

BEN CHIFLEY DAM MANAGEMENT PLAN



Bathurst City Council

NOVEMBER 2000



Terra Consulting
Surveys, Engineering, Town Planning and Environmental Consultants
PO BOX 123
ACT 015 87 338



EDAW

Preface

The development of the Ben Chifley Dam Management Plan represents many years of cumulative work.

The Plan has had extensive community consultation including 8 workshops, consultation with over 40 interest groups and clubs, and close liaison with the majority of all adjacent neighbouring landowners.

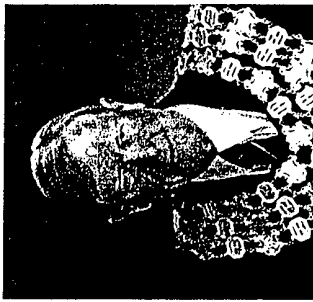
Ben Chifley Dam represents Bathurst's biggest single investment and as such, the asset needs to be effectively and efficiently managed on behalf of the community. This Management Plan is the first step in achieving these goals.

The key recommendations of the plan are:

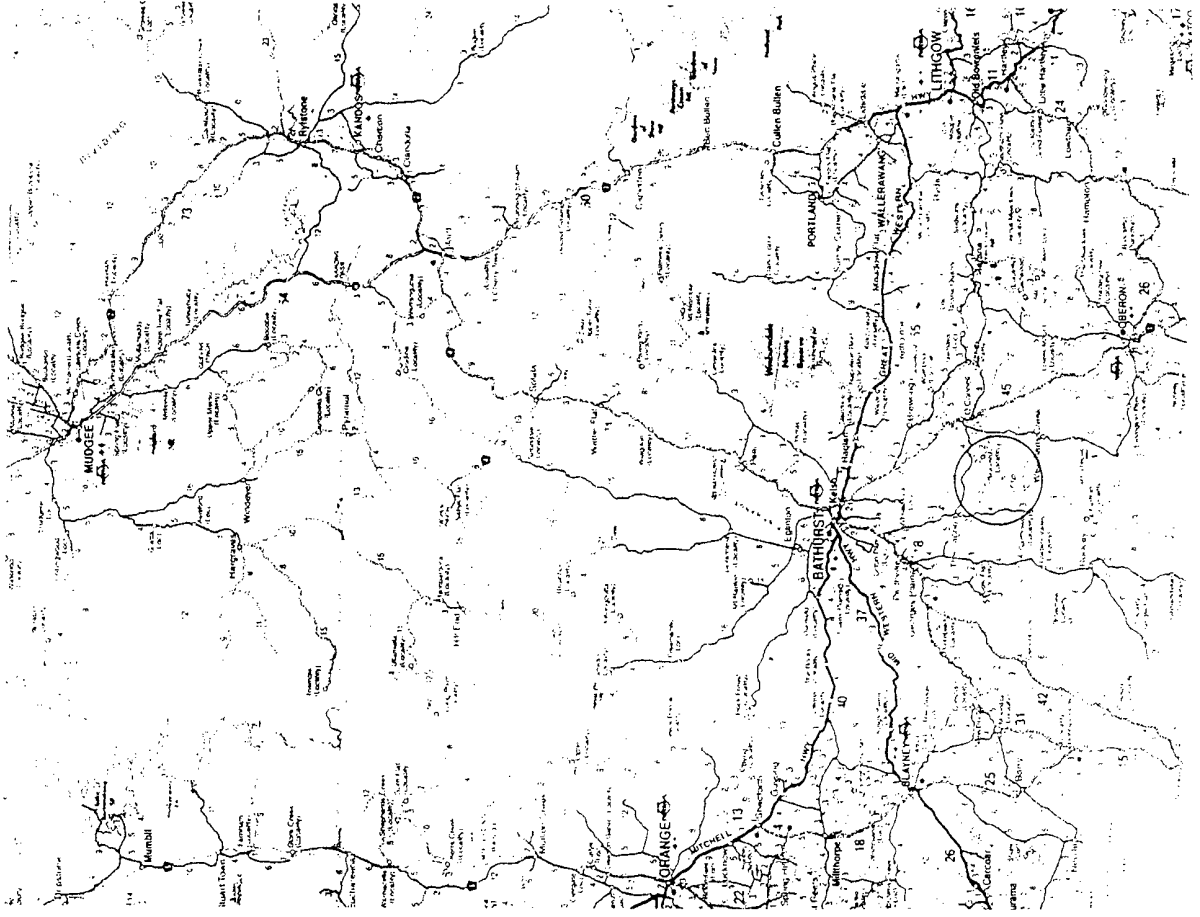
- *The protection of the integrity of the water supply.*
- *To respect the rights of neighbouring landowners.*
- *To provide outcomes that benefit first the local communities.*
- *To preserve the tranquility of the dam environs.*

The document will need to be reviewed periodically to ensure that the outcomes being achieved are consistent with the communities and Council's expectations.

I take pride in presenting this Plan of management to the citizens and community of Bathurst.



*Ian Macintosh
Mayor of Bathurst*



Executive Summary

Works undertaken by Bathurst City Council in raising the wall at Ben Chifley Dam by 5.35 metres represent a major investment of public monies. The new Full Supply Level will inundate between 50 and 500 metres of land, create a water body covering an area of approximately 380 hectares, and establish a new foreshore perimeter of approximately 28 kilometres. Against this background Bathurst City Council commissioned the preparation of this Management Plan to look at opportunities to enhance the amenity and facilities of the area, and ensure the long term sustainability of the community's water supply.

A consultation program designed to develop an understanding of community values and preferences, as well as government agency considerations, was first undertaken to clarify suitable design parameters. This iterative process has helped to ensure that the Management Plan is formulated upon appropriate planning principles, accommodates bio-physical and socio-economic constraints, and capitalises on available opportunities.

The Management Plan recommends a range of actions and works to enhance amenities and uses, foreshore protection and compensatory habitat. Underlying planning principles have included the need to:

- protect the integrity of this drinking water supply;
- respect the right of neighbouring landholders to continue agricultural production;
- provide outcomes that first benefit the local community; and
- preserve the tranquillity of the dam environs.

This Management Plan also includes costed actions and works. These range from the construction of physical infrastructure such as childrens' play equipment sited within a passive reserve area, to the ongoing refinement of adaptive grazing regimes to minimise stress conditions that could exacerbate blue-green algae conditions, to instigating experimental techniques for combating potential foreshore erosion and siltation problems.

The implementation of this Management Plan represents a significant challenge. It will require significant expenditure over a long period of time and demand an on-going commitment to ensure effective adaptive management principles are applied.

The Management Plan recommends works that will provide approximately 70 hectares of land, incorporating up to 10 kilometres of foreshore and active gullies, for compensatory habitat protection. The amenities, facilities and related infrastructure proposed, have been developed to reflect community preferences, and provide a sustainable balance between development opportunities and conservation responsibilities.

The Ben Chifley Dam and its environs are an important community asset. This Management Plan provides a framework for protecting this asset, but at the same time enhancing amenities for the benefit of the local community.



Ben Chifley Dam 12 September 1994 Crown Copyright © Scale: 1:25,000

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Section 1.0

Introduction

1.1 BACKGROUND

Raising the wall at Ben Chifley Dam by 5.35 metres will inundate a strip of between 50 and 500 metres of foreshore. At the new Full Supply Level (FSL) the dam will cover a surface area of approximately 380 hectares, with a foreshore perimeter of approximately 28 kilometres.

Bathurst City Council (BCC) will own the foreshore to the FSL (710.62 mAHD) plus 20 metres horizontal. A flood easement will exist to the Probable Maximum Flood (PMF).

1.1 OBJECTIVE

Bathurst City Council commissioned the preparation of this Management Plan to:

- look at opportunities to enhance the amenity and facilities of the area; and
- ensure the long term sustainability of the community's water supply.

1.2 CONTRIBUTIONS

This Management Plan has been prepared on the basis that it should reflect the ideas and values of the community. In preparing the Plan a range of stakeholders made available valuable time and expertise to help define these values and refine various ideas.

In acknowledgment of their contribution, the Project Team thanks the following stakeholders for their efforts: Bathurst City Council; all adjoining dam foreshore land holders; the Department of Land and Water Conservation; Waterways Authority of NSW; NSW Fisheries, Evans and Blayney Shire Councils; National Parks and Wildlife Service; Roads and Traffic Authority, NSW Agriculture, Environment Protection Authority; Department of Sport and Recreation; State Forests; Bathurst RSL Fishing Club; Flyfish Bathurst Incorporated; RSL Railway JRLFC; Kelso and Bathurst High Schools; Bathurst Lions Club; Bathurst Visitors Information Centre; Australian Trust for Conservation Volunteers; Ben Chifley Dam Catchment Steering Committee; Towri and Windradyne Aboriginal Land Councils; Central West Heritage and Archaeological Services; the Water Skiers and Wakeboarders Forum; and a number of individual members of the community.

1.3 STRUCTURE

The Management Plan has been structured into the following sections:

- **Section 1.0** provides the project background, clarifies the Management Plan objectives, and outlines the structure of the Management Plan.
- **Section 2.0** provides an overview of the process used to develop the Management Plan, as well as identify planning principles and design parameters.
- **Section 3.0** clarifies the objective, identifies relevant design considerations, and recommends associated facilities and infrastructure for proposed works to enhance dam amenities.
- **Section 4.0** clarifies the objective, identifies design considerations, and recommends a suite of proposed aquatic uses for the dam.
- **Section 5.0** clarifies the objectives, identifies design considerations and details actions recommended for foreshore management and protection.
- **Section 6.0** identifies the objectives, design considerations and actions proposed for aquatic management.
- **Section 7.0** presents options relating to the operation and management of the dam, including detailed costings and an overview of possible funding and administrative arrangements.

1.4 REFERENCES

In preparing this Management Plan the following key references were used to help identify constraints and opportunities.

Ben Chifley Catchment Steering Committee Incorporated (December 1997) *The Ben Chifley Dam Catchment Action Plan*

Farrer Centre (January 1998) *Ben Chifley Dam Flora, Fauna and Threatened Species Assessment*

CMPS&F (July 1997) *An Environmental Impact Statement for the Proposed Upgrading and Augmentation of Ben Chifley Dam.*

Central West Heritage and Archaeological Services (July 2000) *An Archaeological Survey of the Foreshores of Ben Chifley Dam*

Section 2.0

Plan Preparation

design parameters for the Management Plan. Input was sought from the community and interested stakeholders about perceived opportunities and constraints. The consultation program targeted a diversity of community interest groups and clubs, future users, affected land holders, regulatory agencies and the broader community.

2.1.3 Design Parameters

A workshop involving government agencies and key community stakeholder groups was then conducted to discuss and refine the assumed planning principles. The workshop agenda was designed to ensure that subsequent concept design work would then be based on agreed expectations and a common understanding of constraints and opportunities.

2.2 PLANNING PRINCIPLES

The needs assessment identified the following as relevant constraints and opportunities, and on this basis were then adopted as appropriate planning principles.

Water Supply

The protection of water quality must represent the fundamental criteria by which any of the intended outcomes or unintended consequences of the Management Plan are determined as acceptable.

Primary Production

The bulk of the land forming the dam's foreshores has been, and will continue to be dedicated for primary production purposes. The Management Plan should not compromise this land use.

Community Asset

The Management Plan should aim to provide outcomes that first benefit the local community rather than try to establish a high visitation tourist drawcard for the region.

Amenity

The tranquility of the dam environs is one of its most valuable features. The Management Plan, while providing for enhanced amenities and facilities, must be cognisant that this feature is an asset that should not be lost.

Public Access

While unrestricted public access to the foreshore area is not acceptable, controlled access to the entire foreshore area should be permissible and made possible. On this basis, the Management Plan should aim to concentrate human activity in the one area, rather than promote dispersed sites of congregation.

The key assumption adopted to guide the preparation of this Management Plan was the need to identify community values and preferences prior to instigating any concept design work. Through undertaking a comprehensive needs assessment, by means of a consultation program and comparative analysis, design parameters could then be developed which would reflect, accurately, community and stakeholder interests.

This iterative process has helped to ensure that the Management Plan is formulated upon appropriate planning principles, accommodates for bio-physical and socio-economic constraints, and capitalises on available opportunities.

2.1.1 Comparative Analysis

Thirteen inland water bodies were analysed to provide a basis for identifying what sort and scale of facilities may be appropriate for Ben Chifley Dam. These water bodies included Wyangla Dam, Lake Oberon, Lyell Reservoir, Lake Windemere, Lake Burrendong, Carcoar Dam, Lake Keepit, Burroughs Dam, Lake Glenbawn, Lake Copeton and Pejar Dam.

All these impoundments range in function, size, administration and use. Combined, an analysis of the services provided at these various locations helped to establish reasonable demand scenarios for Ben Chifley Dam.

Features assessed included:

- **Physical Characteristics** (including volume, surface area, area available for public use, perimeter foreshore, primary function and status as a drinking water supply).
- **Aquatic Recreational Uses** (including power boats, skiing, craft limits, sailing, jet skis, fishing, house boats, swimming and water slide).
- **Land Based Recreational Activities** (including bush walking, tennis courts, golf course, sporting ovals, volley ball, BMX tracks, etc).
- **Accommodation** (including camping grounds, showers, toilets, powered and unpowered caravan sites, bungalows, cabins, sleep halls, flats, hire vans, etc).
- **Services** (including picnic areas, kiosks, fuel supplies, conference facilities, licensed premises, BBQs, water craft hire, boat ramps).
- **Visitation Patterns** (including annual day visitors, overnight stays and long weekend peaks).

2.1.2 Needs Assessment

A consultation program designed to develop an understanding of community values and preferences, as well as government agency considerations, helped to then clarify suitable

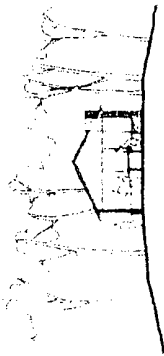
Section 3.0 Amenities

3.1 OBJECTIVE

This section of the Management Plan identifies the type, size and scope of facilities proposed at Ben Chifley Dam.



PARK SHELTER - APPROX. DIMENSION 3x3 METERS. TIMBER SUPERSTRUCTURE ON STEEL WALL WITH MASONRY WALL TO NEAR INCORPORATING PLAN FOR 1-4 BENCHES



WATERSIDE SHELTER - APPROX. DIMENSION 3x3 METERS. TIMBER SUPERSTRUCTURE ON GRADE-LEVEL OVERHANGING WATER, PICK-UP POINT BARBECUES LOCATED ADJACENT TO OTHER

- Basic facilities should be provided that offer shelter from changing weather conditions.
- Concentrate on providing quality day visit facilities for the local community as opposed to trying to create a regional tourist destination for longer term stays.
- Acknowledge that a significant existing asset is the dam's quiet and rustic environs.
- Theme or fun parks facilities, such as a kiosk or water slide, are inappropriate for the dam.

3.2 ISSUES

Issues raised as part of the consultation program and needs assessment, as they relate to the provision of new amenities and facilities, have been summarised below.

- Water quality should not be compromised, given the function of Ben Chifley as Bathurst's potable drinking water supply.
- Facilities should be located in a manner that provides adequate physical separation of water skiers and motorcraft with passive aquatic uses such as swimming.
- The relative small size of the dam should be recognised, and consideration given as to the physical capacity for the dam to safely and sustainably accommodate increased patronage.
- The needs of the elderly and disabled should be provided for.
- Consider provision of a facility with self contained accommodation for large school and youth groups, as well as associated infrastructure designed to give youth confidence and leadership skills.
- Provide a range of cabin style accommodation.
- Up-grading of existing caravan facilities to provide between 10 to 15 powered sites.

3.3 FACILITIES

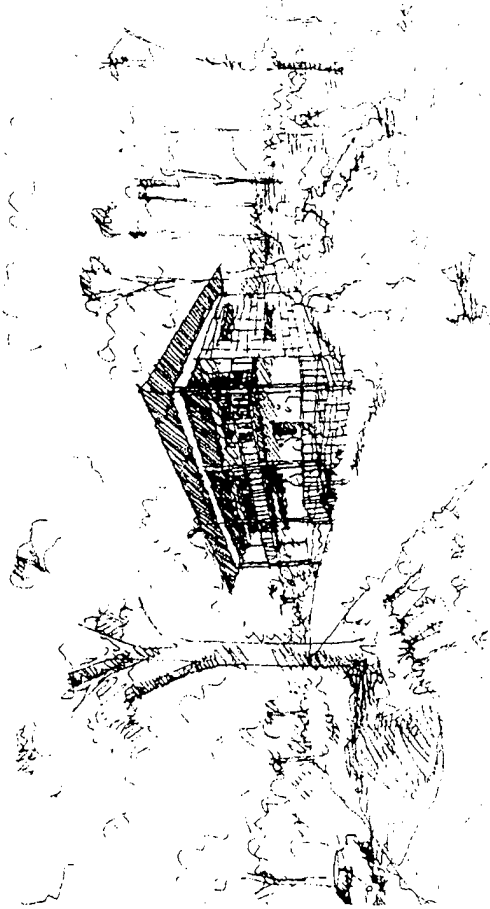
The Master Plan and associated Passive Reserve Plan and Recreational Reserve Plan provide the concept design for enhancing amenities at the dam. Detail on these plans is outlined below.

Passive Reserve Plan

The Passive Reserve is located at the top end of the dam in the area to the south of the dam wall. Amenities provided would include the following key works:

- Upgrading of the existing caravan site, in the same location, to provide for up to ten to 15 powered sites.
- A walkway leading down to the Campbells River below the dam wall.

- Terraced lookouts with sheltered BBQ and picnic areas.
- Childrens' playground and play equipment area.
- Lookout shelter.
- Picnic and BBQ area adjacent to the water's edge.
- Pontoon shelter and pontoon fixed to top water level for disabled and elderly access.



SLEEP HALL. Viewed from approach road. Access to building is from car with parking and turning area at end of road. Map 24, page 24.

Recreational Reserve Plan

The Recreational Reserve is also located at the top end of the dam in the area to the south of the spillway. Amenities provided would include the following key works:

- Four cabins with water supply and outdoor viewing decks.
- BBQ and shelter sites.
- Sleep hall capable of accommodating up to 25 persons.
- A rigging area with storage and amenity building.
- Boat ramp.
- Childrens' playground with play equipment.
- Camping ground.

- Trailer parking areas.
- Foreshore walking paths.
- Wetland and predator exclusion reserve.
- Extensive tree plantings.
- Artificial beach within the passive water use zone.

3.4 INFRASTRUCTURE

Development of the recreational facilities would require expanded infrastructure. The following sections describe the size and scope of the infrastructure required. The *Infrastructure Plan* indicates the conceptual layout of the various infrastructure components.

3.4.1 Water Supply

Water would be required for:

- Potable supply to the cabins, camping grounds, amenities, caravan park and picnic areas; and
- Raw water for irrigation of park areas.

Potable Water Supply

The potable water supply would be drawn from the dam and treated in a package water treatment plant prior to distribution.

Raw water drawn from the dam would be treated in a 30,000 litre per day package water treatment plant and stored in a 100,000 litre potable water tank at the Recreational Reserve area and a 50,000 litre potable water tank at the Passive Reserve area.

The package water treatment plant would include chemical coagulation and flocculation, clarification, filtration and disinfection (chlorination). It is also recommended that the plant include powdered activated carbon dosing for blue-green algae treatment. Treated water quality would need to conform with the World Health Organisation's recommended water quality standards for turbidity, colour and coliforms.

The water tank would be located as shown on the *Infrastructure Plan* to provide gravity reticulation.

The potable water system would be supplemented by rain water tanks installed on the cabins, sleep hall and amenities building. These tanks would have taps to allow for rain water collection by visitors.

Raw Water Supply

The raw water supply would be drawn directly from the dam and distributed through a pressurised reticulation system. This water would be used for watering park areas to maintain a good grass cover.

3.4.2 Sewerage

Sewage Collection

A sewage reticulation system would collect sewage from the various cabins and amenities in the recreation areas. The reticulation system would transfer sewage to pump stations from where it would be pumped to a packaged sewage treatment plant.

The suggested location of the sewage pump stations and rising mains are shown on the *Infrastructure Plan*.

Sewage Treatment Plant

A packaged sewage treatment plant with a hydraulic capacity of 30,000 litres per day would be provided to treated sewage from the recreation areas. The suggested location of the plant is shown on the *Infrastructure Plan*.

The sewage treatment plant would use the extended aeration activated sludge method of biological sewage treatment. The plant would include primary sedimentation, aeration clarification and disinfection (UV or chlorine).

Treated effluent would discharge to an effluent irrigation pond prior to reuse through irrigation.

Treated Effluent Reuse

The irrigation area and storage required for reuse of the treated effluent was assessed in accordance with procedures contained in the draft *Environmental Guidelines – Use of Treated Effluent in Irrigation* (Environment Protection Authority, 1999).

In accordance with the Draft Guidelines, the treated effluent would be classed as a low strength effluent. This means the reuse scheme can be designed based on median rainfall. These calculations indicate an irrigation area of 1.9 hectares and irrigation storage of 4.4 megalitres is required for a design hydraulic loading of 30,000 litres per day.

The suggested location of the irrigation storage and irrigation area is shown on the *Infrastructure Plan*.

3.4.3 Roads

The *Master Plan* and associated *Passive Reserve Plan* and *Recreational Reserve Plan* provide the concept road layout for amenities at the dam.

Dam Access

Notwithstanding a recurring concern raised during the consultation program that the access and egress point to Ben Chifley Dam requires intersection treatment to improve safety, the level of treatment proposed for the access road would be minimal. A planned consequence of this decision is that the condition of the road would continue to act as a deterrent to significantly higher use of the dam by power craft, and in particular, water skiers.

Internal Layout

Internal roads would typically be constructed with a 6 metre wide formation, which would provide opportunity for passing. Roads would be constructed with an all weather gravel surface.

Post and rail fencing (or similar) would be used to prevent vehicle access to grassed park areas.

Parking

Parking would be provided at the Passive Reserve area by a parking area constructed during the dam raising works. This would provide space for 45 cars and 15 car and trailers.

Parking would be provided at the Recreational Reserve by:

- Roadside parallel parking;
- Parking bays at cabins and adjacent to the sleep hall; and
- Parking areas for cars and trailers at the boat ramp site.

This would provide space for 25 cars and 11 car and trailers.

3.4.4 Stormwater

Specific stormwater management measures would be subject to detail design and most would be associated with the road infrastructure.

Given the proximity of the site to the water supply the following objectives should be incorporated into the stormwater system:

- Natural drainage lines should be retained as far as possible;
- Stormwater velocity should be controlled to avoid scour in drainage channels;
- Routine waste management practices should be employed to reduce the potential for gross pollutants to enter the stormwater system; and

- Direct discharge of stormwater into the water supply should be avoided. Preference would be to discharge across some form of filter strip, or install a water quality control device prior to reaching the water storage.

3.4.5 Electricity

Ben Chifley dam is currently serviced by a high voltage line which branches off from The Lagoon road. This line services the existing dam infrastructure (aerators and other electrical components) via a 300 kVA sub station and existing domestic users (care takers cabin) via a 50 kVA sub station. As part of the dam upgrade works, the high voltage line would be extended by about 30 metres and the 300 kVA sub station would be replaced with a 500 kVA sub station.

Through discussion with Advance Energy, it was determined that there should be sufficient power available to supply the proposed recreational facilities. At this stage, without detailed information on loads, the suggested method of supplying power would be to upgrade the 50 kVA sub station to 150 or 200 kVA sub station and run low voltage underground cables to supply the new facilities.

3.4.6 Telephone

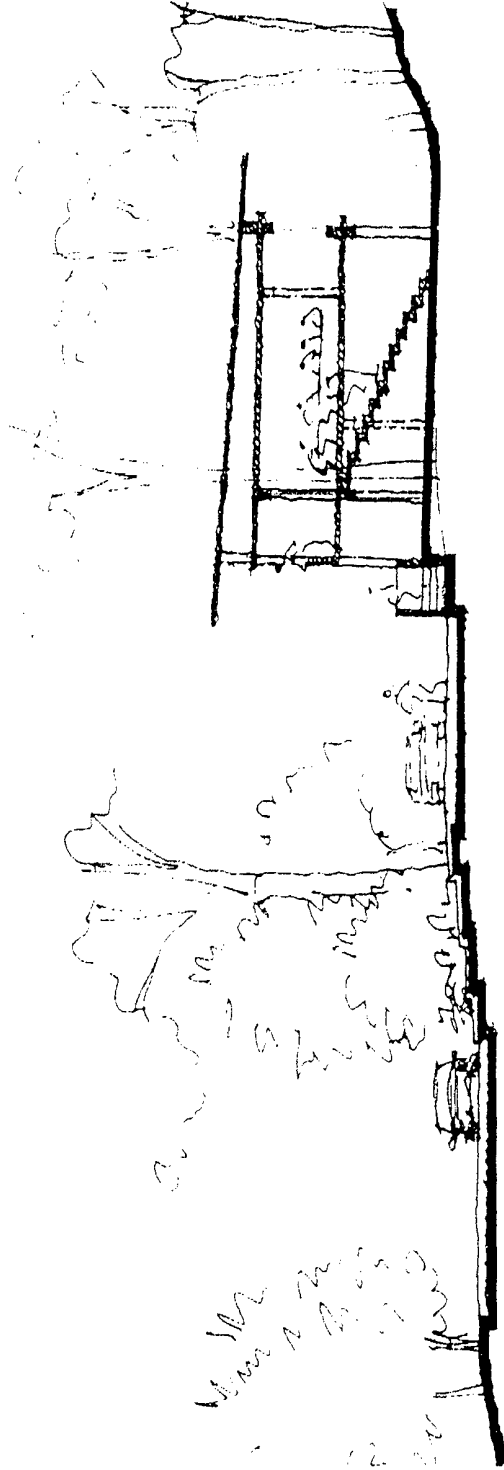
The community consultation program identified that a public telephone would be useful, mainly in the event of emergencies.

It is therefore proposed to locate a public phone at the Passive Reserve area.

3.4.7 Waste Management

Waste management would be provided through the provision of waste skips at the caravan park and main camping area. In addition, litter bins would be provided at strategic locations around the picnic grounds.

It is envisaged that the litter and recycling bins would need to be emptied on a weekly basis (to the skips) and the skips on a fortnightly basis (or more frequently during high use periods).



SLEEP HALL Cross Section showing relationship to main access road, access track and slope. Communal and kitchen area in upper level with views across water, sleeping and amenities on lower level.

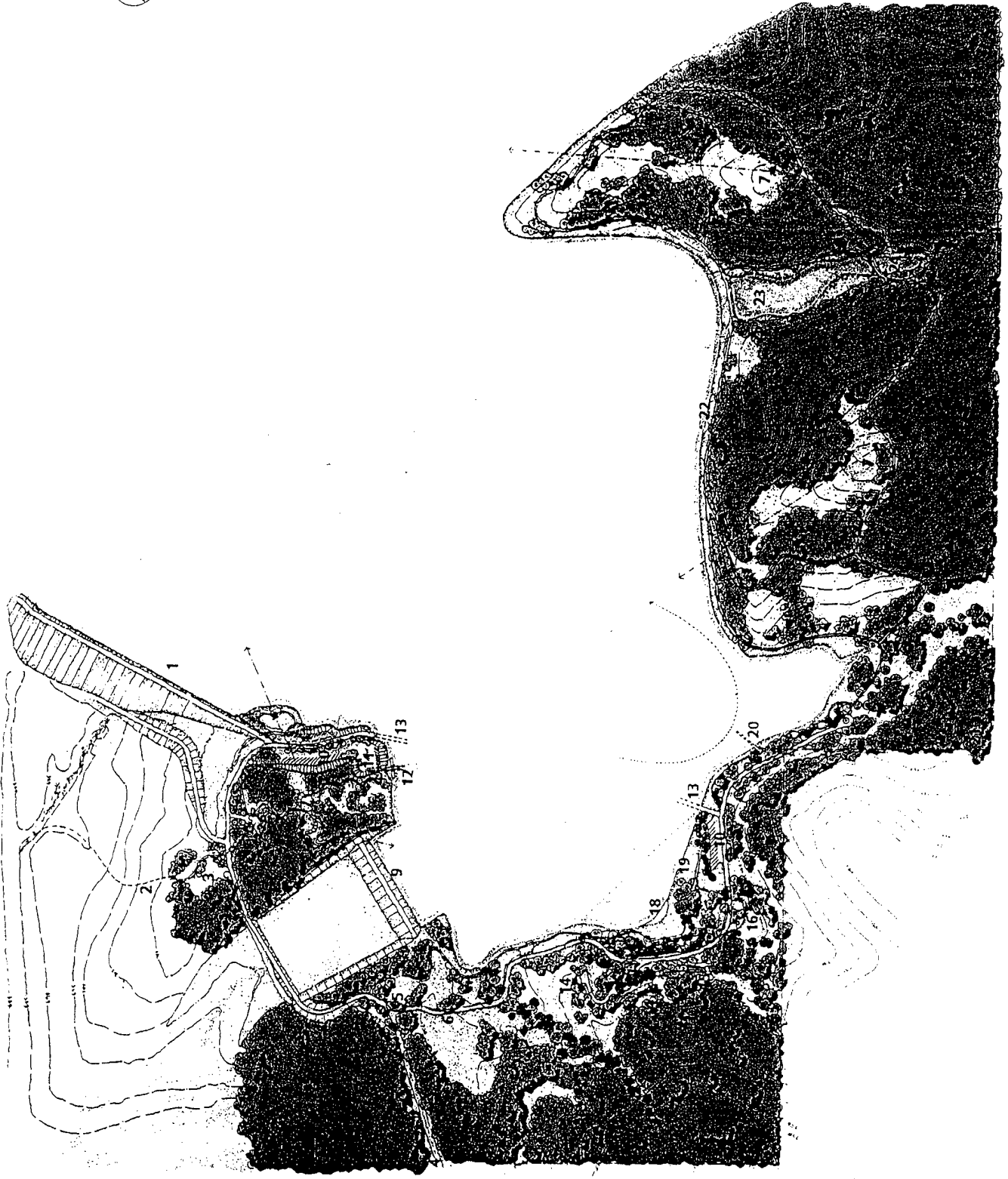
Master Plan

Jan 2000
Scale 1:2,500



KEY

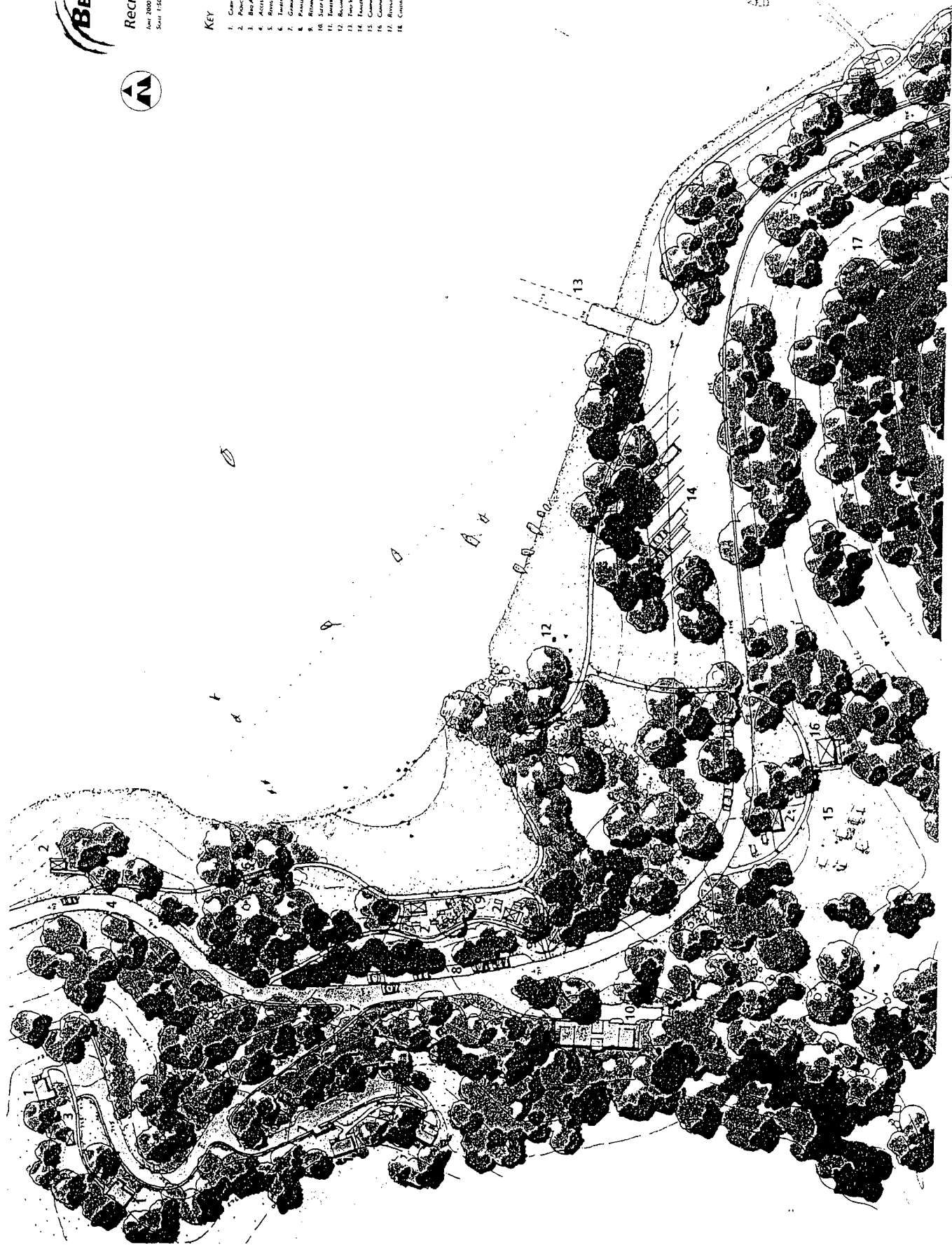
1. Dam
2. Access Paved To Cists
3. Concrete Pave
4. To Binnett
5. Embankment Gravel And Paved Area
6. Access Road
7. Location About And Paved Swirls
8. Embankment Pavement and Part Elements
9. Station
10. Trees Private Area
11. Gate Area
12. Binnett
13. Binnett
14. Gate
15. Staff Hill
16. Concrete
17. Paved Area and Part Elements
18. Basin (Swamp)
19. Basins Area
20. Concrete
21. Concrete Structure
22. Forewater Pave
23. Wetland
24. Stone Masonry Basin
25. Area of Excavation Area
26. Embankment





KEY

1. Concrete Walling Structure and Outcrops, Ditch/Wallway, Paveddown
2. Paved Area, With Benches and Structure
3. Paved Area
4. Asphalt Road/Path
5. Reinforced Concrete Lane/Walkway (100mm to 150mm) Area Paved in Concrete
6. Reinforced Concrete Lane/Walkway
7. Grass Wall
8. Plastic Paving, 2.5m
9. Bituminous Way
10. Sealed Area (25mm)
11. Sealed Concrete
12. Concrete Slab, 100mm Area Paved in Concrete
13. Concrete Slab, 100mm Area Paved in Concrete
14. Concrete Slab, 100mm Area Paved in Concrete
15. Concrete Slab
16. Concrete Slab, 100mm Area Paved in Concrete
17. Reinforced Concrete Slab
18. Concrete Paveddown with Plant (Concrete)

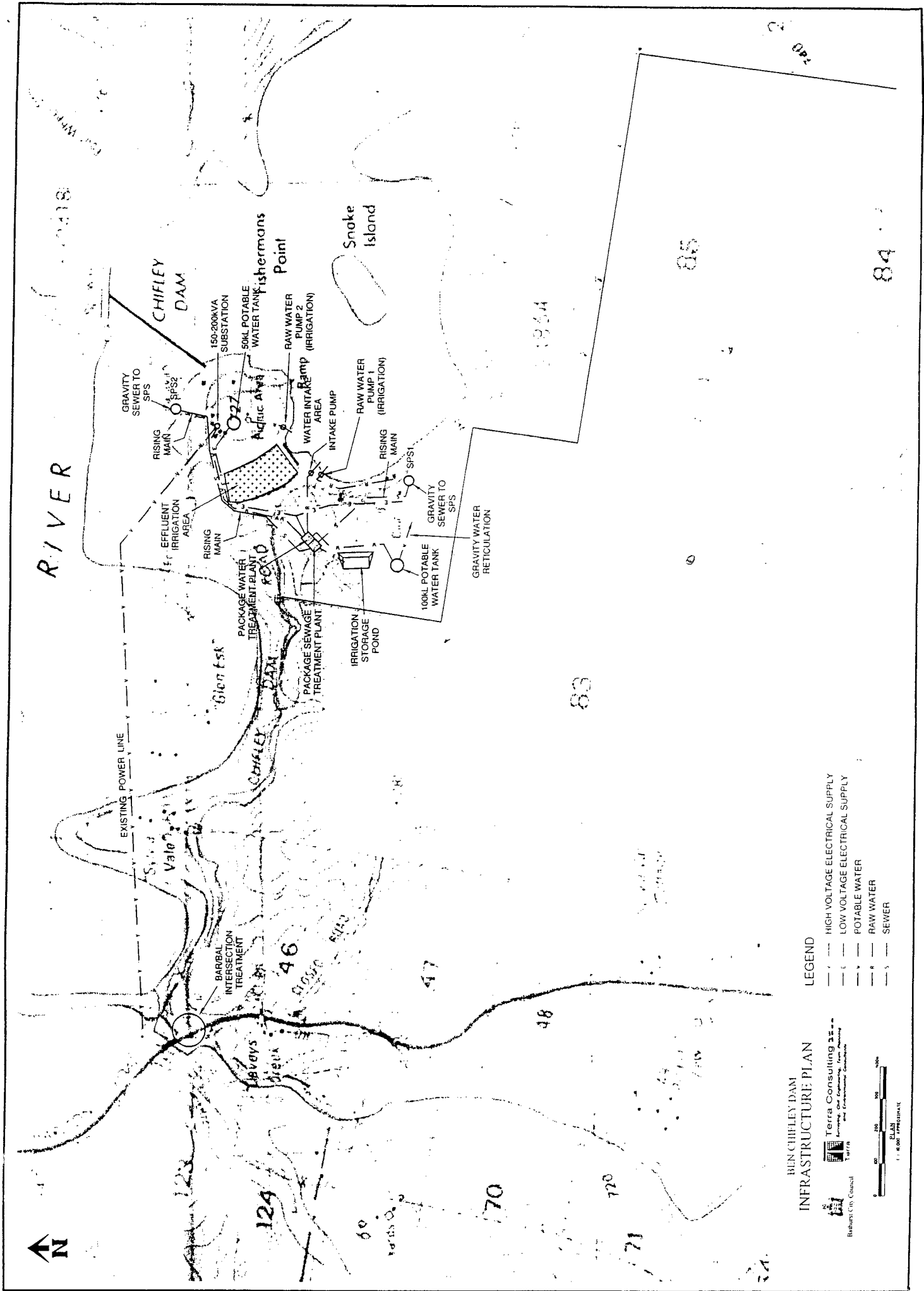




KEY

1. Existing Concrete Pier
2. Concrete To Centre
3. Concrete To Edge
4. Dam (With Access) Primary Structure From And Over At Dam Level
5. Edge Platform In Car Park
6. Terrace Labours With Sealed Bag And Paved Areas
7. Terrace With Bag And Sealed Bag And Paved Areas
8. Terrace/Car Park Areas
9. Tree Planted In Car Park Adjacent To Road
10. Crumbly Pavement and new equipment
11. Barriers 1.2m
12. Barriers 1.8m
13. Concrete Slabs 13 - 14
14. Slab (200 Acrylic)
15. Paved Area Bag Area
16. Car Park
17. Platform Slab
18. Platform Area To For Waste Unit
19. Cast-in-place concrete
20. Tree Block
21. Tree
22. Water Flow



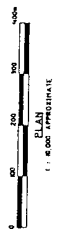


HUN CHIFLEY DAM
INFRASTRUCTURE PLAN

Bathurst City Council
Terra Consulting
Environmental and Geotechnical Engineers
1974

LEGEND

- HIGH VOLTAGE ELECTRICAL SUPPLY
- LOW VOLTAGE ELECTRICAL SUPPLY
- POTABLE WATER
- RAW WATER
- SEWER



Section 4.0

Aquatic Uses

4.3 USES

The facilities and locations for accommodating the various aquatic uses are illustrated in the *Master Plan* and the *Recreational Reserve Plan*.

The regulatory controls for managing these multiple aquatic uses are shown on the *Waterway Navigational Control Plan*.

The underlying principle within this plan is to minimise potential conflict points through the separation of motor craft uses with the more passive aquatic recreation pursuits (swimming, canoeing, etc).

This would be achieved, primarily, through the following mechanisms.

- Establishing an 8 knot zone in the area of passive aquatic recreation.
- Erection of isolated danger signage on McQueens and Snake Islands.
- Establishment of a new boat ramp designed to facilitate a ski circuit that leads skiers away from the passive aquatic recreation area.
- Establishing a 4 knot zone at the southern end of the dam.
- Erection of warning signs to control boat wash around areas of the foreshore.

In addition to establishing regulatory controls that would dictate behaviour of motor craft while on the dam, the *Master Plan* also establishes separate locations and facilities to accommodate for potential conflicts between the different types of aquatic uses.

This includes:

- Establishment of an artificial beach with a sand surface dedicated for passive aquatic uses such as swimming, positioned within an 8 knot control zone.
- A sail rigging area immediately adjacent to the foreshore.
- Trailer and boat parking access close to water skiers' entry and drop off zones.
- Preventing boat access in the vicinity of the dam wall.

Enforcement and monitoring of these controls could be delegated, through a formal process of accredited training undertaken in consultation with the Waterways Authority, to site based management.

4.1 OBJECTIVE

This section of the Management Plan shows how and where different aquatic uses would occur.

4.2 ISSUES

The following issues were raised during the consultative process as matters that warranted consideration in relation to the management of aquatic uses on Ben Chifley Dam.

- The existing single boat ramp creates a situation that concentrates too much power boat activity (ie. launching boats and drop off points for skiers) in too small an area.
- Considered impractical to impose an upper limit of boats on the water at any point in time.
- The submerged Snake and McQueens Islands will need to be clearly marked for safety purposes.
- The existing intersection at the access road out of Ben Chifley Dam is considered, particularly by users pulling a boat, as dangerous.
- The loose stone surface of the internal access road (and associated damage to boat surfaces) is, at present, a deterrent to greater use by skiers.
- Amenities need to be located relatively close to activities.
- Design features of a boat ramp should include off-set channels so that stone and dirt material drains off the ramp.
- Adequate car and trailer parking facilities should be provided in close proximity to a boat ramp, as well as some parking at the foreshore base locations.
- The preferred area for basing passive aquatic uses is the foreshore in the vicinity of the old sailing club.
- Boarding vessels (for all concerned) should be made easier.
- The Management Plan should allow for sailing, water skiing, swimming, boating, fishing, personal water craft, canoeing and sailboarding.



LEGEND

1 ALL UNAUTHORISED VESSELS ARE PROHIBITED IN DIRECTION INDICATED PERMIT TO APPLY

2 ALL UNAUTHORISED VESSELS ARE PROHIBITED IN DIRECTION INDICATED PERMIT TO APPLY

8 NO WASH ZONE IN DIRECTION INDICATED PREVENT RIVER BANK EROSION

9 NO WASH ZONE IN DIRECTION INDICATED PREVENT RIVER BANK EROSION

10 NO WASH ZONE IN DIRECTION INDICATED PREVENT RIVER BANK EROSION

12 SPEED LIMIT IN MANDS BEYOND THIS POINT

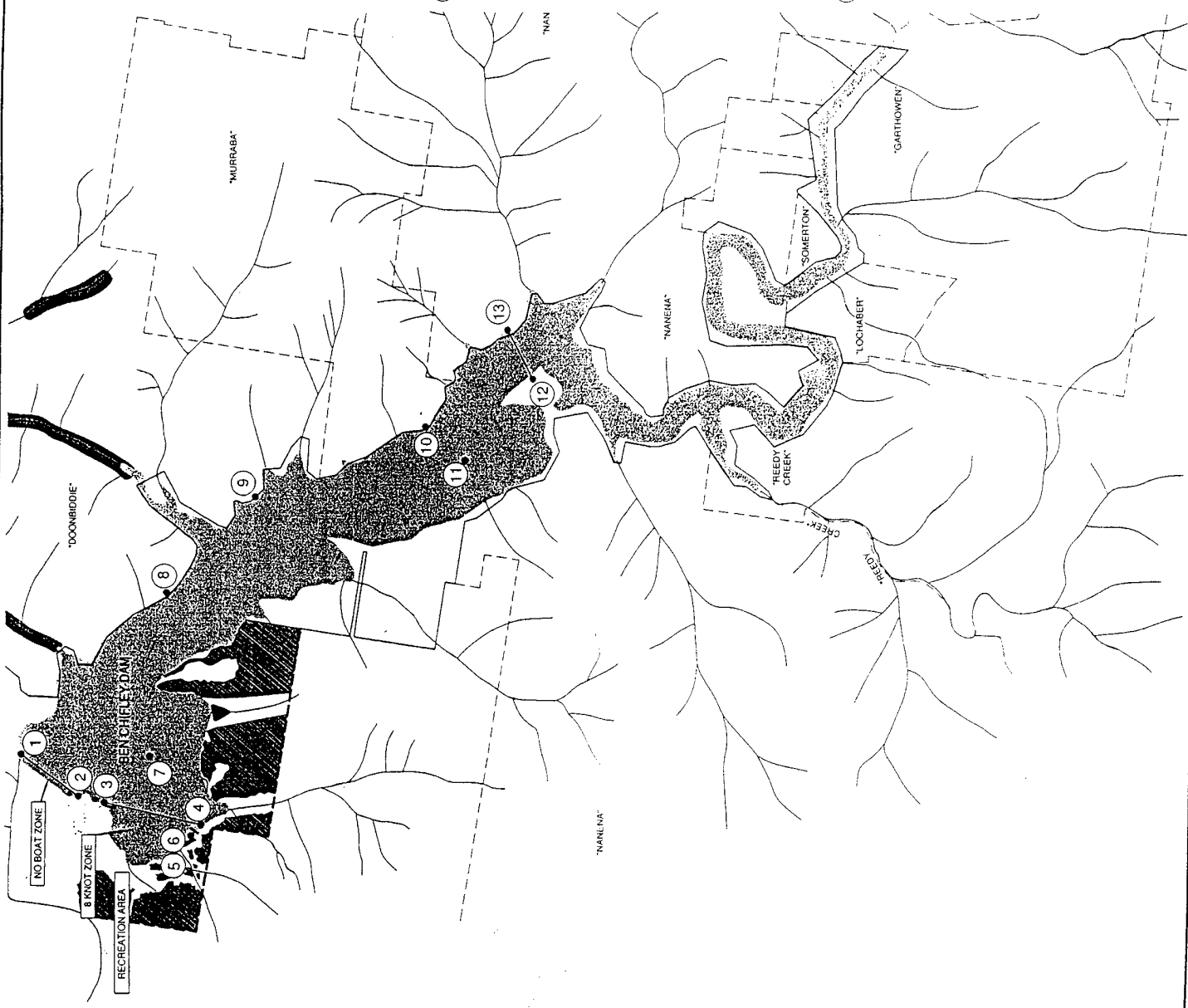
13 SPEED LIMIT IN MANDS BEYOND THIS POINT

8 SPEED LIMIT IN MANDS BEYOND THIS POINT

WARNING

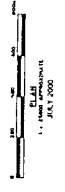
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WARNING



**BEN CHIRLEY DAM
WATERWAY NAVIGATION CONTROL PLAN**

Terra Consulting
 11/11/2008
 11/11/2008
 Bathurst City Council



Section 5.0

Foreshore Management

5.1 OBJECTIVE

This section of the Management Plan identifies the scale and type of foreshore protection measures proposed. It also includes a *Foreshore Protection and Compensatory Habitat Plan*.

5.2 ISSUES

The following are issues that were raised during the consultation program, and identified as relevant considerations in the preparation of foreshore management initiatives.

5.2.1 Fencing Foreshore

Considerations relevant to the issue of the extent of foreshore protection through fencing are listed below. These considerations were identified through the consultation program.

- Practicality of fencing entire foreshore perimeter. Top water level plus 20 horizontal metre could be inundated too frequently. This has significant implications in terms of maintenance costs.
- Need for total stock exclusion for foreshore protection. Opinion that foreshore erosion has not progressively deteriorated and that wave action is the biggest cause.
- From a water quality perspective, question that total stock exclusion would provide a value return. Better investment opportunities, in terms of water quality improvement returns, in the 960 square kilometre catchment's active gullies.
- Management opportunities exist for paddock rotations to minimise stress circumstances (ie. during critical phases of emergent aquatic flora growth and minimising grazing pressure on zooplankton to inhibit conditions for blue-green algae).
- Fenced foreshore with total stock exclusion would create a fire and weed risk. The few areas managed as such, at present, have blackberry infestation, serrated tussock and feral animals.
- Not practical for mechanical maintenance of a vegetated buffer as slashing is not realistic. Prudence of chemical maintenance on foreshore of a water supply body, herbicide safeguards (application techniques and toxicity lifetimes) notwithstanding.
- Landholders are amenable to having fenced areas for revegetation and stock exclusion, in select locations, on the understanding that costs of maintenance (fire risk, weed and feral animal control, and fence maintenance following high flows) are not borne by the landholder.

5.2.2 Off Dam Watering Troughs

- Without a fence stock would not use off dam watering troughs in preference to the dam. Established shade plantings around troughs may divert stock from camping on the foreshore, but only if the foreshore did not provide any shelter vegetation.
- Solar powered off dam troughs would increase maintenance demands (ie. bi-daily maintenance run).

5.2.3 Public Access

- The proximity of Garthowen Road to remote homesteads on the dam's south western area would create security problems if the Management Plan encouraged public use of this road.
- Greater public access to the foreshore, beyond a centralised area on the dam's northern end, would add to security and waste management concerns.
- Licensed anglers should have access, by foot, to the bulk of the dam's foreshores without compromising farm security (eg. stock and fire): particularly with the introduction of some form of regulatory control developed in partnership with NSW Fisheries, adjacent land holders and on-site management.

5.2.4 Scour Risk

- A gully containing light sand material opposite the Crow Trap is likely to scour as a result of the raised water level.

5.2.5 Indigenous Heritage

- The new water level will result in the inundation and likely disturbance to a number of recorded sites of importance to Aboriginal heritage and the Local Aboriginal Land Council.

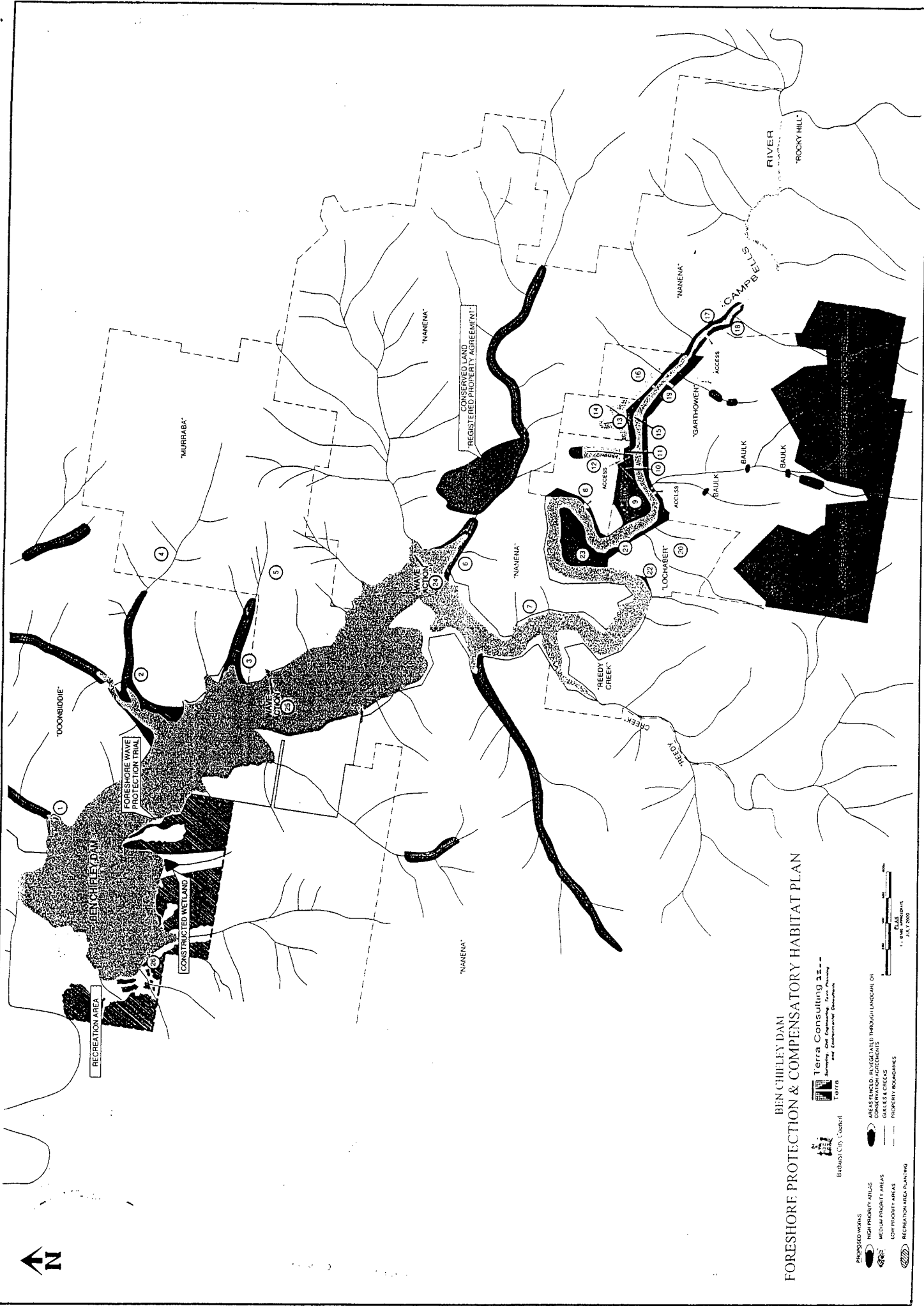
5.3 PROPOSED ACTIONS AND WORKS

5.3.1 Overview

Foreshore protection measures include prioritised works designed to stabilise active gullies, reduce stock grazing pressures, provide for compensatory habitat and enhance habitat potential.

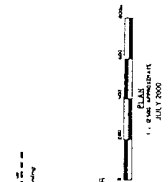
These works are shown on the *Foreshore Protection and Compensatory Habitat Plan*.

Other measures include longer term actions designed to monitor physical changes around the foreshore so that restorative protective works can be mobilised, if required.

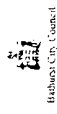


**BEN CHILLY DAM
FORESHORE PROTECTION & COMPENSATORY HABITAT PLAN**

Terra Consulting
 Environmental & Engineering
 10/16



- PROPOSED WORKS
 HIGH PRIORITY AREAS
 MEDIUM PRIORITY AREAS
 LOW PRIORITY AREAS
 RECREATION AREA PLANTING
 PROPOSED WETLAND / REVEGETATED THROUGH LANDSCAPE OR OPEN SPACE CORRIDORS
 GULLIES & CREEKS
 PROPERTY BOUNDARIES



5.3.2 Rehabilitation Works

FORESHORE PROTECTION AND COMPENSATORY HABITAT

Rehabilitation Opportunities

Locations



Livestock and vehicles have access across the gully along the lower gradient areas towards the dam, with the higher reaches becoming prohibitive to cross due to steepness and depth. At the new water level lower gradient areas would be flooded, resulting in the current access point being lost. It is recommended that the gully be fenced to exclude stock and allow for aquatic and semi-aquatic vegetation to become established in the gully mouth. Maintaining this undisturbed area at the mouth of the gully provides an opportunity to enhance fish habitat. Stock exclusion would also reduce sediment entering the dam and provide connectivity to the area previously fenced through a Landcare initiative. As it is proposed that the gully be fenced to link with the gully section already fenced through the Landcare program, a gap in the fence line would be needed to allow for livestock and vehicle access. Some earthworks would be necessary to establish a practical access point. The gully is currently well vegetated with remnant upperstorey vegetation. No further plantings are necessary.



Excluding stock from this gully through fencing would have benefits to fin fish at the mouth of the gully, protect remnant vegetation, and reduce sediment entering the dam. The gully is also very steep and deep, offering no vantage point to gain access from one side to the other except at the eastern most end towards the neighbouring property "Murraba". The general incline of the gully therefore dictates that the fenced area would extend to the appropriate access point near the "Murraba" boundary. The gully is currently vegetated with remnant upperstorey vegetation and would not require revegetating.

4

The gullies currently lack upperstorey tree and shrub species. The landholder is amenable to fencing off these areas to allow for revegetation and stock exclusion if long-term monitoring establishes that additional sediment controls are necessary. These gullies are relatively stable and revegetation works would be considered a low priority because of their distance from the dam.

5

This is a deep, steep gully vegetated predominantly with trees and groundcover grasses and forbs. The landholder is amenable to having the area fenced off for sediment control if long-term monitoring suggests it is necessary. Stock exclusion would be considered a low priority and revegetating the area would not be necessary.

7

The foreshore area would be inappropriate to fence and revegetate. Some areas are extremely steep, creating problems with fence alignment, while fencing end revegetating the lower gradient areas only would create a fragmented riparian corridor. There would also be a number of fences running perpendicular to the river that would require heavy maintenance.

8

Revegetating the banks of the Campbells River in the areas identified would compensate for habitat loss through inundation and provide a substantial riparian corridor. While stock could be excluded from the river by fencing off the riparian corridor, an access point to launch the property owners water craft, and for watering stock, would be necessary. The optimum location will best be determined after the new fully supply level is reached. Following fencing, the area would need to be planted with riparian vegetation.

9

Total stock exclusion can be achieved in these areas, with no boundary fence required. A significant area of compensatory habitat can also be established using a diversity of species and vegetation structures. Vegetation types to be compensated would include aquatic, riparian and terrestrial species.

10

This area can be fully revegetated for compensatory habitat.

11

The lower portion of the privately owned gully in this area can be fenced to exclude stock and revegetated for compensatory habitat and foreshore protection.

12

The landholder is amenable to having the gully fenced and revegetated if long-term monitoring establishes further sediment control is necessary. The area has not been designated as a high priority because it is not in close proximity to the river. It is, however, unstable.

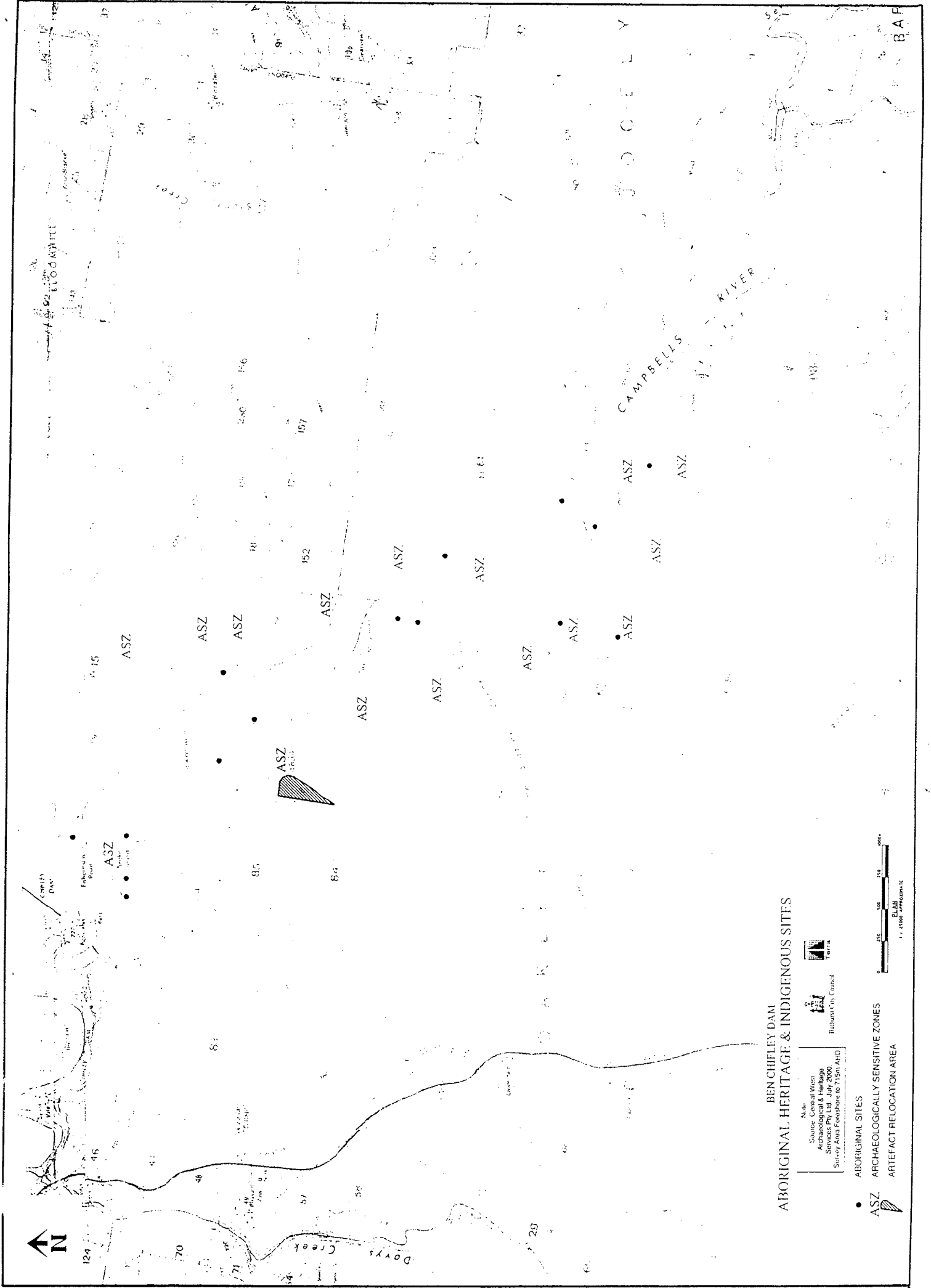
FORESHORE PROTECTION AND COMPENSATORY HABITAT

Locations

Rehabilitation Opportunities

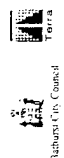
- 14 The landholder would value the opportunity to have the area completely revegetated, though this is considered a low priority area because of its distance from the river.
- 15 This area can be fully revegetated without the need for boundary fencing as the landholder does not intend to run any livestock.
- 17 The area fronting Campbells River can be fenced and revegetated to exclude livestock given alternate water supplies are provided in the paddocks fronting the river. This area can be planted with riparian vegetation, contributing significantly to the formation of a riparian corridor and compensatory habitat.
- 18 The mouth of the creek in this area has been resumed and fenced as it is anticipated that high water levels would be reached at this point. The remaining section has been fenced by the landholder and comprises some remnant riparian vegetation. Stock exclusion and additional plantings in this area would enhance the riparian vegetation corridor, act as a buffer against sediments entering the river and contribute to compensatory habitat.
- 19 The section of the river fronting "Garthowen" can be fenced off to exclude stock and revegetated provided access points to the river are given to water stock when on-farm storages are dry.
- 20 These gullies have been given a low priority because of their stability. They are well vegetated with upperstorey and groundcover species and are further protected by contour banks. The landholder is amenable to having the gullies fenced to exclude stock if long-term monitoring suggests sediment control is necessary.
- 21 This area can be totally revegetated and fenced to exclude stock with provision being made for alternative stock watering points in the three paddocks fronting the river opposite "Somerton" property.
- 22 The area fronting the river can be revegetated and fenced off to generally exclude stock, with an access point being provided for the watering of stock.
- 23 This area can be totally revegetated to contribute significantly to the riparian corridor.
- 24 The bank of the dam in this area is coarsely textured and is prone to erosion especially by wind action. The physical characteristics of the bank may change following different flood levels. This is an area that should be targeted for monitoring, and the trial of siltation protection measures.
- 25 Wave action is causing erosion of the dam bank in this area, partly due to the gradient of the bank. Monitoring of the site during different flood levels is required.
- 26 In the Recreation Area significant compensatory habitat can be achieved in the vicinity of the proposed sedimentation basin and constructed wetland. The wetland, secure within a predator proof fence, would ultimately function as a refuge for migratory and resident fauna. Monitoring and control of exotic predatory species would be required.

The following notes have been prepared to be read in conjunction with the *Foreshore Protection and Compensatory Habitat Plan*. Point numbers below are linked to site locations and properties shown on the plan. Red denotes high priority; Khaki Green denotes medium priority; Yellow denotes low priority; clear denotes no action required and Green denotes recreation area planting

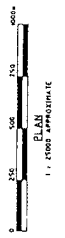


**BEN CHIFLEY DAM
 ABORIGINAL HERITAGE & INDIGENOUS SITES**

Map
 Source: Central West
 Archaeological & Heritage
 Services Pty Ltd, July 2000
 Surveyed by: G. Williams (1975) and J. H. D. (1975)



- ABORIGINAL SITES
- ASZ ARCHAEOLOGICALLY SENSITIVE ZONES
- ARTEFACT RELOCATION AREA



5.3.3 Public Access

The Management Plan centralises facilities at the bottom end of the dam rather than provide a number of sites for camping and day tripping around the foreshore perimeter.

5.3.4 Indigenous Heritage

The following measures are actions specified by the National Parks and Wildlife Service in order to protect indigenous sites of importance to Aboriginal peoples.

- Prior to inundation of recorded Aboriginal sites, artefacts shall be subject to a full recording of basic attributes that will provide an analysis of technological behaviour and any possible inter site variation.
- Prior to raising of water levels, photo monitoring points shall be established at various locations around the dam foreshore.
- Inspection of monitoring points shall be undertaken at three monthly intervals for a period of five years from the time when the dam wall will allow an increase in dam storage capacity. The monitoring points shall be both photographed and physically walked to determine long term changes in the erosional regime and whether or not artefactual material is being disturbed.
- An additional annual inspection shall be undertaken of all known sites and potential archaeological zones that are not inundated at the time.
- Should monitoring reveal a negative impact on sites (ie. erosion induced exposure of artefactual material) or reveal new sites, then National Parks and Wildlife Service shall be notified. Any new sites shall be properly recorded on NPWS site forms and submitted to NPWS.
- As required, protective measures such as wave barriers, sediment traps, rock mattressing or various combinations thereof shall be undertaken as soon as practicable to mitigate against further damage.
- The Local Aboriginal Land Council shall be involved in the definition of Local Aboriginal Land Council activities relative to the Management Plan.

5.3.5 Research and Monitoring

The following initiatives represent a range of longer term actions that require on-going monitoring and research. These include research and monitoring actions required to ensure that monies are spent effectively in the area of foreshore protection. They essentially cover issues that, at present, are complicated by a lack of sufficient data or certainty in prediction of impacts, to ensure they would provide an environmental return.

Managing Grazing Stress

Opportunities do exist for co-ordinating paddock rotations to minimise grazing stress (ie. during critical phases of emergent aquatic flora growth and minimising grazing pressure

on zooplankton to inhibit conditions for blue-green algae). This opportunity has been identified by landholders adjacent to the dam.

Prescriptive controls specified without consideration of seasonal factors would not provide a workable or realistic solution. Rather, grazing regimes need to be adaptive and be developed on the basis of ongoing consultation with land holders.

Critical periods need to be monitored and on-going dialogue maintained with adjacent land holders in order to maximise the potential benefits of modifying grazing regimes in response to high risk periods.

It is also noted that landholders can be expected to maintain a vegetative groundcover in excess of 70 per cent coverage on foreshore areas. This requirement exists within the *Ben Chilley Dam Catchment Action Plan*.

Monitoring Foreshore Erosion

The ability to identify, accurately, specific areas around the foreshore perimeter that are likely to be prone to erosion and associated siltation is limited. General indicators related to soil type and slope do provide just that; indicators. Other factors, primarily the behaviour of future fluctuating dam levels, stock grazing and the affects of wind, will contribute significantly to the extent and location of potential problem areas.

As part of the consultation program land holders also indicated, based on thirty years of observation, that the general foreshore area has not suffered from a condition of worsening foreshore erosion. Further, land holders also maintain that the single biggest cause of foreshore erosion has been the effect of wind, and more specifically, the wave action generated by winds.

While the above circumstances render it premature to specify particular types of siltation protection measures for precise locations, a number of initiatives can be undertaken now. These include experimental techniques for different structural controls, and targeted on-going monitoring. Each of these are discussed below.

Based on a foreshore inspection undertaken with the involvement of land holders, two particular areas have been identified as warranting close monitoring. These areas are identified on the *Foreshore Protection and Compensatory Habitat Plan* (refer location notes 24 and 25). Both are in the vicinity of active gullies and share features of lighter soil type and steep grades.

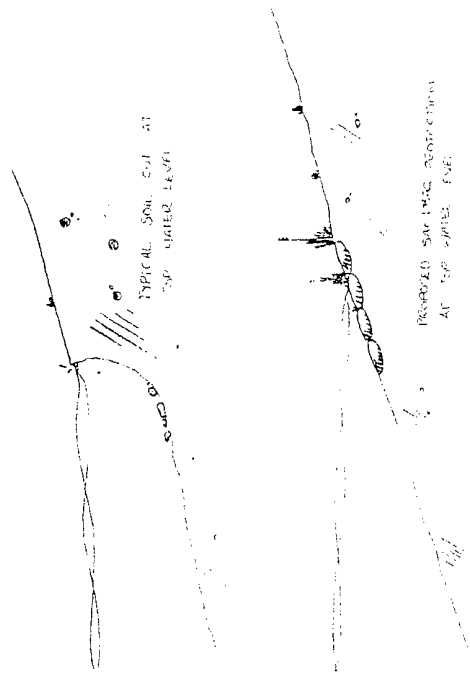
It is a recommendation of this Management Plan that these two particular areas, as well as the general foreshore perimeter, be monitored on an on-going basis. The protocol for monitoring should be developed in consultation with land holders and would need to be refined over time as a better understanding of the actual dam level behaviour is reached.

Monitoring would need to be based on the compilation and analysis of photographic evidence. In so doing, potential problem areas could then be dealt with as early as possible.

Foreshore Wave Protection Trial

In parallel to the above monitoring, it is also recommended that experimental techniques be undertaken with the aim of validating their effectiveness.

Specifically, it is recommended that the first structures installed be relatively low cost (ie. compared to rock matting). The trial technique proposed is shown diagrammatically below.



Wave Protection Trial

The proposed technique involves placing three rows of sand filled hessian bags along the top water level. The bags would have two roles.

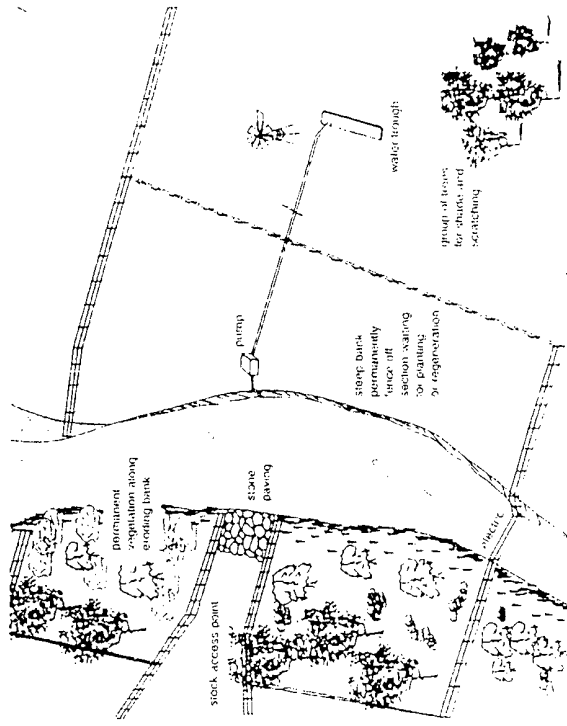
Firstly they would stop direct wave action. Secondly, they would trap sediment as it moves downslope to the water. It is expected that the sediment would then provide a suitable substrate for plant growth. These plants would then provide an additional role on foreshore protection.

The area proposed for the trial is located in an exposed and relatively steep section of foreshore. Initially, it would be proposed that the trial would entail an area of 50 metres, where 25 metres would be protected with this trial structure and the remaining 25 metre would be left unprotected.

Off-Dam Stock Watering

It is recommended that a trial be established to verify the environmental return and maintenance cost and management issues of establishing off-dam stock watering points.

The area proposed for the trial would be in the upper reaches of the dam on the "Nanema" property.



Stock Access Controls (DLWC Riverwise ©)

Constructed Wetland

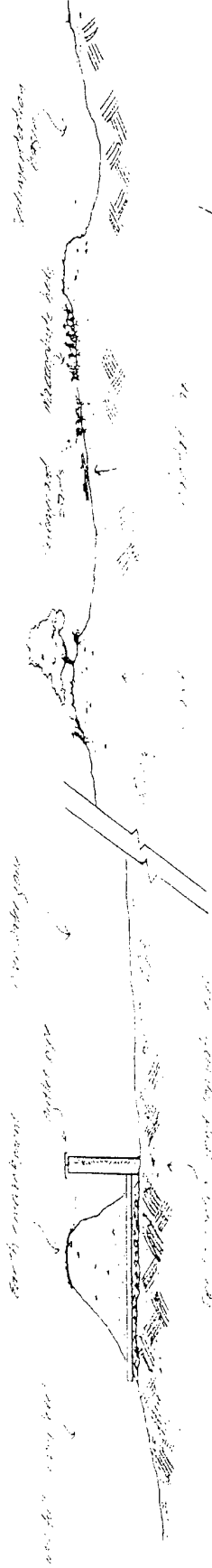
It is considered that a constructed wetland, incorporating a sediment basin, could be effective in reducing the sediment and nutrient load generated from eroding gullies. It is recommended that a wetland is developed to assess its effectiveness.

The constructed wetland would have two roles: firstly it would provide a sediment trapping and nutrient removal function; and secondly it would provide fauna habitat in the compensatory habitat area.

It is recommended that the wetland is constructed on Council land at the outlet of a gully which is showing signs of erosion. The suggested location is identified on the *Foreshore Protection and Compensatory Habitat Plan*.

The wetland would be designed with an upslope sediment basin, macrophyte zones for nutrient uptake and an open water zone for sedimentation. It would be formed by constructing an earth bank across the gully at the new dam full supply level. The water level in the wetland would be controlled by a pipe riser. The pipe would allow rising dam water to enter the wetland and would prevent the wetland water level falling when the dam level drops. The wetland would also trap runoff from the upslope catchment. The conceptual wetland configuration is shown diagrammatically below.

Constructed Wetland



Section 6.0

Aquatic Management

These works are also complemented by Waterway Navigation Controls designed to prevent disturbance to these areas by motor boats. Such controls include signage establishing no wash zones and a four knot speed limit.

6.1 OBJECTIVE

This section of the Management Plan identifies opportunities for fish habitat protection and compensatory habitat for aquatic fauna. It also addresses blue-green algae, both at an operational and planning level.

6.3.2 Fauna Habitat

Specific actions intended to enhance habitat values for aquatic fauna are detailed in the *Foreshore Protection and Compensatory Habitat Plan*.

6.2 ISSUES

The following were issues raised during the consultation program that were considered relevant to aquatic management.

- Creating new fin fish habitats in a freshwater impoundment is an extremely difficult, expensive and as yet, largely unsuccessful endeavour. As such, minimising impacts on existing key habitat areas is considered a more prudent approach to managing the aquatic environment.
- Establishing compensatory habitat areas can best be achieved through adopting management principles akin to those in use at aquatic reserves. Specifically, key habitat areas should be identified, then aquatic uses planned for in a manner that minimises the extent of disturbance to these areas.

To this end, it is noted that many of the characteristics associated with quality fish habitat in an impoundment (ie. snags and submerged vegetation) also make these areas unattractive to other aquatic users.

- Ben Chifley Dam is acknowledged as providing a good food forage regime with some extensive weed beds harbouring daphnia, shrimp, goldfish and small redfin.
- Important habitat areas for fish are at food inflow points (ie. gully discharge sites).
- Successful establishment of new reed beds with emergent and semi-emergent aquatic vegetation requires a very accurate understanding of the foreshore shallows, and knowledge of consistent wetting and drying cycles. This knowledge, as it pertains to the new Full Supply Level of Ben Chifley Dam, is not available.
- NSW Fisheries stocking policy is restricted to the release of recreational fish species. Threatened fin fish species would not be released in Ben Chifley Dam.

6.3 ACTIONS

6.3.1 Fish Habitat

The *Foreshore Protection and Compensatory Habitat Plan* provides for the revegetation, stock exclusion and fencing at four key gully discharge sites.

Works are designed to establish well vegetated riparian zones that would form a dense cover for water birds to nest, roost or find refuge. Within the Recreational Reserve, a key feature of the proposed works is a constructed wetland to be contained within a vegetated reserve enclosed within a predator proof fence. Terrestrial vegetation and quality stands of emergent and semi-emergent aquatic vegetation will provide habitat for birds and aquatic life.

In the upper reaches of the dam, where the bank side vegetation is of greater habitat value, the works recommended in the *Foreshore Protection and Compensatory Habitat Plan* will help establish links with remnant pockets of vegetation on the surrounding landscape, as well as connect with areas dedicated to conservation agreements.

The habitat protection measures proposed represent a significant investment. Approximately 70 hectares and ten kilometres of foreshore and adjacent gullies would be dedicated to establishing compensatory habitat protection.

6.3.3 Blue-Green Algae

In extreme circumstances, outbreaks of blue-green algae have the potential to restrict the level of aquatic recreation that could be safely undertaken on and in the dam. In such circumstances, appropriate signage and advertised warnings would need to be undertaken to minimise risks to the public. The triggers for issuance of these warnings would be linked to the water quality monitoring that is undertaken by Bathurst City Council as part of its drinking water supply operations.

In the event that outbreaks of blue-green algae do occur, controls would need to be imposed that seek to minimise stress on the water body within Ben Chifley Dam. Such controls would include temporarily sealing back public use and visitation.

6.3.4 Research & Monitoring

Fish Assemblages

Redfin currently dominate fin-fish dynamics within the dam. Subsequent stocking programs for recreational species would need to be based on a good understanding as to what is happening to these dynamics as the dam adjusts to its new full supply level. At present, it is not known whether the dominance of redfin will naturally dissipate over time, or whether future stocking programs need to assume a redfin dominance.

Licensed anglers, in collaboration with NSW Fisheries, should develop a collaborative program of monitoring recreational fishing patterns in order to improve the understanding of fish dynamics within the dam.

Platypus

Platypus are known to exist in the upper reaches of the dam within the Campbells River. Raised water levels will flood burrow systems, destroy existing feeding habitat and for an indeterminate period, impact significantly on the dynamics of the population.

Accordingly, it would be beneficial to establish a monitoring program for this population to assess its adaptive capabilities.

To this end, it is noted that during the consultation program there was considerable interest expressed by senior students from the Bathurst region in participating in such a monitoring program. In regard to this, the ease of access to ecological expertise within Charles Sturt University to co-ordinate an appropriately scoped scientific study provides a ready opportunity to do this.

Water Quality Monitoring

The *Ben Chifley Dam Catchment Action Plan* has previously identified land degradation (principally eroded soils) as the most likely source of nutrients getting into the dam. The plan recommends that more measurements over a range of sites will be necessary to draw conclusions about where most of the sediments and the nutrients in the catchment originate.

Opportunities for linking suitable monitoring to the foreshore protection measures identified within this Management Plan should be developed in consultation with the research agenda of the Ben Chifley Catchment Steering Committee.



Section 7.0

Operation and Management

7.1 FUNCTION

This section of the Management Plan identifies funding options as well as operational and structural arrangements for managing Ben Chifley Dam. All the proposed works are also individually itemised and costed.

It is noted that the following issues were raised during the consultative process as matters that warranted consideration.

- A recurring message consistently raised during the consultation program was the preference that Bathurst City Council retain a dominant and active role and control over the area.
- If improved facilities are made available, existing users of the dam would not be adverse to the introduction of an entry fee based on a user pays principle.

7.2 MANAGEMENT OPTIONS

7.2.1 Overview

Based on the consultation program undertaken, a clear and unambiguous message from community stakeholders was a strong preference that Bathurst City Council retain the dominant role in managing activities at Ben Chifley Dam.

Given the relatively modest range of facilities and amenities proposed, coupled with a planning principle of not creating a regional tourist drawcard, it is considered highly unlikely that management of the dam would represent a viable commercial option for the private sector in terms of profit generation.

On the basis of the above, it is considered both inappropriate and unlikely that anybody apart from Bathurst City Council either should or would manage Ben Chifley Dam.

There are relatively few management options available for the administration and implementation of this Management Plan. An overview of these options is provided below.

7.2.2 Trust

While this is an option, the establishment of a Trust to assume responsibility for management at Ben Chifley Dam is not recommended. There are two reasons for this. First, it is not really appropriate as Trusts have been used, historically, as an administrative mechanism for managing Crown Land. Second, there are preferred alternative arrangements through which local government authorities, like Bathurst City Council, can manage community assets under their control.

7.2.3 Council Committee

Pursuant to provisions under the Local Government Regulation, 1999, Councils can establish a Committee to assume responsibility for management at Ben Chifley Dam. Council's have the capacity to establish such committees, by resolution, as it considers necessary. Under this arrangement the Committee must consist of the Mayor and elected or nominated councillors.

A committee established under this arrangement has the capacity to include a range of stakeholders and be comprised of Council staff, elected representatives and key stakeholders.

It is recommended that key stakeholders at Ben Chifley Dam would include adjacent land holders, community representatives and the Department of Land and Water Conservation.

The committee would assume responsibility for establishing works programs, setting priorities and reporting back to Bathurst City Council. Such committees also have the power to appoint staff (ie. full time ranger).

7.2.4 Business Unit

Bathurst City Council could also establish a separate Business Unit to manage Ben Chifley Dam. Typically, such units are only established where there is a good prospect that the venture concerned would be a profitable business. This is not the case at Ben Chifley Dam.

Notwithstanding this, Business Units can be established whereby rather than an agreed profit/dividend, there is a specified agreed loss and the unit is supported by additional/ongoing Council funding.

7.2.5 Council Department

This option entails delegation of responsibility for management at the dam to one of Council's existing internal service departments (ie. Parks and Gardens, Engineering)

Under this arrangement management would rest with Council staff and the venture is funded through Council's general budget or the department's programmed budget.

Historically, these arrangements have not been conducive to stakeholder input, although advisory committees can be formed to establish strategic input.

7.2.6 Tender

A final option would be to tender out the management function at the dam. This is not considered a viable option for a number of reasons.

These are discussed below:

- It was made very clear throughout the consultation program that the community expects Bathurst City Council to retain dominant control over activities at Ben Chifley Dam.
- Implementation of the Management Plan, at this stage, does not provide an opportunity for private sector participation on the basis of securing an adequate commercial return on investment.

Rather, the Management Plan provides for a long term investment designed to protect and enhance a community asset, to be owned by the local community.

In the future it is, however, conceivable that distinct management functions could be contracted successfully to external parties, remaining under the control of Bathurst City Council.

7.3 FUNDING OPTIONS

7.3.1 Introduction

Funding opportunities are linked to the type of expenditure and for this reason costs associated with the implementation of the Ben Chifley Dam Management Plan can be categorised as either facility or environmental related.

Initiatives such as compensatory habitat and foreshore protection are clearly examples of the latter, while provision of BBQs, roads, shelters, etc are examples of the former.

Funding options for these two types of costs are outlined below.

7.3.2 Environmental Works

There are a number of grant opportunities that may provide access to funds to finance the range of works and longer term research and monitoring recommendations identified within this Management Plan.

It should also be highlighted that as the focus of the Management Plan deals with providing a local community asset, voluntary community participation is a reasonable expectation. As this can not be taken as a given, the project costings assume paid labour.

Grants opportunities exist through:

Natural Heritage Trust

It is possible that monies could be made available through the Natural Heritage Trust to assist in undertaking the foreshore protection and compensatory habitat plantings. It is noted, however, that this program is currently entering its last year of operation and while an equivalent replacement program is considered likely, no indications of this happening

have yet come from the Commonwealth Government. To be eligible for NHT funding the community must contribute at least 50% of the cost of the works.

Native Vegetation Conservation Act

It is conceivable that limited monies could be made available by the Department of Land and Water Conservation, under provisions of the *Native Vegetation Conservation Act* to assist in undertaking the foreshore protection and compensatory habitat plantings. For these monies to be available it would be necessary for both Bathurst City Council and land holders to enter into property management agreements with the Department of Land and Water Conservation.

Greening Australia

Some monies could also be available through Greening Australia's vegetation incentives program. This program can make available funds for works related to the protection and re-establishment of vegetation.

Landcare Australia Limited

Landcare Australia Limited, the corporate of the landcare movement, is concerned with accessing corporate funds to assist with landcare group related activity. Some monies for community group initiated activity may be accessible through this source.

7.3.3 Facility and Infrastructure

Funding options for securing access to monies required to build, maintain and manage the amenities at Ben Chifley Dam are limited. Essentially, they are linked to government funded grants or Council's general rates revenue.

With regards to government grants, there are two schemes that could provide some monies for specific aspects of the amenities proposed. An overview of these is provided below.

Capital Assistance Program

The Capital Assistance Program (CAP) is administered by NSW Department of Sport and Recreation and assists Local Government Authorities and "not for profit" recreational organisations to develop community oriented recreational facilities throughout New South Wales.

The purpose of the program is to:

- Increase opportunities for the community to participate in recreation.
- Increase the multi-use or shared capability of recreation facilities.
- Improve the safety of facilities used by the community.

- Improve opportunities for groups in the community that traditionally face difficulties in accessing facilities.
- Contribute towards the shared use of public resources by different government agencies, clubs and organisations.

The maximum contribution by NSW Department of Sport and Recreation will not exceed 50 per cent of the net project cost. The average grant in recent years has been less than \$9,000.

Waterways Asset Development and Management Program

The Waterways Asset Development and Management Program (WADAMP) enables the NSW Waterways Authority, by funding waterway infrastructure, to improve amenities for the boating public. Under WADAMP, the Waterways Authority will allocate funds to projects which demonstrate a positive contribution to the Program's objective. More favourable consideration is given to projects which represent best available solutions to the problems they are addressing. Funds are allocated on a priority basis, taking into account issues raised by the boating community, and assessments of safety, environmental, amenity and socioeconomic benefits. In the order of \$2 million is available annually from the Program.

General Operating Revenue

The allocation of funds from Council's general rate revenue base represents the only likely source of monies. The acceptability of this option can only be judged by Bathurst City Council itself. Complicating factors arise from the situation whereby the monies involved are significant, and secondly, where only a relatively small portion of Council's rate payers appear to utilise the dam.

7.4 COSTINGS

Itemised costings for all the proposed works follow.

It should also be noted that the costings undertaken have:

- Not made any provision for income derived from entrance fees to the dam. No data on visitation is available, nor did the consultation program provide data on likely visitation rates.
- Assumed that opportunities for involving voluntary community participation by various stakeholders would not arise.

BEN CHIFLEY DAM MANAGEMENT PLAN - COSTINGS

SECTION 1 - SUMMARY OF CAPITAL COSTS

Item	Component	Component Cost
Infrastructure		
	Potable Water	\$ 261,250
	Raw Water	\$ 78,750
	Sewerage	\$ 482,813
	Roads	\$ 343,750
	Electricity	\$ 111,250
	Telephone	\$ 3,600
	Surface Water	\$ 112,500
Facilities	Passive Reserve Area	\$ 221,875
	Recreational Reserve Area	\$ 17,500
Aquatic Uses	Waterway Controls	\$ 206,875
Foreshore Management	Fencing	\$ 22,500
	Revegetation	\$ 22,500
	Indigenous Heritage	\$ 570,000
	Research & Monitoring	\$ 179,725
Aquatic Management	Aquatic Management	\$ 41,250
Approvals	EIS, Council approval etc	\$ 100,000
TOTAL CAPITAL COSTS		\$ 3,264,888

SECTION 2 - SUMMARY OF ANNUAL OPERATING AND MANAGEMENT COSTS

Item	Annual Cost
Capital O & M	\$ 85,053
Management	\$ 114,000
TOTAL CAPITAL COSTS	\$ 199,053

SECTION 3 - ANNUAL OPERATING, MAINTENANCE & MANAGEMENT COSTS

Item	Component	Rate	Quantity	Capital Cost	Component Cost	Item Cost
Capital Operating & Maintenance	Potable water	5%	1	\$ 209,000.00	\$ 10,450.00	\$
	Raw water	5%	1	\$ 63,000.00	\$ 3,150.00	\$
	Sewerage	5%	1	\$ 386,250.00	\$ 19,312.50	\$
	Roads	3%	1	\$ 275,000.00	\$ 8,250.00	\$
	Electricity	3%	1	\$ 89,000.00	\$ 2,670.00	\$
	Telephone	3%	1	\$ 3,000.00	\$ 90.00	\$
	Surface water	3%	1	\$ 90,000.00	\$ 2,700.00	\$
	Passive reserve	3%	1	\$ 177,500.00	\$ 5,325.00	\$
	Recreational reserve	3%	1	\$ 617,000.00	\$ 18,510.00	\$
	Waterway controls	3%	1	\$ 14,000.00	\$ 420.00	\$
	Contingency	20%	1	\$ 14,175.50	\$ 14,175.50	\$
Operating & Maintenance Total						\$ 85,053

Item	Component	Unit	Quantity	Unit Cost	Component Cost	Item Cost
Annual Management	Staff (ranger)	no.	1	\$ 40,000.00	\$ 40,000.00	\$
	Vehicle	no.	1	\$ 25,000.00	\$ 25,000.00	\$
	Boat	no.	1	\$ 10,000.00	\$ 10,000.00	\$
	Council management	no.	1	\$ 20,000.00	\$ 20,000.00	\$
	Contingency	20%	1	\$ 19,000.00	\$ 19,000.00	\$
Annual Management Total						\$ 114,000

TOTAL ANNUAL OPERATING & MANAGEMENT COSTS

						\$ 199,053
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Appendix A

Itemised Costings

SECTION 4 - CAPITAL COSTS

INFRASTRUCTURE

Item	Component	Unit	Quantity	Unit Cost \$/unit	Component Cost \$	Item Cost \$
Potable Water	Intake pump - potable	no	1	\$ 5,000.00	\$ 5,000.00	
	Slab and shed	no	1	\$ 3,000.00	\$ 3,000.00	
	Rising main	m	300	\$ 35.00	\$ 10,500.00	
	Controls/elec	no	1	\$ 3,000.00	\$ 3,000.00	
	Package water treatment plant	no	1	\$ 60,000.00	\$ 60,000.00	
	Pump to potable tanks	no	1	\$ 10,000.00	\$ 10,000.00	
	Rising main to tanks	m	1100	\$ 35.00	\$ 38,500.00	
	100 KL tank	no	1	\$ 12,000.00	\$ 12,000.00	
	50 KL tank	no	1	\$ 7,000.00	\$ 7,000.00	
	Gravity reticulation	m	2000	\$ 30.00	\$ 60,000.00	
	Design	5%	1	\$ 10,450.00	\$ 10,450.00	
	Contingency	20%	1	\$ 41,800.00	\$ 41,800.00	
	Potable Water Total					\$ 261,250

Raw Water 1	Intake pump - raw	no	1	\$ 5,000.00	\$ 5,000.00	
	Slab and shed	no	0	\$ 3,000.00	\$ 0.00	
	Rising main	m	500	\$ 35.00	\$ 17,500.00	
	Controls/elec	no	1	\$ 1,000.00	\$ 1,000.00	
	Irrigation	m	1000	\$ 10.00	\$ 10,000.00	
Raw Water 2	Intake pump - raw	no	1	\$ 5,000.00	\$ 5,000.00	
	Slab and shed	no	1	\$ 3,000.00	\$ 3,000.00	
	Rising main	m	300	\$ 35.00	\$ 10,500.00	
	Controls/elec	no	1	\$ 1,000.00	\$ 1,000.00	
	Irrigation	m	1000	\$ 10.00	\$ 10,000.00	
	Design	5%	1	\$ 3,150.00	\$ 3,150.00	
	Contingency	20%	1	\$ 12,600.00	\$ 12,600.00	
	Raw Water Total					\$ 78,750.00

Sewerage	Gravity sewer	m	1000	\$ 140.00	\$ 140,000.00	
	Man holes	no	2	\$ 2,000.00	\$ 4,000.00	
	Sewage pump stations	no	2	\$ 20,000.00	\$ 40,000.00	
	Rising main to STP	m	1200	\$ 40.00	\$ 48,000.00	
	Package sewage treatment plant	no	1	\$ 90,000.00	\$ 90,000.00	
	Rising main to pond	m	150	\$ 35.00	\$ 5,250.00	
	Irrigation pond	no	1	\$ 25,000.00	\$ 25,000.00	
	Irrigation pump	no	1	\$ 5,000.00	\$ 5,000.00	
	Slab and shed	no	1	\$ 3,000.00	\$ 3,000.00	
	Irrigation system	no	1	\$ 10,000.00	\$ 10,000.00	
	Design	5%	1	\$ 19,312.50	\$ 19,312.50	
	Contingency	20%	1	\$ 77,250.00	\$ 77,250.00	
	Sewerage Total					\$ 482,812.50

Roads	Intersection treatment (BAR/BAL)	no	1	\$ 150,000.00	\$ 150,000.00	
	Internal roads	km	1	\$ 100,000.00	\$ 100,000.00	
	Barriers	m	500	\$ 50.00	\$ 25,000.00	
	Design	5%	1	\$ 13,750.00	\$ 13,750.00	
	Contingency	20%	1	\$ 55,000.00	\$ 55,000.00	
	Roads Total					\$ 343,750.00

Electricity	150-200 kVA sub station	no	1	\$ 15,000.00	\$ 15,000.00	
	Underground electrical cable	m	800	\$ 80.00	\$ 64,000.00	
	Connections	no	1	\$ 10,000.00	\$ 10,000.00	
	Design	5%	1	\$ 4,500.00	\$ 4,500.00	
	Contingency	20%	1	\$ 17,800.00	\$ 17,800.00	
	Electrical Total					\$ 111,250.00

Telephone	Public phone booth and connection	no	1	\$ 3,000.00	\$ 3,000.00	
	Contingency	20%	1	\$ 600.00	\$ 600.00	
	Telephone Total					\$ 3,600.00

Surface water	Pipes, culverts, channels	m	200	\$ 200.00	\$ 40,000.00	
	Quality controls	no	1	\$ 50,000.00	\$ 50,000.00	
	Design	5%	1	\$ 4,500.00	\$ 4,500.00	
	Contingency	20%	1	\$ 18,000.00	\$ 18,000.00	
	Surface water Total					\$ 112,500.00

INFRASTRUCTURE TOTAL						\$ 1,393,913
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FACILITIES

Item	Component	Unit	Quantity	Unit Cost \$/unit	Component Cost \$	Item Cost \$
Passive Reserve	Passive Reserve					
	Picnic shelters	no	8	\$ 6,000.00	\$ 48,000.00	
	BBQs	no	4	\$ 5,000.00	\$ 20,000.00	
	Play equipment	no	1	\$ 15,000.00	\$ 15,000.00	
	Picnic tables	no	5	\$ 1,500.00	\$ 7,500.00	
	Park bins	no	4	\$ 500.00	\$ 2,000.00	
	Landscaping	no	1	\$ 20,000.00	\$ 20,000.00	
	Caravan park upgrade	no	1	\$ 50,000.00	\$ 50,000.00	
	Pontoon	no	1	\$ 15,000.00	\$ 15,000.00	
	Design	5%	1	\$ 8,875.00	\$ 8,875.00	
	Contingency	20%	1	\$ 35,500.00	\$ 35,500.00	
	Passive Reserve Total					\$ 221,875

Recreational Reserve	Picnic shelters	no	6	\$ 6,000.00	\$ 36,000.00	
	BBQs	no	6	\$ 5,000.00	\$ 30,000.00	
	Picnic tables	no	1	\$ 1,500.00	\$ 1,500.00	
	Multi-purpose shelter	no	1	\$ 8,000.00	\$ 8,000.00	
	Play equipment	no	1	\$ 15,000.00	\$ 15,000.00	
	Park bins	no	6	\$ 500.00	\$ 3,000.00	
	Stall shed and shelter	no	1	\$ 10,000.00	\$ 10,000.00	
	Landscaping	no	1	\$ 40,000.00	\$ 40,000.00	
	Cabins	no	4	\$ 50,000.00	\$ 200,000.00	
	Sleep Hall	no	1	\$ 70,000.00	\$ 70,000.00	
	Toilet Block	no	1	\$ 100,000.00	\$ 100,000.00	
	Camping Area	no	1	\$ 5,000.00	\$ 5,000.00	
	Boat ramp (50m x 6m)	m ²	3000	\$ 17.00	\$ 51,000.00	
	Artificial beach (50m x 50m)	m ²	2500	\$ 16.00	\$ 40,000.00	
	Drainage	5%	1	\$ 30,850.00	\$ 30,850.00	
	Contingency	20%	1	\$ 123,400.00	\$ 123,400.00	
	Recreational Reserve Total					\$ 771,250.00

FACILITIES TOTAL						\$ 993,125
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AQUATIC USES

Item	Component	Unit	Quantity	Unit Cost \$/unit	Component Cost \$	Item Cost \$
Waterway Controls	Waterway Controls					
	Advisory signs	no	15	\$ 600.00	\$ 9,000.00	
	Bouys	no	10	\$ 500.00	\$ 5,000.00	
	Design	5%	1	\$ 700.00	\$ 700.00	
	Contingency	20%	1	\$ 2,800.00	\$ 2,800.00	
	Passive Reserve Total					\$ 17,500

AQUATIC USES TOTAL						\$ 17,500
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SECTION 4 - CAPITAL COSTS (continued)

FORESHORE MANAGEMENT - FENCING & REVEGETATION

Item	Component	Unit	Quantity	Unit Cost \$/Unit	Component Cost \$	Item Cost \$	
Fencing Priority 1	Map no. 1	m	550	10.00	5,500.00		
	Map no. 2	m	3,000	10.00	30,000.00		
	Map no. 3	m	1400	10.00	14,000.00		
	Map no. 6	m	1000	10.00	10,000.00		
	Map no. 7	m	800	10.00	8,000.00		
	Map no. 11	m	300	10.00	3,000.00		
	Map no. 16	m	600	10.00	6,000.00		
	Map no. 17	m	1000	10.00	10,000.00		
	Map no. 19	m	1500	10.00	15,000.00		
	Map no. 21	m	600	10.00	6,000.00		
	Map no. 22	m	500	10.00	5,000.00		
	Map no. 26	m	700	25.00	17,500.00		
	Design	5%	1	5,375.00	5,375.00		
	Contingency	20%	1	21,500.00	21,500.00		
	Fencing Priority 1 Total						\$ 156,875
	Fencing Priority 2	Map no. 12	m	700	10.00	7,000.00	
		Design	5%	1	350.00	350.00	
Contingency		20%	1	1,400.00	1,400.00		
Fencing Priority 2 Total						\$ 8,750.00	
Fencing Priority 3	Map no. 4	m	1400	10.00	14,000.00		
	Map no. 5	m	900	10.00	9,000.00		
	Map no. 20	m	1000	10.00	10,000.00		
Design	5%	1	1,650.00	1,650.00			
Contingency	20%	1	6,600.00	6,600.00			
Fencing Priority 3 Total						\$ 41,250.00	
FENCING TOTAL						\$ 206,875	

Item	Component	Unit	Quantity	Unit Cost \$/Unit	Component Cost \$	Item Cost \$	
Revegetation Priority 1	Map no. 6	m ²	30,000	0.30	9,000.00		
	Map no. 8	m ²	30,000	0.30	9,000.00		
	Map no. 9	m ²	75,000	0.30	22,500.00		
	Map no. 10	m ²	40,000	0.30	12,000.00		
	Map no. 11	m ²	10,000	0.30	3,000.00		
	Map no. 15	m ²	20,000	0.30	6,000.00		
	Map no. 16	m ²	40,000	0.30	12,000.00		
	Map no. 17	m ²	20,000	0.30	6,000.00		
	Map no. 21	m ²	30,000	0.30	9,000.00		
	Map no. 22	m ²	10,000	0.30	3,000.00		
	Map no. 23	m ²	140,000	0.30	42,000.00		
	Design	5%	1	6,675.00	6,675.00		
	Contingency	20%	1	26,700.00	26,700.00		
	Revegetation Priority 1 Total						\$ 166,875.00
	Revegetation Priority 2	Map no. 12	m ²	20,000	0.30	6,000.00	
		Map no. 13	m ²	30,000	0.30	9,000.00	
		Design	5%	1	750.00	750.00	
Revegetation Priority 2 Total						\$ 18,750.00	
Revegetation Priority 3	Map no. 4	m ²	30,000	0.30	9,000.00		
	Map no. 5	m ²	25,000	0.30	7,500.00		
	Map no. 14	m ²	120,000	0.30	36,000.00		
Map no. 20	m ²	30,000	0.30	9,000.00			
Design	5%	1	3,075.00	3,075.00			
Contingency	20%	1	12,300.00	12,300.00			
Revegetation Priority 3 Total						\$ 76,875.00	
REVEGETATION TOTAL						\$ 262,500	

FORESHORE MANAGEMENT - HERITAGE

Item	Component	Unit	Quantity	Unit Cost \$/Unit	Component Cost \$	Item Cost \$
Indigenous Heritage	Artifact recording	no.	1	7,000.00	7,000.00	
	Establish photo monitoring points	no.	1	4,000.00	4,000.00	
	3 monthly inspection for 5 years	no.	5	6,000.00	30,000.00	
	Annual inspection	no.	1	10,000.00	10,000.00	
	LALC involvement	no.	1	5,000.00	5,000.00	
	Management	5%	1	2,800.00	2,800.00	
Contingency	20%	1	11,200.00	11,200.00		
Indigenous Heritage Total						\$ 70,000

FORESHORE MANAGEMENT - INDIGENOUS HERITAGE TOTAL						\$ 70,000
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FORESHORE MANAGEMENT - RESEARCH & MONITORING

Item	Component	Unit	Quantity	Unit Cost \$/Unit	Component Cost \$	Item Cost \$
Grazing Stress	Annual inspection/consultation (5 yrs)	no.	5	2,000.00	10,000.00	
	Management	5%	1	500.00	500.00	
	Contingency	20%	1	2,000.00	2,000.00	
	Grazing Stress Total					
Monitoring	Annual inspection/consultation (5 yrs)	no.	5	2,000.00	10,000.00	
	Management	5%	1	500.00	500.00	
	Contingency	20%	1	2,000.00	2,000.00	
Monitoring						\$ 12,500.00
Wave Protection Trial	Initial site establishment	no.	1	5,000.00	5,000.00	
	3 monthly monitoring for 5 years	no.	5	4,000.00	20,000.00	
	Management	5%	1	1,250.00	1,250.00	
Wave Protection Trial Total						\$ 26,250.00
Constructed Wetland	Earthworks	m ²	10000	6.00	60,000.00	
	Outlet works	no.	1	10,000.00	10,000.00	
	Planting	m ²	5000	2.00	10,000.00	
	Survey & Design	7%	1	5,600.00	5,600.00	
	Contingency	20%	1	16,000.00	16,000.00	
	Constructed Wetland Total					
Off-dam Stock Watering	Solar pump, tank, trough piping	no.	1	10,000.00	10,000.00	
	3 monthly monitoring for 5 years	no.	5	1,500.00	7,500.00	
	Management	5%	1	875.00	875.00	
Contingency	20%	1	3,500.00	3,500.00		
Off-dam Stock Watering Total						\$ 21,875.00
FORESHORE MANAGEMENT - RESEARCH & MONITORING TOTAL						\$ 179,725

AQUATIC MANAGEMENT

Item	Component	Unit	Quantity	Unit Cost \$/Unit	Component Cost \$	Item Cost \$
Aquatic Management	Fish assemblages (5 years)	no.	5	2,000.00	10,000.00	
	Playtop monitoring (2 years)	no.	2	4,000.00	8,000.00	
	Water quality monitoring (5 years)	no.	5	3,000.00	15,000.00	
	Management	5%	1	1,650.00	1,650.00	
	Contingency	20%	1	6,600.00	6,600.00	
Aquatic Management Total						\$ 341,250
AQUATIC MANAGEMENT TOTAL						\$ 41,250