reviewed for this report. The last line of Table 5 sets out the proposed widths for this reach of the creek.

Table 5: Riparian Zone Recommendations for Middle Creek Tributary Upstream of Barnes Road

Source	Classification	CRZ (m)	VB (m)
Guidelines for Controlled Activities: Riparian Corridors	First order stream	10	10
Managing Urban Stormwater: Soils & Construction	Category 2	20	10
Warringah Creek Management Study	Low sinuosity sand bed. Group C	25	5[1]
Proposed Widths		***15***	***5***

Note 1: VB based on recommendations in Appendix D of *Warringah Creek Management Study*

This reach of Middle Creek Tributary represents the headwaters of the creek system. As described in Chapter 4, and shown in Photograph 4, this reach of the creek is highly degraded by trampling as a result of stock access and the absence of any riparian vegetation. It is proposed to rehabilitate this reach of creek to allow the recovery of aquatic habitat, and to provide a CRZ of 15 m and a VB of 5 m. These proposed buffer widths are based on considerations of the existing degraded state of the creek and the fact that the adjoining landscape will be fully managed as part of the site maintenance undertaken by the body responsible for management of the whole site. The proposed CRZ of 15 m represents a compromise between the recommendation for a first order stream as set out in the *Guidelines for Controlled Activities: Riparian Corridors* and the recommendation for a Category 2 stream set out in *Managing Urban Stormwater: Soils & Construction*. The VB width of 5 m is considered appropriate in view of the adjoining managed landscape.

7.4.2 Barnes Road to the Australian Tennis Academy

For simplicity, this reach of Middle creek Tributary will be referred to as the middle reach. Table 6 summarises the classification of the middle reach of Middle Creek Tributary according to the various regulations and guidelines reviewed for this report. The last line of Table 6 sets out the proposed CRZ and VB widths based on consideration of the merits of the various regulations/guidelines and the specific conditions in this reach of the creek.

Table 6: Riparian Zone Recommendations for the Middle Section of Middle Creek Tributary

Source	Classification	CRZ (m)	VB (m)
Guidelines for Controlled Activities: Riparian Corridors	First order stream	10	10
Managing Urban Stormwater: Soils & Construction	Category 2	20	10
Warringah Creek Management Study	Low sinuosity sand bed. Group C	20	R - 20[1] L -5[1]
Proposed Widths – East Bank		***20***	***20***
Proposed Widths – West Bank		***15***	***5***

Note 1: VB based on recommendations in Appendix D of *Warringah Creek Management Study*

This reach of the creek is different from all other reaches of the drainage lines on the site in that it has a band of bush on the eastern side extending as far as Oxford Falls Road, a distance that

varies from about 55 m to 65 m. This band of bushland will be retained and will provide a significant width to fulfil CRZ (nominal 20 m) and VB (nominal 20 m) functions on the eastern side of the creek.

On the western bank, there is currently a narrow band of weed (particularly lantana and privet) infested vegetation which gives way to open grazed paddocks. On this side of the creek it is proposed to provide a CRZ of 15 m and a VB of 5 m. These widths are proposed as compromises between the various recommendations in Table 6 for similar reasons to the proposed buffer widths for the reach of the creek upstream of Barnes Road.

7.4.3 The Australian Tennis Academy

For simplicity, this reach of Middle Creek Tributary will be referred to as the lower reach. Table 7 sets out the classification of the lower reach of Middle Creek Tributary according to the various regulations and guidelines reviewed for this report. Table 7 also lists the recommended CRZ and VB widths derived from these sources together with the proposed widths based on considerations of the merits of the various regulations/guidelines and the specific site conditions in this reach.

Table 7: Riparian Zone Recommendations for the Lower Section of Middle Creek Tributary

Source	Classification	CRZ (m)	VB (m)
Guidelines for Controlled Activities: Riparian Corridors	First order stream	10	10
Managing Urban Stormwater: Soils & Construction	Category 2	20	10
Warringah Creek Management Study	Low sinuosity sand bed. Group C	20	5[1]
Proposed Widths		***15***	***5***

Note 1: VB based on recommendations in Appendix D of *Warringah Creek Management Study*

In this reach the channel form is highly modified for a distance of about 150 m, possibly as a result of works to drain a swamp area in this vicinity that is shown on early parish maps. In this reach it is proposed to reconstruct a channel to include some sinuosity and an off-stream wetland on the western bank. Given that this section of creek has no existing riparian habitat, a CRZ of 15 m and a VB of 5 m is considered an appropriate compromise that would achieve the objectives of the *Guidelines for Controlled Activities: Riparian Corridors* and provide terrestrial and aquatic habitat in line with the objectives of a Category 2 stream as set out in *Managing Urban Stormwater: Soils & Construction.*

8 SUMMARY

8.1 CRZ AND VB WIDTHS

Based on the analysis of various guidelines set out in Chapter 7 above the proposed widths for CRZ and VB are set out in Table 6.

Table 6: Proposed Buffer Zone Widths

Drainage Line	**Core Riparian Zone** (each side)	**Vegetated Buffer** (each side)
Middle Creek Tributary: Upstream of Barnes Road	15 m	5
Middle Creek Tributary: Barnes Road – Aust Tennis Academy	East – 20 m West – 15 m	East - 20 m West - 5 m
Middle Creek Tributary: Aust Tennis Academy	15 m	5 m
Drainage Line 1	5 m	0
Drainage Line 2	10 m	5 m

8.2 WORKS WITHIN DRAINAGE LINES

All channel modification and realignment works and stormwater outlets works associated with the Middle Creek Tributary will be designed and documented in accordance with the relevant Guideline. An application will be made for a "controlled activity approval" covering these works.

All channel modification and realignment works and stormwater outlets works associated with the Drainage Lines 1 and 2 will be designed and documented in accordance with the relevant Guideline. Because these drainage lines are not "rivers" as defined in the WMA, a "controlled activity approval" is not required.

8.3 CROSSINGS

Two crossings are proposed on Middle Creek Tributary:

- A bridge structure will be used to carry the main site entrance over Middle Creek Tributary immediately upstream of the Drainage Line 1 junction;
- A culvert will be constructed on Barnes Road to provide access to the southern precinct of the Site.

Both these structures will be designed and constructed in a manner that is sympathetic to the movement of terrestrial, amphibious and aquatic fauna.

9 PHOTOGRAPHS

Photo 1
Drainage Line 1 - Constructed Channel on the Southern Side of the Tennis Courts (Looking West)

Photo 2
Drainage Line 2 - Constructed Channel Downstream of the Dam

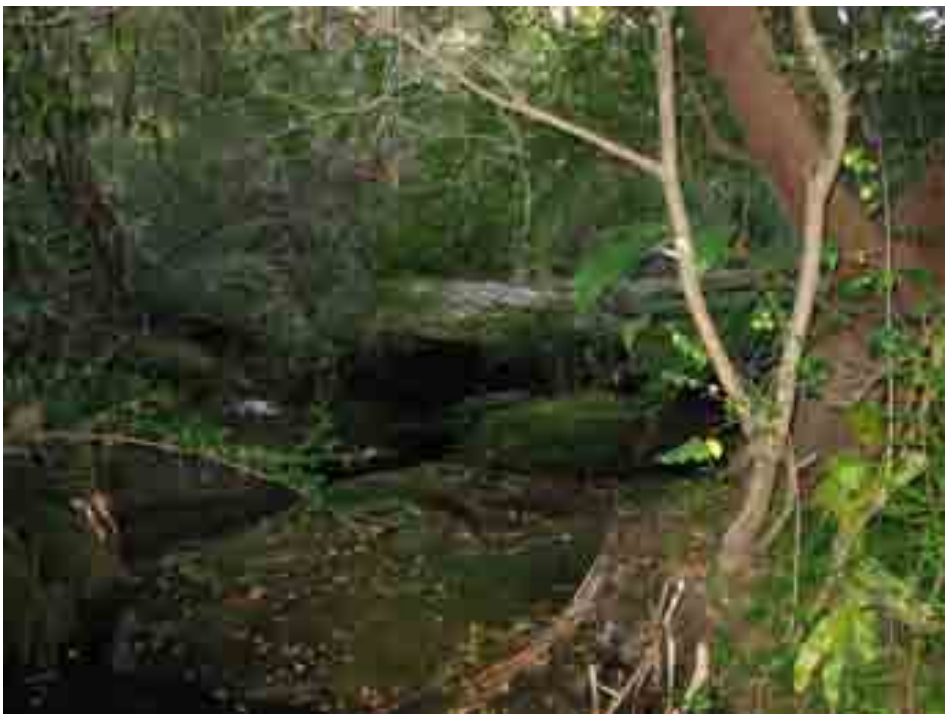

Photo 3
Drainage Line 2 - Upstream of the Dam

Photo 4
Middle Creek Tributary Upstream of Barnes Road
(Looking Upstream)

Photo 5
Middle Creek Tributary Within the Australian Tennis Academy
(Looking Downstream)

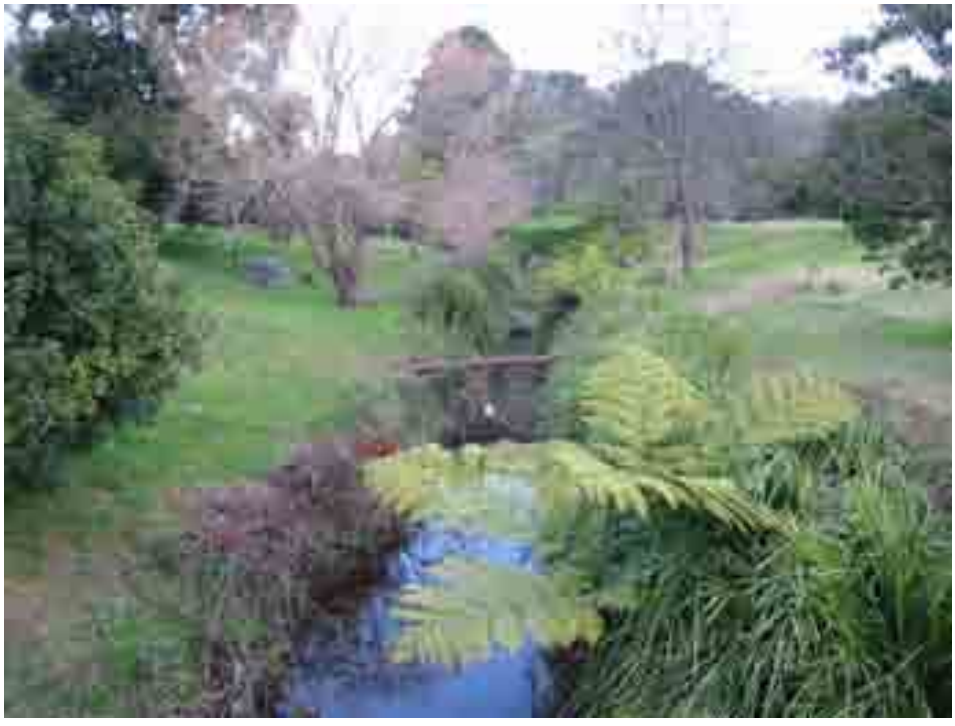

Photo 6
Middle Creek Tributary Upstream of Dreadnought Road
(Looking Upstream)

Photo 7
Middle Creek Tributary Downstream of Dreadnought Road
(Looking Downstream)

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APPENDIX 4

DWE Requirements

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February 2008

Guidelines for controlled activities
Riparian corridors

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

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

Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. Riparian corridors:

- provide bed and bank stability and reduce bank and channel erosion
- protect water quality by trapping sediment, nutrients and other contaminants
- provide a diversity of habitat for terrestrial, riparian and aquatic flora and fauna species
- provide connectivity between wildlife habitats
- allow for conveyance of flood flows and control the direction of flood flows
- provide an interface between developments and waterways.

The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events.

When determining an appropriate width for a riparian corridor and how much riparian vegetation should be protected or re-established on a site, the following three riparian corridor zones (Figure 1) should be considered.

1. A **Core Riparian Zone** (CRZ) is the land contained within and adjacent to the channel. The Department wil seek to ensure that the CRZ remains, or becomes vegetated, with fully structured native vegetation (including groundcovers, shrubs and trees). The width of the CRZ from the banks of the stream is determined by assessing the importance and riparian functionality of the watercourse (Table 1), merits of the site and long-term use of the land. There should be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the CRZ.

2. A **Vegetated Buffer** (VB) protects the environmental integrity of the CRZ from weed invasion, micro-climate changes, litter, trampling and pollution. There should be no infrastructure such as roads, drainage, stormwater structures, services, etc. within the VB. The recommended width of the VB is 10 metres but this depends on merit issues.

3. An **Asset Protection Zone** (APZ) is a requirement of the NSW Rural Fire Service and is designed to protect assets (houses, buildings, etc.) from potential bushfire damage. The APZ is measured from the asset to the outer edge of the vegetated buffer (VB). The APZ should contain cleared land which means that it can not be part of the CRZ or VB. The APZ must not result in clearing of the CRZ or VB. Infrastructure such as roads, drainage, stormwater structures, services, etc. can be located within APZs.

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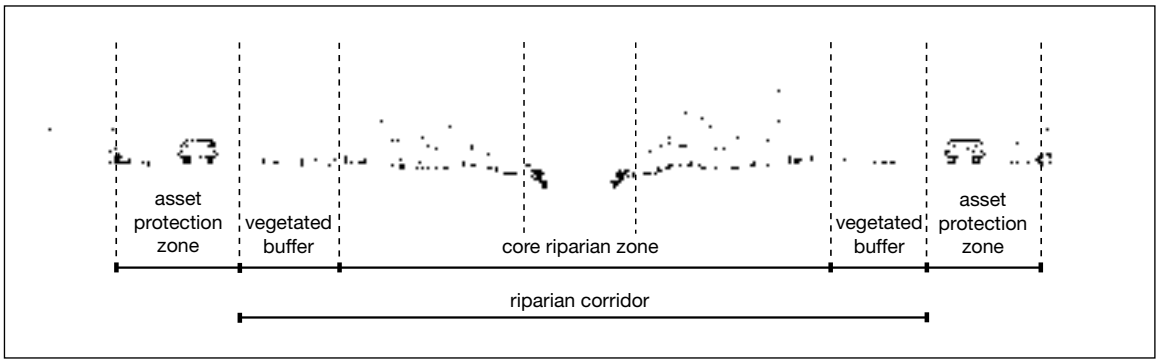
Figure 1. Riparian corridor zones.



The Department recommends that a vegetated CRZ width based on watercourse order[1] be considered in the design of any controlled activity (see Table 1). However, the final CRZ width will be determined after a merit assessment of the site and consideration of any impacts of the proposed activity. CRZ widths should be measured from the top of the highest bank and on both sides of the watercourse.

Table 1. Recommended CRZ widths.

Types of watercourses	CRZ width
any first order[1] watercourse and where there is a defined channel where water flows intermittently	10 metres
• any permanently flowing first order watercourse, or • any second order[1] watercourse and where there is a defined channel where water flows intermittently or permanently	20 metres
any third order[1] or greater watercourse and where there is a defined channel where water flows intermittently or permanently. Includes estuaries, wetlands and any parts of rivers influenced by tidal waters.	20 – 40 metres[2]

[1] as classified under the Strahler System of ordering watercourses and based on current 1:25 000 topographic maps

[2] merit assessment based on riparian functionality of the river, lake or estuary, the site and long-term land use.

Further information

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

Important notes

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Water Management Act 2000

February 2008

Guidelines for controlled activities
Vegetation Management Plans

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

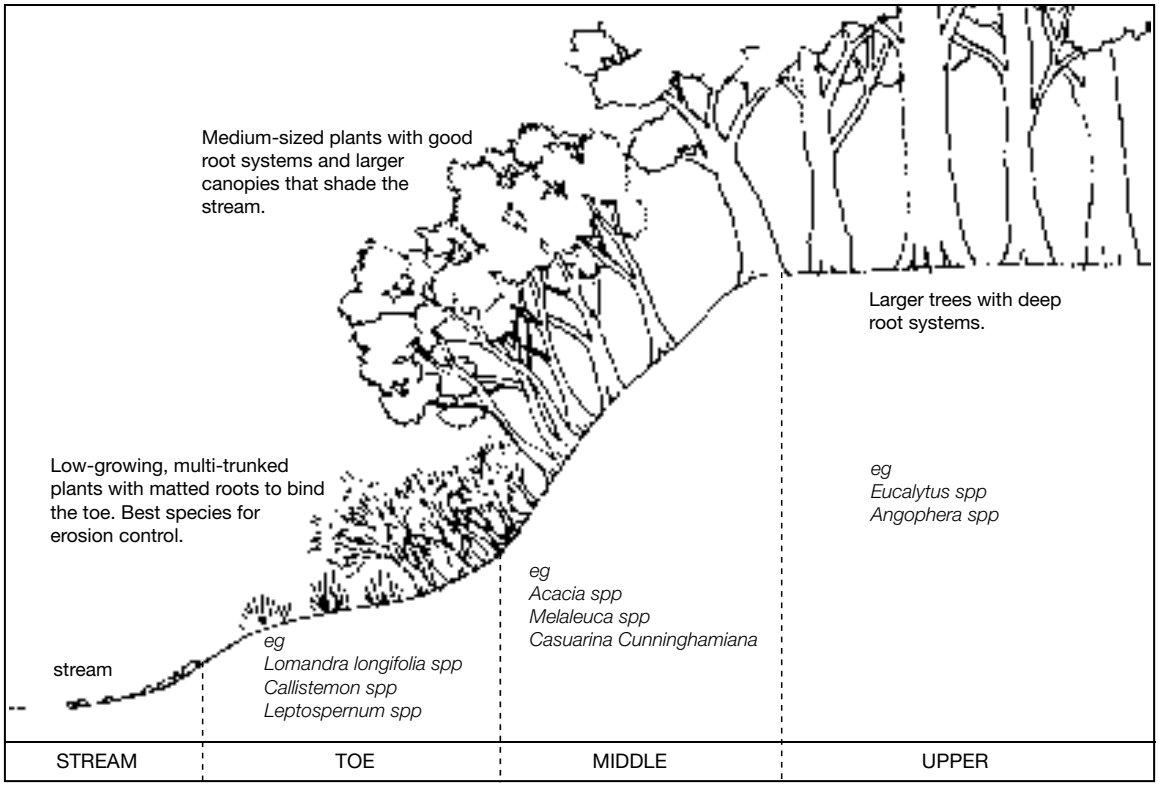
This means that a controlled activity approval must be obtained from the Department prior to carrying out a controlled activity.

Riparian corridors form a transition zone between terrestrial and aquatic environments and perform a range of important environmental functions. The protection or restoration of vegetated riparian areas is important to maintain or improve the geomorphic form and ecological functions of watercourses through a range of hydrologic conditions in normal seasons and also in extreme events.

A Vegetation Management Plan (VMP) which outlines the criteria for the establishment and management of a riparian corridor may be required to be prepared and submitted to the Department for assessment and approval prior to the issuing of a controlled activity approval for works in or within 40 metres of a river, lake or estuary.

The objective of a VMP is to provide for a stable watercourse and riparian corridor which emulates the native vegetation communities in the area. Figure 1 illustrates a typical riparian cross section.

Figure 1. Typical riparian cross section



Adapted from *Rivercare: Guidelines for Ecological Sustainable Management of Rivers and Riparian Vegetation:* Raine, A.W & Gardiner, J.N, (1995), LWRRDC, Canberra.

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A VMP should be prepared by a suitably qualified person and should consider but not be limited to the following criteria:

- An appropriate width for the riparian corridor should be identified in accordance with the Department's *Guidelines for controlled activities – Riparian corridors*. The VMP should consider the full width of the riparian corridor and its functions including accommodating fully structured native vegetation.
- The location of the bed and banks or foreshore of waterfront land and the footprint of the riparian corridor should be clearly identified.
- Measures for controlling access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified.
- Vegetation species composition, planting layout and densities should be identified. Plantings should emulate the ecotone of vegetation naturally or previously occurring along the waterfront land. Mature vegetation communities are generally well structured, comprising trees, shrubs and groundcover species. The required mix of these species relates to the actual community to be emulated and the size of the area/s to be rehabilitated. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse.
- Seed/plant sources should be identified and where possible native plants and seed sources of local provenance should be utilised.
- Exotic vegetation should be avoided. Use of exotic species for the purposes of temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.
- Details of the planting program, rehabilitation methods and staging should be provided. Other revegetation techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.
- Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80% survival rate for all plantings and a maximum five percent (5%) weed cover for the treated riparian corridor (controlled activity) is achieved.
- Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.
- Maps or diagrams which identify the proposed riparian area, existing vegetation, vegetation to be retained, vegetation to be cleared, footprint of construction activities, areas of proposed revegetation etc should be prepared.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance, monitoring and reporting, etc should be prepared.
- Processes for monitoring and review, including a method of performance evaluation, should be identified. This should include assessing the need for replacing plant losses, addressing deficiencies, problems, climatic conditions, successful completion of works, etc.

Further information

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February 2008

Guidelines for controlled activities
In-stream works

This guideline relates to the design and construction of works within a watercourse and/or riparian corridor. Such works may include enhancements of the watercourse, rehabilitation, channel modifications, bed controls, pipe and cable trenching and laying, etc.

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

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

The design and construction of works and activities within a watercourse and/or the adjoining riparian corridor should aim to be as 'natural' as possible. A watercourse 'rehabilitation' design philosophy rather than a 'construction' philosophy should be applied.

Consultation with relevant government agencies at the concept stage (of development) and during the design phase is recommended so that good outcomes can be identified, planned for and achieved.

The design and construction footprint, and the extent of disturbances within the riparian corridor, should be minimised while achieving the desired function and outcome. All ancillary infrastructure such as asset protection zones (APZ), utility easements, detention basins and water quality control structures, roads, paths/cycle ways, etc. should be located outside of any riparian corridor. Runoff should be of appropriate water quality and quantity before discharging into a riparian corridor or watercourse. Appropriate rehabilitation of disturbed areas following the works should restore the integrity of the watercourse and riparian corridor.

In order to minimise the impacts of in-stream works on the hydrologic, hydraulic and geomorphic functions on a watercourse, all works and activities should be designed and constructed to maintain the integrity of the existing channel, as well as being sympathetic with the ecological values of the watercourse and its riparian corridor.

The design and construction of in-stream works should consider, but not be limited to, the following design principles:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors.*
- The design and construction of in-stream works should consider the full width of the riparian corridor and riparian functions, including accommodating fully structured native vegetation.
- Identify options for works and show rationale for the selection of preferred options.
- The design and construction footprint and the proposed extent of disturbances to soil and vegetation within the riparian corridor should be minimised.
- Maintain or mimic existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse. Demonstrate that the in-stream works will not have a detrimental effect on these functions.

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- Maintain natural geomorphic processes; that is:
  - accommodate natural watercourse functions
  - establish natural bed and bank profiles, eg. meanders, chains of ponds, surface water pools and riffles, bed controls, etc.
  - allow for the movement of sediment and woody debris
  - do not increase scour and erosion of the watercourse bed or banks in any storm events
  - avoid locating works or structures on bends in the channel unless they are structures to restore stability
  - where existing bed degradation occurs, address bed degradation to protect structure and restore channel bed stability.
- Maintain natural hydrological regimes; that is:
  - accommodate site hydrological conditions, eg. maintain low flows
  - do not alter natural bank full or floodplain flows. Modifications to watercourses should be based on roughness coefficients that represent the 'natural' state including fully structured mature riparian vegetation.
  - do not change the gradient of the bed (except to address existing bed and bank degradation).
  - do not increase velocities by constricting flows.
- Protect against scour by designing and providing any necessary scour protection, eg. rock rip-rap and vegetation.
- Stabilise and rehabilitate all disturbed areas including topsoiling, revegetation, mulching, weed control and maintenance in order to adequately restore the integrity of the riparian corridor.
- Monitor and maintain all in-stream works until suitably stabilised.

When seeking approval to construct in-stream works, information detailing the above is required for the Department to assess the works and authorise the activity if acceptable. Details of all in-stream works/ activities should be designed by suitably qualified persons.

Additional information will generally also be required and may include but not be limited to:

- Detailed design drawings of proposed works. Engineering certification may be required.
- Detailed design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing the proposed works relative to existing and proposed bed and bank profiles and water levels. The cross section is to extend to the landward limit of the identified riparian corridor.
- Report detailing pre and post construction hydraulic conditions. The report should address, bank full discharge, velocity, tractive force or sheer stress, afflux (Modified RTA method is acceptable), Froude and Manning 'n', relative to the proposed structure.
- Plans showing extent and designs of permanent bed and bank stabilisation works necessary for scour protection.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- A Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans.*
- A Site Management plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, monitoring and reporting, etc.
- Costing of all works (ie materials, labour) and stages of works (eg. channel stabilisation, rehabilitation)
- Provide for a maintenance period of a minimum of two years after practical completion of each stage, depending on the extent and risk of the works or until suitably stable. Maintenance should include sediment and erosion control, replacement of any works/areas damaged or destroyed by flows and flooding or vandalism, and any other requirements necessary to ensure a naturalised stable watercourse system is functioning by the end of the maintenance period.
- Other relevant approvals eg development consent.

Further information

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February 2008

Guidelines for controlled activities
Watercourse crossings

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

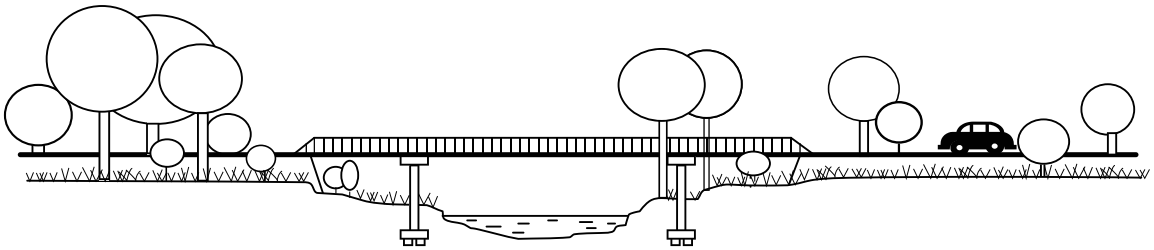
Controlled activities carried out in, on or under waterfront land are now regulated by the *Water Management Act 2000* (WMA). The Department of Water and Energy is required to assess the impact of a controlled activity to ensure that minimal harm will be done to any waterfront land, ie. the bed and a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

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

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

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

Figure 1. Bridge crossing over watercourse and riparian corridor



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

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

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

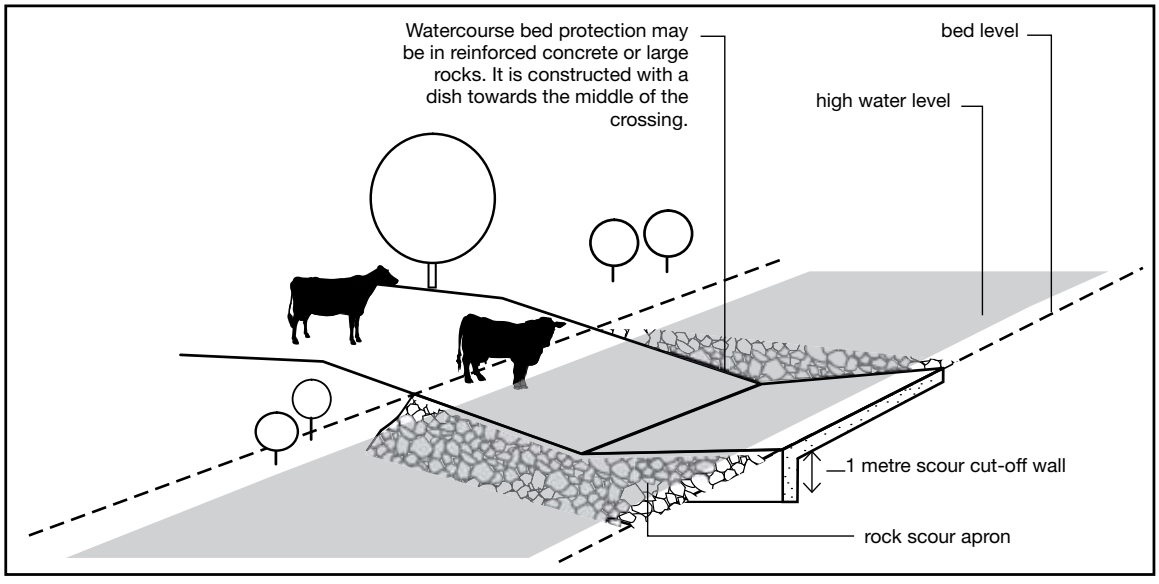
Additional considerations for design of bridges

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

Additional considerations for design of causeways

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

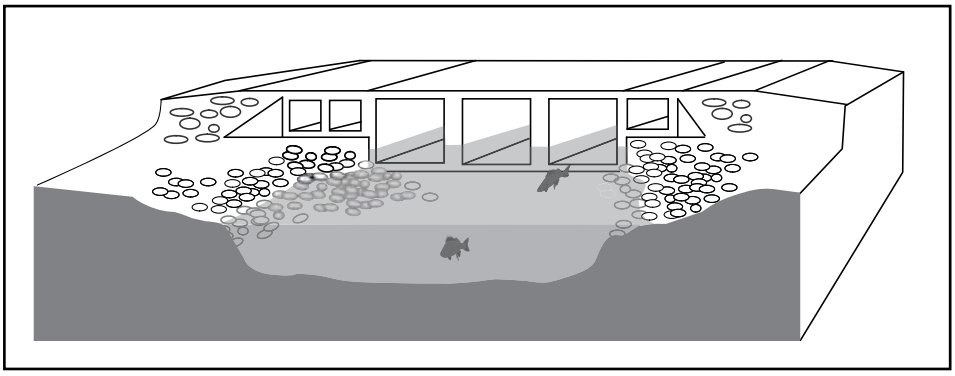
Figure 2. Splash crossing for livestock and vehicles



Additional considerations for design of culverts

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

Figure 3. Road crossing allowing fish passage



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

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

Further information

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

Important notes

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

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

Disclaimer

While every reasonable effort has been made to ensure that this document is correct at the time of publication, the State of New South Wales, its agencies and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

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Water Management Act 2000

February 2008

Guidelines for controlled activities
Laying pipes and cables in watercourses

This guideline relates to the laying of pipes and cables in or across watercourses and the adjoining riparian corridor for utilities such as sewage, water, gas, electricity and communications.

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

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

When considering the placement of utilities in or across watercourses the design and construction footprint and the extent of disturbances proposed in the watercourse and riparian corridor should be minimised. Appropriate rehabilitation of disturbed areas post installation will be required to adequately restore bed and bank stability as well as the integrity of the vegetated riparian corridor.

The design and installation of utilities in or across a watercourse should consider, but not be limited to, the following:

- Identify the appropriate width of the riparian corridor in accordance with the Department's *Guidelines for controlled activities – Riparian corridors.* The location and installation of utilities should consider the full width of the riparian corridor and riparian functions including accommodating fully structured native vegetation.
- The design and construction footprint, and extent of disturbances to soil and vegetation within the watercourse and riparian corridor, should be minimised.
- Ideally, existing easements should be utilised. Utilities should be incorporated within existing cleared or disturbed areas with (or adjacent to) other crossing points such as roads, particularly if future maintenance and on-going access is required.
- Maintain existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse. Demonstrate that the utility installations will not impact on these functions.
- Identify options for works and show rationale for the selection of preferred options.
- Directional boring under watercourses is preferred to trenching through a watercourse so that construction impacts are minimised.
- Directional boring considerations:
  - Minimise or avoid disturbance to channel bed and banks
  - Minimise or avoid rehabilitation, maintenance and on-going costs after construction
  - ensure depth is sufficient to avoid cave-ins
  - risk of bed collapse and frac-outs during boring
  - ensure depth does not result in exposure of assets if channel experiences bed or bank degradation
  - bore entry and exit locations should be located outside designated riparian corridors
  - recovery and removal of construction plant and materials (including drilling mud).
- Trenching considerations:
  - rehabilitation of disturbed bed and banks will be required
  - lay pipes and cables across the watercourse on the downstream side of channel bedrock outcrops (through the drop deposit zone if a plunge pool is present)

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— avoid outside bends – choose a straight section of the watercourse to cross
— place infrastructure below calculated bankfull flow scour depths and allow a safety margin
— avoid concrete caps and casings at shallow depths which may become exposed by bed lowering
— backfilling should restore the channel shape and bed level to preconstruction condition
— trench is to be open for minimal length of time
— where flow in a watercourse is permanent consider staging the trench across part of the channel to maintain flows. Flows should not to be stopped unless essential; if necessary to stop flows it must be for a minimal time only.
— additional disturbances from temporary coffer dams or diverting flows around work site, vehicle and machinery access and crossings, material stockpiles, etc.
— potential water quality issues (turbidity, spills)
— recovery and removal of construction plant and materials.

When seeking approval to install utilities across a watercourse, information detailing the above should be submitted to the Department for assessment. Details of all works/activities within watercourses should be designed by suitably qualified persons.

Additional information will generally also be required and may include but not be limited to:

- Design drawings of proposed works/structures. Engineering certification may be required.
- Design drawings which include a surveyed plan, cross sections (across the watercourse) and a long section of the watercourse, showing the proposed works relative to existing and proposed bed and bank profiles and water levels. The cross section is to extend to the landward limit of the identified riparian corridor.
- A report detailing pre and post construction hydraulic, hydrologic and geomorphic conditions.
- Plans showing the extent and designs of bed and bank stabilisation works for scour protection.
- Photographs of the site should be supplied and photo points should be identified for future monitoring and reporting purposes. The photo points should be identified by GPS coordinates or by survey particularly for large scale earthworks or extractive industries.
- A Vegetation Management Plan prepared in accordance with the Department's *Guidelines for controlled activities – Vegetation Management Plans*
- A Site Management plan incorporating the schedule, sequence and duration of works, erosion and sediment controls, monitoring and reporting, etc.
- Costing of all works (ie materials, labour) and stages of works (eg channel stabilisation, rehabilitation)
- Other relevant approvals, eg. development consent.

Further information

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