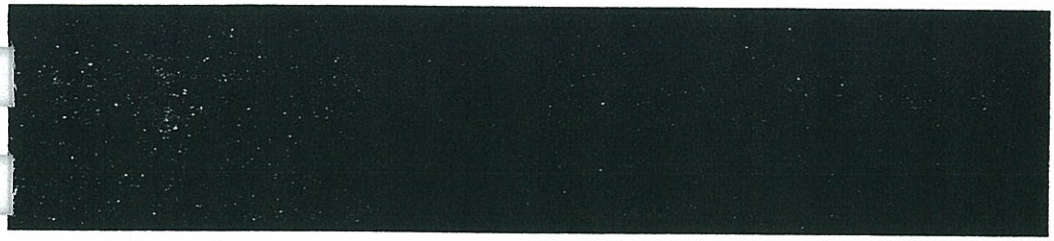
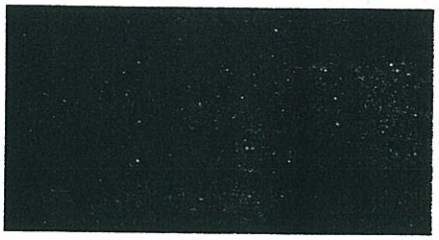
SCHAFFER BARNSLEY LANDSCAPE ARCHITECTS





WHITES CREEK VALLEY PARK
HYDROLOGY AND CIVIL ENGINEERING

Issue No. 1
MAY 1998

Patterson Britton
& Partners Pty Ltd
consulting engineers

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1 INTRODUCTION

Patterson Britton & Partners (PBP) were engaged by Schaffer Barnsley Landscape Architects to provide specialist input to development of a Strategy and Plan of Management for Whites Creek Valley Park. The Plan of Management was commissioned by Leichhardt Municipal Council.

Whites Creek Valley Park extends from Moore/Booth Street to Piper Street in Annandale. A sketch of the study area is shown in **Figure 1**.

The following issues were addressed by PBP in the study:

- feasibility of removing the existing concrete channel in order to create a more natural drainage system;
- opportunities to improve water quality by construction of wetlands within/adjacent to the existing channel;
- preparation of preliminary cost estimates for the alternative channel options, and
- review of available information on existing flood behaviour (*flows, levels and velocities*).

Meetings were held with Leichhardt Municipal Council (*Paul Solomon*) and Sydney Water (*Phil Hammond*) to obtain available information and to discuss the alternative channel options.

The study was not intended to be a detailed hydrologic investigation. Sufficient background information was compiled in order to determine likely impacts of the proposed works and to prepare preliminary concepts and cost estimates for proposed channel modifications. All concepts and costs would therefore need to be confirmed at the detailed design stage.

WHITES CREEK VALLEY PARK

Map Identifying The Various Properties

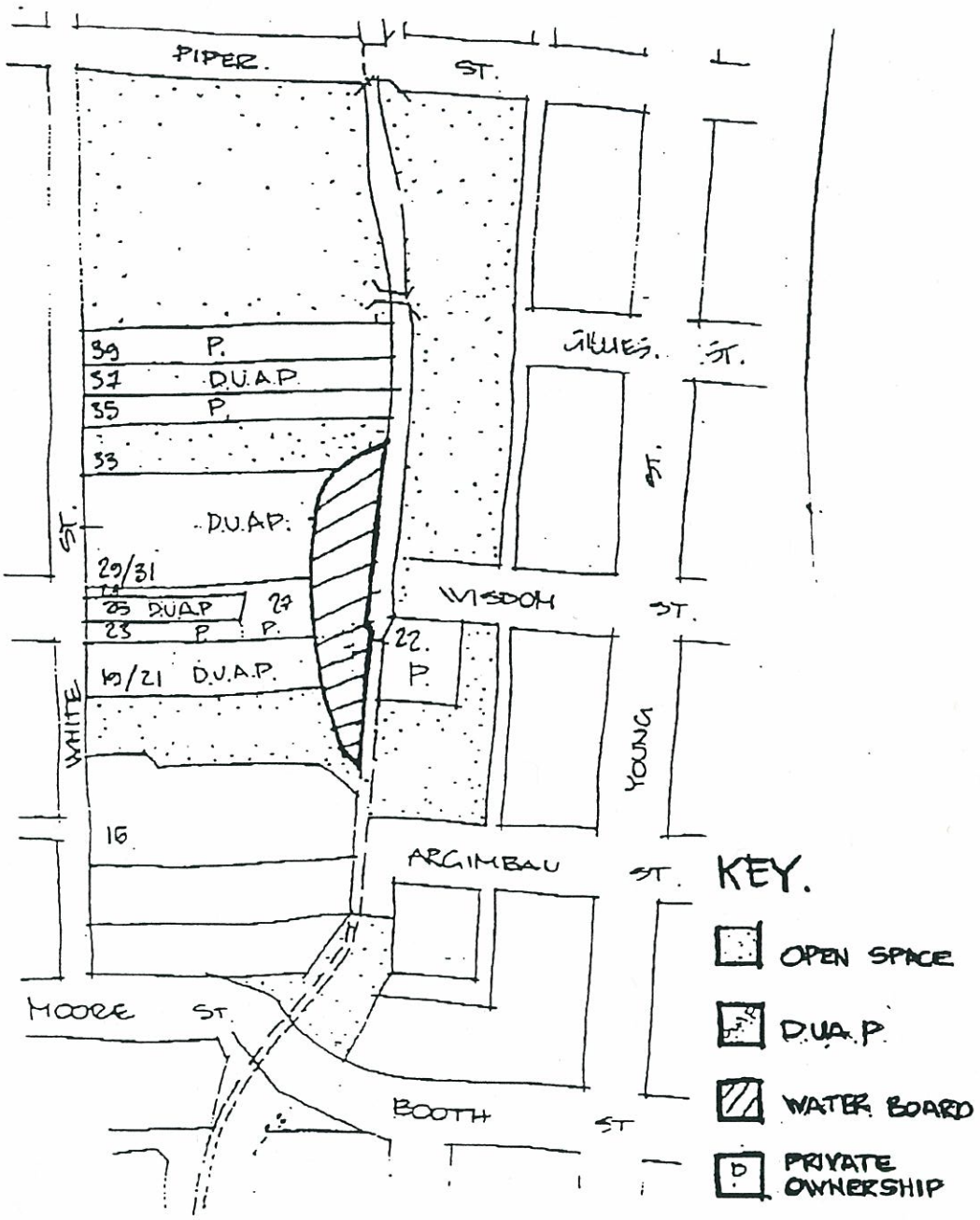


FIGURE 1

2 HYDROLOGY

2.1 EXISTING DRAINAGE SYSTEM

Whites Creek drains an area of approximately 260 hectares to Rozelle Bay. The area is heavily built up, consisting of mainly semi detached or terrace housing with some land use for commercial premises and light industries. Less than 5% of the catchment is zoned as open space, mostly adjacent to the open channel.

The lower 1060m length of the main channel is tidal and consists of a reinforced concrete lined channel with a bed width varying from 5m to 8m and a depth varying between 1.4m and 2.0m. Throughout most of the catchment stormwater runoff is conveyed in road side kerbs, with only minor Council pipe lines draining directly to the channel.

The upper reaches of the catchment (*south of Parramatta Road*) falls within the Marrickville Council area, while the remainder and larger part of the catchment lies within the Leichhardt Council area.

An open concrete lined channel (*approximately 5m wide and 2m deep*) passes through Whites Creek Valley Park, along what was probably the original alignment of Whites Creek. The upstream section of the channel is covered.

2.2 EXISTING FLOOD LEVELS, FLOWS AND VELOCITIES

The Whites Creek channel, which is owned by Sydney Water, has been subject to a number of hydrology/hydraulic investigations. Findings from the studies indicate that the capacity of the existing channel is less than 3 years ARI (*average recurrence interval*). This is considerably less than current design standards which recommend that the 20 year ARI flow be contained within the channel. It is also important that an overland flow path be available for larger floods up to the 100 year ARI event, to ensure that houses remain flood free up to this event.

Preliminary flows, velocities and flood levels for this section of Whites Creek were provided by Sydney Water. Available information is summarised in **Table 2.1** for a range of flood events.

Table 2.1 Preliminary Flood Flows, Levels and Velocities

Design Recurrence Interval (years)	Flow Rate (m^3/s)	Flood Level (m AHD)	Flow Velocity (m/s)
100	76	4.23	$3.27^{??}$
20	59	3.10	4.76
5	45	2.79	4.25

The above information is for chainage 894 (ie at intersection with Piper Street)
Note: $^{??}$ velocity appears to be incorrect – probably closer to 5.5m/s (velocity at next u/s cross section)

From the available information it appears that the 100 year ARI flood level for this section of Whites Creek would be approximately 4.25m AHD, which is about 1.5m above the top of the existing channel. Therefore the area adjacent to the existing channel functions as a floodway.

It is therefore essential that the proposed strategy does not impede the flow path by creating obstructions within the floodway. It is also important that consideration be given to lateral flows, which drain to the channel from adjacent areas.

2.3 POSSIBLE UPGRADING

Upgrading requirements to improve the hydraulic capacity of the channel have been identified by Sydney Water. These include widening the open channel by approximately 4m to carry the 20 year ARI flow. Preliminary plans indicate that the new channel would be constructed on the western side of the existing channel.

However, the proposed channel works do not appear on current Sydney Water works programmes. Sydney Water's current priorities do not appear to include stormwater drainage, although this may change in the future. Therefore any strategy for the area should take the possible upgrading into consideration.

3 ALTERNATIVE CHANNEL OPTIONS

3.1 OPPORTUNITIES

The overall objective of the project was to develop an integrated strategy to restore the health and diversity of the former creek, and the flora and fauna of its banks within an urban context. A more natural creek system would provide opportunities to improve or enhance the following attributes, which have been lost by construction of the concrete channel:

- improved water quality by creation of wetland areas within the base of the creek
- creation of a more natural and diverse habitat within and adjacent to the channel
- potential for increased flow capacity by widening the creek, and
- improved aesthetics and recreational amenity.

The recreation of a more natural creek system within the park would provide an asset to the local community by development of a more natural and sustainable environment. However, removal of the concrete channel will be an expensive exercise, as shown by the cost estimates given in **Section 4**.

3.2 CHANNEL OPTIONS

A number of options were developed that would enable full/partial restoration of the natural creek system in order to address the above opportunities. These options ranged from complete removal of the concrete channel to covering of the channel with a grate/boardwalk.

Figure 2 to 6 illustrate the general characteristics (*plan and cross sectional details*) of the various options, that were examined. These options are as follows:

Option 1 Remove existing concrete channel and realign to create a more natural creek line. The existing fence would also be removed. The base of the channel would be planted with macrophytes to enhance habitat and provide pollutant assimilation. Refer to **Figure 2**.

Option 2: Remove sides of existing concrete channel (*base retained for low flows*) and create a wetland within the base of the channel. The existing fence would also be removed. The proposed channel is wider than for Option 1 in order to provide an increased area for creation of a larger wetland adjacent to the low flow channel. Refer to **Figure 3**.

Option 3: Cover existing concrete channel with a galvanised grid decking or timber boardwalk. This would enable removal of the existing fence. Refer to **Figure 4**.

Option 4: Remove existing fence but retain concrete channel. Create shallow (*approximately 0.5m deep*) linear wetlands along each side of the existing channel. Stormwater runoff from the local catchment would be diverted to the wetlands. The wetland

would "treat" local runoff and also provide a buffer to the existing channel to ensure public safety. Refer to **Figure 5**.

Option 5: Option 5 was originally proposed by "Friends of the Earth" *(a copy of their proposal is included in **Appendix A**)*. The existing channel and fence would be retained and a freshwater wetland would be created adjacent to the channel, within land owned by Sydney Water. Low flows from the covered section of the channel would be diverted to the wetland. Refer to **Figure 6**.

It must be stressed that the options have only been developed in sufficient detail to enable preliminary cost estimates to be prepared. A more detailed design and hydraulic calculations would be required prior to construction.

3.3 IMPACT ON HYDRAULICS

The capacity of the existing channel is limited. Therefore it will be necessary to ensure that the proposed works, for each of the options, do not adversely affect the hydraulics of the stormwater drainage system. Therefore hydraulic modelling would be required at the detailed design stage to confirm that the proposed works do not increase flood levels.

3.4 WATER QUALITY

Although a number of the options include creation of a freshwater wetland, it must be stressed that this would provide only minor water quality improvement. For a 160 hectare catchment (*ie area upstream of the Whites Creek Park*), an effective wetland in terms of pollutant (*suspended solids and nutrients*) removal would need to cover an area of about five hectares (*3% of the catchment area)* and have a substantial water storage volume. The proposed wetlands have a maximum area of 0.3 ha and little or no water storage volume.

Option 1 would provide a water quality benefit during dry weather but during wet weather, the near negligible effective flow retention time in the macrophyte area would result in minimal water quality improvement. The vegetated banks at a slope of 1V:3H would be difficult to maintain.

Option 2 would provide less water quality improvement than Option 1 because most of the low flow in dry weather would be contained in the concrete base channel.

Option 3 would provide no water quality benefit.

Option 4 would provide a significant improvement in the water quality of local runoff entering the canal because it could be retained in the wetland cells for a reasonable period. This would include both dry and wet weather flows.

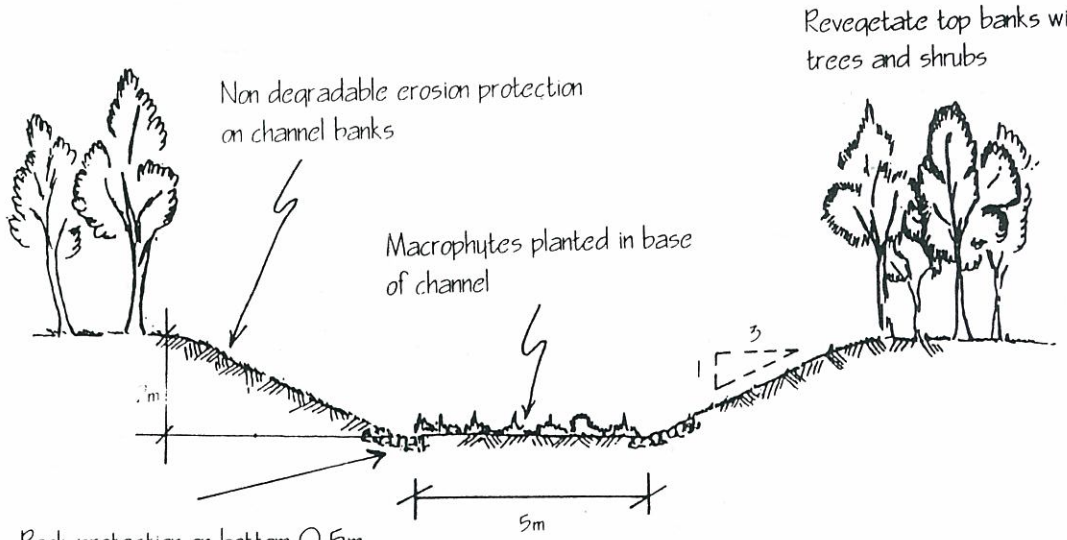
Option 5 would have a similar water quality benefit to that of Option 1. It will provide water quality improvements during dry weather low flows. However, during wet weather, the water quality improvements would be negligible.

Given the limited opportunities for water quality improvements in the study area, Option 4 would maximise the benefits by concentrating on treating local runoff. Option 4 is preferred on the basis of water quality improvements to runoff.

WHITES CREEK VALLEY PARK

Plan of Management - Option 1

- Remove existing concrete channel and fence
- Regrade and realign to create a more 'natural' creek
- Rock protection at transitions
- Rock bars at 25m spacing in base of channel
- Channel banks to be grassed and covered with non degradable erosion protection



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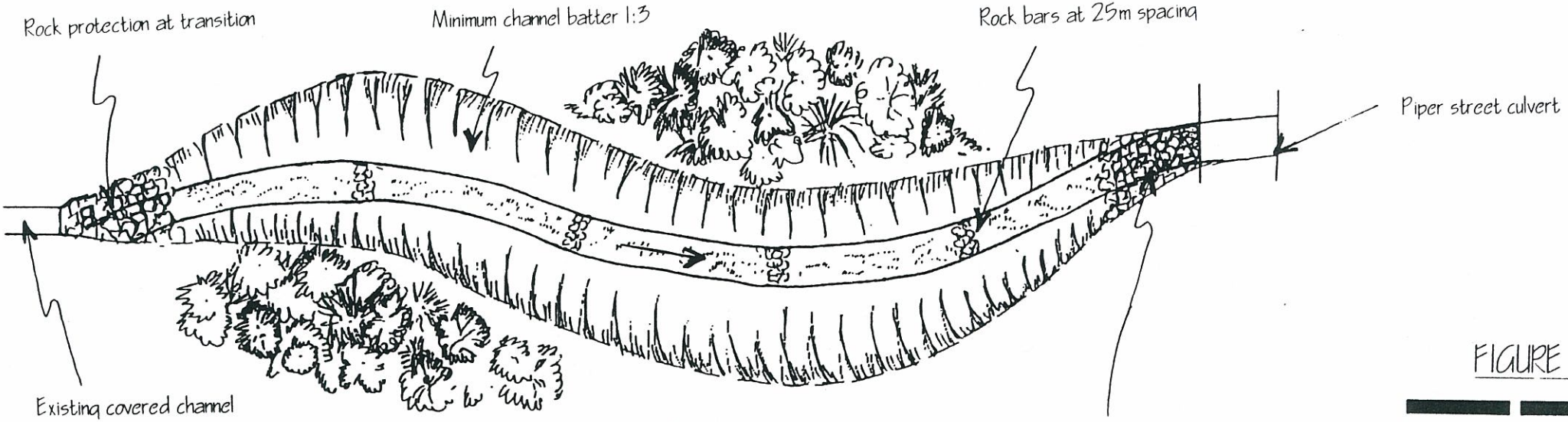
NTS



PLAN
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FIGURE 2

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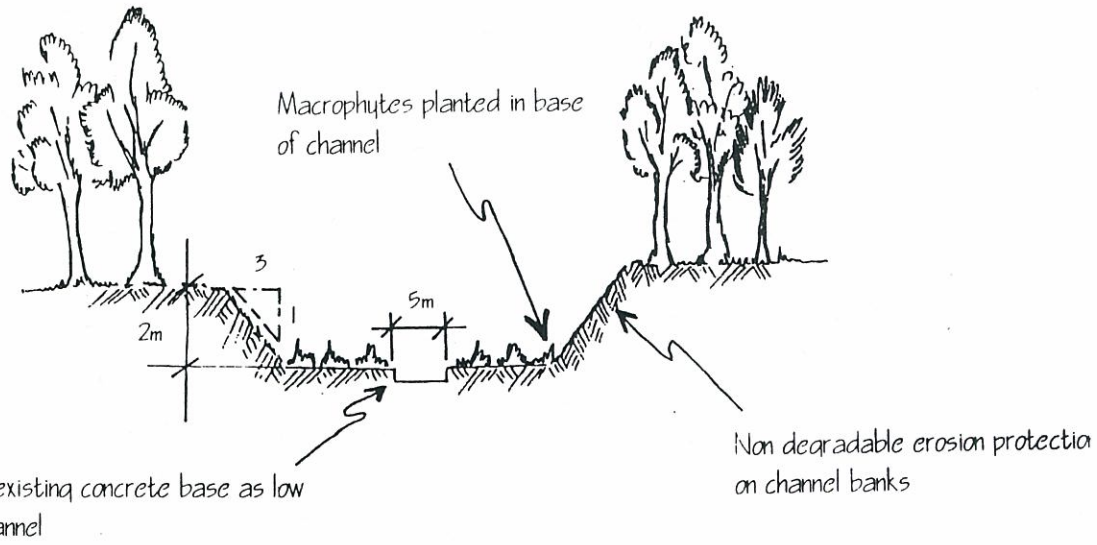
WHITES CREEK VALLEY PARK

Plan of Management - Option 2

- Remove existing concrete channel and fence (retain base)
- Regrade and realign to create a more 'natural' creek
- Rock protection at transitions
- Rock bars at 25m spacing in base of channel
- Channel banks to be grassed and covered with non degradable erosion protection



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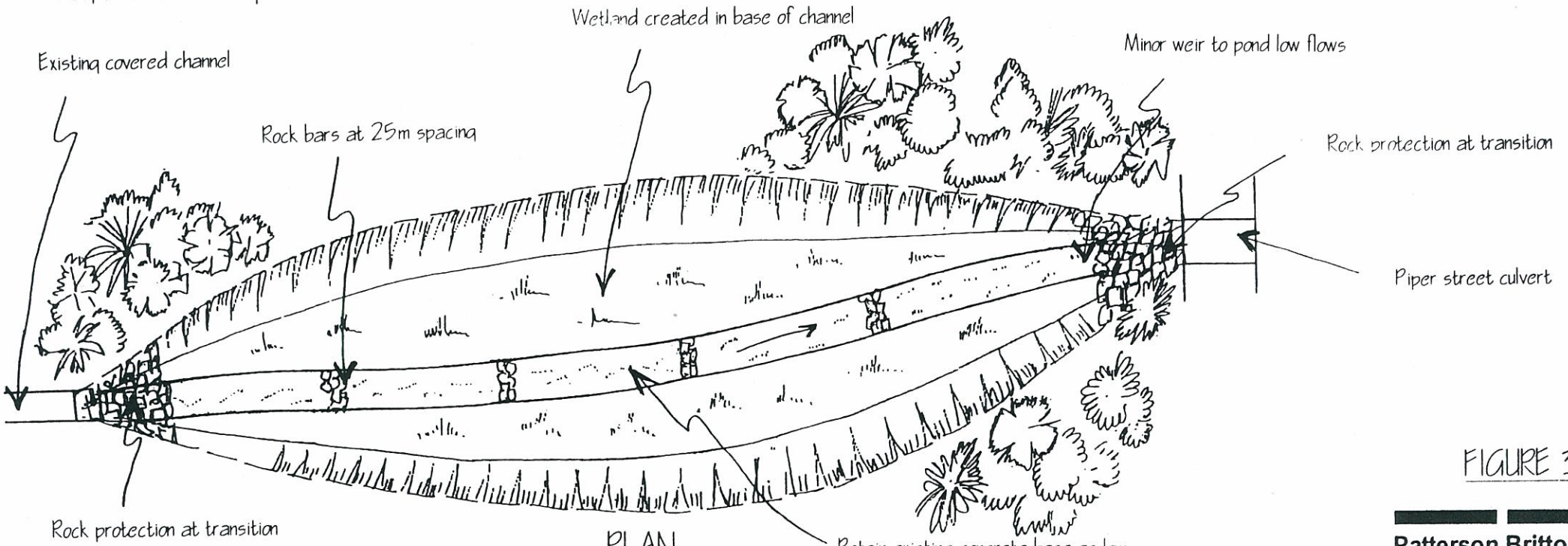

PLAN

FIGURE 3

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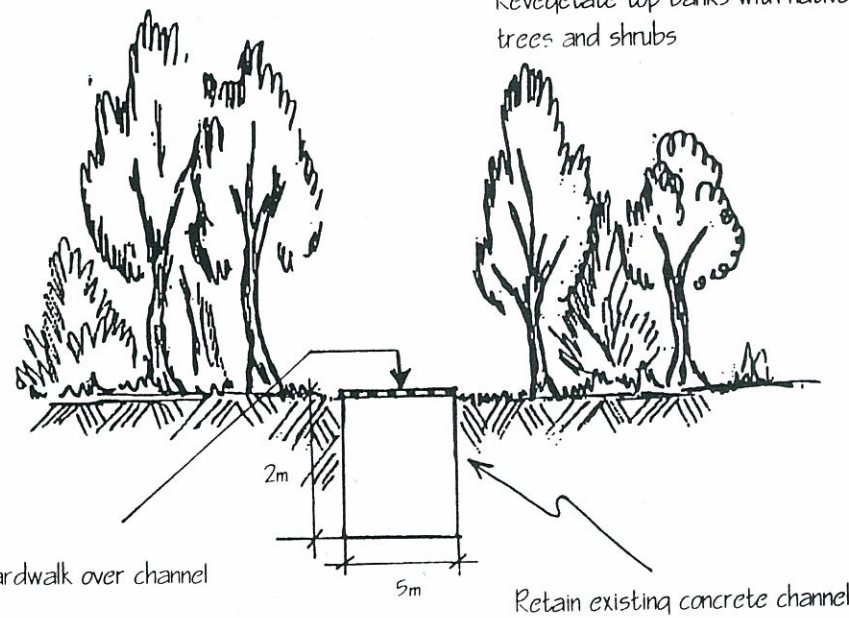
WHITES CREEK VALLEY PARK

Plan of Management - Option 3

- Retain existing concrete channel
- Remove existing fence
- Cover channel with grate/ timber boardwalk



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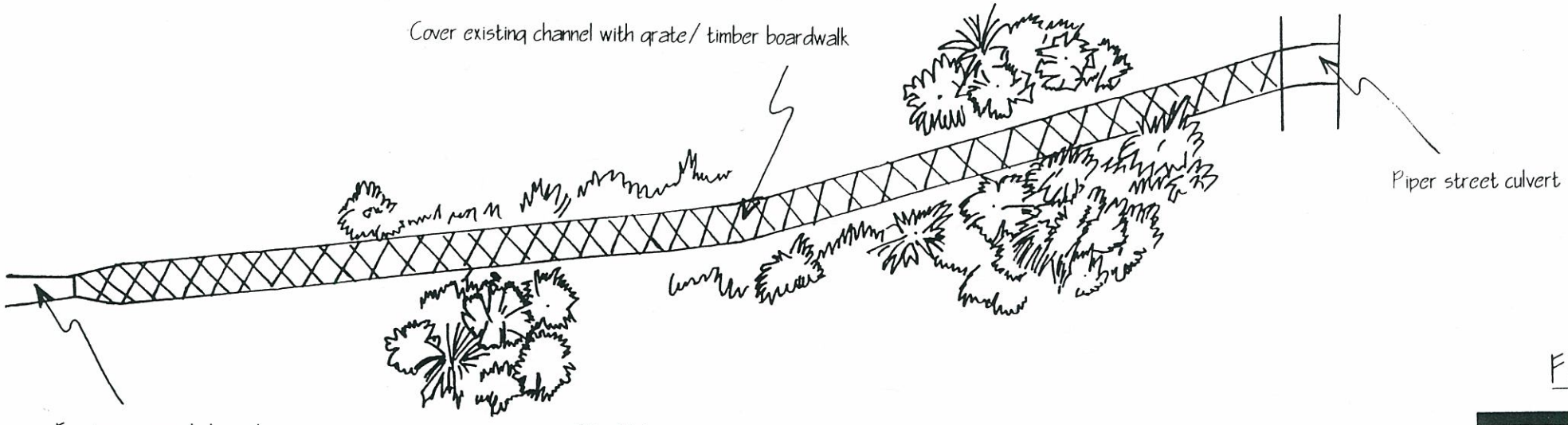

PLAN
N.T.S

FIGURE 4

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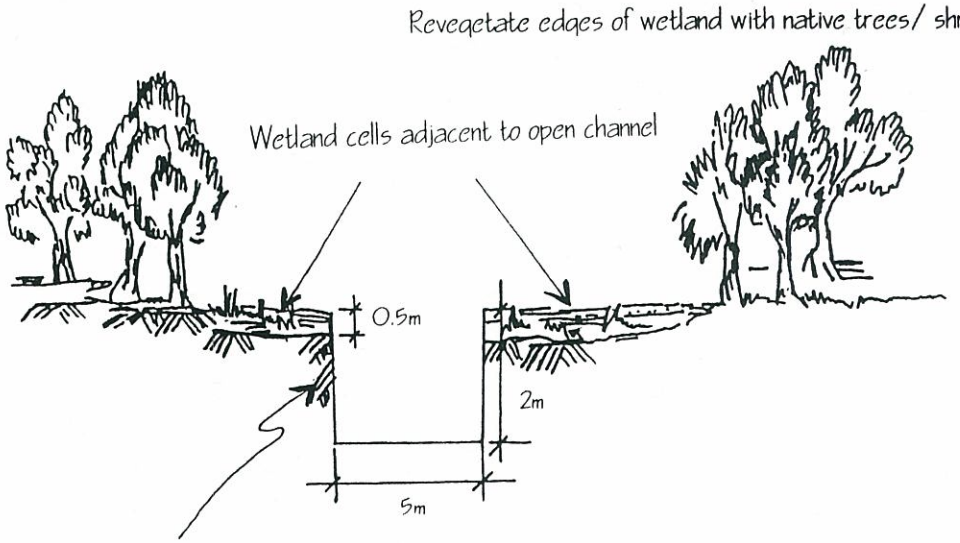
WHITES CREEK VALLEY PARK

Plan of Management - Option 4

- Retain existing concrete channel
- Remove existing fence
- Construct shallow (0.5m deep) wetland cells adjacent to the channel
- Direct local catchment runoff into the wetland cells



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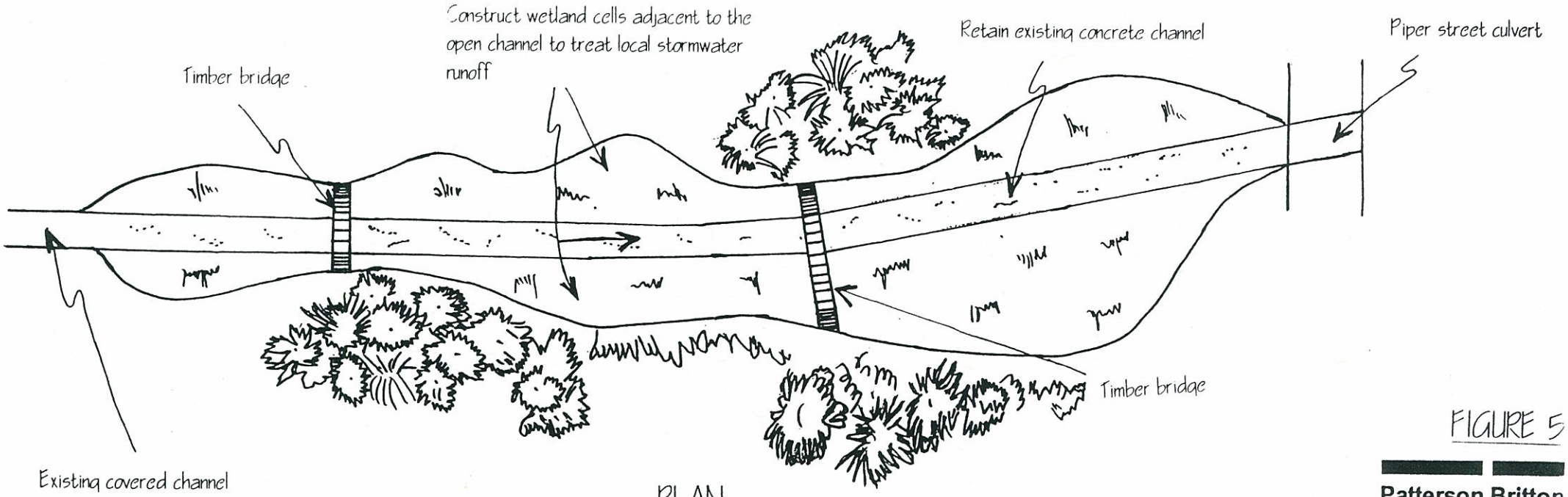

PLAN

FIGURE 5

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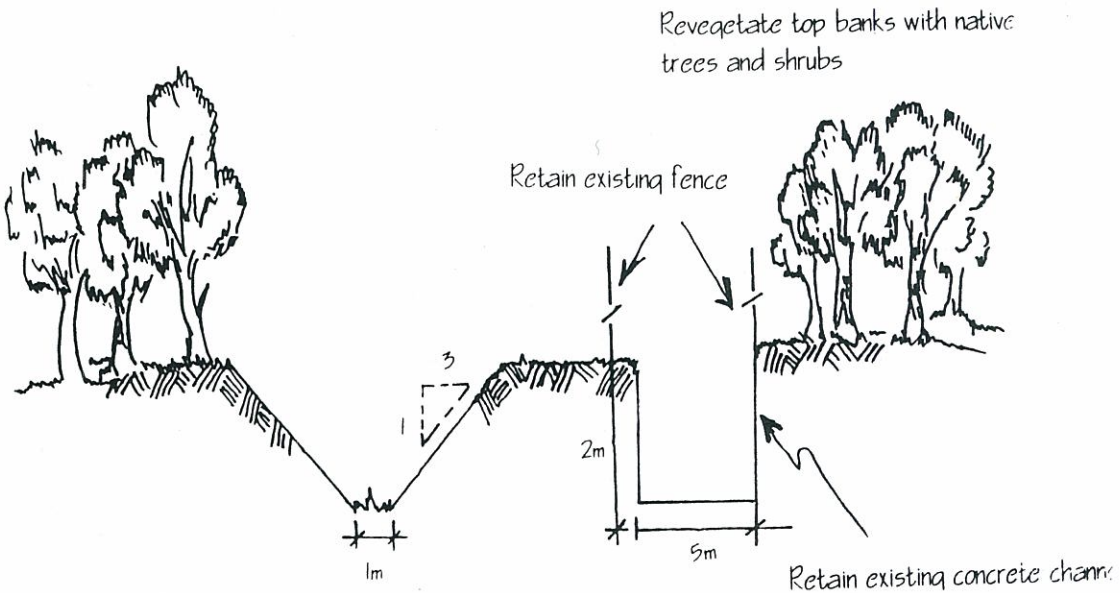
WHITES CREEK VALLEY PARK

Plan of Management - Option 5

- 'Friends of the Earth' proposal
- Retain existing concrete channel
- Retain existing fence
- Construct offline wetland adjacent to the existing channel
- Low flows to be diverted from the existing channel to the wetland
- Stabilise side slopes of wetland



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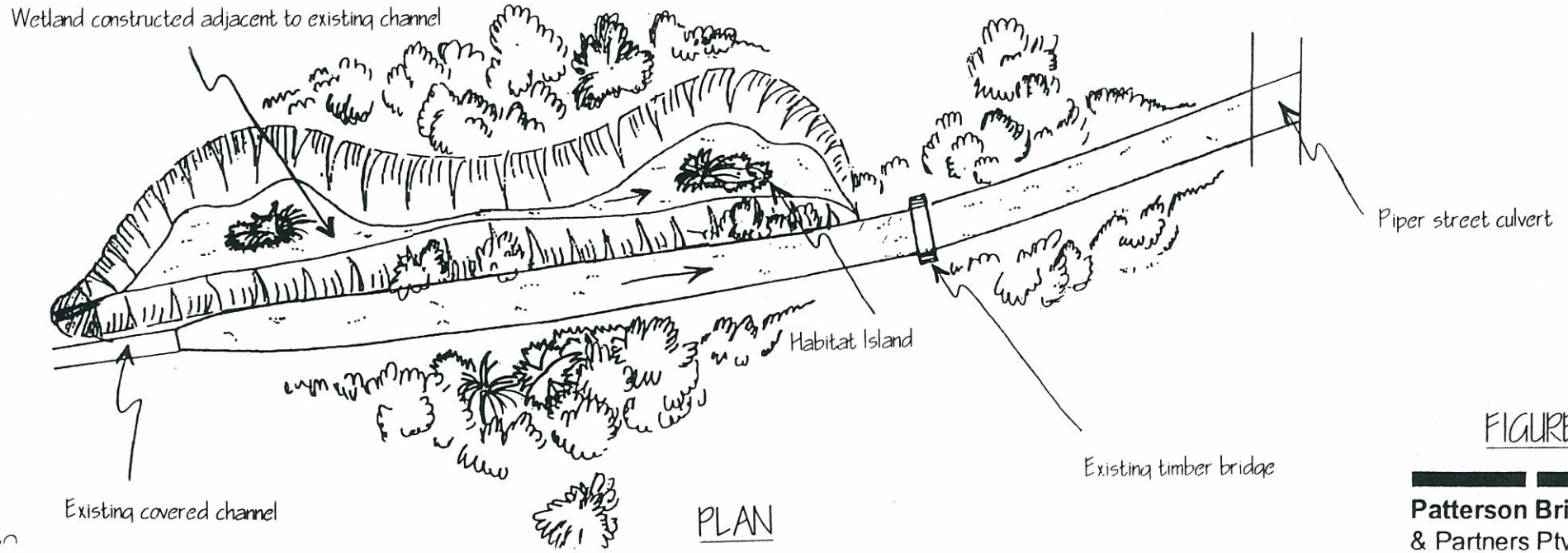

PLAN

FIGURE 6

12930/P1B50

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4 COST ESTIMATES

Preliminary construction cost estimates were developed for the five alternative channel options. A summary of the construction costs is given in **Table 4.1**, while a more detailed costing is given in **Appendix B.**

Table 4.1 Cost Estimates for Alternative Channel Options

Channel Option	Construction Cost ($)
Option 1	820,000
Option 2	1,200,000
Option 3	240,000
Option 4	210,000
Option 5	330,000

5 OTHER CONSIDERATIONS

5.1 GENERAL

Other considerations that would need to be addressed at the detailed design stage include:

- impact of the proposed works on hydraulics and carrying capacity of the channel
- ownership of the existing channel and adjacent land
- ownership and responsibility for maintenance
- safety issues with regard to batter slopes and fencing
- location and depth of adjacent utility services
- erosion and sediment control during and after construction
- sustainability of wetlands, if adopted.

5.2 ANNANDALE SAND FILTER TREATMENT PROJECT

Leichhardt Municipal Council recently received funding *($77,500)* from the NSW Stormwater Trust to construct a trial sand filtration system adjacent to the existing stormwater channel at the corner of Smith and Gillies Streets. Construction of the proposed works is likely to commence around August 1998.

Under the proposal, stormwater runoff from the local catchment would be collected and conveyed into a bunded area (*approximately 440m^2*), within Whites Creek Valley Park, on the eastern side of the existing channel. The proposed location was chosen for the following reasons:

- open area that would not require removal of existing trees, and
- proximity to existing stormwater pipe draining to the channel.

The storage for the system would be provided via 300mm high landscaped banks around the perimeter of the infiltration area.

The water would be temporarily stored above ground until it infiltrates into the ground, passing through the grass and topsoil and then a filter medium consisting of a proprietary product called "Atlantis Ecosand", removing heavy metals, hydrocarbons and faecal coliforms. The gross pollutants (*litter, leaves and grass clippings*) are left on the surface of the ground to be collected separately.

The infiltrated water is then collected in a layer of drainage cells and directed back into the Whites Creek Channel. Although the water could be directed to a wetland for additional treatment, if a wetland were constructed within the park.

5.3 EXISTING UTILITY SERVICES

As shown on **Figure 7**, a number of existing sewer lines (*gravity and rising mains*) are located close to the existing channel. These are as follows:

- major sewer viaduct, which passes over the existing channel;
- gravity sewer line (*clay pipes*), which was constructed in 1903, running parallel to the existing channel at a depth of between 2.3m and 2.9m below existing ground levels;
- disused sewer rising main (*150mm CICL*), and
- rising main (*300mm CICL*), which was constructed in 1968.

WHITES CREEK VALLEY PARK

EXISTING SERVICES

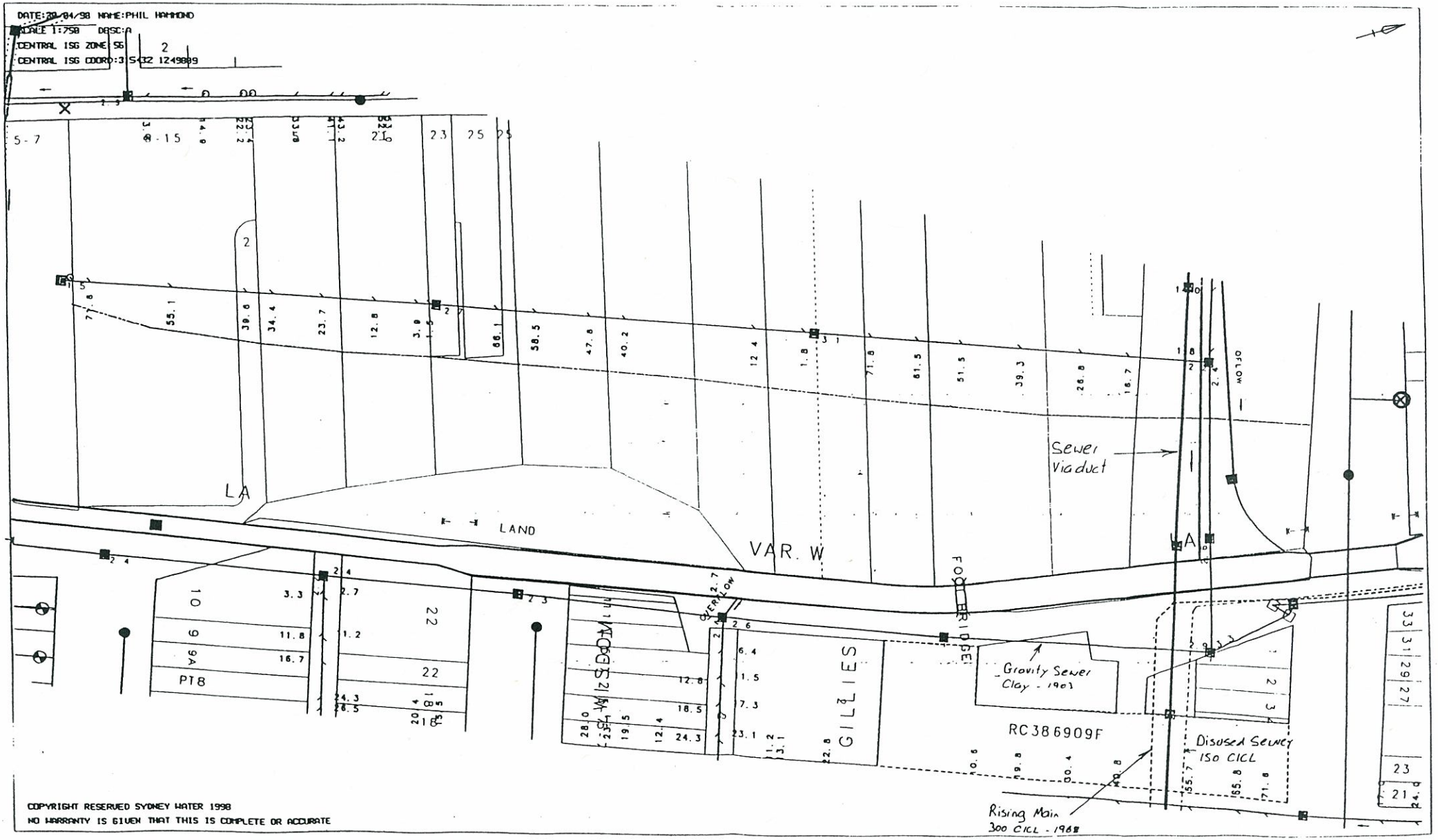

FIGURE 7

Appendix 1

Floyd 1996
Whites Creek Catchment. Water is life 1.
Brochure prepared by Friends of the Earth.

Floyd 1997
Upper Catchment Management Whites Creek
Report prepared by Friends of the Earth.