6. IMPLEMENTATION

This section sets out a range of ways and means for pursuing the strategies for conservation and management of the creek and catchment. The initial action should be to establish the Rapid Creek Catchment Advisory Committee, who would adopt and implement the Plan. A programme of works, based on the strategies described in Section 5, would then be established.

The suggested priorities and opportunities for implementing the various strategies have been described. This, along with the summary of major project components of high priority, listed in Figure 6.1 for ease of reference, would form the basis of a work programme. The work programme would be prepared by the Advisory Committee (if in existence) or through a series of co-ordination meetings between the various Government authorities and community groups.

This section also includes broad details relating to the implementation works under the following headings:

6.1 *Corridor Controls*. Suggested boundary and corridor controls along the creek line.

6.2 *Design and Material Guidelines*. Typical details and construction techniques for use in rehabilitation works.

6.3 *Costing*. A guide to the relative costs for specific projects and rates for general treatments throughout the creek catchment.

6.4 *Alternative Funding Sources.* Summary of grants available from State and Local Government, statutory authorities and other agencies that may be sought to assist with project developments arising from this Plan.

FIGURE 6.1

MAJOR PROJECT COMPONENTS OF HIGH PRIORITY

1. Establish the Rapid Creek Catchment Advisory Committee to adopt and implement the Plan.

2. Develop a broad-based education and information strategy aimed at increasing the communities awareness of Rapid Creek and the natural systems within the catchment. Aspects to be covered would include water quality, vegetation communities, pathways (including links to other areas), views and the need for appropriate care when in the creek corridor.

3. Develop and implement programmes for regeneration and revegetation of areas of remnant bushland, particularly within the monsoon forest and Marrara Swamp communities. A weed control programme will be implemented at the same time.

4. Improve water quality within the creek and protect the creek's flood mitigation role by:

   -reducing nutrient and sediment through a programme of education and use of gross pollutant traps, filter strips and erosion control measures

   - continue and expand existing water quality monitoring programme

   -protect and maintain the upper catchment in its present undeveloped nature which is a key component in flood control

5. Prepare a fire management strategy as part of the habitat conservation programme for the different vegetation communities.

6. Establish a dual-use pathway network that links Marrara Swamp and the upper catchment with the creek mouth and include cross links with adjoining paths and reserves; control access to Marrara Swamp and improve access to the mangrove communities in the area of Casuarina Coastal Reserve and Northern Territory University. Restrict vehicle access within the corridor to emergency and maintenance vehicles only.

7. Rationalise ownership and improve compatibility of management practices in Defence and DIA grounds.

8. Establish a coherent design approach to urban design elements and identify the creek catchment under the umbrella term of 'Rapid Creek Park'.

9. Following representation to the NT Government, and assuming land ownership issues are resolved develop the area of Crown Land adjacent to McMillans Road and Henry Wrigley Drive as a catchment interpretive centre and trail head. This project could be a focal point for the on-going protection and enhancement of the creek and could be known as The Gurambai Centre.

6.1 CORRIDOR CONTROLS

Following from the strategies, there will be several planning, design and creek management initiatives that apply along the whole length of the creek, particularly where these have a direct relationship to water levels, or the need for management access, for example.

Illustrated in Figure 6.2 are controls that should be pursued in the immediate and long term to ensure conservation of the natural resources of the creek corridor. They are intended to control the type and location of development along the corridor and should form the basis of Land Use Objectives under the New Planning Act (Section 8).

Understanding that the Planning Act does not have force over Federal Lands, the controls would require the co-operation of both Defence and DIA.

The various components of the corridor controls, as described in the Land Use Objectives, will be:

- **Natural Creek Corridor** - conservation of habitat

  A continual corridor along the creek that is determined by the extent of both the remnant vegetation community and the 1 in 100 year flood levels. The primary action in this area would be regeneration of the remnant community. Access would be restricted to pedestrians only, and landscape works would be confined to bank stabilization, path provision and interpretative information as required and where appropriate.

- **Landscape Buffer** - species selection guidelines and maintenance corridor

  A band adjacent to the creek corridor in which canopy tree planting is particularly encouraged and any vegetation introduced is limited to indigenous species that relate to the natural areas. These works would be undertaken as part of a revegetation programme.

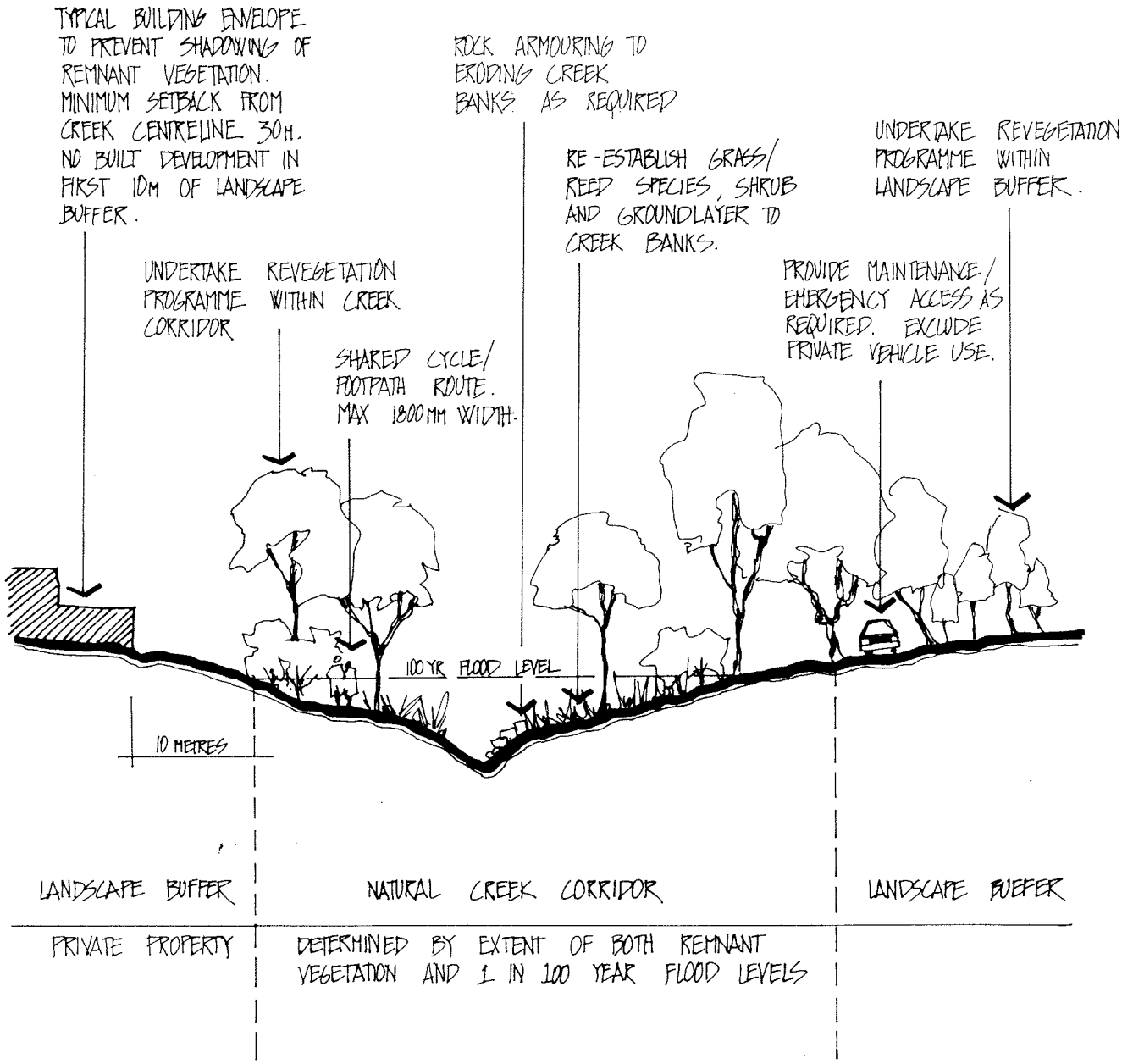
  A corridor will be provided to allow maintenance / emergency access as required. The access route is important in defining the extent of varying maintenance regimes and would also function as a fire break.

- **Building Setback** - visual and shadow impact

  The intention of this component is to control the visual quality of the resource and prevent shadowing and physical encroachment on the creek corridor. The rear land of the buffer may be developed in line with the relevant Land Use Objectives for conditions of site coverage, side boundary building setbacks etc but with a consistent building height envelope.

FIGURE 6.2

CORRIDOR CONTROLS



6.2 DESIGN AND MATERIAL GUIDELINES

Continuing management of the creek should aim for a high standard of appearance and aesthetic control in all construction and rehabilitation works. To this end, the following guidelines suggest materials, techniques and details that are suitable for Rapid Creek bank treatments, structures, planting and pollution control measures.

For ease of interpretation this section is largely illustrative. The details are guidelines only and cannot be applied without specific site investigation and detailed design. They are intended to demonstrate the scale, character and relative impact / costs of appropriate treatments.

FIGURE 6.3

PRINCIPLES FOR CONSOLIDATING REMNANT VEGETATION

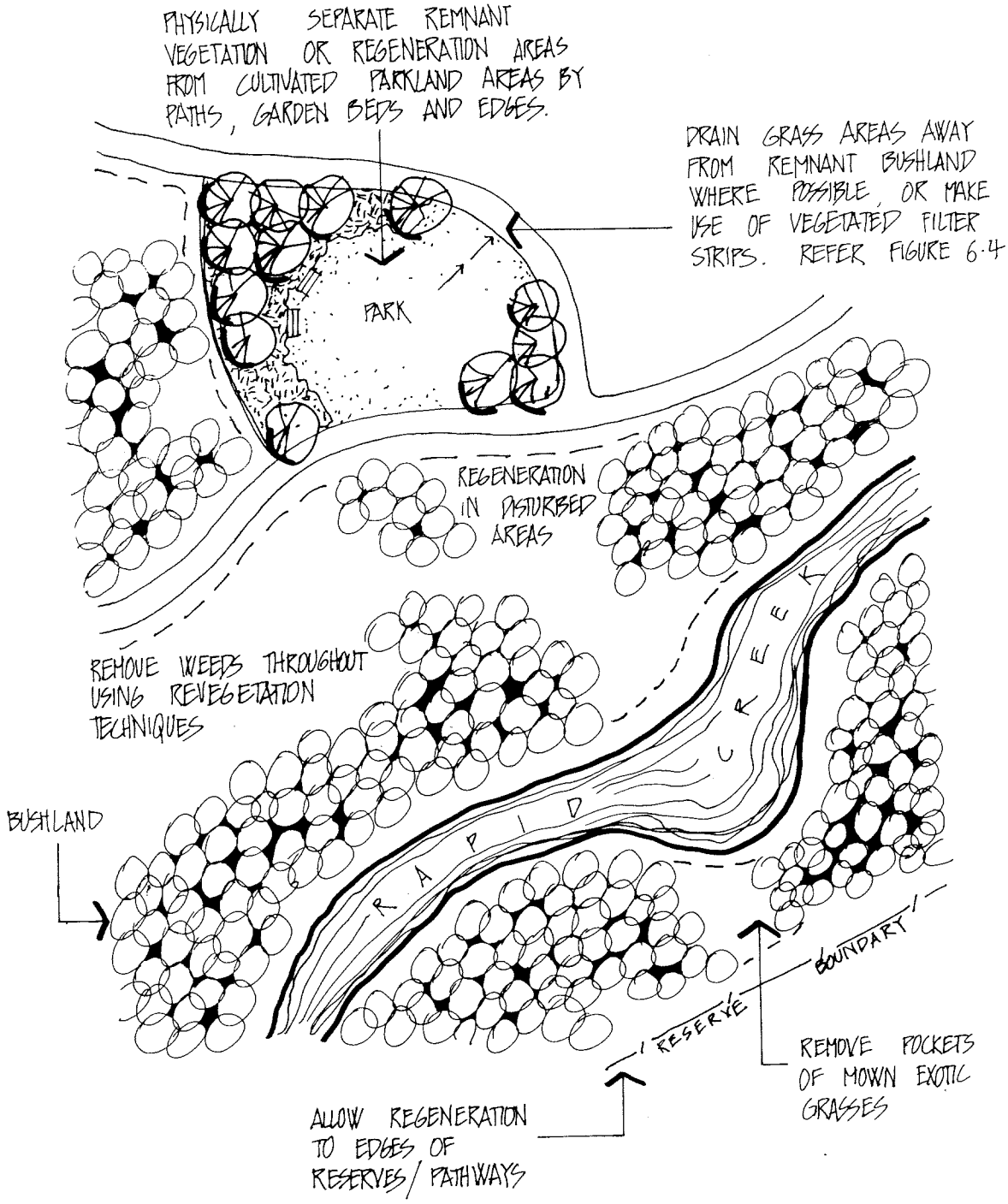
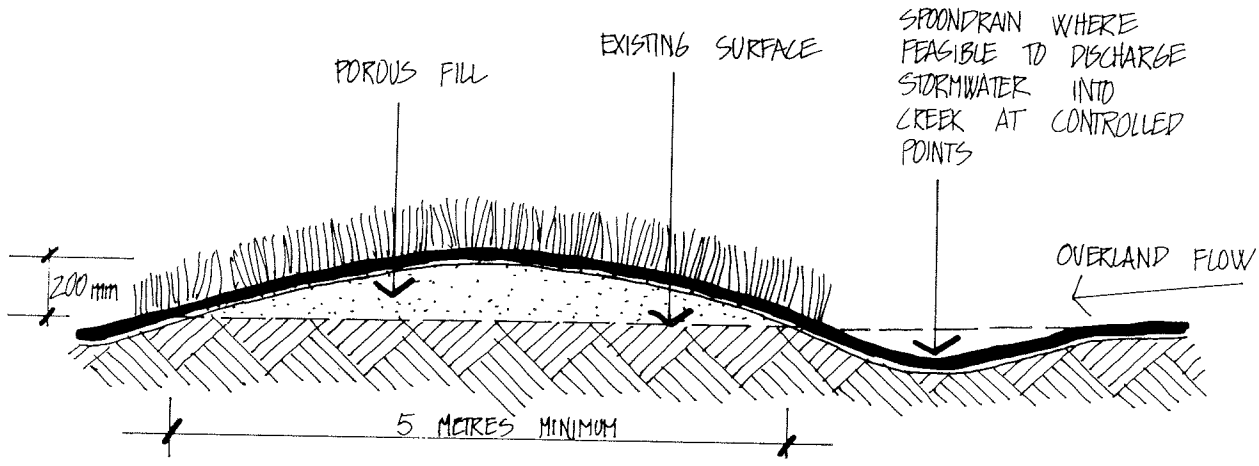


FIGURE 6.4

CONCEPT FOR VEGETATED FILTER STRIP



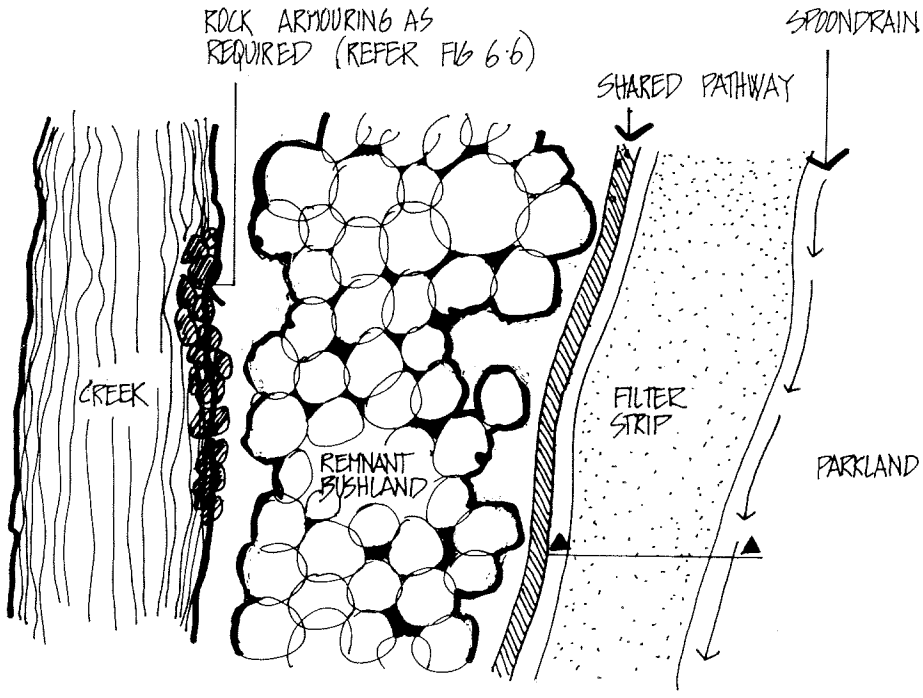
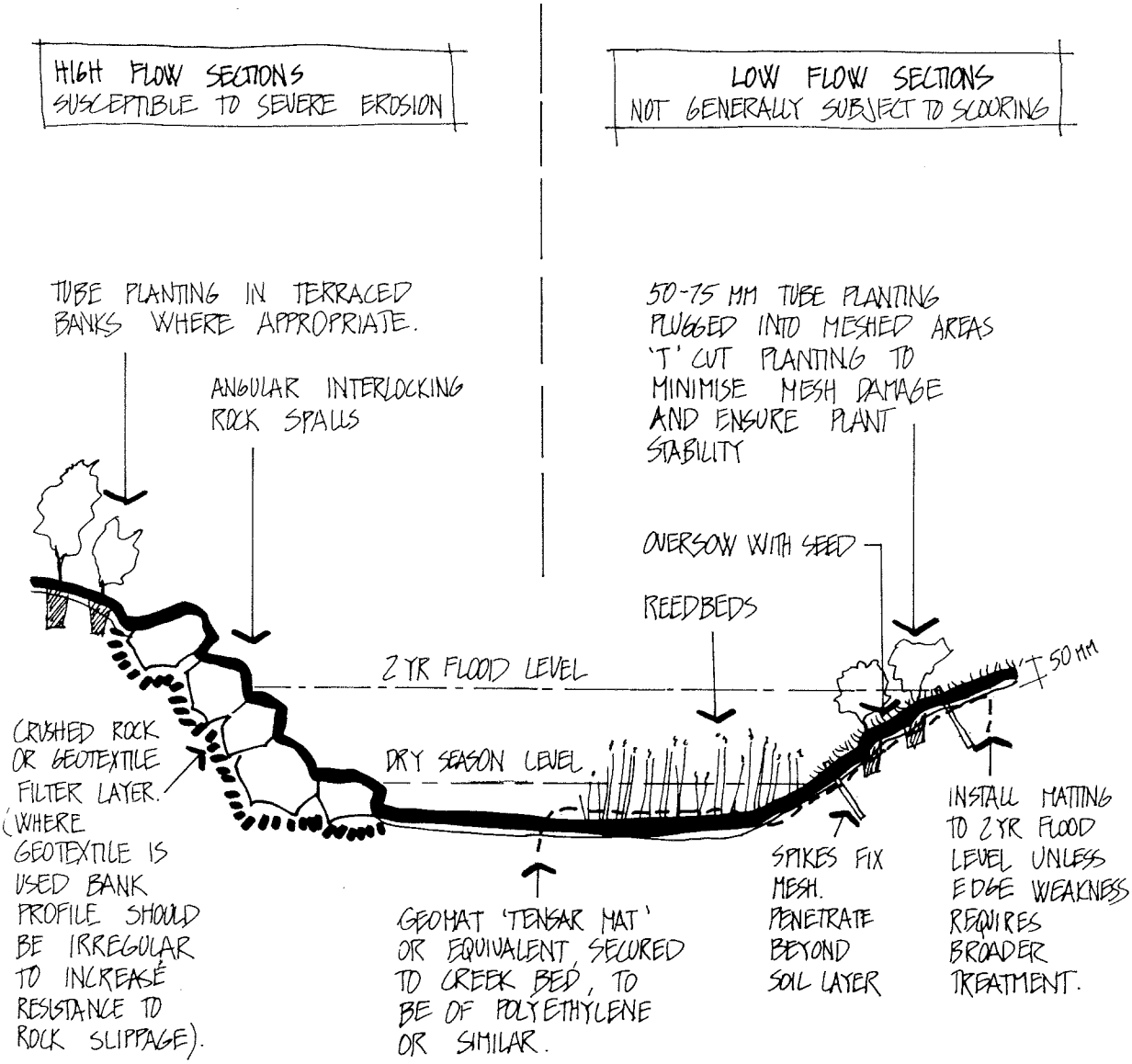


FIGURE 6.5

STABILISATION OF CREEK BANKS, VEGETATION MANAGEMENT



GENERAL NOTE:

FOR UPSLOPE PLANTING WEED CONTROL (FOLLOW REVEGETATION PROCESS):—
IF GREATER THAN 1:4 SLOPE, USE COCONUT MAT. OTHERWISE USE LEAF MULCH, WITH TUBESTOCK PREFERABLY.
ALL BANK STABILIZATION TREATMENTS ARE SUBJECT TO DETAILED INVESTIGATION/DESIGN.

FIGURE 6.6

CONCEPT FOR ARMOURING ERODING BANKS

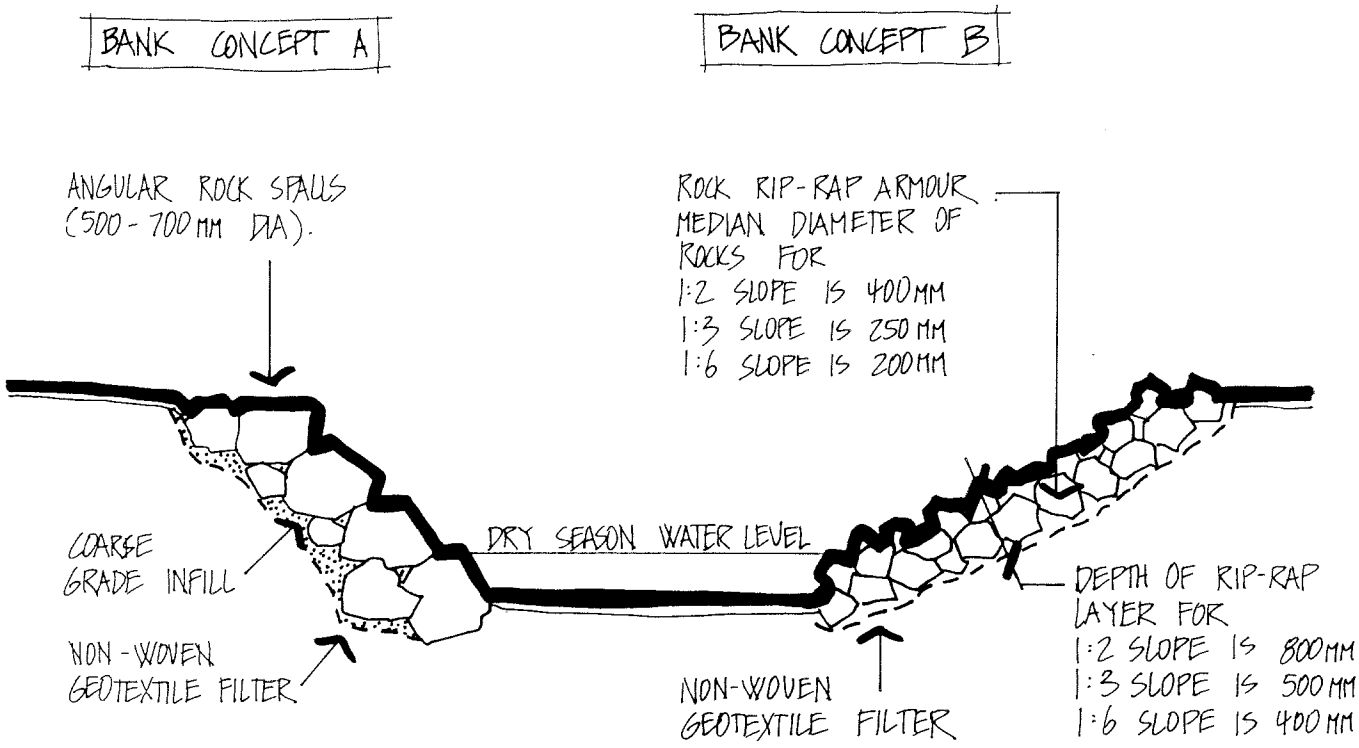


FIGURE 6.7

DUAL-USE PATHWAY CONSTRUCTION
(Major Linear Path and Cross-links

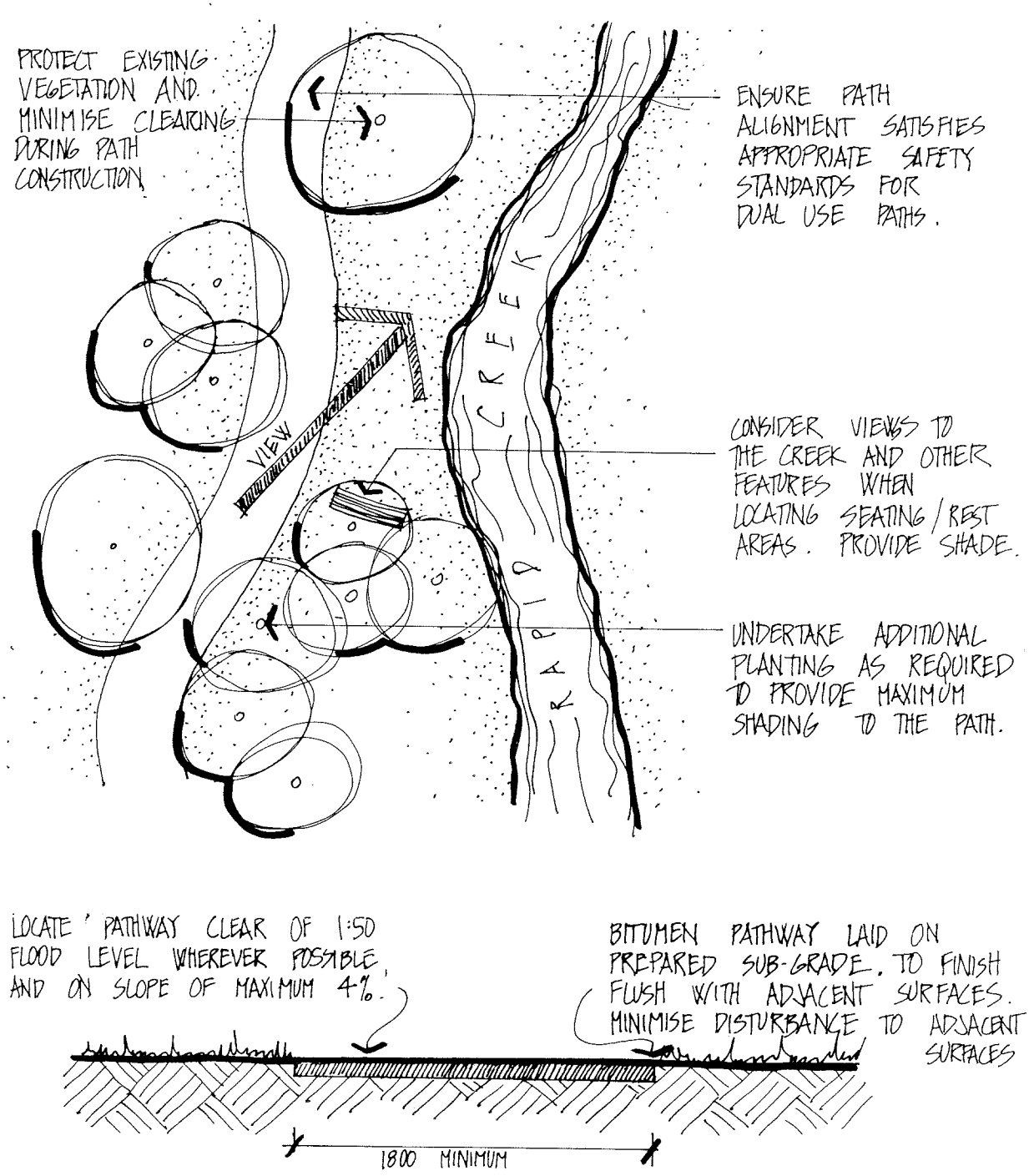


FIGURE 6.8

STABILISED GRAVEL PATH
(Minor Pedestrian Access Routes)

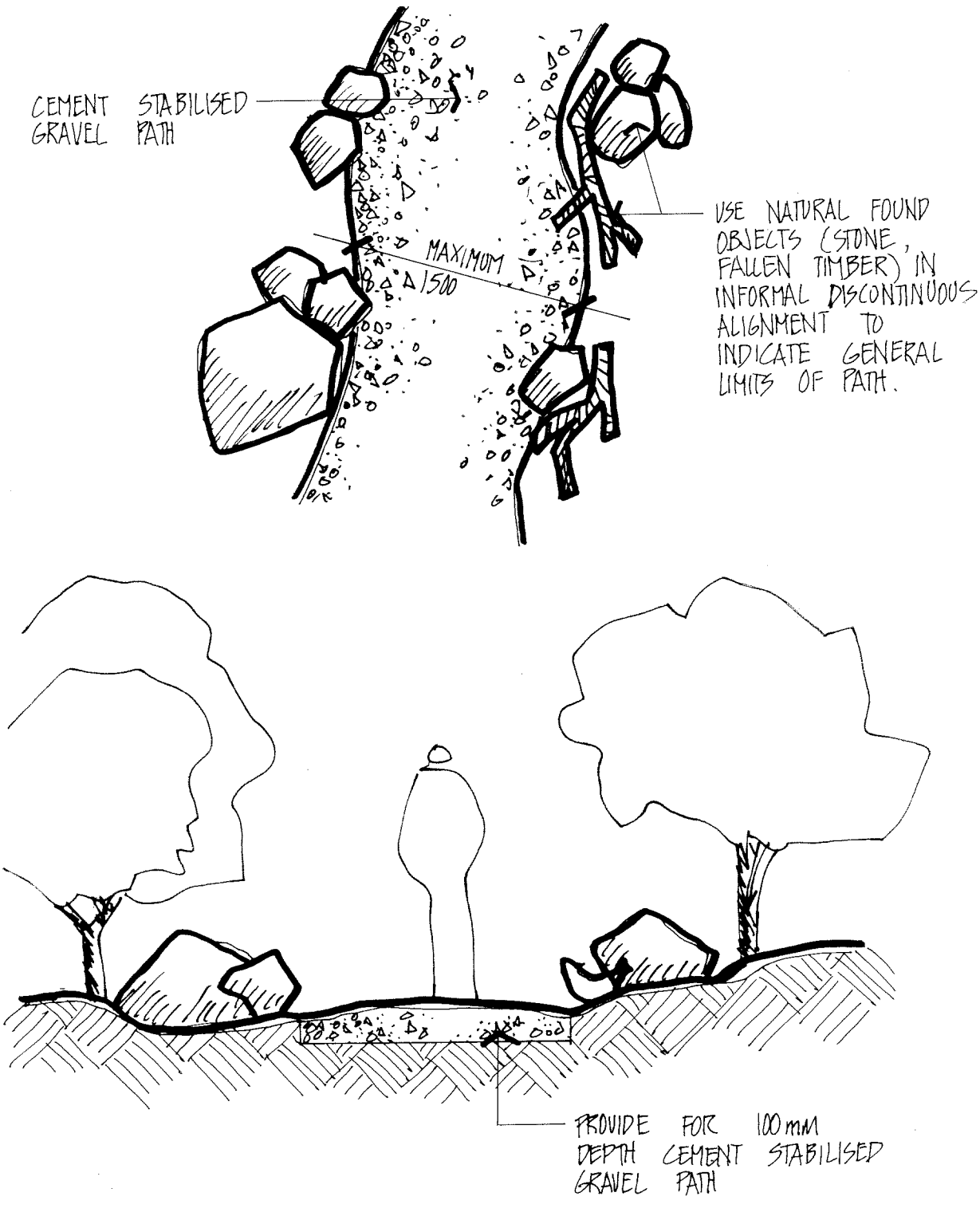
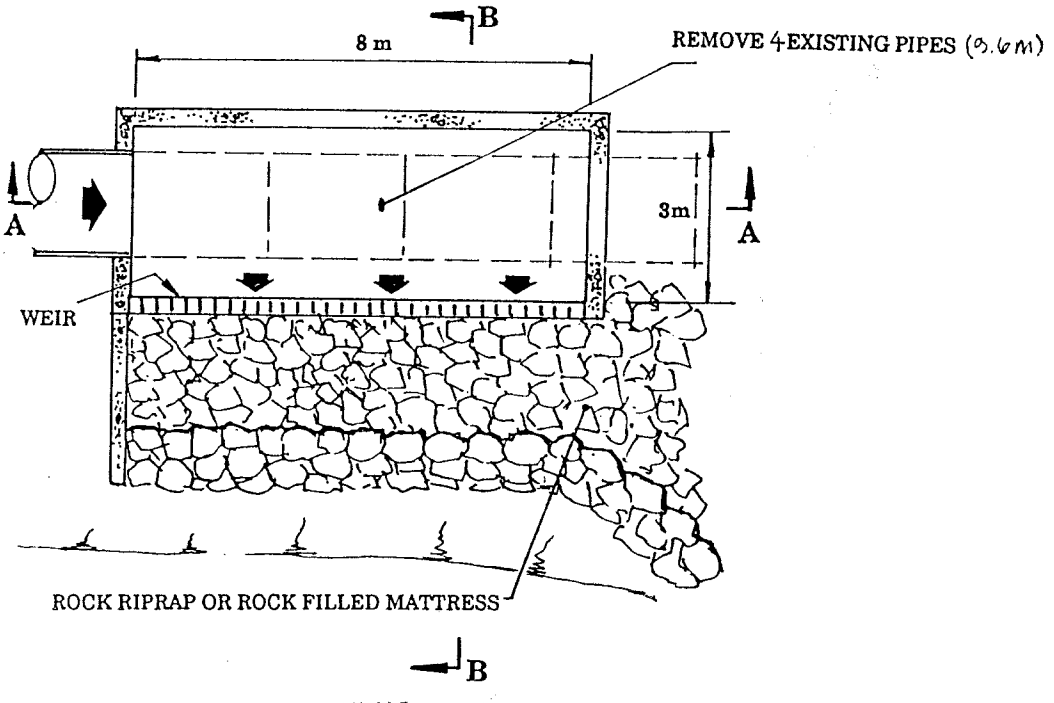
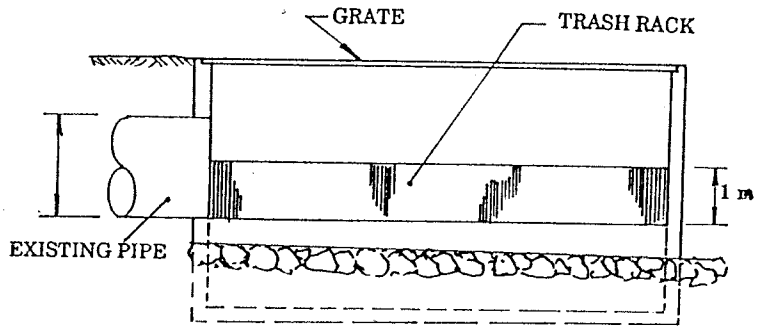


FIGURE 6.9

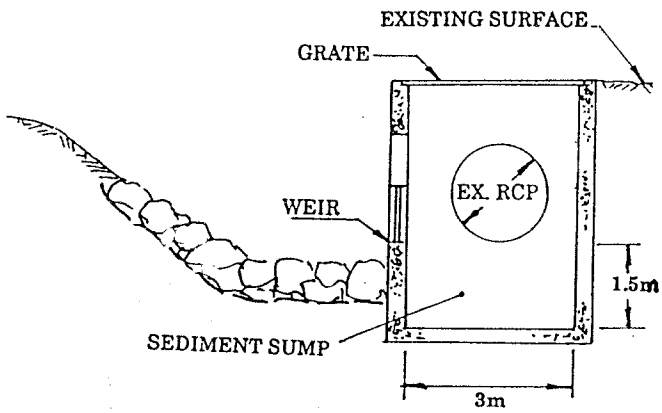
CONCEPT DESIGN FOR MINOR GROSS POLLUTANT TRAP



PLAN



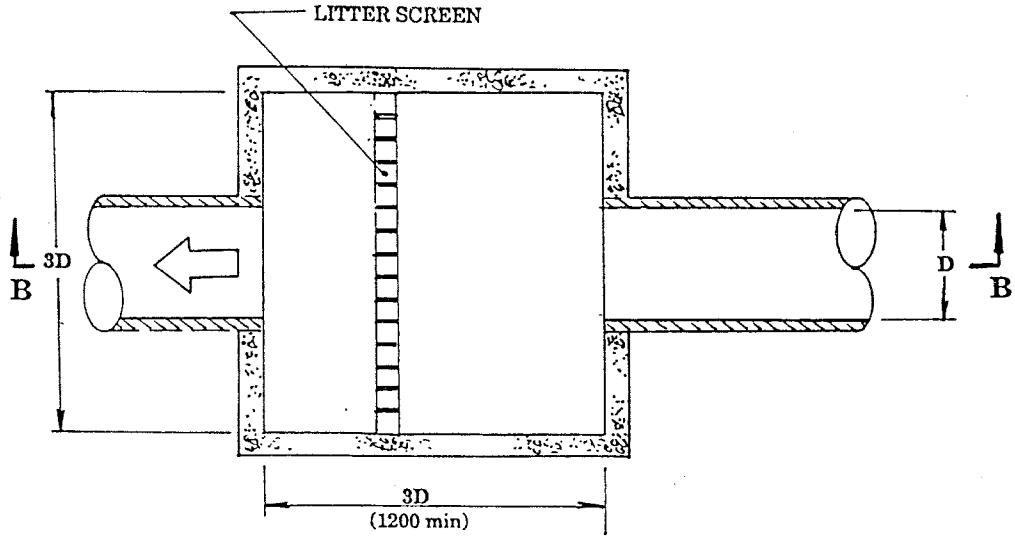
SECTION A -A

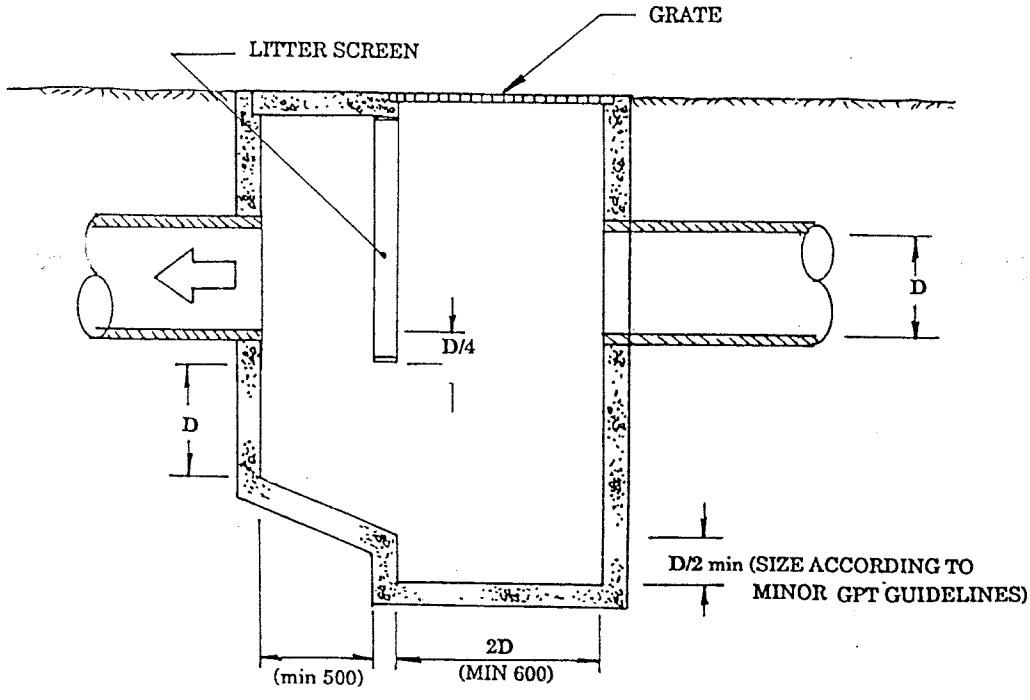


SECTION B - B

FIGURE 6.10

CONCEPT DESIGN FOR MINI GROSS POLUTANT TRAP

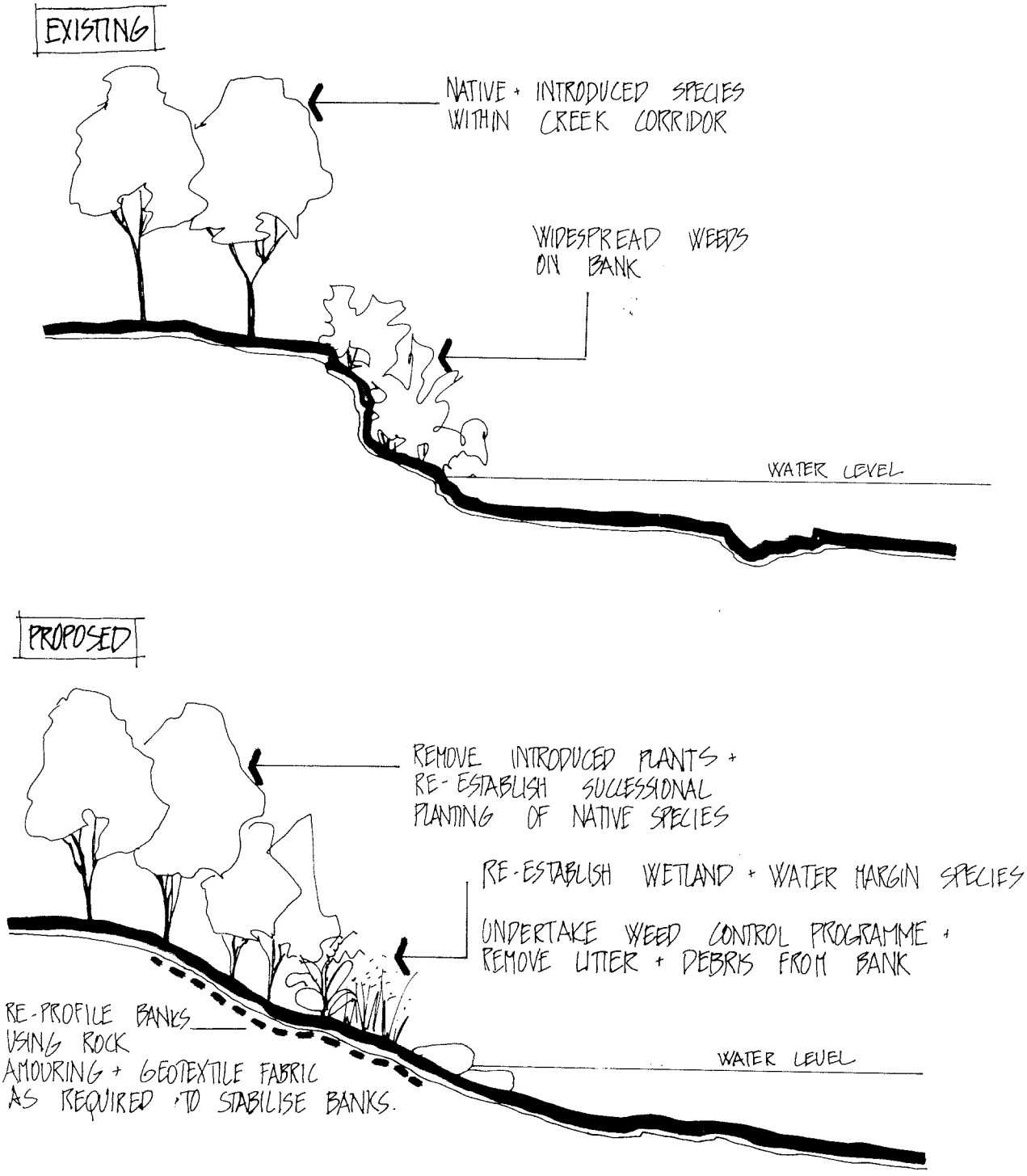




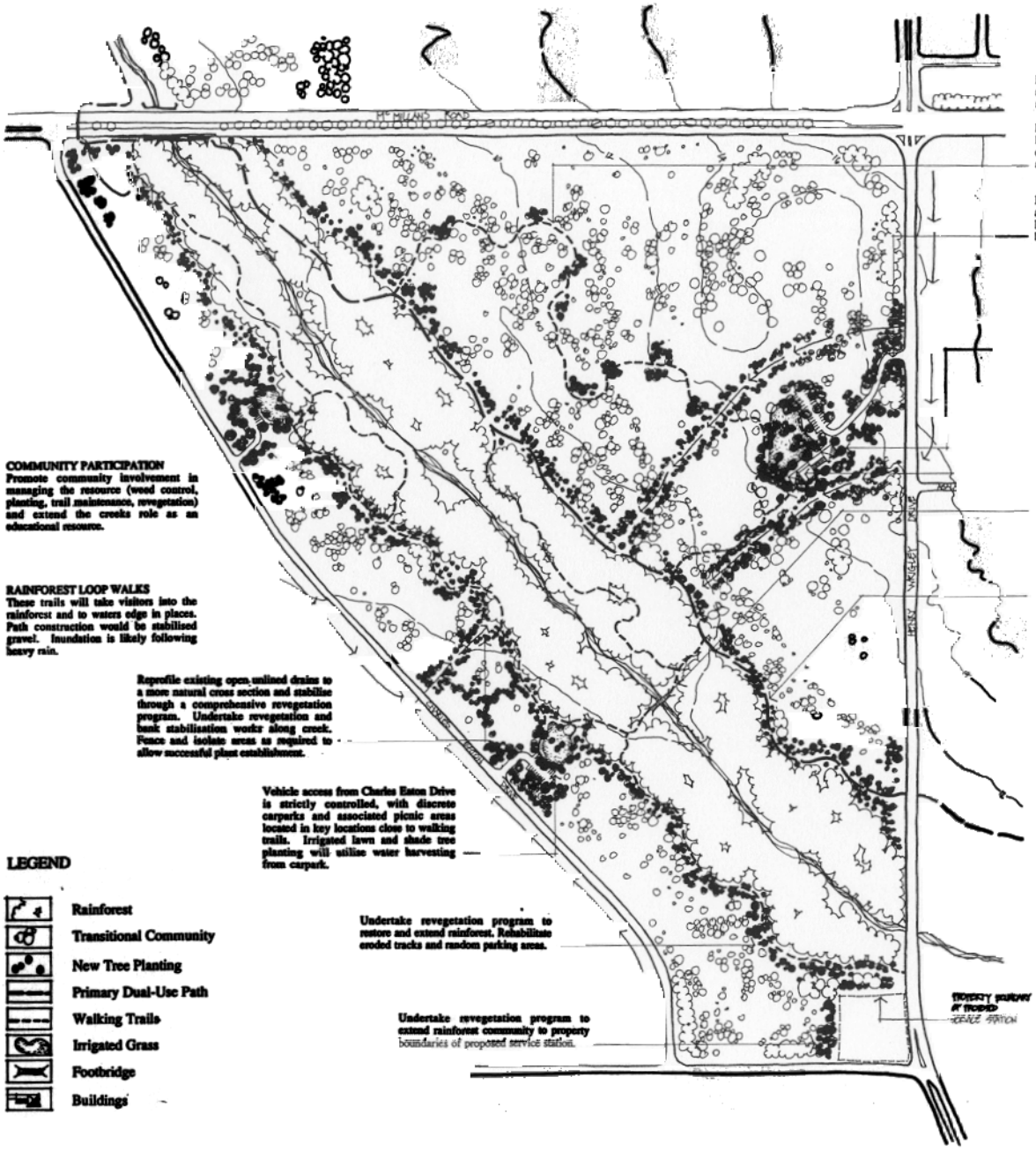
SECTION B- B

FIGURE 6.11

PRINCIPLES FOR EDGE PROFILE TREATMENT
(eg Darwin Water Gardens and Other Locations As Applicable)



GURAMBAI CENTRE
Figure 6.12




INTERPRETIVE SITE


TRAIL HEAD AND PICNIC AREA.


TYPICAL SECTION THROUGH CARPARK AND PICNIC AREA

RAPID CREEK
MANAGEMENT STUDY

CLOUSTON
LANDSCAPE ARCHITECTS • LANDSCAPE PLANNERS
FOR GREENING AUSTRALIA AND DARWIN CITY COUNCIL

6.3 COSTING

The following opinions of probable cost have been prepared as a guide only in order to assist the management bodies with budgeting. It must be noted that a more accurate estimate for works will be necessary in association with design development. Costs do not account for professional fees or inflation

6.3.1 MAJOR PROJECT COSTS

- **The Gurambai Centre**

  The Gurambai Centre (See Figure 6.12) may be broadly broken down as follows:

-	Road works, including access off Henry Wrigley Drive, carparking area and bollards	$48 000
-	Gross pollutant control structures and rehabilitation/reprofiling of existing drainage structures	$80 000
-	Interpretive Centre - Free standing, open structure, including Clivus Multrum toilet, water supply and lighting	$150 000
-	Pathway network, including signage and interpretation	$80 000
-	Park furniture, including lighting	$35 000
-	Planting and bushland rehabilitation	$85 000
-	Creek bank stabilisation works	$120 000
-	On-going maintenance	$30 000 per annum

6.3.2 MINOR PROJECT COSTS

•	**Education and Information Programmes**	
-	Extend existing programmes of both PAWA and Darwin City Council	$10 000 - $20 000
-	Rapid Creek Brochure prepared by Advisory Committee and widely distributed (foldout A4 format)	$25 000
•	**Rehabilitation and Upgrading of Reserves**	
-	Tree and shrub planting	$75- $180 each (depending on size)
-	Upgrade and consolidate play equipment in key locations (Playgrounds adjoining Rapid Creek Road and Freshwater Road)	$8 000 - $30 000
-	Signage (Interpretation and Identification)	$800 each
•	**Rapid Creek Park Entrances**	
-	Major entrances at Amy Johnson Drive, Henry Wrigley Drive, Nightcliff shore front and Casuarina Coastal Reserve (including entrance structure, signage, interpretation and planting)	$15 000 each
-	Minor entrances at Malak Caravan Park, Northlakes, Marrara complex and Northern Territory University (including signage and planting)	$5 000 each
•	**Street Tree Planting**	
-	Typical costs per tree including 12 months maintenance, planting and staking of advanced stock	$180 each
•	**Pathway Construction**	
-	Bitumen pathway including clearing and ground preparation (1 800 mm width)	$80/lm
-	Stabilised gravel path including clearing and ground preparation (1 200mm width maximum)	$30/lm
•	**Creek Crossings**	
-	Low profile bridge structure to provide pedestrian crossings in area of monsoon forest	$20 000 each

6.3.3 WATER MANAGEMENT COSTS

Cost Estimates for Selected Control Devices

- Gross Pollutant Traps. Capital costs will vary depending on the site conditions, but may be expected to be in the order of $3 000 to $4 000 per square metre of plan area. Clearing costs using a backhoe and truck will be in the order of $70/m^3.

- The indicative cost for the GPT's at the major drainage outlets at Northern Territory University and behind the social clubs at McMillans Road would be $160 000 and $120 000 respectively.

- Mini Gross Pollutant Traps. Where large numbers of these devices are to be constructed costs may be reduced by standardising sizes and adopting reusable concrete formwork. for a single structure typically 1 200mm x 1 200mm x 1 500mm deep the estimated cost would be in the order of $8 500.

- Rock Armouring. The cost of rock armouring will depend greatly on the availability of suitable rocks. All up construction costs using "quarry run" rip-rap would be in the order of $400 - $600/m2.

- Reconstruction of Minor Drain Outlets. Where GPT's are not appropriate, reconstruct outlets to minimise localised ponding and erosion, and to reduce visual impact in natural areas. Depending on extent of works, costs could range from $4 000 - $10 000 each.

- Filter Strips. Construct filter strips between cultivated parkland areas and remnant bushland. All up costs for strips 5 000m width would be approximately $60/lm, including grass establishment costs.

- Removal of Weeds and Debris. Costs would vary depending on access and nature of debris. Typically, 2 labourers working with a backhoe and operator would cost $1 000 - $1 500/day. Clearance of $50m3 per day would be a reasonable work rate.

6.3.4 BUSHLAND MANAGEMENT COSTS

Costs for bushland management and revegetation are clearly dependant on the nature of work force concerned. This may be contracted bushland regeneration teams, salaried council staff or volunteers. However, as a guide, trained regenerators could be expected to charge at an hourly rate of $18.00 - $25.00 per hour.

Bushland regeneration is a labour intensive activity and use of alternative labour sources such as volunteer groups, prison internees and other people under LEAP programmes may be appropriate. The major cost here would be training and supervision costs of the teams.

6.4 ALTERNATIVE FUNDING SOURCES

To assist in the funding of works involved in the management plan there are a range of Commonwealth Government Grants available. These funds are usually only for capital works which may include professional planning and documentation fees. Grants usually have to be matched by Council or the appropriate Management authority, with a commitment to carry out ongoing maintenance of constructed works.

Commonwealth Grants are now all amalgamated under the National Landcare Programme. Relevant Grants are listed below in the following table with a brief description and where appropriate, possible applications.

Limited funding is available for re-current works, however, as is already the case, agencies such as Greening Australia can provide assistance in setting up Community Groups willing to participate in ongoing bushland management.

The Territory Government, although not in the practise of giving grants for such project, does have a number of current programmes through which funds may be available. These include the Urban Enhancement Programme and the Tourism Development Initiative. In each case funds may be available for both professional fees, as well as capital works.

NAME OF GRANT	PURPOSE	ADMINISTRATING AGENCY	SCOPE AND LIMITS OF ASSISTANCE
1. National Landcare Programme Save the bush	Remnant bushland management, revegetation, establishment of faunal corridors	Australian Nature Conservation Agency	Bushland revegetation. Typical grant $1 000 - $5 000 occasionally up to $10 000. Must be broad community support for the project.
2. National Landcare Programme One Billion Trees	Standard re-vegetation strategies	Greening Australia	Typical grant approx. $1 000.
3. National Landcare Programme National Soil Conservation Programme	Works directed at soil management	Department of Conservation and Land Management	Maybe of limited applications in Rapid Creek but worth investigating. Grants directed specifically at combating soil erosion. dollar for dollar grant. Max $#30 - $40 000.
4. Job Skills	Over 21 year old trained labour for re-vegetation work	Department of Employment and Training	Labour to assist in documented revegetation work. Job skills programme already in place with the Council. a new programme could be established specifically for work and projects on Bardwell Creek. Grant covers funding for a co-ordinator and approx. 20 trainee staff for about 26 weeks.
5. Landcare and the Environment Action Programme (LEAP)	Under 21 year old trained labour for re-vegetation work	Department of Employment and Training	Same as Job skills, except no programmes are yet in place with Council.
6. Special Projects	funding for specific projects related to the Job Skills Programme	Department of Employment and Training	Grant to $20 000 to supplement the Job Skills Programme. Must be matched by Council. Be of community benefit and endorsed by the unions.