Constructing ford crossings over waterways

Current Recommended Practice

greenadelaide.sa.gov.au

GREEN ADELAIDE

Contents

Part 1

1.1 What is the purpose of this document?

This Green Adelaide Current Recommended Practice (CRP) outlines the procedure that applies if you are planning to construct a ford across a waterway within the Green Adelaide region. It sets out whether a Water Affecting Activity (WAA) permit is required for the activity and how the activity must be undertaken to be exempt from a WAA permit.

This document is in three parts:

- Part 1 guides you in determining whether or not a permit (and/or other approval) is required.
- Part 2 sets out the outcomes that MUST be achieved, if the activity will be undertaken in line with this procedure and without a permit.
- Part 3 provides information and guidance on methods and techniques that can be used to ensure the required outcomes are achieved.

Note: in this procedure, the term 'waterway' includes creeks, rivers, lakes, springs, wetlands, on-stream dams, estuaries and other natural watercourses, whether modified or not. The procedure also applies to the floodplains of these waterways.

1.2 What is a ford crossing?

A ford crossing provides a simple and low impact way for people, vehicles and animals to cross a waterway. It may be natural or constructed and is characterised by its low profile, being at ground level along the bed and banks of the waterway.

This CRP applies only to the construction of fords across waterways

Culverts, bridges and any other type of crossings that may result in the placement of structures or materials in a waterway are not covered by this procedure, and will require a WAA permit. These structures require professional engineering advice and design to ensure they are safe and suitable for the intended purpose. Contact Green Adelaide to discuss your situation further and for information on how to apply for a WAA permit.

1.3 Background

Under the *Landscape South Australia Act 2019,* specific activities that affect waterways in the Green Adelaide region can only be undertaken with a WAA permit. These activities are set out in sections 104(3) and 104(4) of the Act.

The Green Adelaide board has approved that WAA permits are not always required if the activity is undertaken in line with an agreed CRP such as this procedure. These CRPs have been developed to help reduce 'red tape' and encourage landholders to properly manage waterways. There are penalties that may apply if you undertake activities without the necessary permit, or if you don't follow this procedure correctly.

1.4 How do I use this procedure?

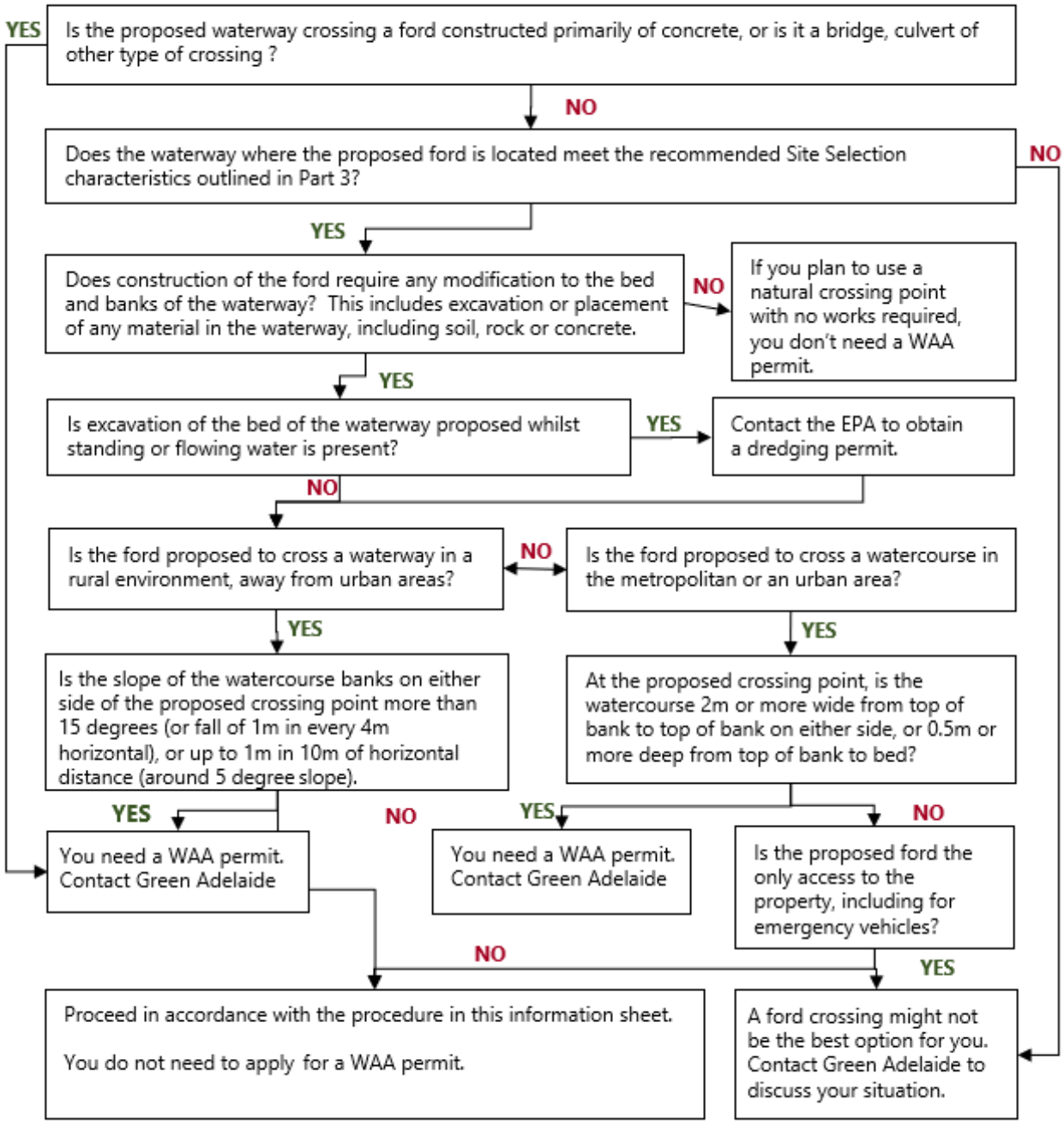
1. Confirm whether your property is in the Green Adelaide area, consulting the map at greenadelaide.sa.gov.au/about-us#ourarea or by contacting Green Adelaide.
2. Use the decision tree below to check whether you can undertake your activity without a WAA permit. If you are not sure, contact Green Adelaide.
3. If you need to apply for a permit, go to greenadelaide.sa.gov.au/discover/water-plans-permits
4. If you determine that you do not need a WAA permit, you should then read Parts 2 and 3 of this procedure carefully, before going ahead with your ford crossing construction activity. Make sure you understand the required outcomes and follow the described methods which will help you to achieve these outcomes.

Whether you require a permit or are exempt, it is a good idea to talk to any neighbours or others that share the waterway or floodplain ownership with you about the activities you're proposing. The construction of a crossing is likely to impact on them and their property. If you share a boundary or easement, you may be legally obliged to consult other property owners.

If the proposed ford construction works involves the removal of vegetation you may need a permit to remove this vegetation. Consult the CRP for *Removing vegetation from waterways* to determine whether you need a WAA permit, and possibly a Native Vegetation Clearance permit.

If this procedure does apply to your proposed works and you are exempt from a WAA permit, you must carefully plan the works and determine whether you can successfully undertake them before commencing.

1.5 WAA Permit requirement decision tree



Part 2

2.1 Required outcomes

To comply with this procedure you must achieve the outcomes identified in the following table. Further information on required outcomes is available in Green Adelaide's Water Affecting Activity Control Policy at greenadelaide.sa.gov.au

If the work method you propose is different to the advice presented in this procedure, or if you are unable to meet any of these required outcomes, you must contact Green Adelaide to discuss your situation before proceeding.

Outcome	How to achieve the outcome
Constructing a ford must not cause adverse effects on water-dependent ecosystems, or the migration of aquatic biota.	Refer to Part 3, Design considerations.
Constructing a ford must not cause erosion.	Refer to Part 3, Site selection, and Design considerations.
Constructing a ford must not adversely impact upon the natural flow of a waterway.	Refer to Part 3, Design considerations.
Constructing a ford must not increase the risk of flooding, upstream or downstream.	Refer to Part 3, Design considerations.
Constructing a ford must not be constructed where it, or any debris collected by it, would increase the risk of damage to property or the risk to safety of persons.	Refer to Part 3, Site selection, and Design considerations.

Part 3

3.1 Installing a ford crossing

This part of the procedure provides you with guidelines and information to assist you in achieving the required outcomes set out in Part 2.

The following advice applies only to the construction of fords that meet the requirements outlined in the WAA Permit Requirement Decision Tree. For fords that do not meet these requirements, and for all other types of crossings you must apply for a WAA permit, and this will generally require that you obtain design advice from a suitably qualified professional.

Ford crossings provide the most environmentally friendly and least disruptive way to gain access across a waterway. By following the design and construction advice in this information sheet you can ensure that:

- the disruption or concentration of flow leading to erosion of the waterway is minimised
- the likelihood of flooding due to waterway blockage is minimised as debris is able to pass across the ford
- fish and other aquatic animals have uninterrupted access up and downstream of the ford

- your ford provides you with many years of safe and uninterrupted access across your waterway.

If the waterway flows all year round and you must undertake excavation work whilst standing or flowing water is present you will need to contact the Environment Protection Authority (EPA) to determine whether a dredging permit is required. The EPA includes the excavation of solid matter from the bed of any inland waters (including waterways) in the definition of dredging.

Whether a dredging permit is required or not you must still achieve the required outcomes set out in Part 2.

Site selection

The considered and careful location of the ford can reduce construction and ongoing maintenance costs, minimise the environmental impact, and increase the lifetime of the structure. To make sure the ford meets the required outcomes as well as your own needs in the long term it should be located as much as possible as follows:

- Along a straight reach of the waterway where flow is directed through the centre of the channel as meandering waterway reaches are active erosion or sediment deposition zones and may damage or cause misalignment of the ford across the waterway.
- Along a naturally rocky reach of the waterway, in order to provide a more stable foundation for all weather access.
- In shallow water (when flowing) and never through deeper pools to allow best chance of year-round access across the waterway, and will minimise the potential impact on aquatic animals that rely on the pool for habitat. To avoid impact on ecosystems fords should not be located between two closely spaced pools as this may impact on the migration of fish and other aquatic animals from one pool to the other.
- Along reaches where the grade approaching the waterway is shallow, and where the waterway banks are stable, showing no signs of excessive (steep sided) erosion.
- The grade of the banks leading into and out of the waterway must not exceed a maximum slope of 1m fall for 4m of horizontal distance (around 15^{O} slope), or up to 1m in 10m of horizontal distance (around 5^{O} slope).
- Away from high value environmental aquatic and riparian habitat. Do not remove vegetation unnecessarily as this is integral to the long-term success of the ford. If you do need to remove vegetation refer to the CRP "*Removing vegetation from waterways*" to determine whether you need a permit.
- Away from areas with known significant cultural heritage. You have legal responsibilities with regard to Aboriginal Cultural Heritage when carrying out works on or around waterways. For more information visit - agd.sa.gov.au/aboriginal-affairs-and-reconciliation

Design considerations

A generic design for a ford is provided in Figure 1. Whilst the design detail of your ford may vary to accommodate your specific site conditions, the main design elements should be adhered to, as they are necessary to achieve the required outcomes.

Good design will ensure that the ford meets your needs over the course of the year and is around for the long term. It will also ensure that damage to the waterway bed and banks, aquatic plants and animals, and the surrounding area is minimised both during construction and in the future.

The design of the ford will determine how it functions and the extent to which it is integrated into the natural environment. A good design will produce good outcomes. When designing the ford you should consider the outcomes in the following table:

Design consideration	Outcomes	How to achieve the Outcome
Intended function of the ford	• The ford accommodates and facilitates the intended weight, type and frequency of traffic, including animals and vehicles. • The design (including materials) is suitable for the intended life of the ford.	• Consider your long-term needs. • Good site selection (refer to Part 3, Site selection) • Good design (refer to Part 3, Design considerations 1 to 6)
Waterway geomorphic processes	• The natural bed and bank profile is preserved. • The natural movement of sediment and debris at times of flow is not inhibited. • The bed and banks are protected from scour (the removal of sediment) and erosion during storms. • Where bed scour and erosion exist, the ford design should address erosion to protect the structure and restore bed and bank stability.	• Good site selection (refer to Part 3, Site selection) • Good design (refer to Part 3, Design considerations 1 to 4).
Maintain natural flow regimes	• The ford accommodates the range in waterway flow velocity and water depth. • Natural waterway flow depth and velocities are maintained. • Upstream water levels and flow are not detained and elevated behind the ford crossing. • The gradient of the bed and banks is preserved (except where addressing existing bed and bank degradation).	• Good design (refer to Part 3, Design considerations 1, 2 and 4).
Waterway ecological processes	• Waterway environmental functions are protected from harm. • Fish and other aquatic animals are able to freely migrate along the waterway up and downstream of the ford. • Disturbance of the riparian zone is minimised and vegetation cover is maintained to protect the stability of the ford and for habitat.	• Good design (refer to Part 3, Design considerations 2 and 6)

1. Flow depth and velocity

To better understand the likely range of water flow depth and velocity the ford should be designed to accommodate, it is highly recommended that you observe flow conditions in your waterway over the course of at least one year. If the bed of the waterway is dominated by rocks greater than 100mm in size the velocity of flow at the ford crossing is likely to be greater than 2 metres/second. If the bed of the waterway is dominated by soils and erosion is evident, the velocity of flow at the ford crossing is likely to be greater than 1 metre/second. Be aware that light vehicles become unstable in flood waters when the flow velocity is greater than 2.5 metres/second and flow depths are greater than 100mm.

2. Ford crossing dimensions

Width: for safety, a crossing designed for livestock or vehicle access should be a minimum of 3 metres wide. Where the ford is likely to provide access across a waterway when it is flowing a minimum width of 4 metres will provide additional clearance for vehicles when the crossing is submerged.

Length: to give you the best chance for year around access, and to minimise the potential for damage to the waterway bed and banks, the ford must extend beyond the expected yearly high water flow mark in the waterway. Ensure that the ford extends at least 300mm above the expected high water flow mark.

Height: to achieve the outcome of not impeding migration of aquatic plants and animals, the surface of the ford must be at the same level or no more than 100mm higher than the waterway bed. If higher than the waterway bed, the ford should transition back to the level of the bed on the immediate upstream and downstream edges of the crossing.

3. Preparing the waterway bed and banks

Good site preparation is critical to a stable and long-lived ford, and minimising the excavation of any materials will minimise long term and permanent damage to the waterway. Selecting a naturally rocky reach of waterway will increase stability and minimise the need for earthworks. Soft or loose soils and vegetation must be removed only from the footprint of the ford and replaced with rock to provide a stable foundation. The soft or loose soils should be excavated to a depth of up to 500mm and replaced with hard rock up to 300mm in size. Excavated soils and vegetation must be moved outside the path of waterway flow so that they can't get washed away and impact on water quality.

Soils exposed by excavation within the waterway may need to be protected from erosion prior to the placement of rock. This is important to protect the ford from undermining due to erosion of fine soils, and to meet the required outcomes. This may be achieved by placing a medium weight geotextile fabric between the hard rock and excavated waterway surface (geotextile is available from most large building materials suppliers and hardware stores). The geotextile needs to be pinned to the waterway foundations.

4. Materials

Only use clean rock in ford construction. Rock should be hard and angular, not flat or round, and should incorporate a range of sizes, from around 300mm to 100mm. At least 90% of the foundation rock should be greater than 150mm in size, with at least 50% around 300mm in size. No more than 10% should be less than 150mm in size.

By incorporating a range of sizes, the rock will "lock" together and provide greater resistance to movement. Finer rock material can be incorporated into the rock towards the surface where a flatter finish may be required. You can expect that waterway flow will move sediment into and across the ford once in operation. This will further improve its trafficability.

Some concrete may be used to bind the rock together and will generally provide a greater design life. However, it also reduces the ability of the rock in the ford to move with natural movement of the waterway bed and banks, potentially leading to erosion and height differences across the ford which need to be corrected by maintenance. A smooth concrete surface should be avoided as it will result in greater flow velocities across the ford, making it difficult for fish passage upstream.

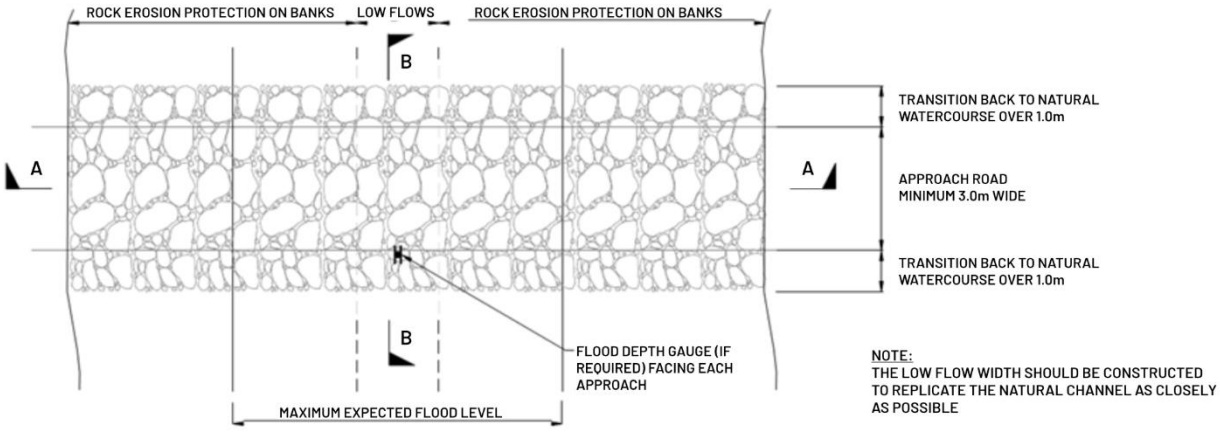
Fords constructed primarily of concrete may require professional engineering design and are not exempt from a Water Affecting Activity Permit under this procedure. If your situation requires a ford crossing constructed primarily of concrete you must apply for a Water Affecting Activity Permit.

5. Safety

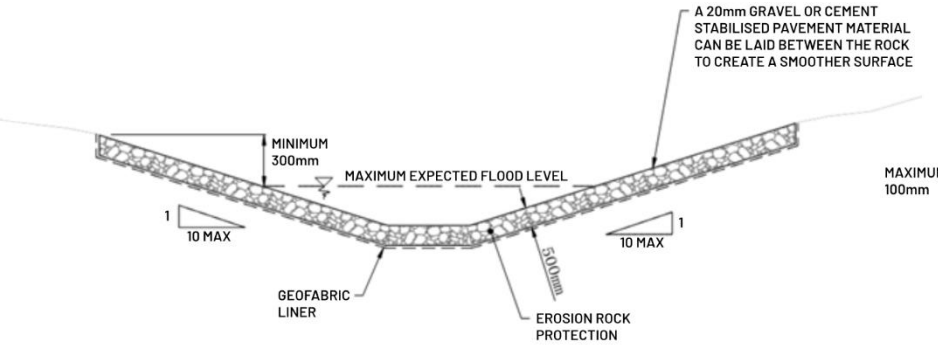
Safety is paramount in the design of any structure crossing a waterway, and particularly in the case of a ford under flowing water. Light vehicles become unstable in flood waters when the flow velocity is greater than 2.5 metres/second and flow depths are greater than 100mm. If you intend to use the ford all year around or if it is likely to be used by someone unfamiliar with the crossing point, it's recommended that you include a depth gauge that shows the height of the water above the lowest point on the ford.

6. Fish passage

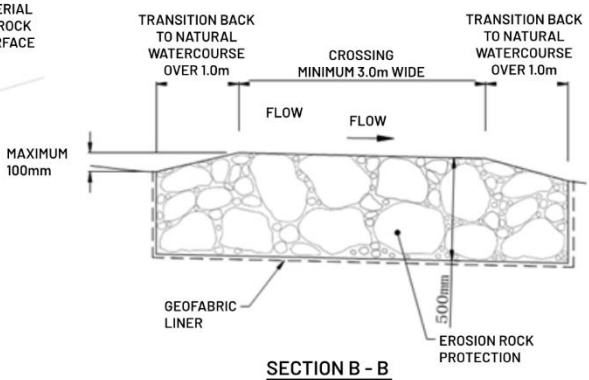
Native fish will migrate upstream and downstream to look for food and habitat, and to live out the stages of their life cycle. Barriers to migration will interrupt any of these activities, lead to isolation of fish populations and potentially loss of that population. Ford crossings that extend up to 100mm above the waterway bed must include a ramp down to natural bed level on both the upstream and downstream sides of the ford. Maintaining a rough "rocky" finish to the ford creates turbulent and lower velocity flow conditions that facilitate fish movement across the structure. Avoid an excessively smooth finish to the ford to assist with maintaining a healthy fish population in your waterway.



PLAN
SCALE 1:100



SECTION A - A
SCALE 1:100



SECTION B - B
SCALE H 1:50 V 1:20

Construction notes

1. Mark out the site, including the approach to the ford and its alignment across the waterway, and establish the finished level for the structure no more than 100mm above bed level.
2. Subject to having any necessary approvals in place, remove native vegetation within the footprint of the ford and where possible preserve it so that it can be replanted adjacent to the ford once construction is completed.
3. If necessary, excavate the footprint of the ford to a maximum depth of 500mm, ensuring that the finished rock surface will be no more that 100mm higher than the waterway bed level.
4. Lay geotextile over the length of the ford foundation. The geotextile should be laid so that any overlapping seams run in the same direction as water flow (that is, should be perpendicular to the length of the ford). Any joins in geotextile should overlap a minimum of 500 mm. Geotextile should be pinned to the soil foundations at 1 m intervals.
5. Where possible, place rock commencing at the downstream side of the ford.
6. Carefully place rock so that the voids between larger rocks are filled with smaller rocks and the ford forms a single interlocking mass of rock.
7. As necessary, distribute finer rock over the surface of the ford to assist in the filling of the voids between the rocks to create a more trafficable surface.

Timing of the works

To achieve the required outcome of avoiding erosion or impacts on ecosystems, ford construction works should be undertaken when the waterway has ceased flowing. If the waterway flows all year around and you must undertake excavation work whilst standing or flowing water is present you will need to contact the Environment Protection Authority (EPA) to determine whether a dredging permit is required.

If your waterway flows all year around you must contact Green Adelaide to confirm how you will ensure there is no adverse impact on water quality and aquatic habitat as a result of the construction works you're proposing.

Monitoring and maintenance

Even a well designed and constructed ford will require maintenance over its life, and you should incorporate this activity into your property management. Regular monitoring and maintenance of the ford will prolong its life and help with the early identification of potential problems. Notes on monitoring and maintaining your ford once constructed are summarised below.

1. Inspect the ford during periods of low flow to ensure that fish passage across the structure is not blocked.
2. Ford crossings should be inspected for damage after significant flow events. Early intervention and repair of erosion will be much more effective and cost efficient in protecting the structure against more significant damage in the longer term.
3. Settlement of rock in the ford may be expected over the short-term following completion. Place additional rock as required.
4. The first high flow events across the ford may dislodge some large rocks and move some of the smaller rock downstream. Ensure that no significant holes or loose rocks develop in the ford. Adjust/move rock as required and place additional rock where necessary.
5. Be particularly mindful of the development of any erosion on the downstream edge of the ford. Act quickly and place additional rock as required.
6. Monitor the edges of the ford, including at either end of the approach to the ford for any sign of erosion. Repair as necessary.
7. Keep a stockpile of the rock used in construction, including any finer rock used on the surface to make sure you are able to respond quickly to maintenance requirements.

Part 4

4.1 Help and further information

Green Adelaide can help

If you are still unsure whether you require a permit or not, please contact Green Adelaide for assistance.

The installation of a ford crossing **must** be undertaken at the right time and in the right way, and Green Adelaide can help ensure your works are best suited for your site.

This is a free service and is aimed at ensuring the best outcome for you, your property and your waterway.

Green Adelaide

T: (08) 7424 5760

E: dew.greenadelaidenews@sa.gov.au

greenadelaide.sa.gov.au

Environment Protection Authority

Website: epa.sa.gov.au

Telephone: (08) 8204 2004

Email: epainfo@sa.gov.au

Note: This document is a **Current Recommended Practice** procedure approved by the Green Adelaide Board, as provided for in Section 2.1 of the *Green Adelaide Water Affecting Activity Control Policy*. The purpose of these procedures is to set out what the board considers to be the most appropriate approach, methodology and/or design for undertaking activities pursuant to section 104 of the *Landscape SA Act 2019*, and the circumstances under which there may be an exemption from the requirement for a Water Affecting Activity permit.