

FLOODPLAIN MANAGEMENT PLAN FOR

WINGELLO CREEK

FINAL REPORT

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CONTENTS

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Section		Page
SUMM	ARY	·
WG1	REPTILE PARK REACH	
WG1.1	Description of the problem	1
WG1.2 WG1.3	Concise description of the plan	1 1
WG2	JARRETT STREET TO RAINFOREST RESERVE LINING AREA	
WG2.1	Description of the problem	2
WG2.2 WG2.3	Concise description of the plan	2 3
WG3	ROSELANDS AVENUE TO WARRAWILLA ROAD GRASSED WATERWAY	
WG3.1	Description of the problem	4
WG3.2 WG3.3	Concise description of the plan	4 5
WG4	EXISTING PECAN CLOSE DETENTION BASIN	
WG4.1	Description of the problem	6
WG4.2 WG4.3	Concise description of the plan	6 6
WG5	TRIBUTARY 1 AREA UPSTREAM OF WARRAWILLA ROAD	
WG5.1	Description of the problem	7
WG5.2 WG5.3	Concise description of the plan	7 7

e

CONTENTS

Section

WG6	TRIBUTARY 1 AREA DOWNSTREAM OF MAIDENS BRUSH ROAD	
WG6.1	Description of the problem	8
WG6.2	Recommendations	8
WG6.3	Concise description of the plan	8
WG7	WINGELLO CREEK FLOODWAY	
WG7.1	Description of the problem	9
WG7.2	Recommendations	10
WG7.3	Concise description of the plan	10
WG8	FUTURE DEVELOPMENT	
WG8.1	General	11
WG9	PRIORITIES OF WORK	
WG9.1		12

LIST OF TABLES

Table		Page
WG1	Recommended works and priority ranking for Wingello Creek	13

LIST OF ILLUSTRATIONS

Figure		Page
WG1	Recommended works for Wingello Creek	14
WG2	Management Plan for Wingello Creek—existing conditions contours	15
WG3	Flood contours at completion of proposed works for Wingello Creek	17
WG4	Typical cross-sections for Wingello Creek	19

SUMMARY

Wingello Creek is a tributary of Lower Narara Creek and has a total catchment area of 5.0 km^2 . The majority of the creek flows are contained within the channel, but there are sections of the creek where the undersized culverts or restrictive channel cross-sections have caused flooding. This flooding is compounded by the high downstream water levels in Narara Creek.

The study area for Wingello Creek has been divided into six distinct regions. These regions are:

- Reptile Park Reach—Pacific Highway to Jarrett Street (Area WG1);
- Jarrett Street to Rainforest Reserve lining area Jarrett Street to Roselands Avenue (Area WG2);
- Roselands Avenue to Warrawilla Road grassed waterway area (Area WG3);
- Existing Pecan Close Detention Basin (Area WG4);
- Tributary 1 Area Warrawilla Road (Area WG5) – Maidens Brush Road (Area WG6);

Figure WG1 indicates the locations of the regions.

In addition, a catchment based strategy has been considered for Wingello Creek (WG7) and for the future development areas (WG8).

Various flood mitigation options were examined in order to provide a basis for the formulation of the Wingello Creek Floodplain Management Plan and these have been discussed in detail in the Floodplain Management Study.

Key features of the plan are:

- ultimately no buildings will be flooded in habitable areas by the designated flood, this is accomplished by formalizing channels and culvert upgrades;
- provision for limited development on flood fringe land subject to strict controls;
- lands within the floodway will be maintained in perpetuity for the passage of flood water and a drainage easement dedicated where appropriate;

- a staging of works;
- controls for future development of the upstream catchment.

The recommended works for the plan are shown on Figure WG1 and the Management Plan is shown in Figure WG2 (Council Drawings 4/112/A1 and 4/113/A1). The flood contours shown on the plan are for existing conditions. Flood contours at the completion of proposed works are shown in Figure WG3 (Council Drawings 4/114/A1 and.4/115/A1). Typical channel cross-sections are shown in Figure WG4.

Benefit-cost ratios have been calculated and included where possible. Where the proposed works do not specifically prevent flooding of houses, rather solve other problems such as scour and erosion of the creek bed, benefit-cost ratios cannot be calculated.

WG1 REPTILE PARK REACH

WG1.1 DESCRIPTION OF THE PROBLEM

Between the Pacific Highway and Jarrett Street, Wingello Creek meanders through the Reptile Park where it has been a feature. Just downstream of the Jarrett Street culverts, large fence gates have been placed across the creek to prevent animals from escaping. These are hinged, so theoretically in flood flows they rise and do not impede flows. In addition, there is a concrete weir set at RL 3.7 m AHD to create a permanent pond as well as a low level steel access bridge. All these structures have created an impedance to the flow and have increased flood levels upstream.

No buildings within this reach are flood liable for the 1% AEP event. However, as a result of the high flood levels, houses upstream of Jarrett Street have a reduced freeboard.

WG1.2 RECOMMENDATIONS

The proposed works for this section of the creek are to remove the low level access bridge in the creek and to lower the concrete weir from the present level of RL 3.7 m AHD to RL 2.7 m AHD. The low level access bridge could be replaced by a similar structure that would cause minimal obstruction to flows.

It is also proposed to retain the large fence gates, but a regular maintenance programme should be undertaken to ensure that they operate effectively.

The estimated cost of this work is \$2,000.

WG1.3 CONCISE DESCRIPTION OF THE PLAN

- Establish regular maintenance of fence gates.
- Lower concrete weir crest level from RL3.7 to RL2.7.
- Replace existing low level bridge by a more flood compatible structure.
- Consultation with the Reptile Park management is needed to ensure an acceptable solution.
- Future buildings should be constructed to an appropriate Council specified minimum floor level.

WG2 JARRETT STREET TO RAINFOREST RESERVE LINING AREA

WG2.1 DESCRIPTION OF THE PROBLEM

The houses immediately upstream of Jarrett Street in Adnamira Close, have minimal freeboard for the 1% AEP event as a result of the high water levels downstream of the Jarrett Street. Once the downstream obstructions have been removed, the flood levels would be reduced to an acceptable level.

From the Jarrett Street culverts to Halycon Street, Wingello Creek passes through several sharp bends. Owing to severe bank erosion and scour, there is potential to undermine the foundation of nearby houses.

Upstream of Halycon Street, the creek flows through a natural reserve (Rainforest Reserve) with a dense growth of rainforest trees on both banks. The existing natural channel has several sharp bends, and some rock protection has been laid on some of these bends to prevent scour and erosion. As a result of the dense undergrowth, flood levels are high along this section of creek, and this could affect the upstream subdivision along Roselands Avenue.

WG2.2 RECOMMENDATIONS

It is recommended that the section of creek between Jarrett Street and Halycon Street be straightened and lined. This channel has been assumed to be concrete lined, but a channel of stacked rock of an equivalent conveyance may be considered more acceptable. Typical cross-sections are shown in Figure WG4.

These channel cross-sections have been designed to avoid excess cut and landtake and do not fully contain the 1% AEP flow. However, the more frequent events are contained within the channel.

With this proposal, the problem of bank erosion and scouring would be solved and no houses would be in danger of being undermined. In addition, the three houses in Adnamira Close would have a greater freeboard for the 1% AEP flood.

At present, several houses in Roselands Avenue have only 50 to 100 mm freeboard above the 1% AEP flood level. In order to increase this freeboard and reduce the amount of scour and bank erosion, it is also proposed to line the channel from Halycon Street to Roselands Avenue.

Concrete lining of this reach would result in about 500 mm of freeboard for the existing Roselands Avenue subdivision, while only about 250 mm of freeboard is available if this reach were lined with rock. Typical creek cross-sections are shown in Figure WG4.

This section of natural reserve is classified as 'urban bushland'. Consequently, any works carried out within the reserve would require an environmental review which would need to be put on public exhibition. A detailed survey and study would therefore be needed to identify a channel alignment that would necessitate the removal of as few trees as possible, would be hydraulically effective and blend in the surrounding environments.

There is an exposed sewer 450 mm in diameter near Halycon Street. Ideally the sewer should be removed and diverted to enable unobstructed flow. However, as a result of lining of the creek, the head loss created by the exposed sewer could be tolerated.

The estimated cost for lining the creek from Jarrett Street to Roselands Avenue is \$590,000.

WG2.3 CONCISE DESCRIPTION OF THE PLAN

- Straighten alignment and line meandering natural creek from Jarrett Street to Ch593 (near Roselands Avenue).
- Undertake a detailed environmental study to identify the best alignment and of lining material type through the Rainforest Reserve.
- Approval needs to be sought from adjoining land owners for creek re-alignment. Some lots would recover land while others would suffer sterilization of a portion of their land.
- Future buildings should be constructed to an appropriate Council specified minimum floor level.
- The availability of land may determine the size of channel and hence possible lining material.

WG3 ROSELANDS AVENUE TO WARRAWILLA ROAD GRASSED WATERWAY

WG3.1 DESCRIPTION OF THE PROBLEM

The creek between Chainage 593 and Chainage 835 was previously formalized into a trapezoidal grassed waterway as part of the works for the Roselands Avenue subdivision. This waterway passes through a drainage easement between Roselands Avenue and Dalton Street. A low-pipe system was planned for construction under the grass waterway, but was omitted due to the risks of blockage. Bed scour has since severely eroded the trapezoidal grassed waterway. Several of the houses along Roselands Avenue have a freeboard of less than 200 mm for the 1% AEP event.

Upstream of the Roselands Avenue subdivision, Wingello Creek meanders across a wide open floodplain. Opposite Fuschia Avenue a tributary joins the main creek from the south resulting in some bank erosion.

The existing six cell culvert at Warrawilla Road is undersized and poorly configured due to the two major tributaries joining at its upstream side. This is compounded by the flow paths not being streamlined toward the culvert entrance. In addition, the excessive number of intermediate piers creates an unnecessarily high head loss. It is also evident that siltation has rendered some of the flow area ineffective.

Upstream of the Roselands Avenue subdivision, no houses are affected by the 1% AEP flood.

WG3.2 RECOMMENDATIONS

The main problem along this section of the creek is channel erosion. After the completion of the recommended works downstream, the design flood levels will be reduced and thus the freeboard for the houses along Roselands Avenue will be increased.

However, between Chainage 593 and Chainage 835 it is recommended that a low flow channel (3.0 m by 0.6 m deep) be constructed to improve the flow condition and to control erosion. This low flow channel could be either lined with concrete or stacked rock. During construction of the channel, the silt deposited in the bed of the creek should be removed and the waterway cross-section re-established. A typical cross-section is shown in WG4.

The estimate cost of this low flow channel is \$150,000.

Upstream of the Roselands Avenue subdivision, it is proposed, that as a long term option, the grassed waterway between Chainage 593 and Chainage 837 be extended up to

Warrawilla Road between Chainage 835 and Chainage 1381. A typical cross-section is shown in Figure WG4. As a short term option, additional rock protection should be provided where the tributary joins the main creek flow to reduce the bank erosion.

The estimated cost for the grassed waterway and concrete low-flow channel is \$680,000.

No works are proposed for the Warrawilla Road culvert. As a result of the formalization of the channel downstream into a grassed waterway, the design flood levels at the culvert will be sufficiently reduced so that Warrawilla Road will only be overtopped during extreme events.

WG3.3 CONCISE DESCRIPTION OF THE PLAN

- Provide localized bank erosion as a short term option.
- Construct low flow channel in channel adjacent to Roselands Avenue and reestablish grassed waterway.
- Realign channel and construct grassed waterway with low flow channel upstream of Roselands Avenue.
- Buildings should be constructed to an appropriate Council specified minimum floor level.

WG4 EXISTING PECAN CLOSE DETENTION BASIN

WG4.1 DESCRIPTION OF THE PROBLEM

The existing basin north of Pecan Close is unexcavated, and has been created by a broad earth embankment across the valley. Two pipes 1,200 mm in diameter of approximately 90 m in length, pass under the basin. These pipes can carry flows up to the 5% AEP event. For the less frequent events (e.g. 1% AEP), the creek overflows into the basin. The crest of the embankment is approximately 14.30 m AHD and this is higher than two of the house floor levels in Pecan Close. During major floods, these houses are inundated before the basin overtops. There is no emergency weir along the embankment.

WG4.2 RECOMMENDATIONS

The recommended works are to lower a 40 m section of the embankment to RL13.75 and make it into an emergency weir with a spillway and energy dissipation structure. However, a more specific and detailed study should be undertaken prior to the final design.

After this work, the combined capacity of the pipes and weir would be able to pass the 1% AEP flow without any houses in Pecan Close being inundated. The estimated cost is \$120,000 and the benefit cost ratio is approximately 0.2.

WG4.3 CONCISE DESCRIPTION OF THE PLAN

- Lower a section of the embankment to make an emergency weir with a spillway and energy dissipation structure.
- Buildings should be constructed to an appropriate specified minimum floor level.
- Detailed design and planning required prior to final design.
- Spillway to be designed to contain extreme event.

WG5 TRIBUTARY 1 AREA UPSTREAM OF WARRAWILLA ROAD

WG5.1 DESCRIPTION OF THE PROBLEM

Upstream of Warrawilla Road, the main creek flow is joined by a tributary from the south (Tributary 1). This tributary flows parallel to Maidens Brush Road before turning through two 90° bends and passing under Warrawilla Road. Significant scour has occurred on the southern bank of the bend adjacent to Maidens Brush Road. No houses are endangered by flooding in this area.

WG5.2 RECOMMENDATIONS

The recommended works are to realign the creek along this section to remove one of the bends and that rock protection be placed to prevent further scour. The estimated cost is \$50,000.

WG5.3 CONCISE DESCRIPTION OF THE PLAN

- Realign and line creek bank upstream of Warrawilla Road.
- Rock lining should be placed to prevent further undermining.

WG6 TRIBUTARY 1 AREA DOWNSTREAM OF MAIDENS BRUSH ROAD

WG6.1 DESCRIPTION OF THE PROBLEM

No houses are affected by flooding in this tributary area although Maidens Brush Road would be overtopped during a 1% AEP event. The main problem here is bank erosion and bank instability, especially on the northern bank just downstream of Maidens Brush Road culvert.

WG6.2 RECOMMENDATIONS

The recommendation is to protect the northern bank against further erosion with either sandstone rocks or other appropriate lining. The estimated cost is \$39,000.

No augmentation of the Maidens Brush Road culvert is necessary at this time, as no houses are affected.

WG6.3 CONCISE DESCRIPTION OF PLAN

- Line northern bank of creek downstream of Maidens Bush Road.
- Rock lining should be placed to prevent further undermining.

WG7 WINGELLO CREEK FLOODWAY

WG7.1 DESCRIPTION OF THE PROBLEM

Wingello Creek is a reasonably well defined creek that discharges into Narara Creek. The majority of the creek flows are contained within the channel but there are sections of the creek where undersized culverts or restrictive channel cross-sections have caused flooding. Mitigation measures to alleviate these problem areas are discussed in other sections; however the maintenance of the creek as a whole is described here.

A major problem associated with flooding in the Narara Creek tributaries is the heavy vegetation within the creek and the dense bush on the flood plains, resulting in higher than normal flood levels. Removing vegetation and obstructions from the channel can often improve the conveyance of the stream, thus reducing design flood levels. However, any channel clearing and maintenance works should be carefully undertaken so that erosion of channel banks is minimized.

Another common problem in the Narara Creek tributaries is the erosion and scour that occurs. This is as a result of the narrow creek rapidly changing direction as it runs off the steep catchment.

The Wingello Creek floodway can generally be defined as the full extent of the flood liable land. Land use in floodways must also be carefully controlled to ensure that the conveyance of the floodway is not reduced. Neither buildings nor hazardous uses, obstructions or operations likely to impede floodwaters should be permitted in floodways: only land use that is flood compatible or likely to enhance floodway capacity should be allowed.

Floodways may need to be crossed by service installations, such as water, sewer, power, and gas mains. These should be permitted in the floodway provided they are investigated adequately and designed in a manner that does not significantly affect flood flow capacity or flood levels. They should also be designed so as to reduce damage potential to the services to the absolute minimum.

WG7.2 RECOMMENDATIONS

A regular maintenance programme is to be established for the creek to ensure that there is no reduction in the conveyance of the creek and in consequence an increase in flood levels. The creek should be regularly inspected to detect any signs of increasing erosion.

The floodway is to be permanently maintained so that there would be no significant development within the floodway to reduce the future capacity of the floodway.

WG7.3 CONCISE DESCRIPTION OF THE PLAN

The proposed plan for the Wingello Creek floodway is as follows:

- No work that would impair the passage of floodwaters would be permitted in the floodway.
- Fences of rigid paling, chain wire or similar construction likely to collect debris and/or impair floodwaters would not be permitted.
- All land uses are to be flood compatible.
- A regular creek maintenance programme would be established.
- Proposals to cross the floodway with services would be permitted provided that the proposals were adequately investigated and designed in a manner that did not significantly affect flood flow capacity and levels.

WG8 FUTURE DEVELOPMENT

WG8.1 GENERAL

One of the main findings in this study indicates that the present creek system will not be able to sustain any significant increase in flow volumes generated by future developments in the upstream areas. As a result, all future development applications must incorporate suitable water detention facilities before such developments will be approved by Council.

The design of detention facilities requires input of the stage-storage-discharge relationship into an overall established hydrologic model for the whole creek system. The normal method of stipulating that peak developed discharge must not exceed pre-developed discharge may not be entirely applicable for all cases as it does not take into consideration the effect of time. Also, depending on the complexity of the network of basins in a catchment, the positive effects of one basin may be partially or completely neutralised by another basin instead of complementing each other. It is recommended that detention facilities are to be designed by experienced hydrologic and hydraulic professionals in order to realise the full benefits of a network of basins within a catchment.

WG9 PRIORITIES OF WORK

WG9.1

The proposed staging of works is consistent with the provision of a reduced flood hazard and implementation of the plan while being conscious of financial constraints. The proposed priority of works is given in Table WG1. This table is given as a guide should Council have money available at any time then the lower priority works could be undertaken to make use of the financial resources available.

Table WG1	Recommended works and priority ranking for Wingello Creek			
Location	Description	Cost	Priority	
Reptile Park Reach (Ch0 to Ch275)	Remove obstructions in Reptile Park and lower weir	\$2,000	Completed 1992	
Jarrett St to Rain Forest Reserve lining area (Ch275 to Ch593)	Lined channel from Ch275 to Ch593	\$590,000	1	
Roselands Ave to Warrawilla Rd grassed waterway area (Ch593 to Ch1381)	Construct low flow channel for existing grassed channel from Ch593 to Ch875 to improve flow conditions and prevent erosion	\$150,000	4	
	Construct grass waterway from Ch875 to Ch1381 with low flow channel including bank protection for side creek	\$680,000	2	
Existing Pecan Close detention basin (Ch1391 to Ch1611)	Construct emergency weir for existing Pecan Close basin incorporating concrete spillway, training walls and dissipation structures	\$120,000	3	
Tributary 1 area	Localised bank protection on northern bank downstream of Maiden Brush Rd	\$39,000	Completed 1992	
	Localised bank protection on southern bank upstream of Warrawilla Road	\$50,000	5	













Figure WG4 TYPICAL CROSS-SECTIONS FOR WINGELLO CREEK

WYOMING CREEK, WINGELLO CREEK & BRADYS GULLY CREEK FLOOD PLAIN MANAGEMENT STUDY

End of Report