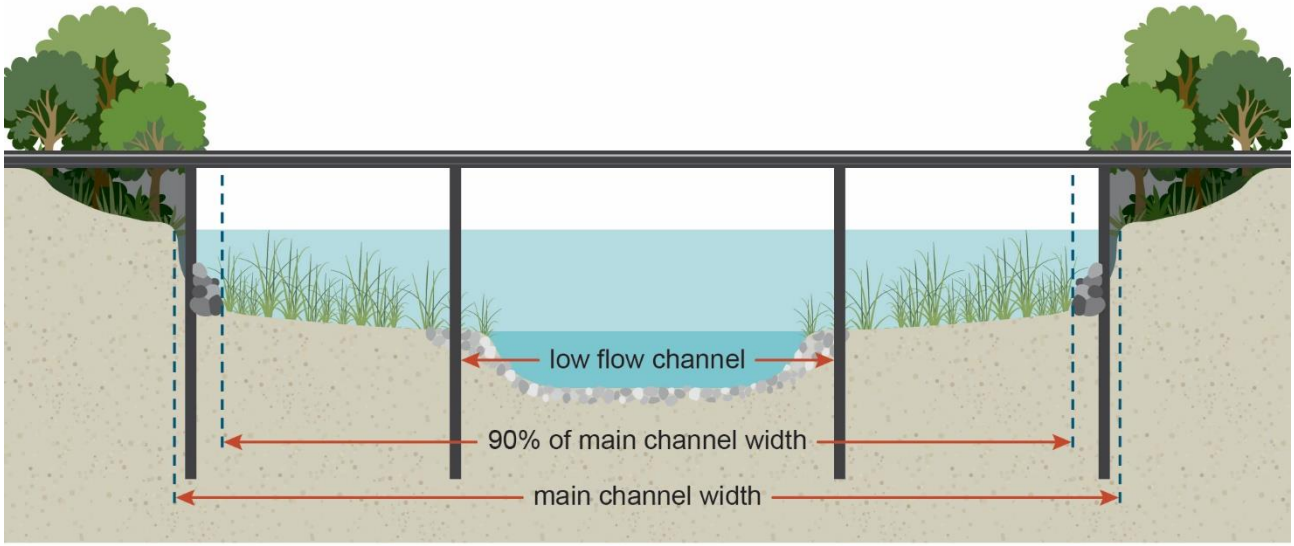

Figure 2. Multi-span bridge (cross-section of waterway) – amber and green waterways

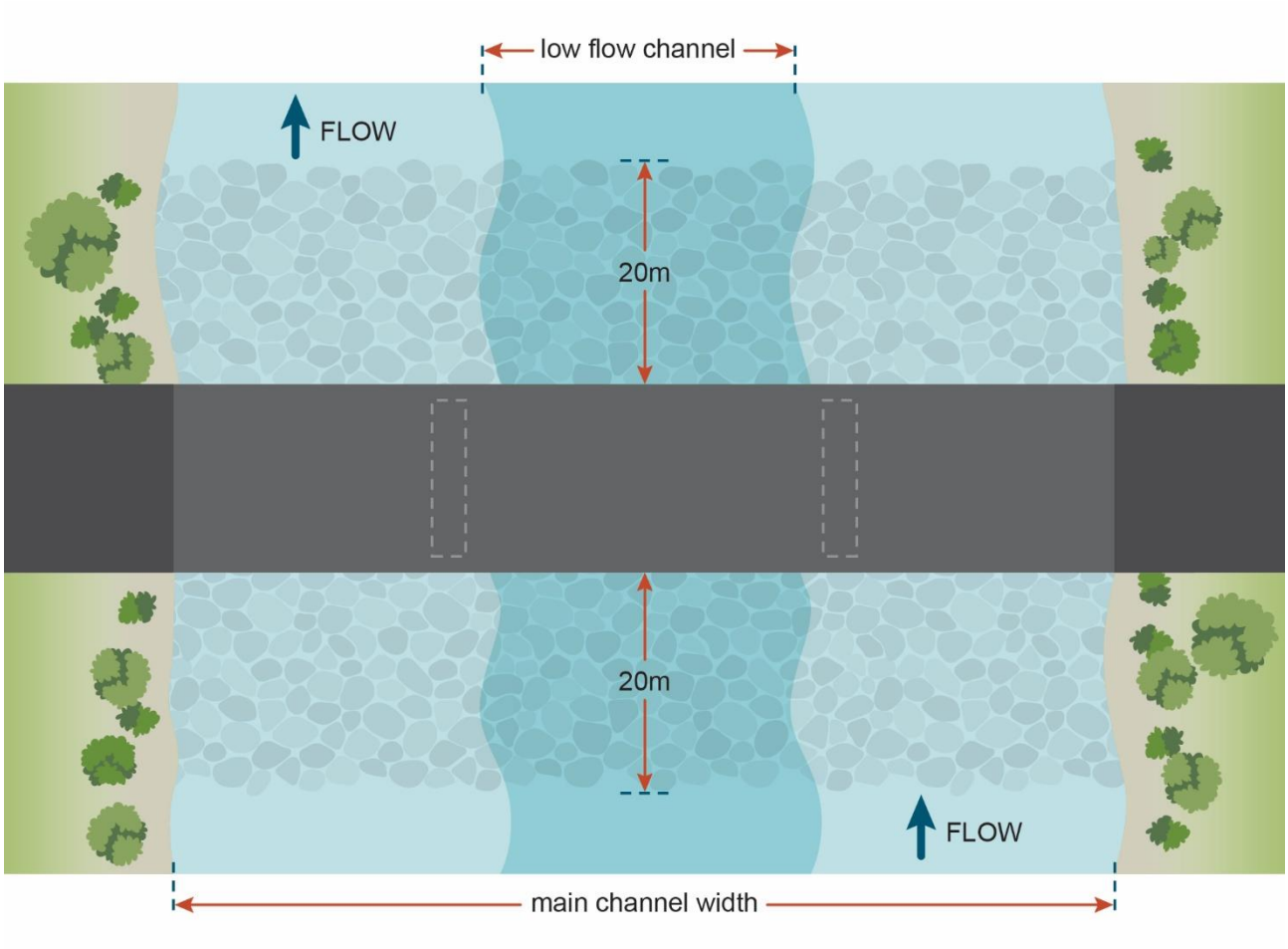

Figure 3. Multi-span bridge (plan view) – amber and green waterways

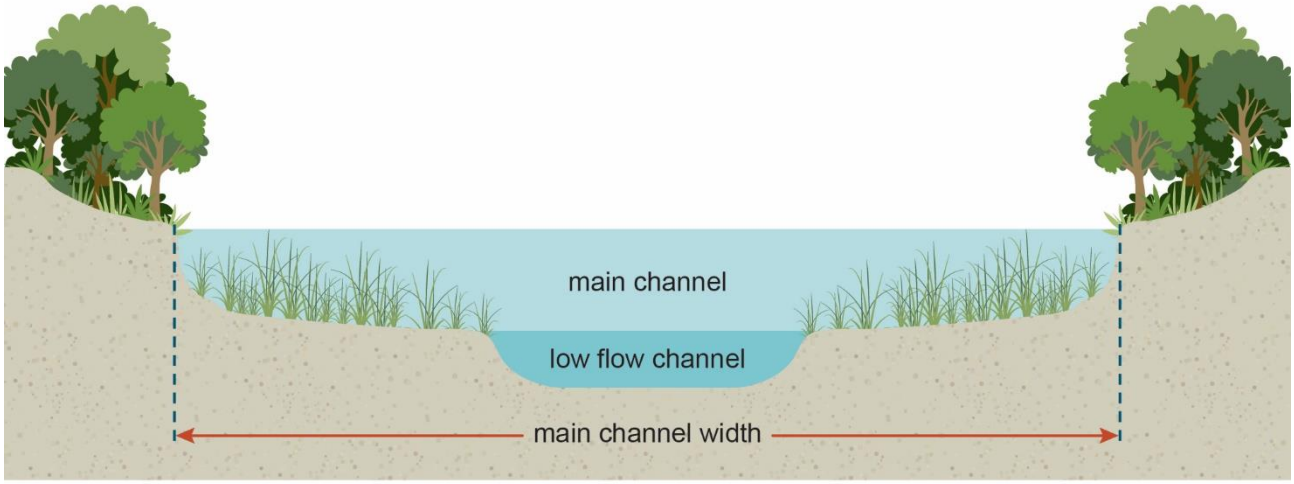

Figure 4. Waterway profile (cross-section of waterway)

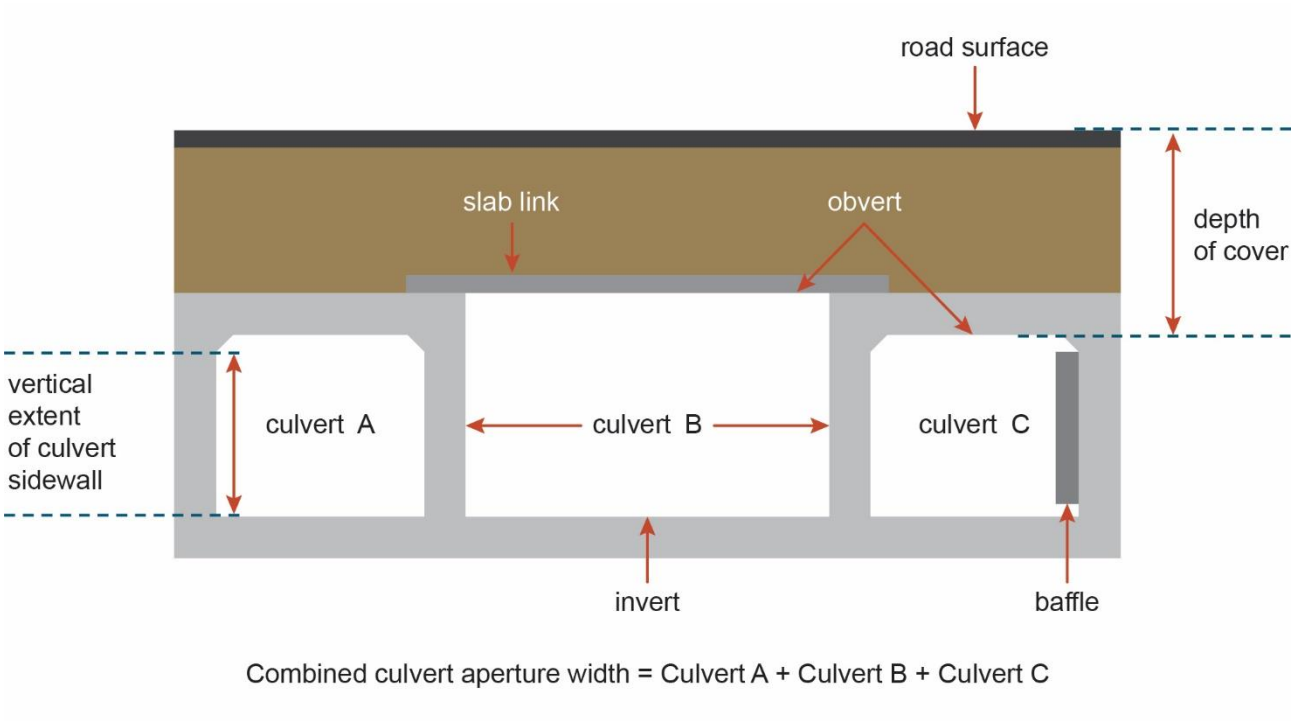

Figure 5. Culvert crossing key elements

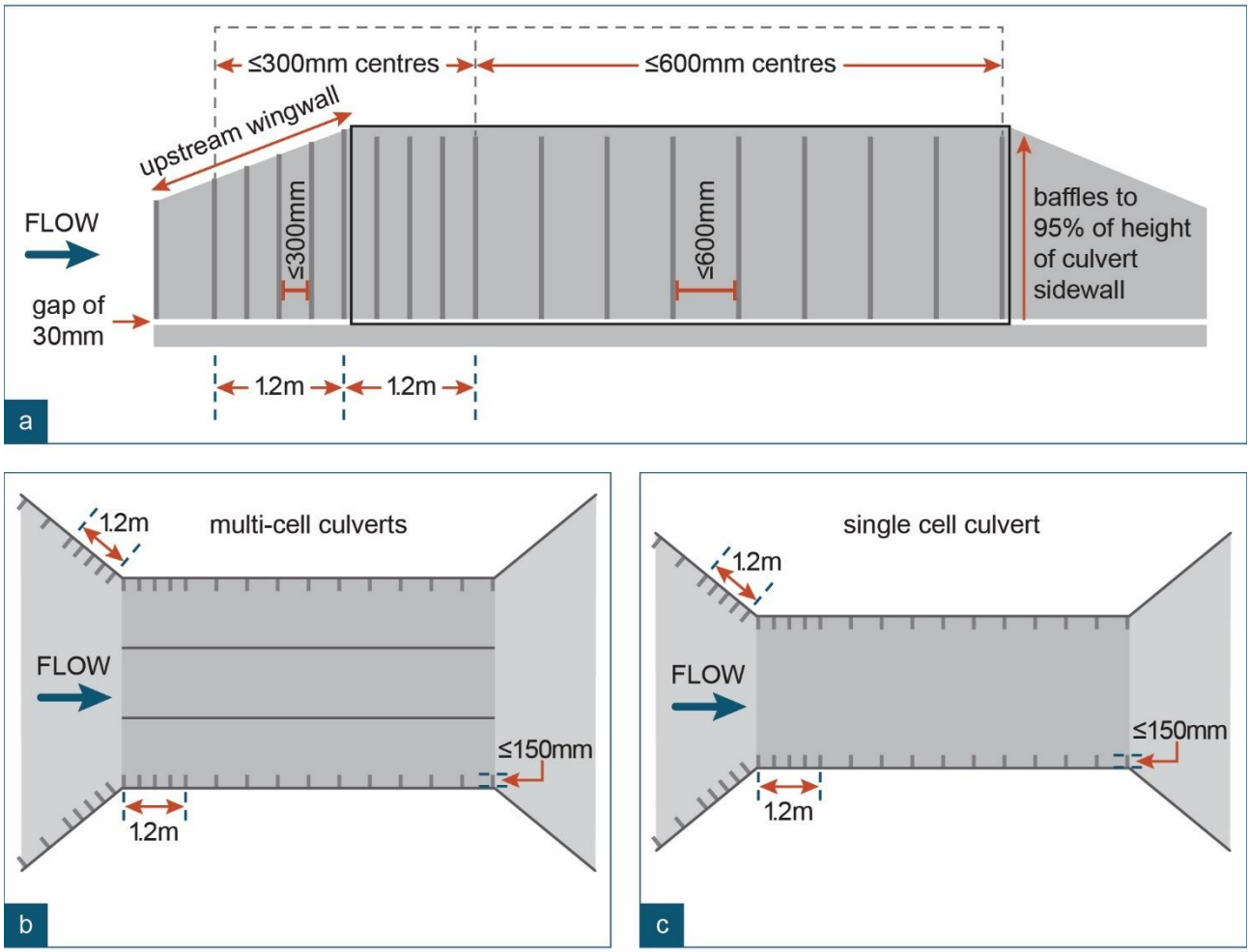

Figure 6. Culvert crossing showing (a) baffle height and spacing (b) baffles – multi-cell culverts (plan view) (c) baffles – single cell culvert (plan view)

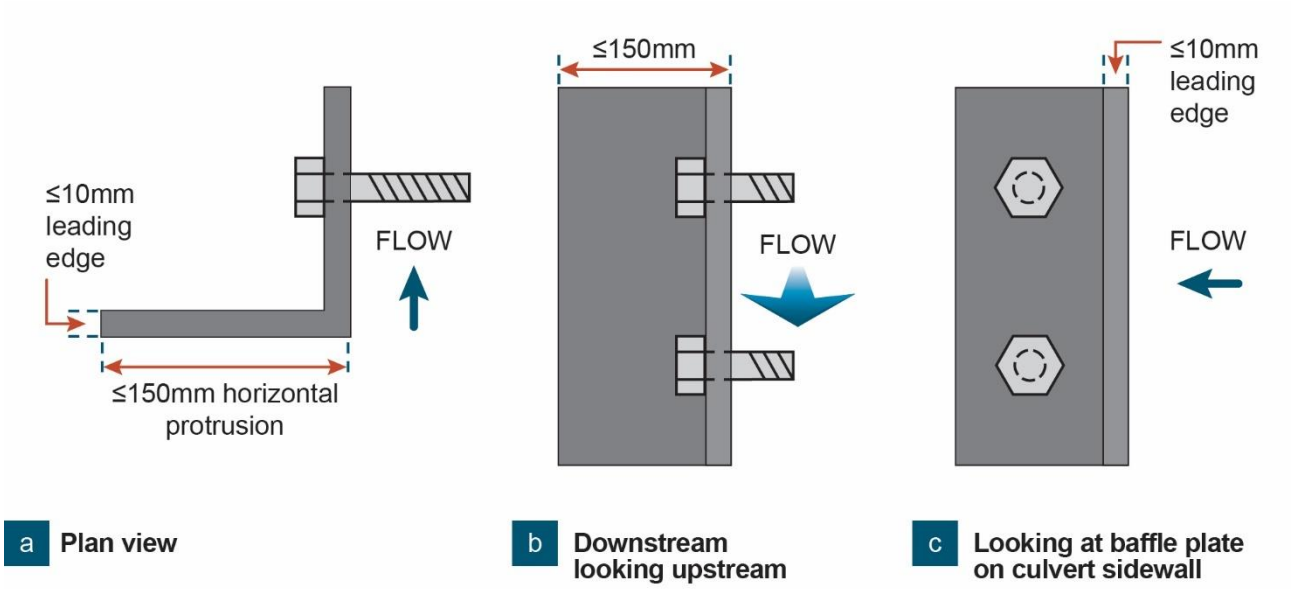

Figure 7. Baffle detail (a) plan view (b) downstream looking upstream (c) baffle plate on culvert sidewall

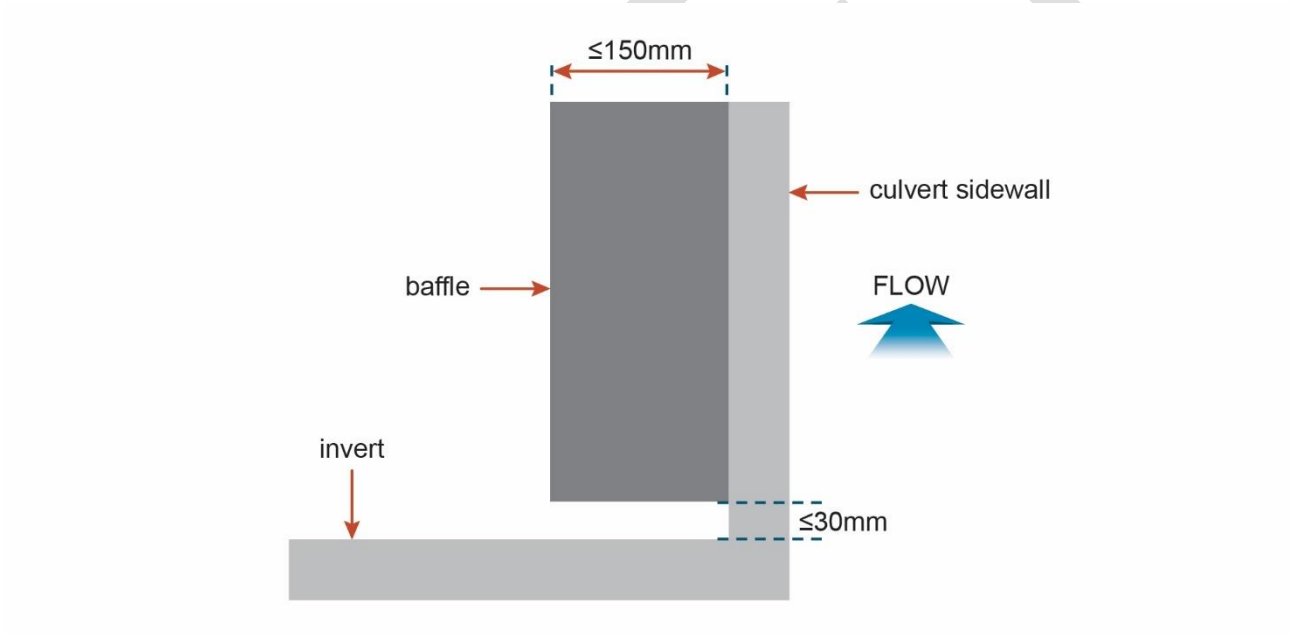

Figure 8. Baffle section (upstream looking downstream)

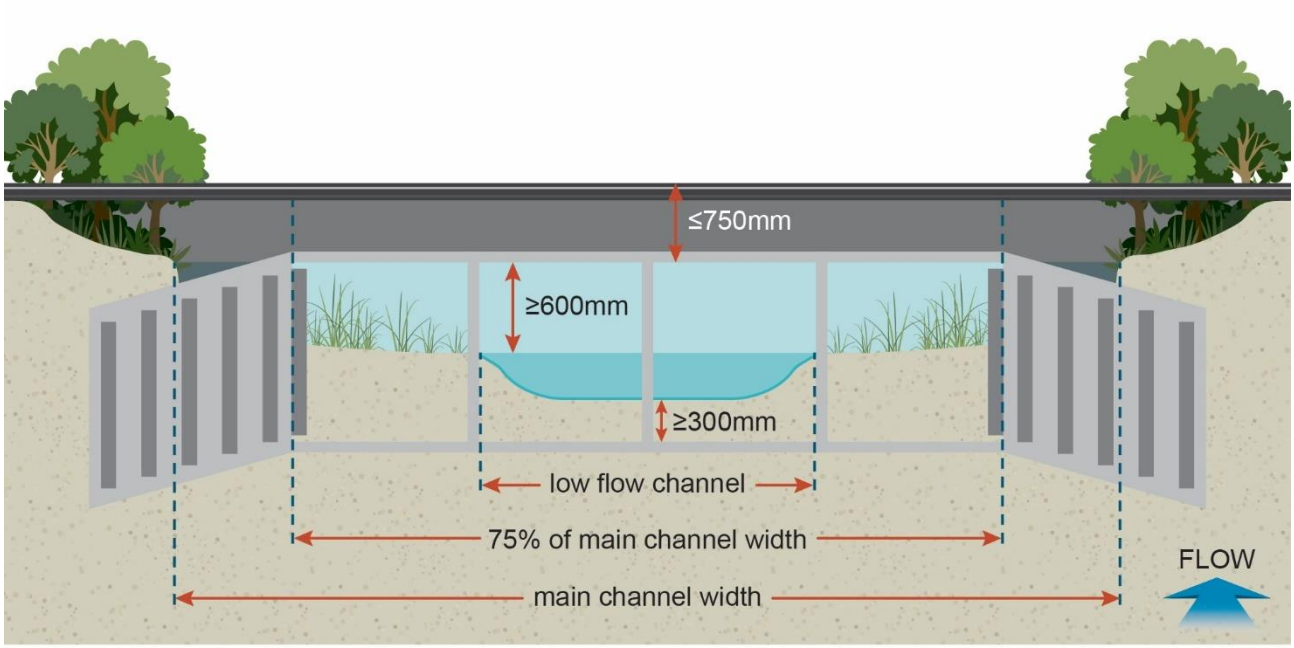

Figure 9. Culvert crossing option 1 (cross-section of waterway) – red waterway

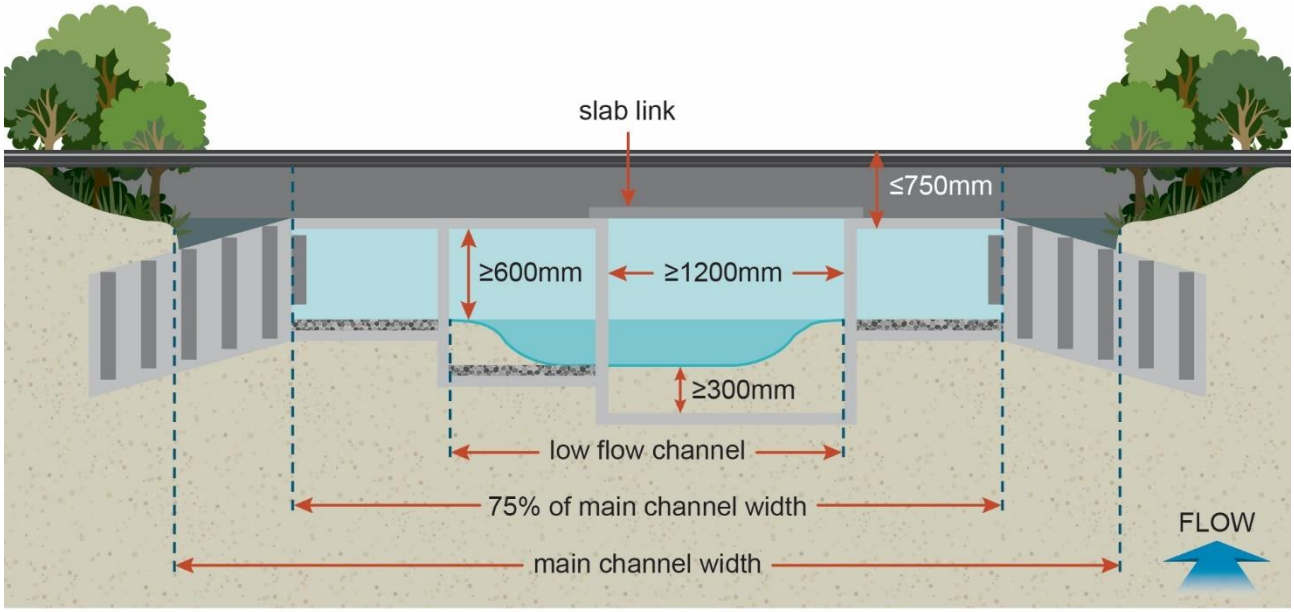

Figure 10. Culvert crossing option 2 (cross-section of waterway) – red waterway

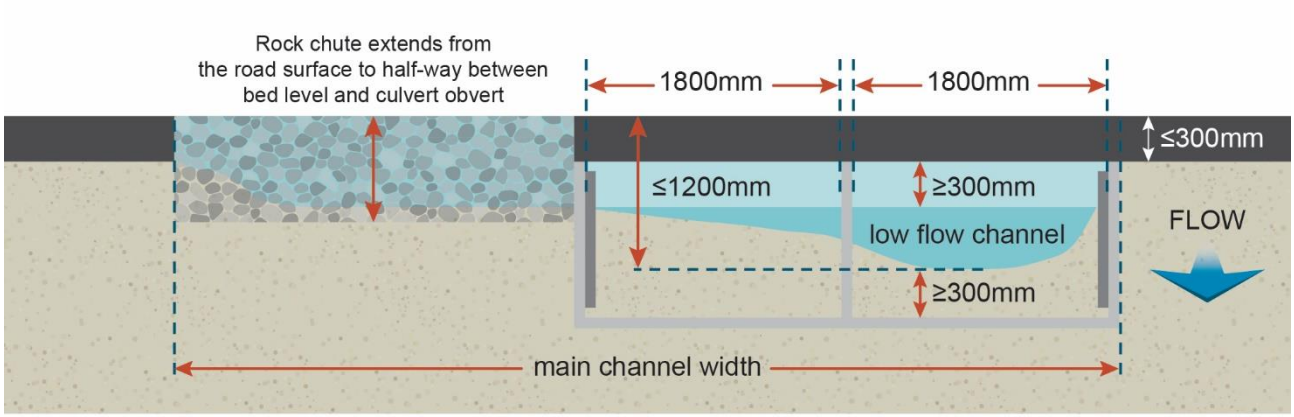

Figure 11. Culvert crossing option 3 (cross-section of waterway) – red waterway

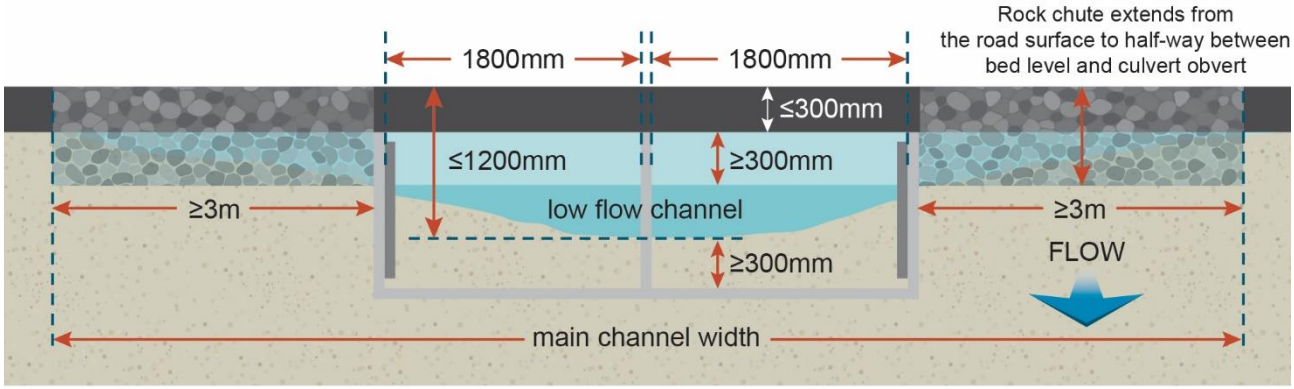

Figure 12. Culvert crossing option 3 (cross-section of waterway) – red waterway

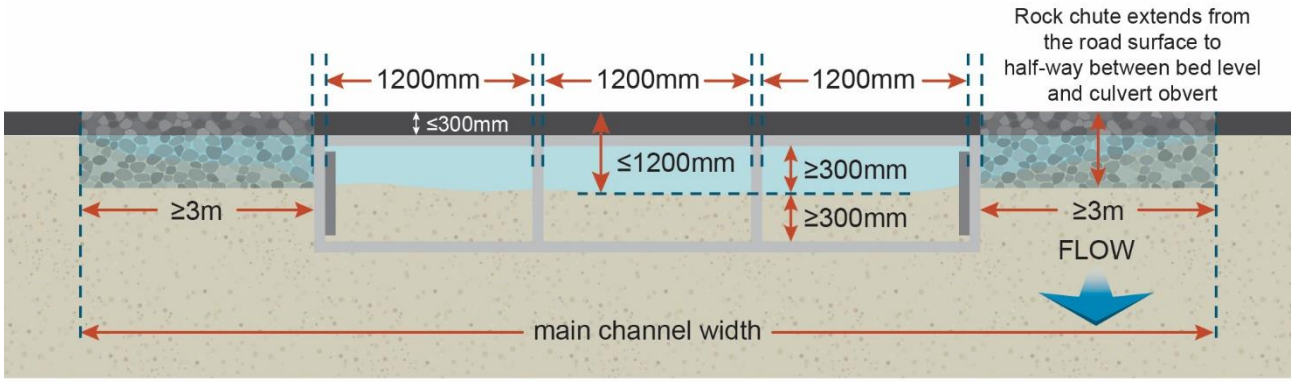

Figure 13. Culvert crossing option 3 (cross-section of waterway) – red waterway

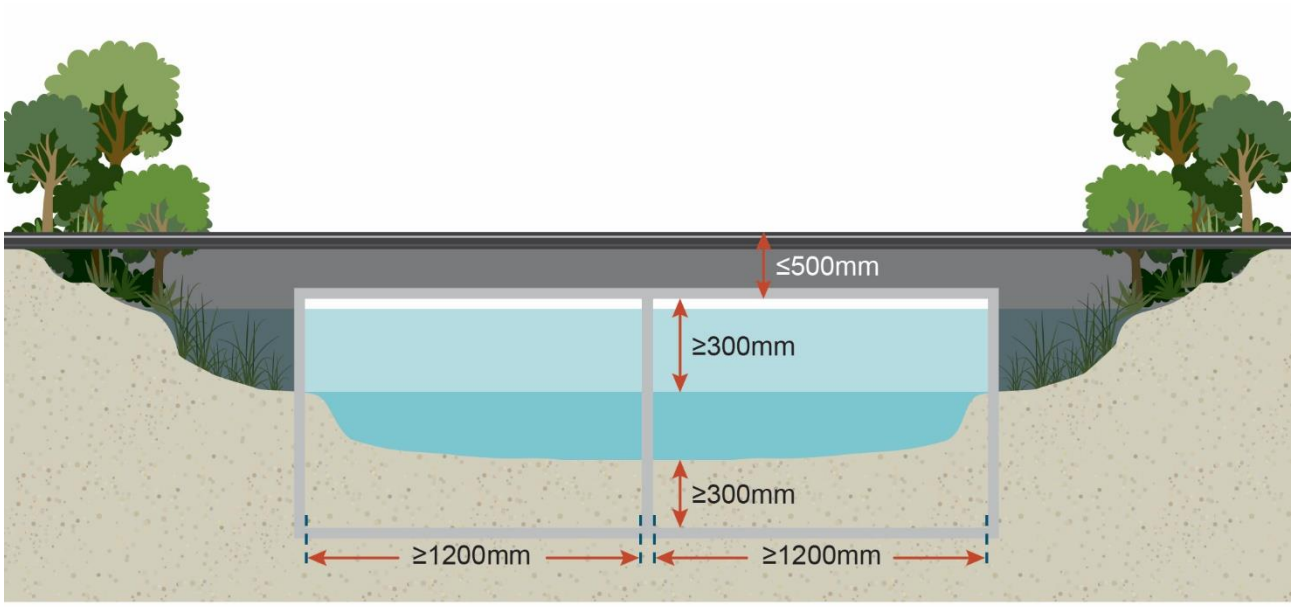

Figure 14. Culvert crossing (cross-section of waterway) – amber waterway

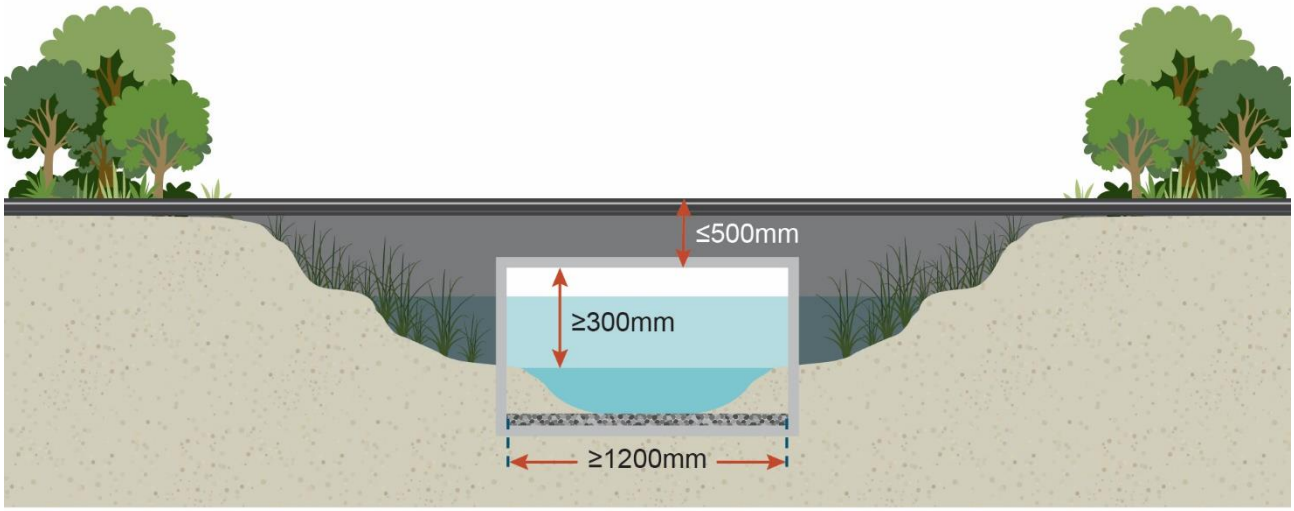

Figure 15. Culvert crossing (cross-section of waterway) – green waterway

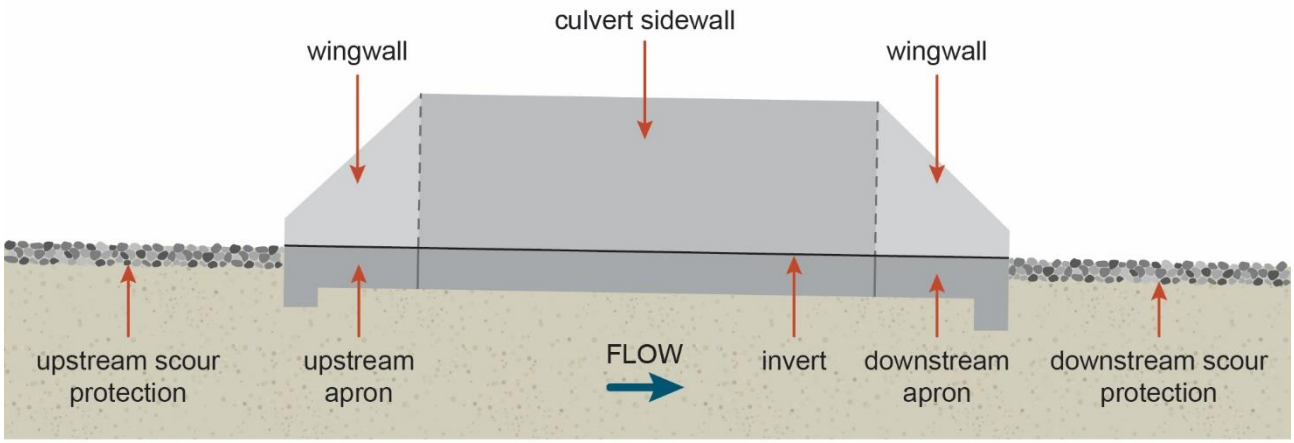

Figure 16. Culvert crossing scour protection (long-section of waterway)

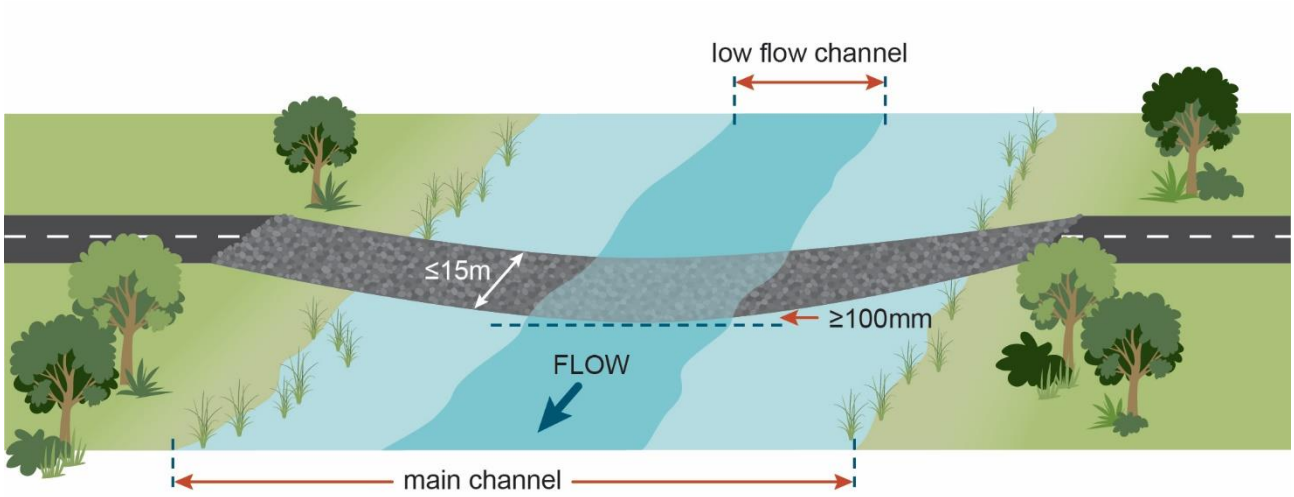

Figure 17. Bed level crossing

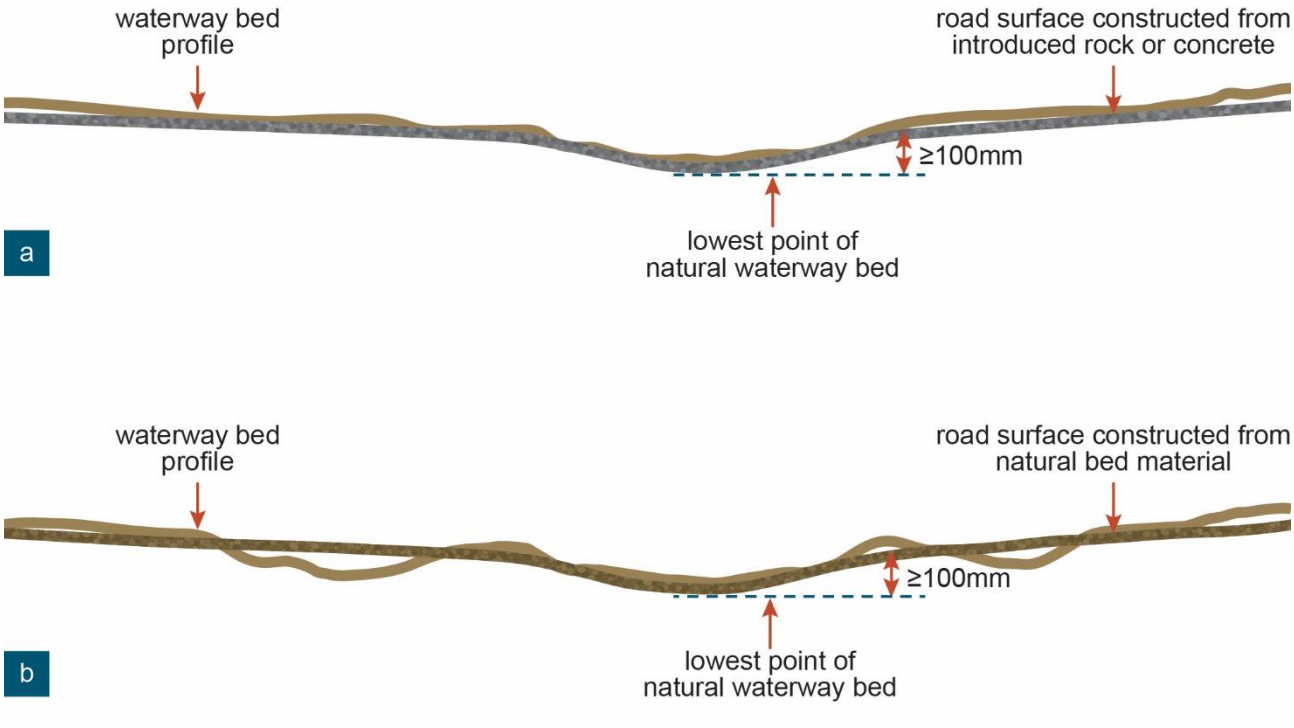

Figure 18. Bed level crossing option 1 (cross-section of waterway) – purple, red, amber and green waterways (a) constructed from rock or concrete (b) constructed from natural bed material

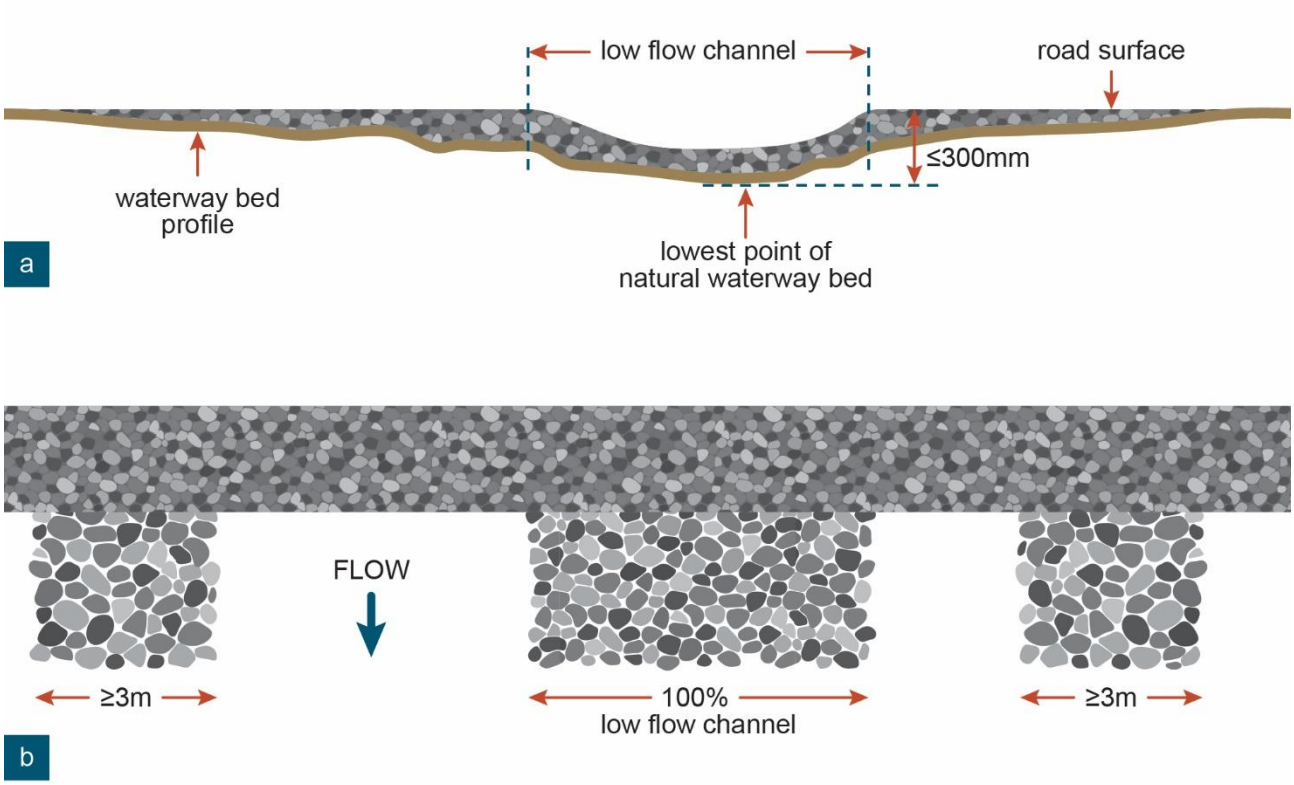

Figure 19. Low level crossing option 2, incorporating low flow channel – purple and red waterways (a) cross-section of waterway (b) plan view

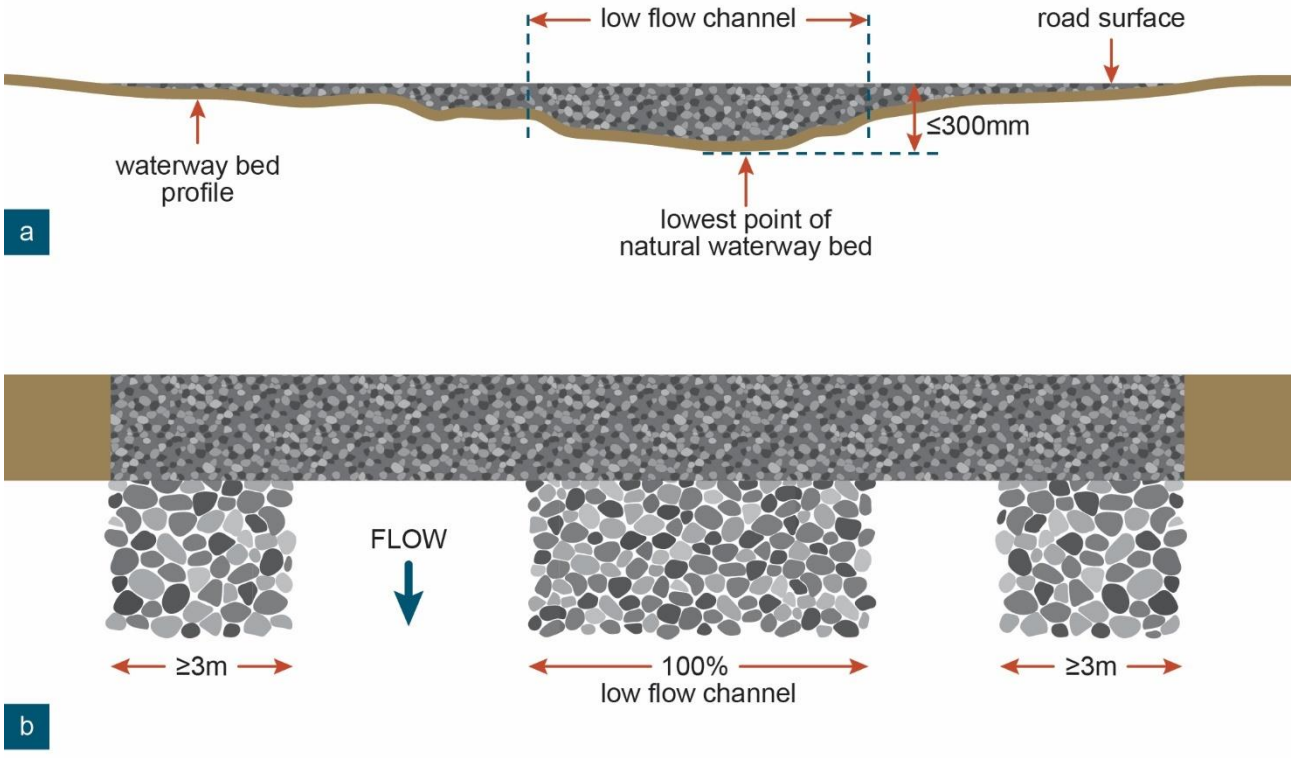

Figure 20. Low level crossing option 2 – purple and red waterways (a) cross-section of waterway (b) plan view

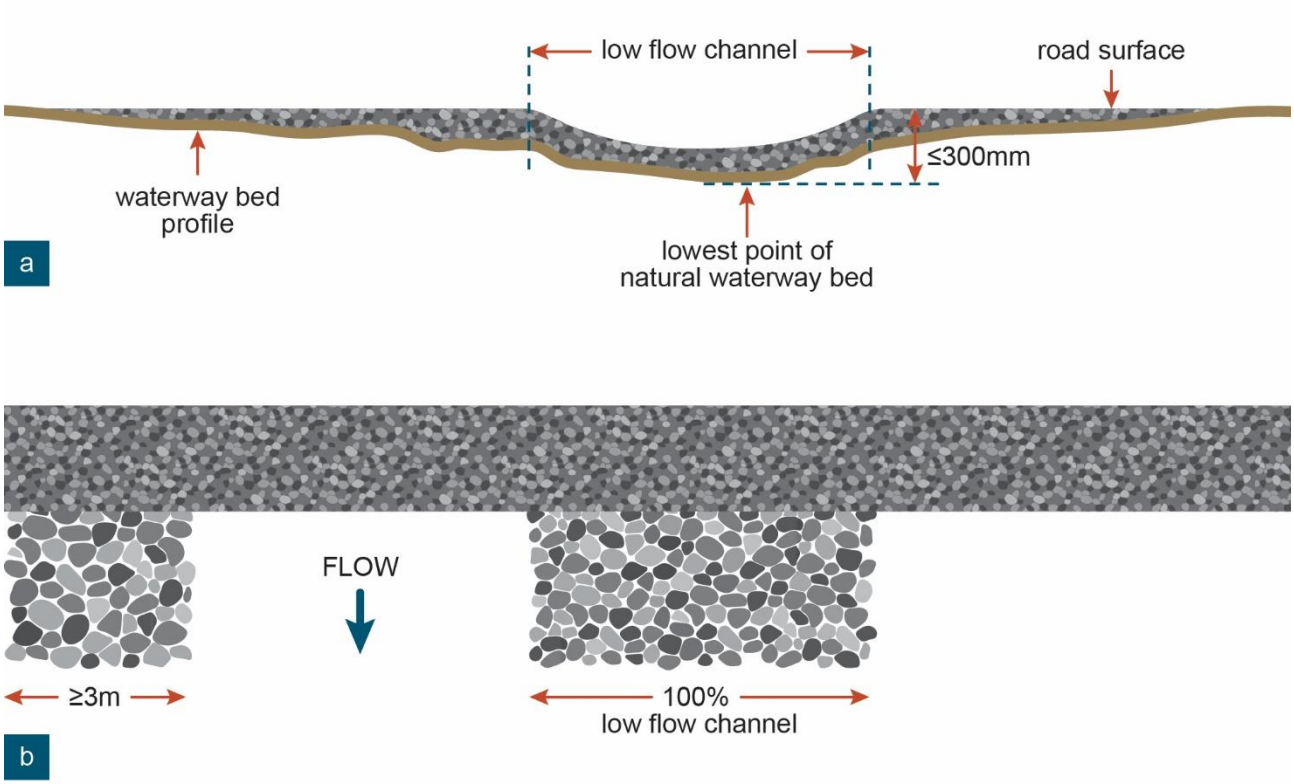

Figure 21. Low level crossing option 2, incorporating low flow channel – amber waterway (a) cross-section of waterway (b) plan view

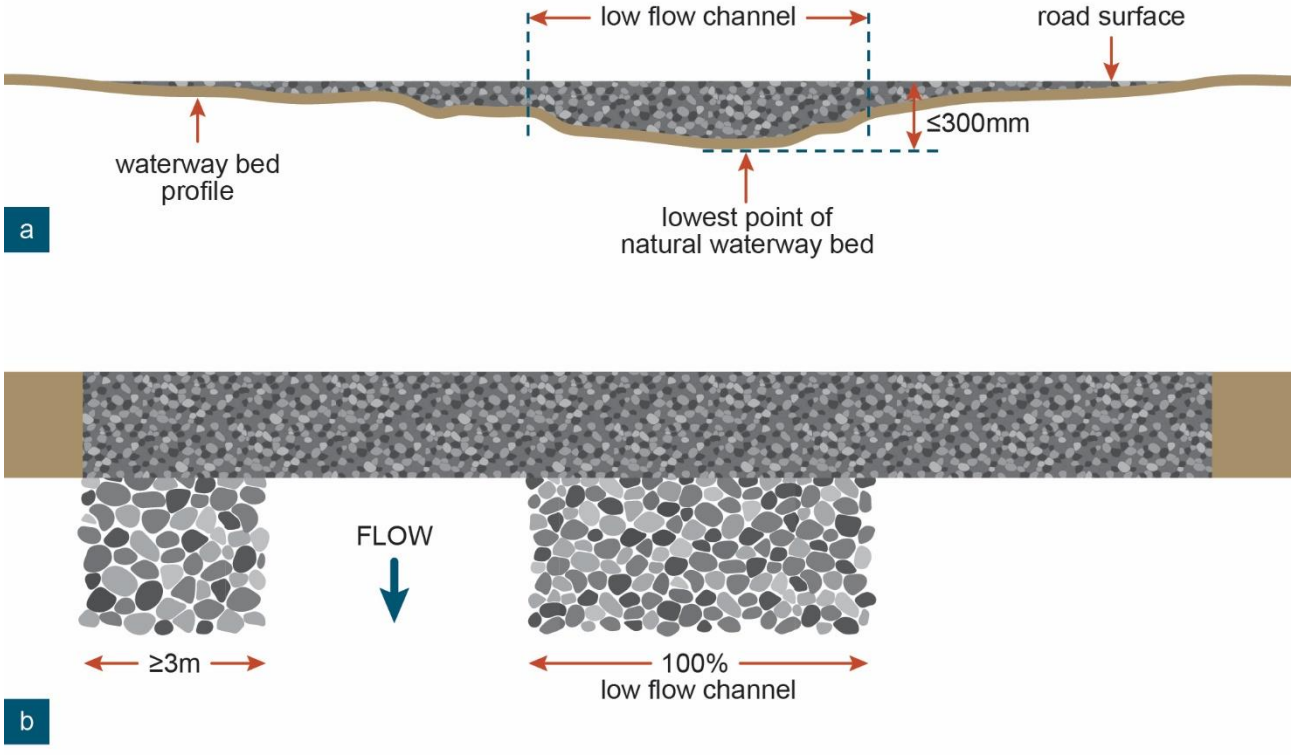

Figure 22. Low level crossing option 2 – amber waterway (a) cross-section of waterway (b) plan view

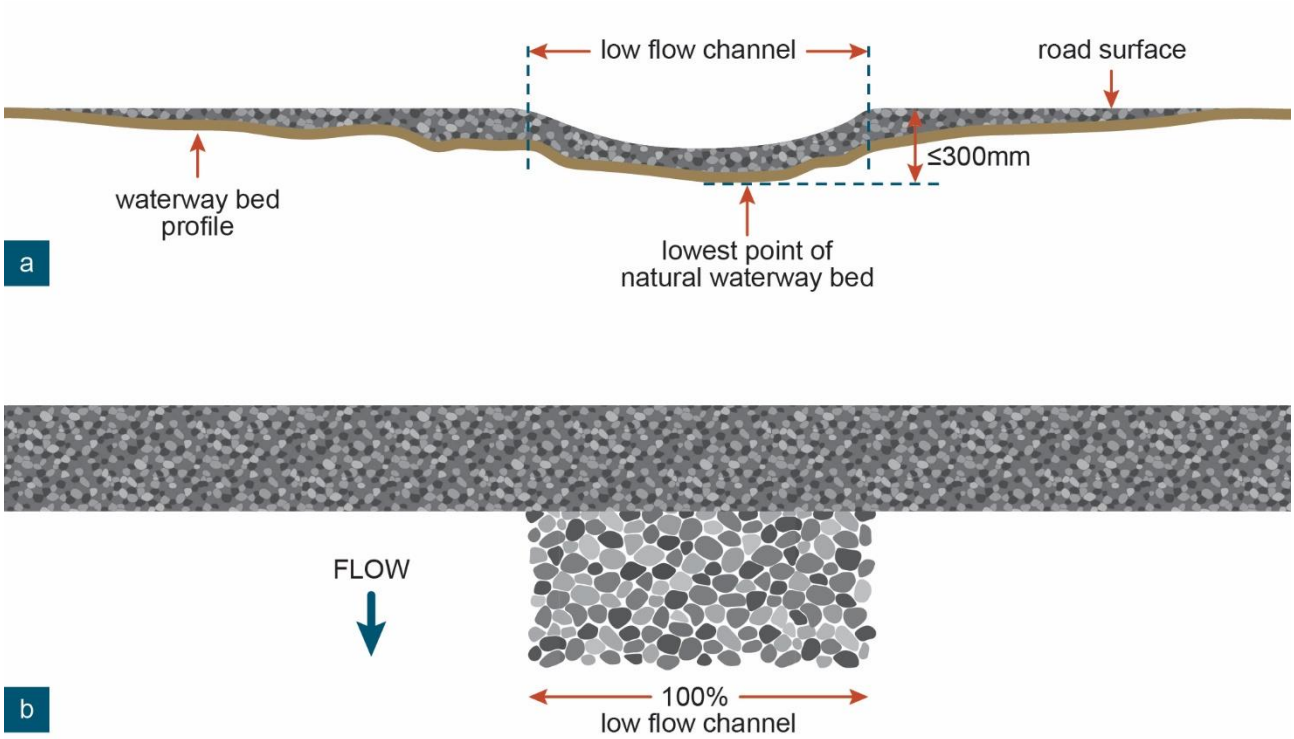

Figure 23. Low level crossing option 2, incorporating low flow channel – green waterway (a) cross-section of waterway (b) plan view

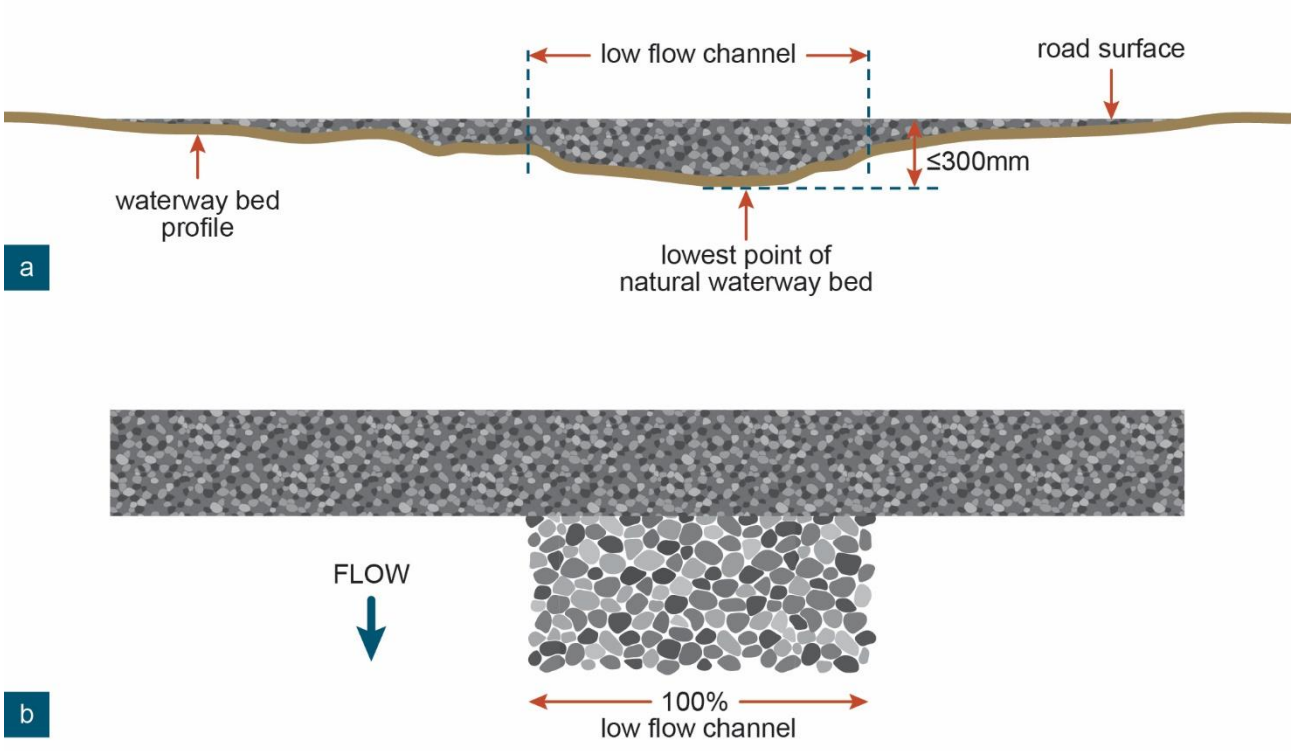

Figure 24. Low level crossing option 2 – green waterway (a) cross-section of waterway (b) plan view

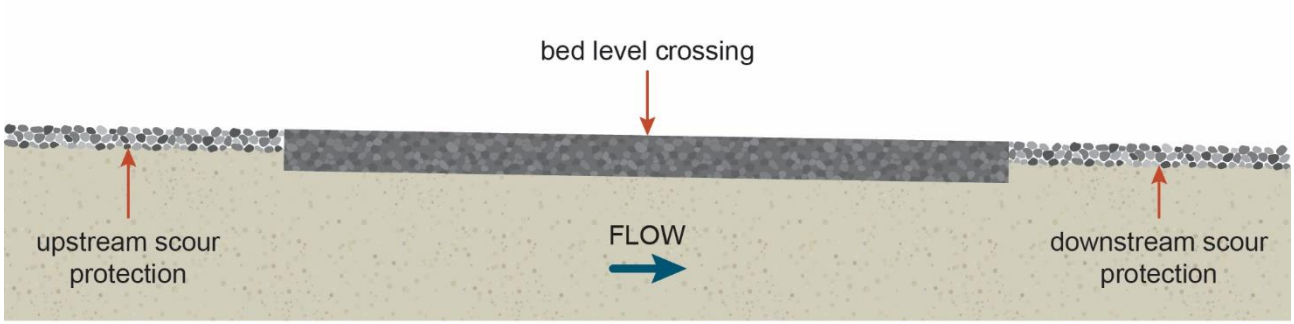

Figure 25. Bed level crossing scour protection (long-section of waterway)

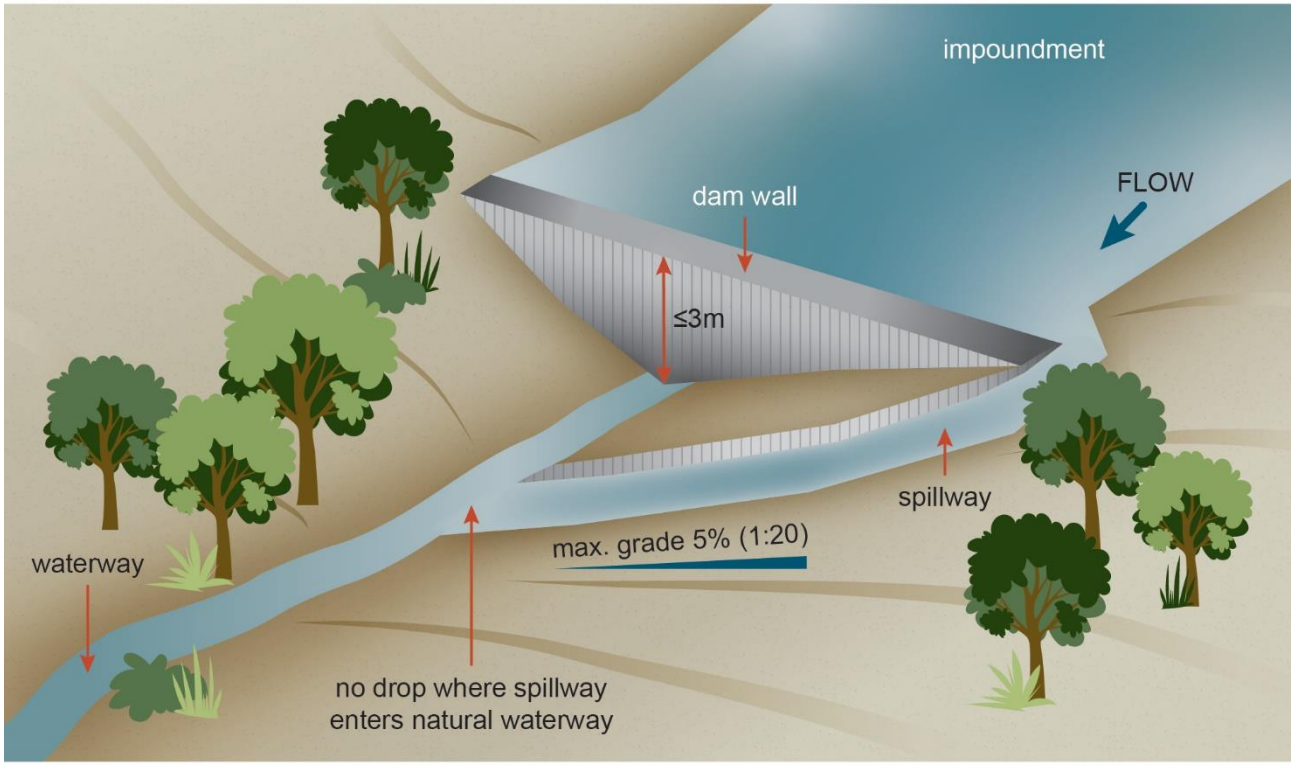

Figure 26. Dam equal to, or less than 3m high with spillway (5%) located to side – green waterway

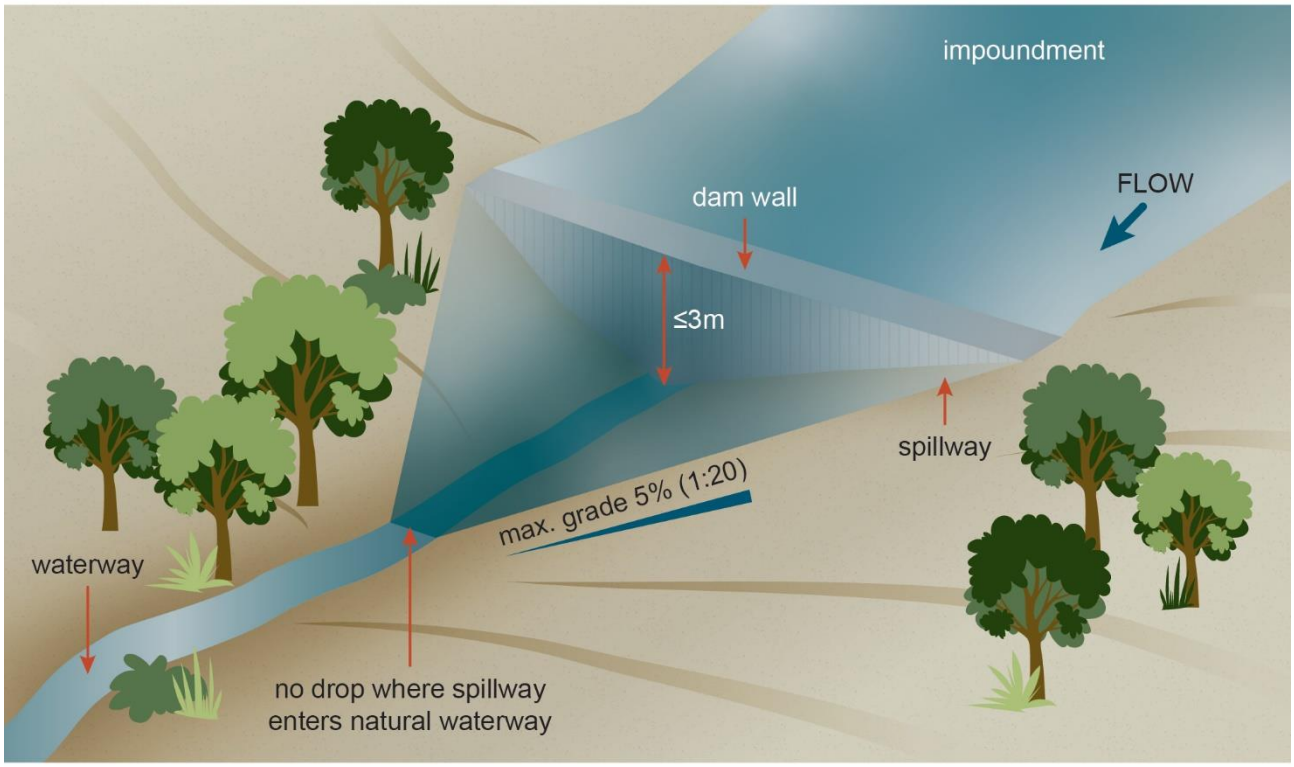

Figure 27. Dam equal to, or less than 3m high with spillway (5%) centrally located - green waterway

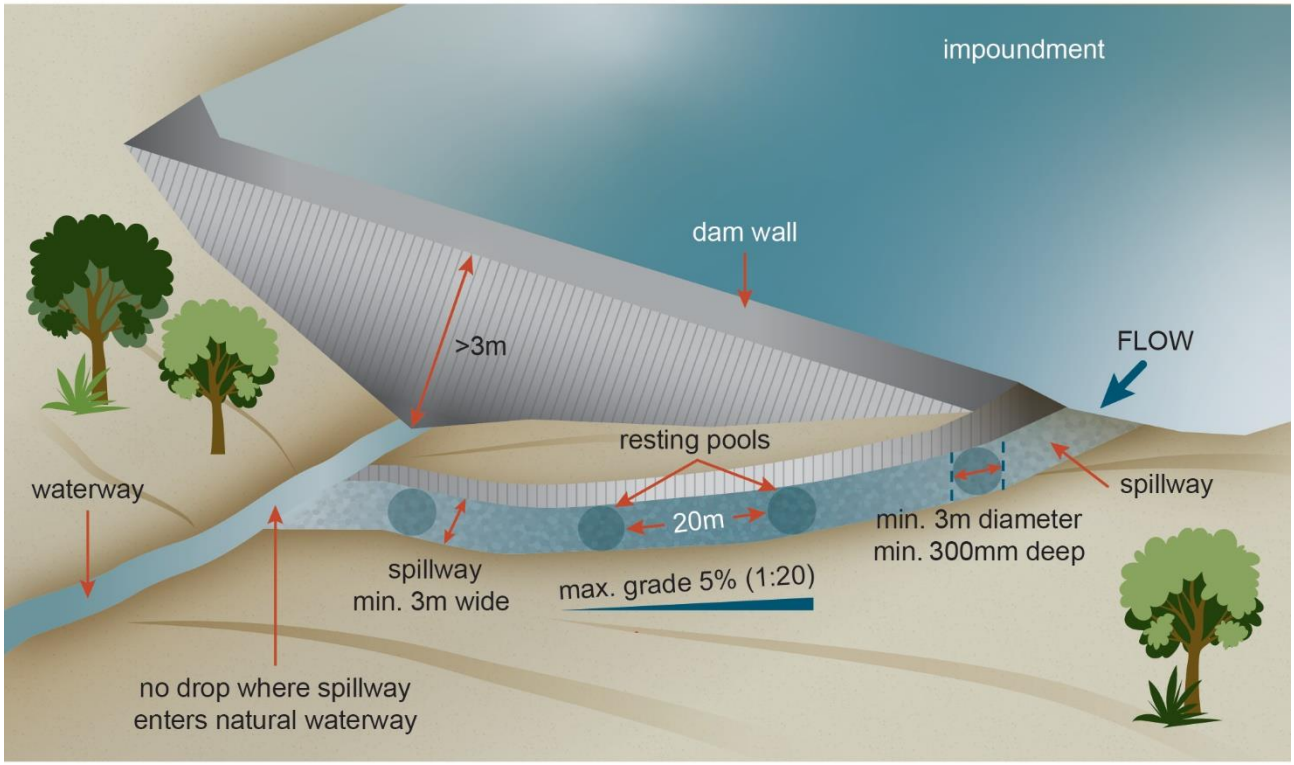

Figure 28. Dam greater than 3m high with resting pools in spillway (5%) – green waterway

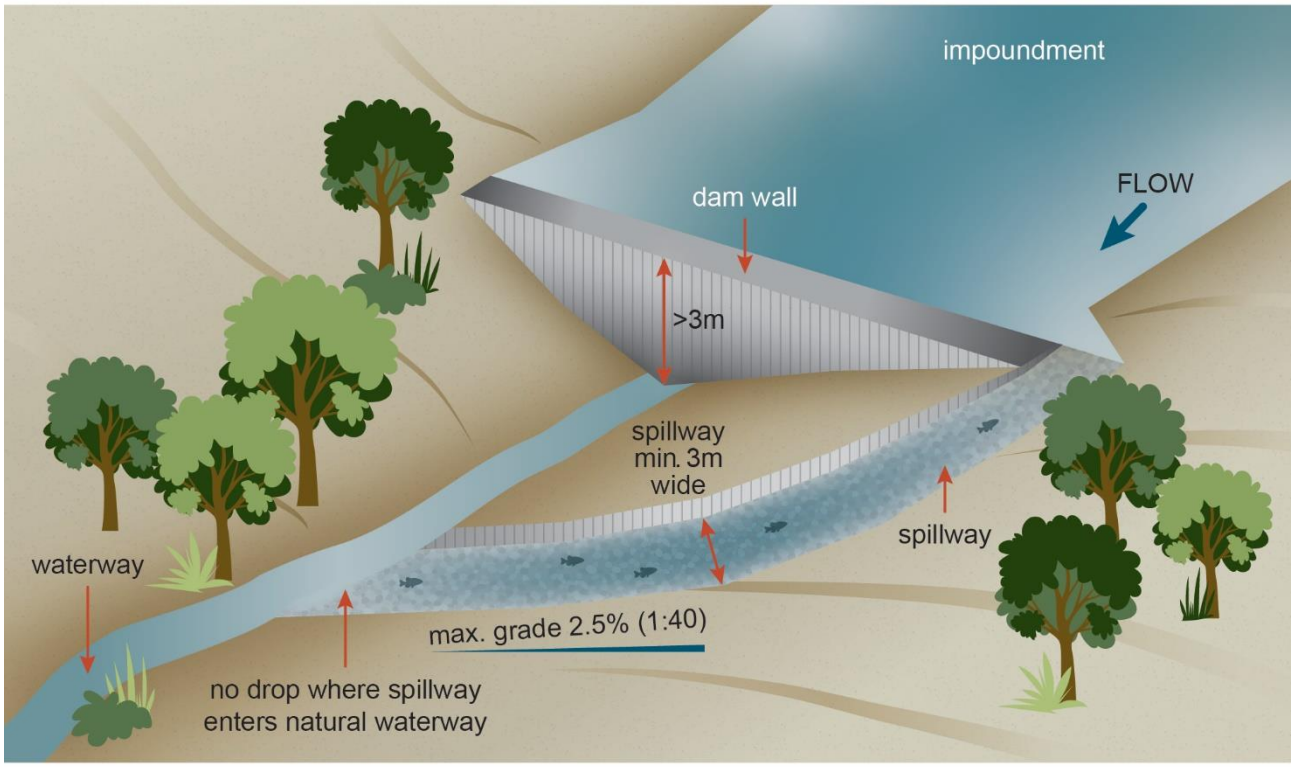

Figure 29. Dam greater than 3m high with spillway (2.5%) – green waterway

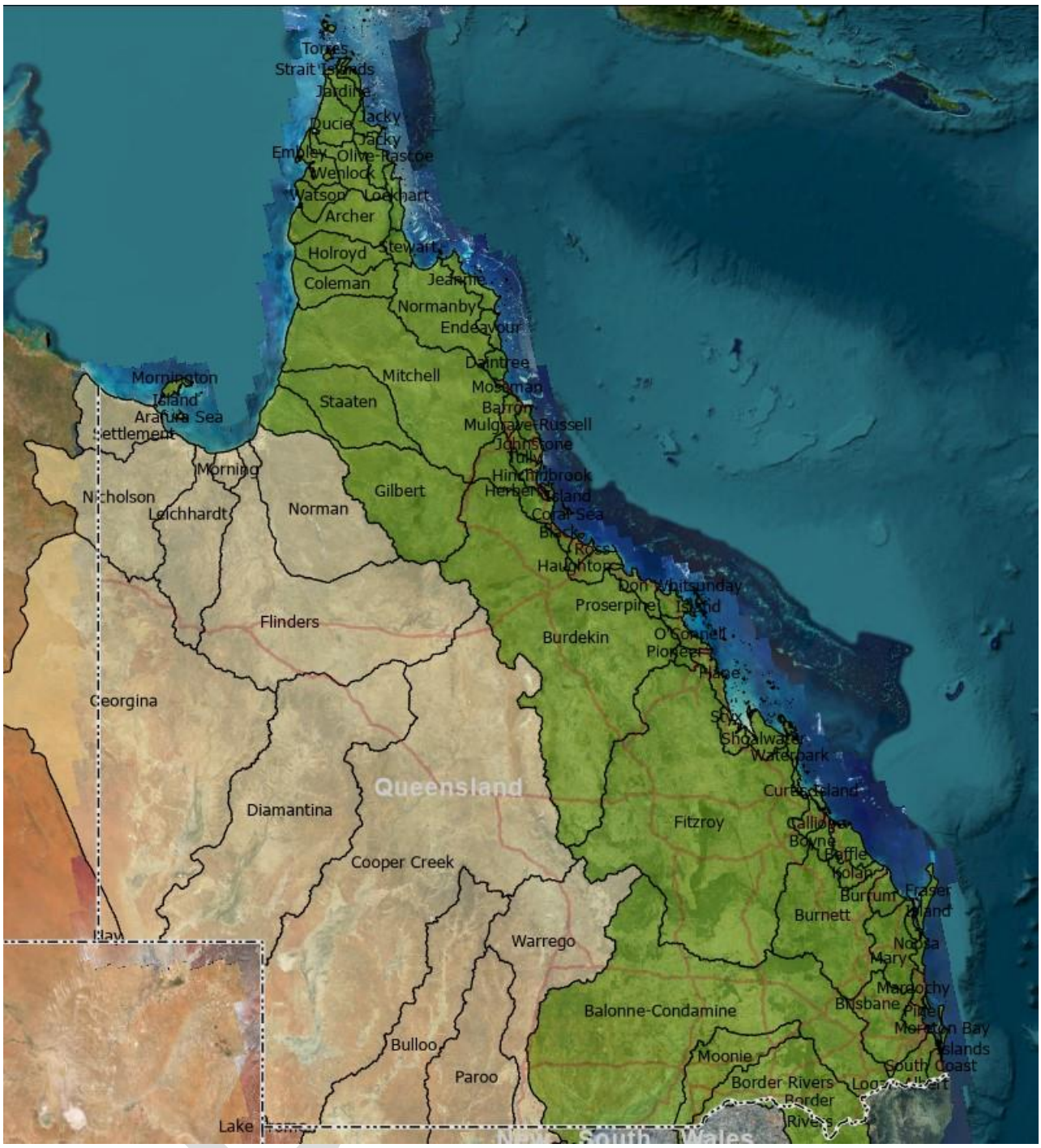

Figure 30. Eastern and western drainage basins

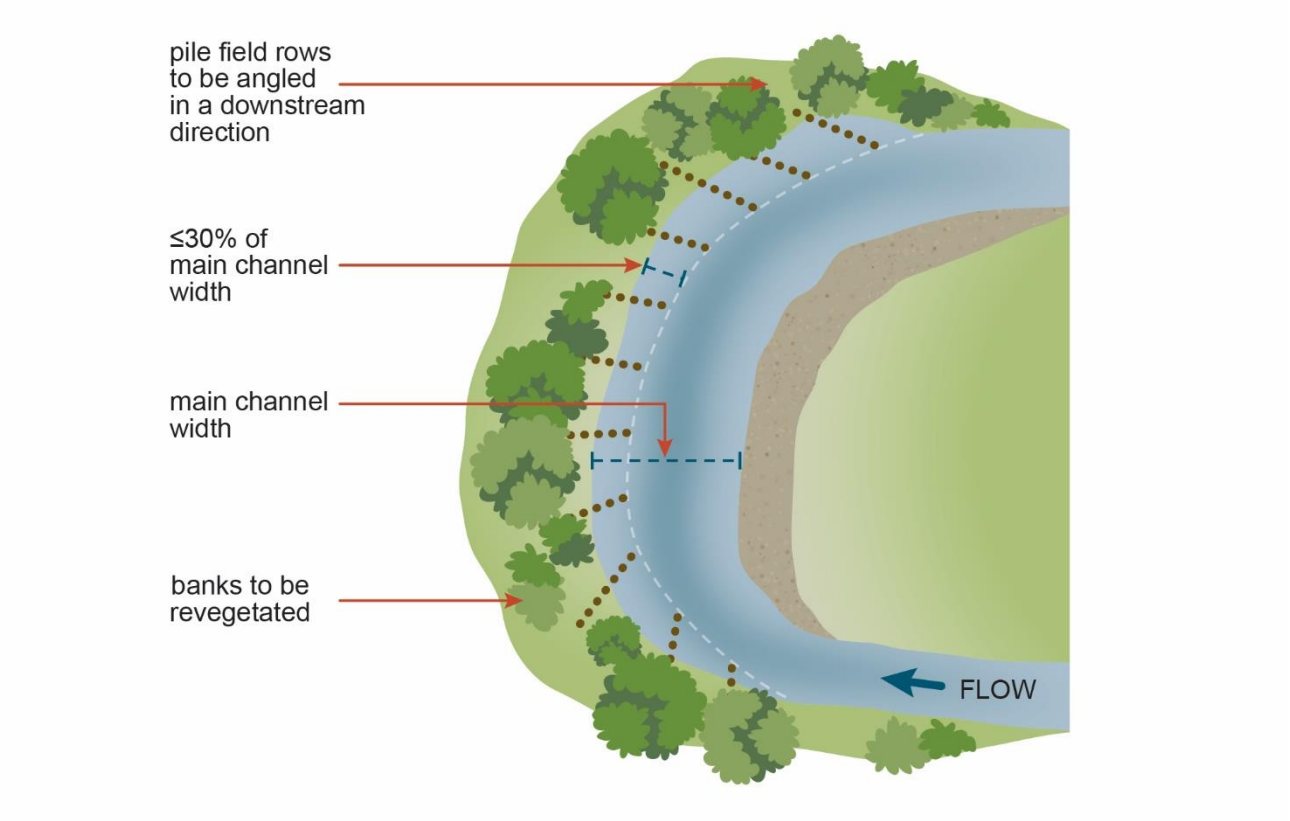

Figure 31. Pile fields (plan view) – purple, red, amber and green waterways

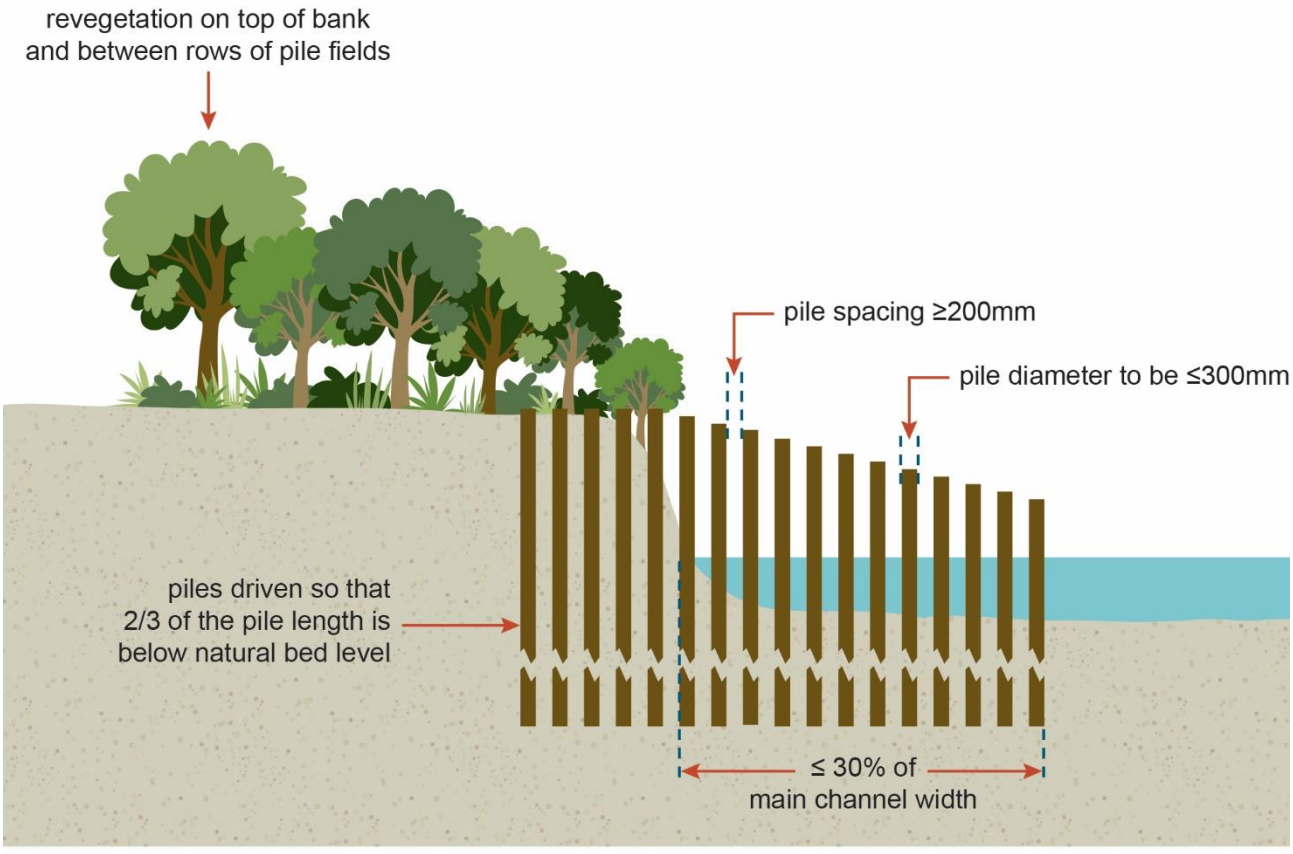

Figure 32. Row of piles (cross-section of part-waterway) – purple, red, amber and green waterways

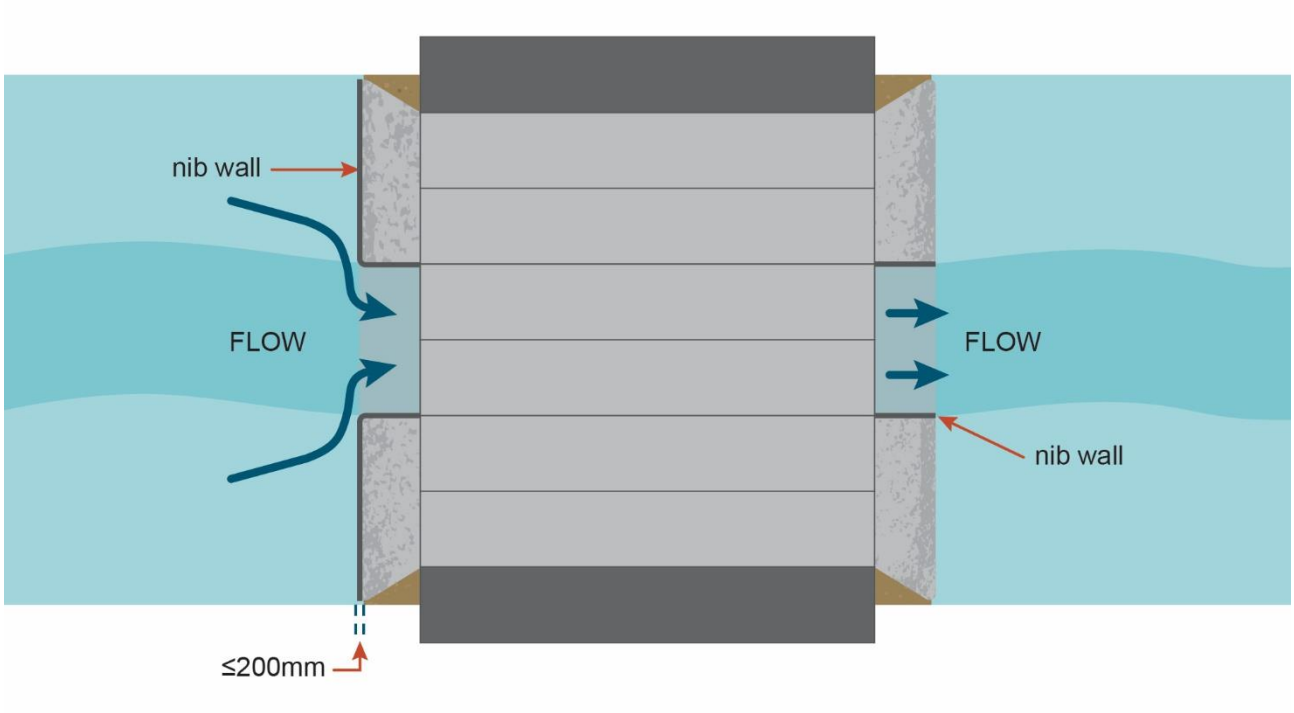

Figure 33. Interim nib walls on existing culvert crossing (plan view) – tidal (grey), purple, red, amber and green waterways

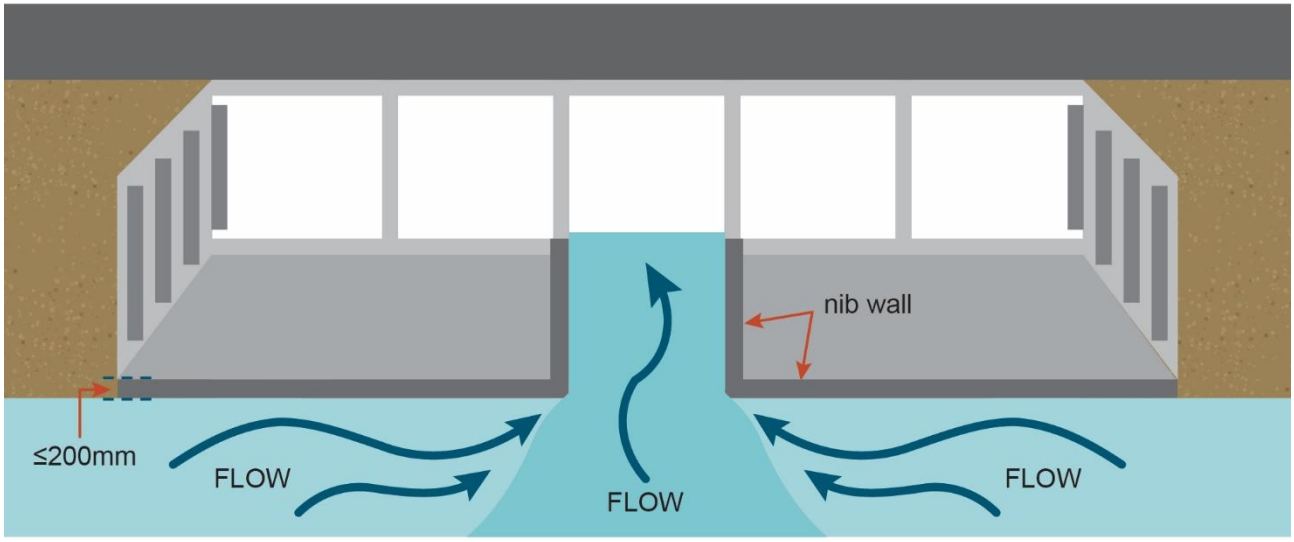

Figure 34. Interim nib walls on existing culvert crossing (cross-section of waterway) – tidal (grey), purple, red, amber and green waterways

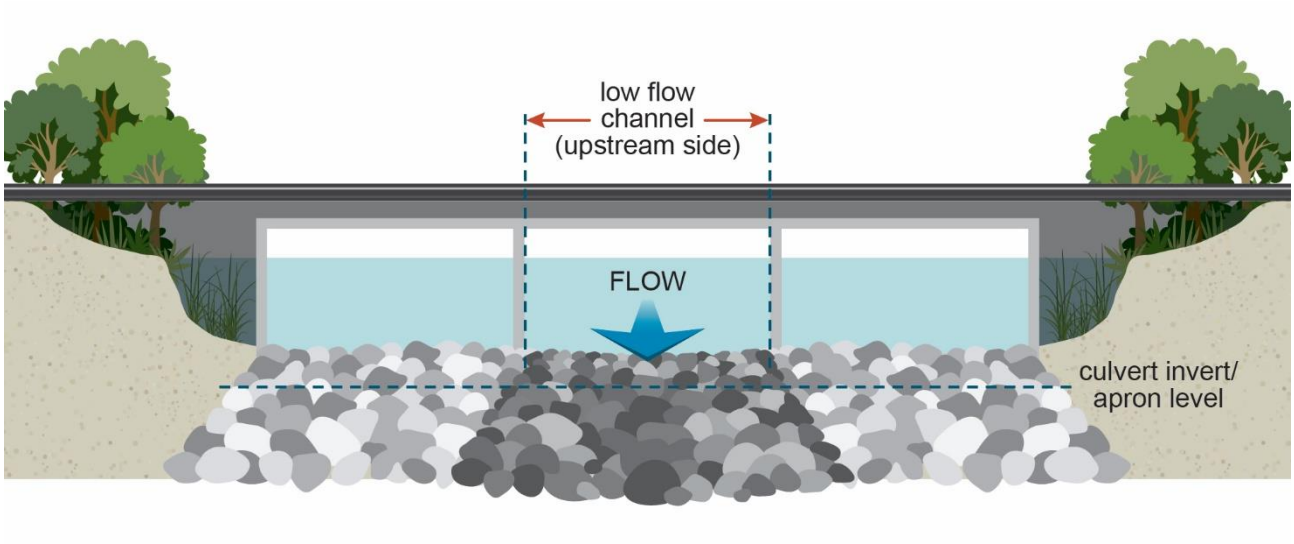

Figure 35. Interim rocked fish ramp on existing culvert crossing (cross-section of waterway) – purple, red, amber and green waterways

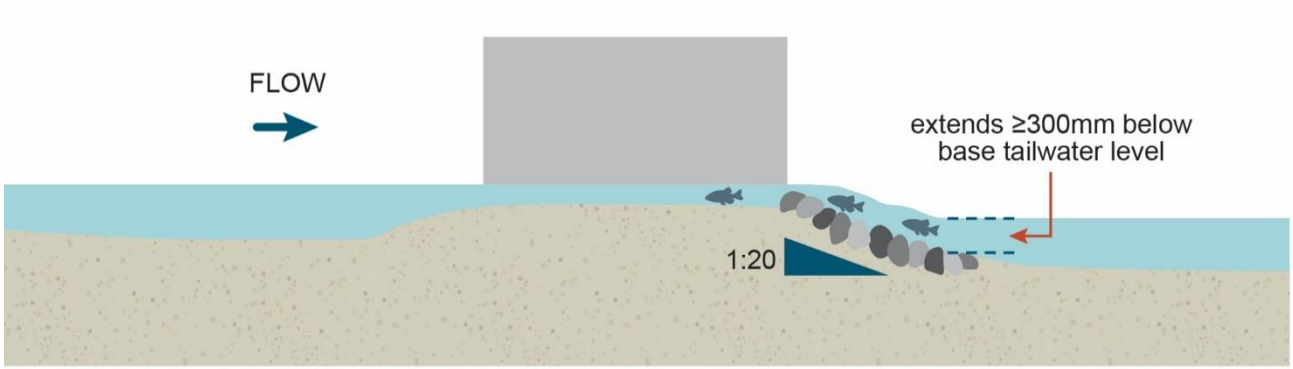

Figure 36. Interim rocked fish ramp on existing culvert crossing (long-section of waterway) – purple, red, amber and green waterways

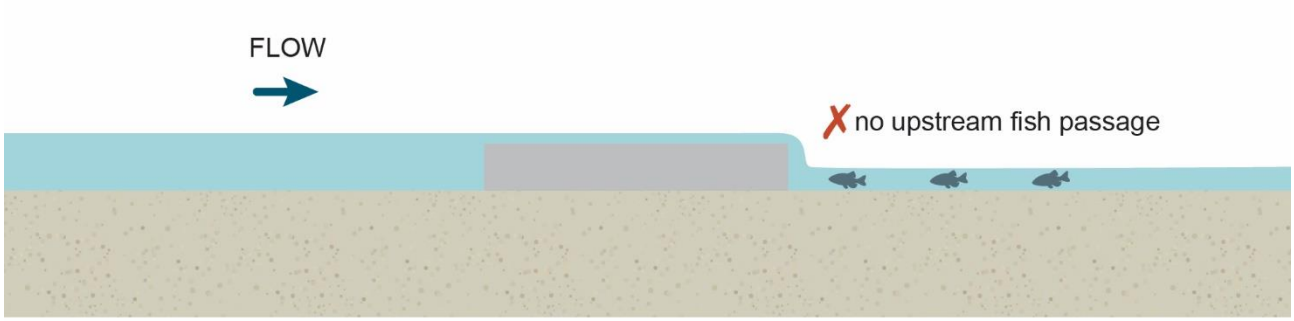

Figure 37. Water overtopping causeway or culvert crossing (long-section of waterway)

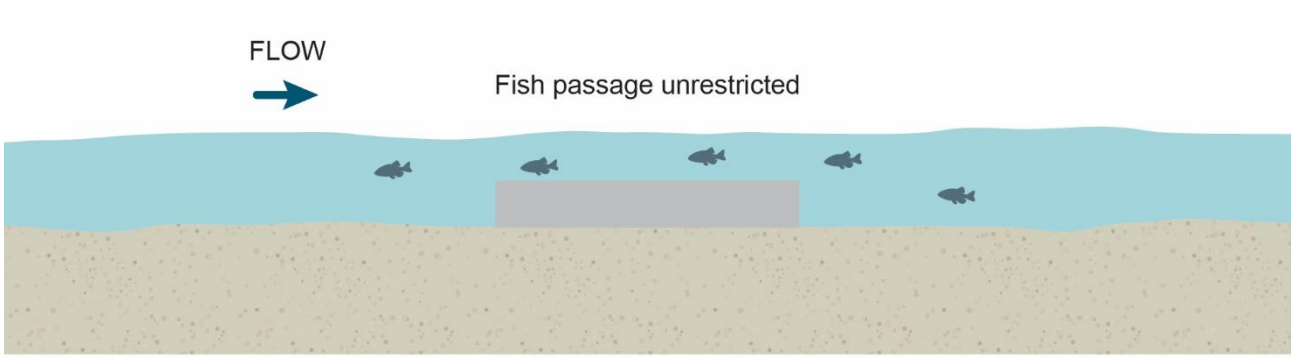

Figure 38. Causeway or culvert crossing is drowned out (long-section of waterway)

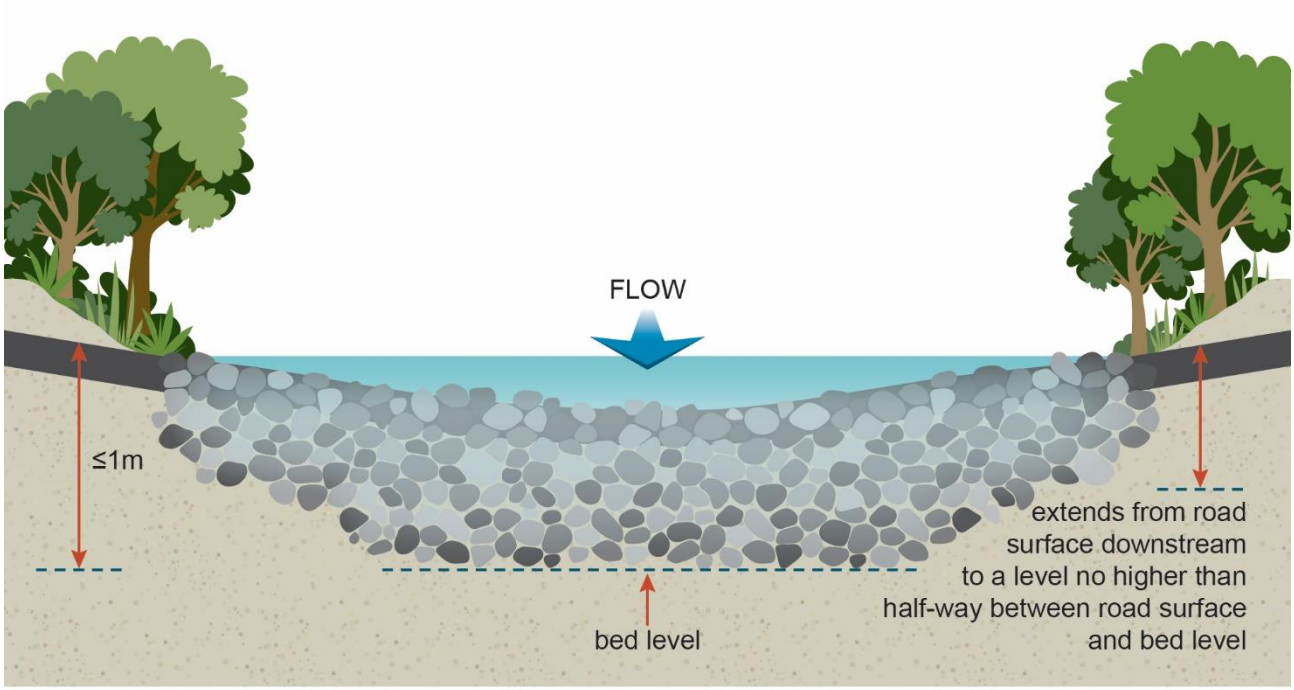

Figure 39. Interim rocked fish ramp on existing causeway (cross-section of waterway) – purple, red, amber and green waterways

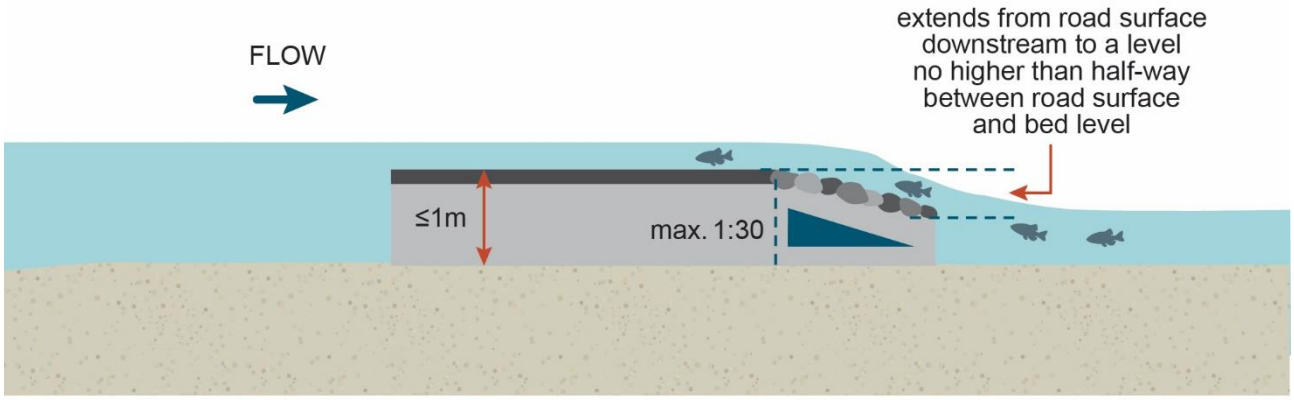

Figure 40. Interim rocked fish ramp on existing causeway or culvert crossing (long-section of waterway) – purple, red, amber and green waterways

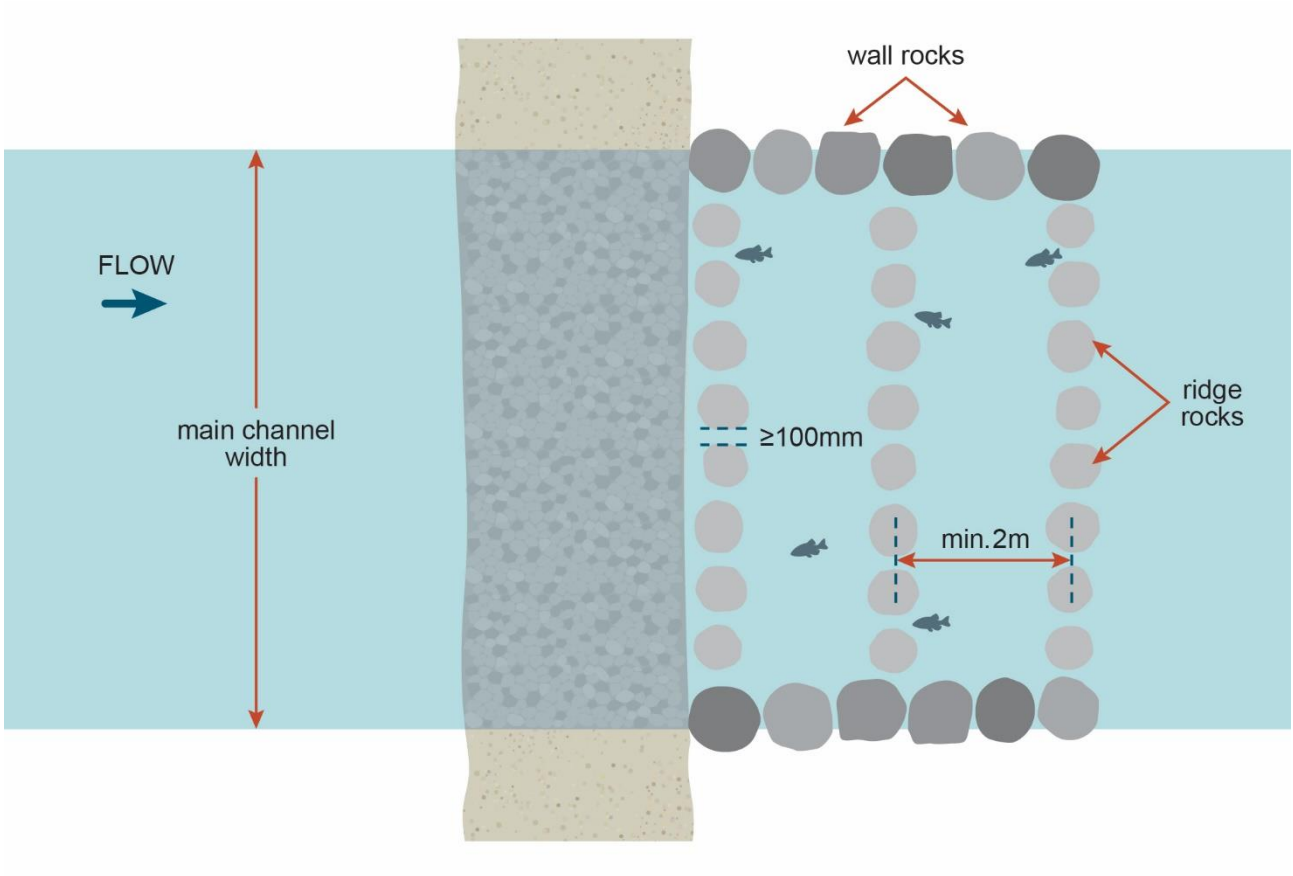

Figure 41. Interim full-width rock ramp fishway on existing causeway or weir (plan view) – amber and green waterways

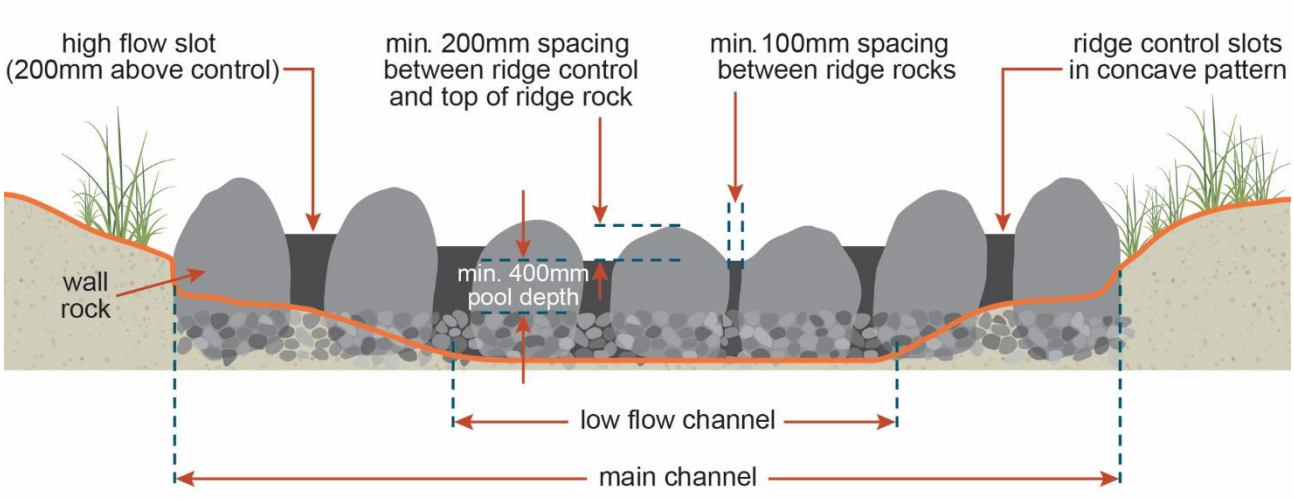

Figure 42. Interim full-width rock ramp fishway on existing causeway or weir (cross-section of waterway) – amber and green waterways

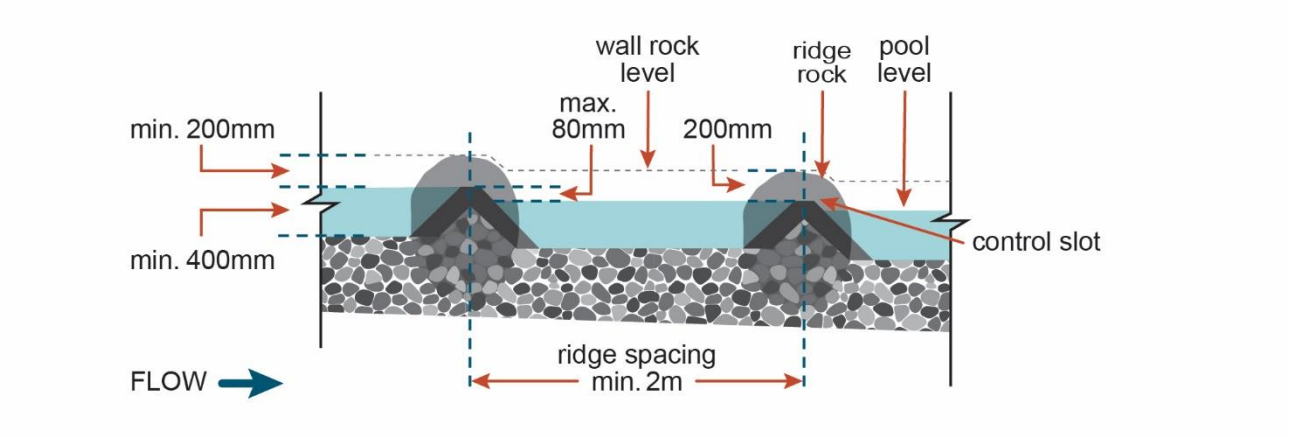

Figure 43. Interim rock ramp fishway showing pool and rock detail (long-section of waterway) – amber and green waterways

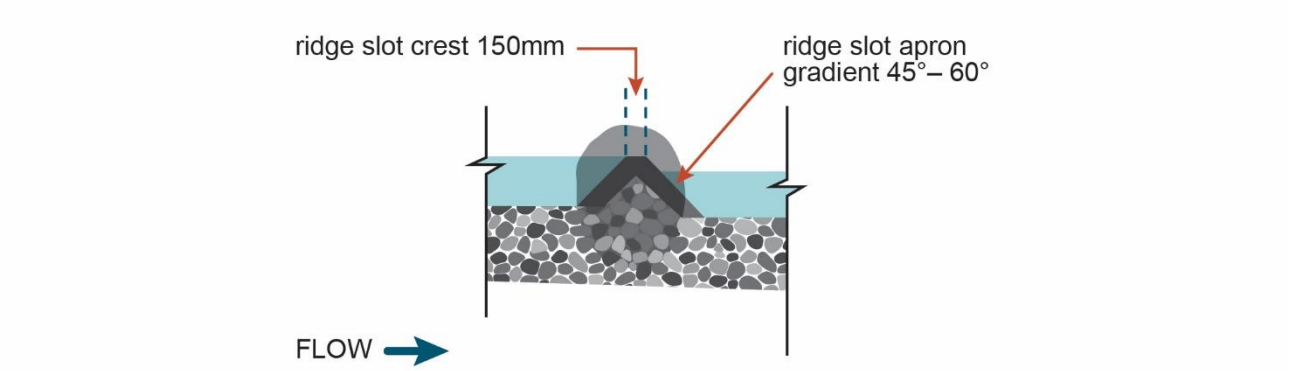

Figure 44. Interim rock ramp fishway showing ridge detail (long-section of waterway) – amber and green waterways

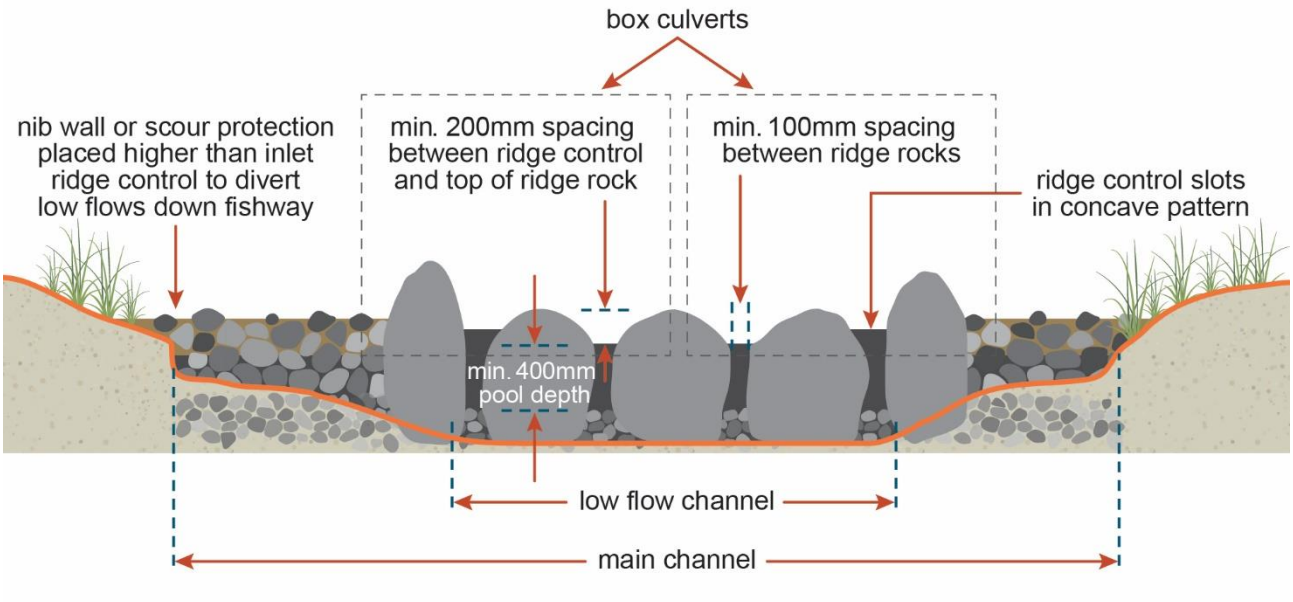

Figure 45. Interim partial-width rock ramp fishway on existing culvert crossing (cross-section of waterway) – amber and green waterways

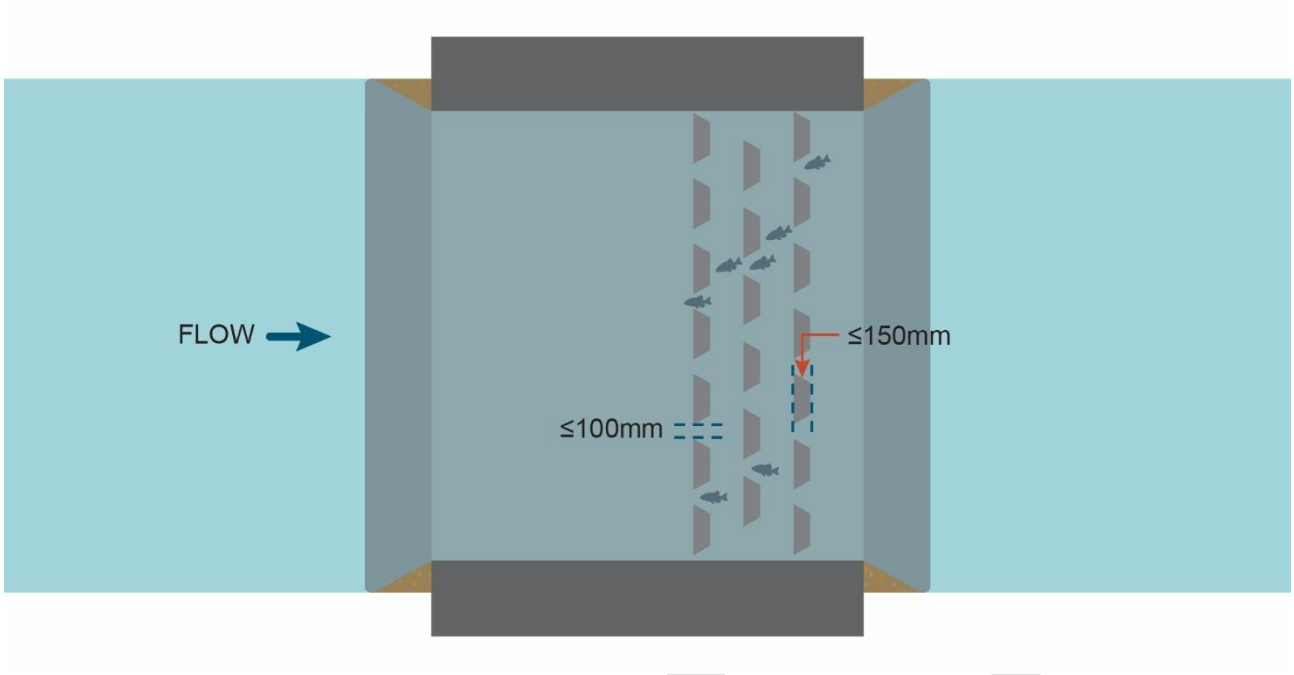

Figure 46. Interim floor baffles on existing culvert crossing (plan view) – tidal (grey), purple, red, amber and green waterways

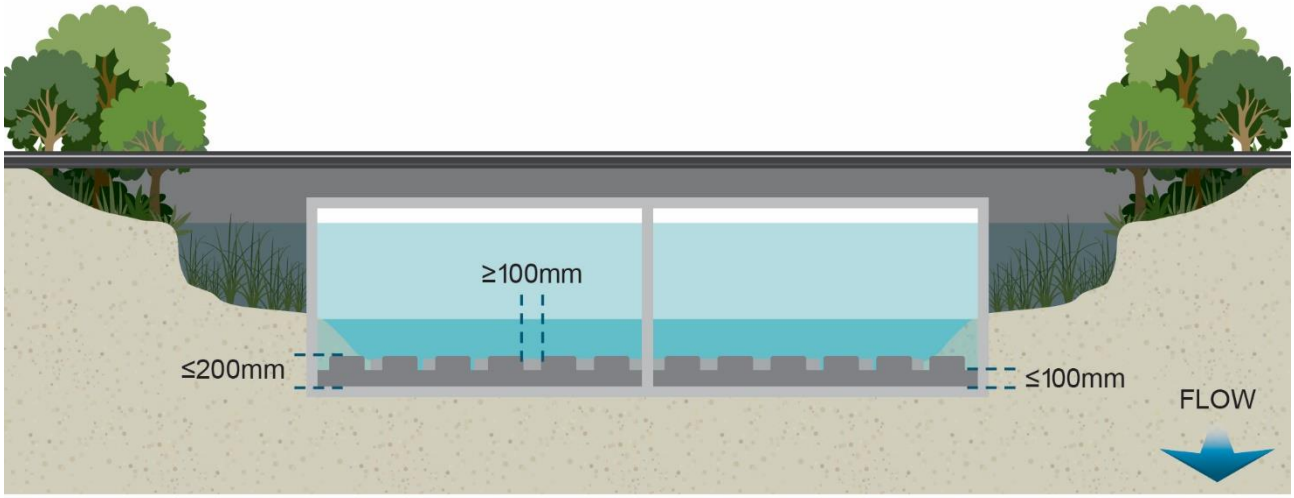

Figure 47. Interim floor baffles on existing culvert crossing (cross-section of waterway) – tidal (grey), purple, red, amber and green waterways

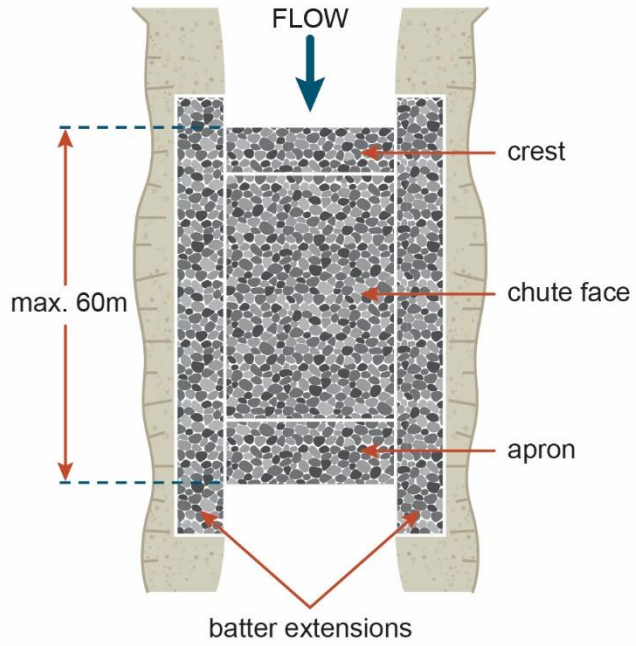

Figure 48. Rock chute (plan view) – green waterway

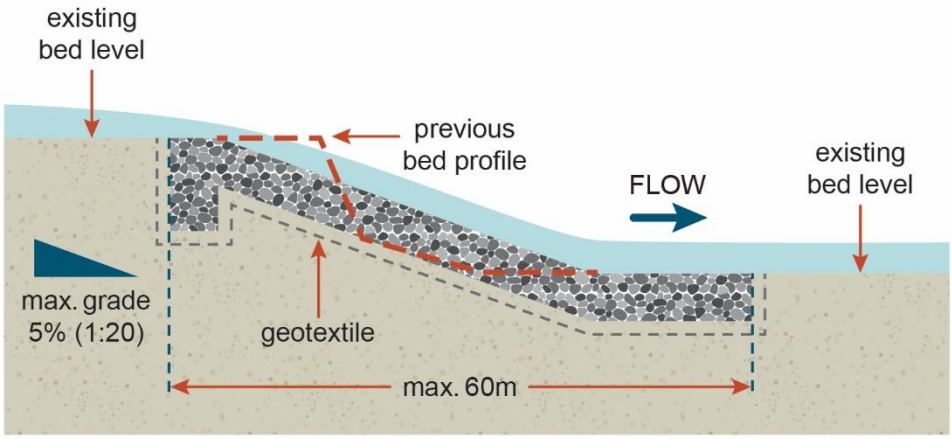

Figure 49. Rock chute (long-section of waterway) – green waterway

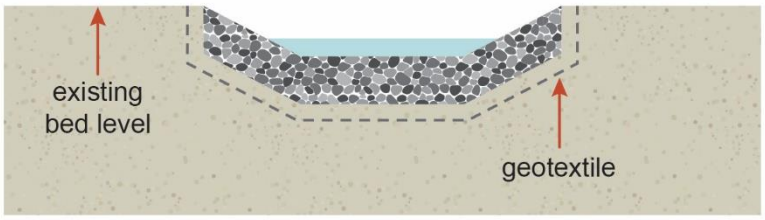

Figure 50. Rock chute (cross-section of waterway) – green waterway

Figure 51. Partial removal of tidal bund downstream looking upstream (long-section of bund)

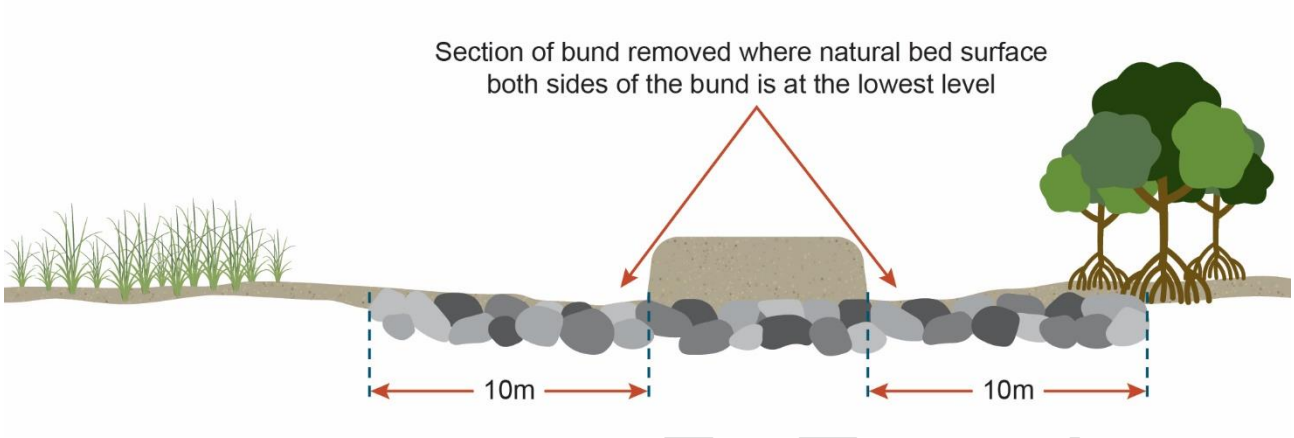

Figure 52. Partial removal of tidal bund (cross-section of bund)

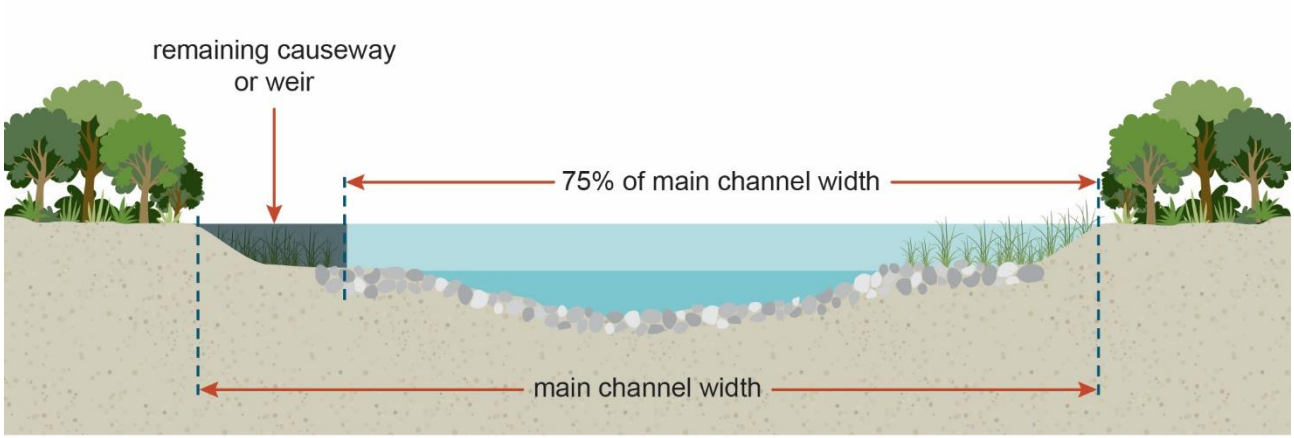

Figure 53. Partial removal of causeway or weir (cross-section of waterway) – red, amber and green waterways

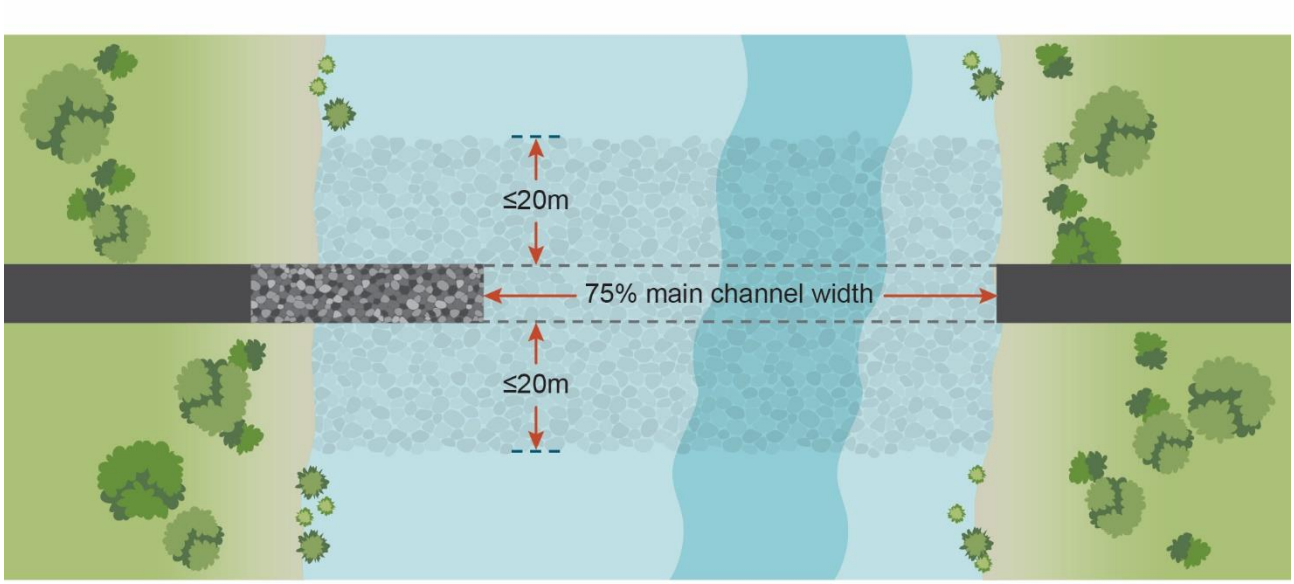

Figure 54. Partial removal of causeway or weir (plan view) – red, amber and green waterways

12.2 Appendix 2: Main channel

The **main channel** of a **waterway** is the active component of the flow channel.

Most creeks and rivers display geomorphological features indicative of the main (active) channel. This may include more than one active channel for a given **waterway**, especially in low gradient **waterways** with sand and gravel sediments. A small number of **waterways** may not display indicators for the **main channel**, such as those incised in bedrock.

In many **waterways** the **main channel** is within the high banks, however this is not always the case and in some **waterways**, the **main channel** width approximates the location of the high banks. The location of the **main channel** width is site specific, however the following features may be used to help identify the limits of the **main channel**. These features or indicators are often characterised by a distinct change in the appearance of the bank at a certain level, including:

- undercutting
- changes in vegetation density
- sudden changes in bank slope
- boundary levels for water marks
- mosses or lichens
- changes in sediment particle size
- the height of a point bar (sediment bar) on the inside of a meander bend.

The determination of the **main channel** should be made in an area of the **waterway** that is relatively stable and not severely altered by localised scouring and erosion or modified by **development**. Where the **main channel** width is variable at a given site, an average width for the site may be used for determining dimensions of the **waterway**.

Overseas studies have found that the dominant active channel forming flow occurs at an average recurrence interval between 1 and 2 years.[7] [8] This modest flow forms and maintains the **main channel** of a given **waterway**, with larger flow events potentially altering its course and flow path.[9] Knowledge of these flow levels can help in identifying the **main channel**.

The following photos are examples of **waterways** throughout Queensland and show the main (↔) and **low flow** (↔) channels. The titles refer to the colour coding used in the *Queensland waterways for waterway barrier works* mapping. In some **waterways** the **low flow** and **main channels** may be difficult to differentiate such as the waterhole sections of wallum and low slope and/or braided western **waterways**.

Main channel ↔

Low flow channel ↔

[7] Dunne, T. and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman & Co. New York. 818pp.

[8] Q1 – Q2 or annual exceedance probability (AEP) equivalent.

[9] Water and Rivers Commission, 2000. *Stream Channel Processes: Fluvial Geomorphology.* Waters and Rivers Commission River Restoration Report No. RR6.

Image 1: Purple waterway —Bottle Creek (Rosedale)

Image 2: Purple waterway—Elizabeth Creek (Burketown)

Image 3: Purple waterway—Gilliat River (Julia Creek)

Image 4: Purple waterway—Splitters Creek, Bundaberg

Note: Blue line indicates the cease to flow level for this waterhole.

Image 5: Red waterway—Un-named Tributary (Rosedale)

Image 6: Red waterway—Splitters creek (Bundaberg)

Image 7: Amber waterway—Un-named Tributary (Baffle Creek)

Image 8: Amber waterway—Magowra Creek (Normanton)

Image 9: Amber waterway—Un-named tributary (Condamine)

Image 10: Green waterway—Butha Creek (Great Sandy Straits)

12.3 Appendix 3: Site photograph instructions

Site photograph instructions

Figure 1 depicts where the photographs need to be taken at a given **waterway** for pre- and post-works notification.

If any additional photos are considered to provide a more accurate representation of the works on-ground, in particular for remediation works, these should also be supplied.

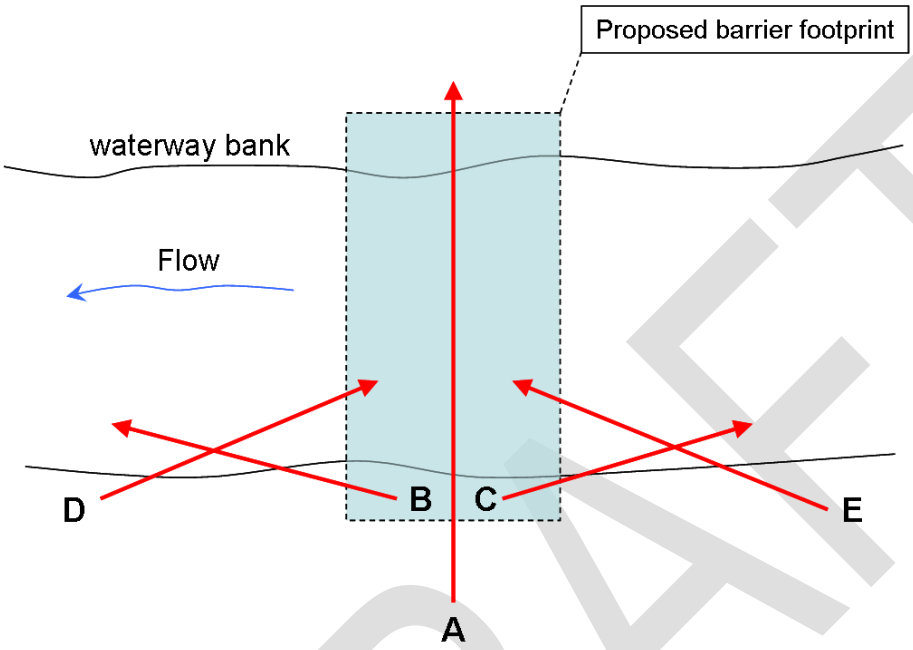

Figure 1: Generalised plan view of a site showing the location of photos to be taken for pre- and post-works notification.

Example of notification photos

A minimum of five photographs need to be taken of the waterway both before and after the **works** are completed at the same photo locations. The below examples are from a post works scenario.

Photo A: Looking across the waterway.

Photo B: Looking downstream (after waterway barrier works).

Photo C: Looking upstream (after waterway barrier works).

Photo D: Looking at the completed waterway barrier works from a downstream position.

Photo E: Looking at the completed waterway barrier works from an upstream position.

12.4 Appendix 4: Criteria and capabilities of a suitably qualified and experienced fish passage professional

Specialised knowledge is required to understand the biology and behaviour of native fish and how structures can be designed or modified to provide effective fish passage. Remediation work under sections 8.2, 8.4, 8.5, 8.6, 8.7, and 8.8 must be overseen by a suitably qualified and experienced fish passage professional.

A fish passage professional must:

- understand the aquatic biology and ecology of Queensland's native fish species, including fish behaviour, swimming ability, life cycles, and movement patterns
- have personal experience in the design, construction, operation, **monitoring** and maintenance of rock ramp fishways
- understand how the remediation work will be able to be successfully built and commissioned to remediate and provide adequate fish passage, taking into consideration size of the **waterway barrier work**, flow capacity, fish community, species composition and biomass.