A MANAGEMENT PLAN FOR DUGALUP BROOK

CROWN RESERVE 42673, BETWEEN CAPE NATURALISTE ROAD AND NATURALISTE TERRACE, DUNSBOROUGH

Adopted August 2008

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For the Shire of Busselton

Management Plan for Dugalup Brook

and Crown reserve 42673, between Cape Naturaliste Road and Naturaliste Terrace, Dunsborough

Prepared for GeoCatch and the Shire of Busselton January 2006

Adopted by Shire of Busselton - August 2008

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1 INTRODUCTION

1.1 Background

The Dugalup Brook is a small, seasonal creek that runs through the Dunsborough town centre within crown reserve 42673. The Dugalup Brook is in poor ecological condition and the reserve is degraded. The visual impact and waste associated with the commercial users has caused considerable community concern. With increasing urban and commercial pressure on the waterway, the Dunsborough Coast and Land Care group (DCALC), the community, GeoCatch and the Shire of Busselton have identified a need for a concept plan for crown reserve 42673 between Cape Naturaliste Road and Naturaliste Terrace, including Lot 106 ('the study area'). Crown reserve 42673 is a 'C' class reserve vested in the Shire of Busselton for the purpose of 'Public Recreation'.

The key components of the concept plan, identified by GeoCatch, are:

(1) Identifying areas for restoration of the brook to a near natural seasonal streamline with its riparian vegetation;
(2) Measures to ensure good water management and control; and
(3) Identifying areas for community and tourist amenity such as public open space.

1.2 Project objectives and tasks

The specific project objectives, identified by GeoCatch, were:

(1) To restore the ecological values (e.g. fringing vegetation, native fauna) and functions (e.g. water flow, nutrient stripping, flood control) of Dugalup Brook.
(2) To develop and maintain defined areas for social function purposes, for example recreation and commercial use.
(3) To provide a tool to better guide the management of the study area and distribute limited resources.

Specific project tasks, identified by GeoCatch, included:

(1) Establishing the community's vision for the study area through liaison with community stakeholders including adjacent commercial landholders to gain a balanced vision for the area.
(2) Identifying and prioritising management actions for the study area, including foreshore improvements and revegetation, and land use.

The Shire of Busselton intends to construct a new pathway along the brook in reserve 42673 that will adjoin the existing dual-use pathway system that links the town centre to the Geographe Bay foreshore via the downstream sections of Dugalup Brook, within Redgum Place and Melaleuca Park (also crown reserves). A specific task of the project was identification of the community's preferred location for the pathway, including determination of the requirements for bridges and boardwalks and the preferred materials for the pathway.

1.3 Relevant documents

Two planning documents are relevant to this concept plan. The Dunsborough Structure Plan (DPUD, 1990) contains policy guidelines for the development of Dunsborough town site. The Dunsborough Townscape Plan (Shire of Busselton, 2002) provides guidelines for development of the Dunsborough town centre, including management of the creekline reserves along Dugalup Brook and the provision of public amenities.

1.3.1 DUNSBOROUGH STRUCTURE PLAN – AUGUST 1990

The Dunsborough Structure Plan emphasizes preserving the important environmental landscape elements, notably the mature trees, wetlands and creeks, which define Dunsborough:

> *"The high aesthetic value of the environment is a significant feature of Dunsborough providing a scenic setting for urban development but also providing a constraint in that development should create minimal impact on the environment. Insensitive building design and siting will see the essential quality of Dunsborough compromised. ... It is important that natural or appropriately modified creek-lines and associated vegetation and wetlands are protected as important landscape elements"* (DPUD, 1990:6).

The plan identified the need for a path that follows the creek-line and provides access to town and the beaches, and noted that the creek is an attractive asset that shops and shoppers could enjoy as a view (DPUD, 1990:19).

Policies of the Dunsborough Structure Plan which are relevant to this plan are:

- *1. Indigenous vegetation should be protected and incorporated into development* (DPUD, 1990:49).
- *4. Development which results in the protection of vegetation, minimises impacts on views while maximising the opportunity of occupants to enjoy the environment should be encouraged* (ibid.).
- *4.1 While some single residential development is likely to take place in this policy area* (Central Dunsborough) *the emphasis should be on catering for tourist uses and preserving the riparian vegetation, wetlands and roadside vegetation* (DPUD, 1990:52).
- *4.3 The creek should be protected and developed with a linear pathway* (Ibid.).

1.3.2 DUNSBOROUGH TOWNSCAPE PLAN – OCTOBER 2002

The Dunsborough Townscape Plan (Shire of Busselton, 2002) contains guidelines for development of the creekline, foreshore, town centre civic space and Clark Street which are directly relevant to this concept plan:

Creekline

- 4. Install shared use path along south side of creek line and provide safe crossing at Gifford Rd.
- 6. Preserve mature trees.

- 7. Encourage adjoining developments to acknowledge and utilize the visual quality of the area.
- 10.provide a shared path system that links the town center, foreshore and surrounding residential areas.
- 11. Provide low level lighting in pedestrian areas.
- 12. Undertake and implement a management plan dealing with weed eradication, re-vegetation, water and water quality management.
- 13. Provide public amenities including toilets, picnic shelters, tables and seating along creek-line.
- 14. Encourage community participation of the restoration of the creek-line.
- 15. Provide education interpretive information about the ecosystem of the creek and foreshore.

Foreshore

- 33. Upgrade stormwater catchments and naturally filter water using indigenous vegetation.

Town Center Civic Space

- 55. Link cycle paths to the foreshore and creekline open space shared use path system.

Clark Street

- 69. Provide pedestrian access to new link road (Cyrillian Way).

2 THE STUDY AREA

The study area encompasses reserve 42673, comprising Lot 4958 (3617 m^2) and Lot 5528 (7664 m^2), which is vested in the Shire of Busselton for the purpose of 'Public Recreation'. The total area of the reserve is 11,281 m^2. The study area also includes Lot 106, a currently undeveloped lot zoned for 'Recreation' adjoining the eastern side of the reserve. Cyrillean Way and several undeveloped commercial lots (zoned 'Business') adjoin the eastern side of the reserve while the rear boundaries of commercial lots on Clark Street, currently zoned 'Industrial' and used as a light industrial area, form the western boundary of the site. Cape Naturaliste Road lies at the southern end of the reserve while Naturaliste Terrace lies to the north.

The reserve is a narrow corridor of degraded native vegetation straddling the Dugalup Brook within the Dunsborough town centre. The Dugalup Brook is a small, seasonal creekline with a catchment of approximately 10 square kilometres, about half of which is urbanised and half of which is rural, however this balance is changing with rapidly increasing urbanisation of the catchment.

At the commencement of the project (September 2005), the current condition of the study area was investigated and mapped. Figure one shows: the condition and extent of native vegetation remaining within the reserve including landmark trees; presence and extent of exotic vegetation (weeds present during spring); areas of erosion requiring stabilisation; foreshore disturbances including pedestrian crossings and informal paths; and stormwater outlets and detention basins. The following sections of the plan

describe the current condition of the reserve's environment and its use by the community.

2.1 Native vegetation

The vegetation of the reserve is degraded riparian vegetation, predominantly a closed woodland of peppermint trees (*Agonis flexuosa*) with occasional marri (*Corymbia calophylla*) and blackbutt (*Eucalyptus patens*) on the higher ground (upstream of Lot 106 to Cape Naturaliste Road), and a closed woodland of flooded gum (*Eucalyptus rudis*) over peppermint trees on the lower ground (from Lot 106 to Naturaliste Terrace).

Although the reserve retains continuous canopy cover for most of its area, there are only nine small areas which retain good condition native understorey (figure 1). Near Cape Naturaliste Road, there are stands of the native sedges pale rush (*Juncus pallidus*) and blue twig-rush (*Baumea juncea*) lining the stream, and patches of blackboys (*Xanthorrhoea preissii*) and prickly Moses (*Acacia pulchella*) are present under peppermint trees (figure 1). Within the area of flooded gums (adjacent to and downstream of Lot 106) there are five small areas where the understorey is dominated by the shrub swamp peppermint (*Taxandria linearifolia*) over four-sided sword sedge (*Lepidosperma tetraquetrum*) or spreading sword sedge (*Lepidosperma effusum*) and river twig-rush (*Baumea rubiginosa*) (figure 1). Other native understorey plants present within the reserve include soap bush (*Trymalium floribundum*), swishbush (*Viminaria juncea*) and native wisteria (*Hardenbergia comptoniana*).

In 2002, two off-stream stormwater detention basins were installed within the reserve, and one existing pool on the brook was enlarged, to enable the brook to take stormwater flows from Cyrillean Way (figure 1). These areas were revegetated with locally occurring native riparian plant species that, although growing well, are currently experiencing some weed competition.

2.2 Environmental weeds

Environmental weeds have replaced the native understorey within most of the reserve. There are several large infestations of arum lily (*Zantedeschia aethiopica*) and large areas that are dominated by kikuyu grass (*Pennisetum clandestinium*) (figure 1). Other weed infestations that require removal are: bridal creeper (*Myrsiphyllum asparagoides*), watsonia (*Watsonia* sp.), freesia (*Freesia* sp.), Tangier pea (*Lathyrus tingitanus*), nasturtiums (*Tropaeolum majus*), budding club rush (*Isolepis prolifera*) and fleabane (*Conyza* sp.). The location of these infestations is shown on figure 1. The remainder of the reserve is dominated by annual grasses interspersed with some blackberry nightshade (*Solanum nigrum*), dock (*Rumex* sp.), and several species of flatweed (*Hypochaeris* spp.).

While there has been some weed control in the areas that were replanted in 2002, annual grasses and flatweeds are still present however the density of weeds is reduced when compared to the upstream portion of the reserve.

All arum lily within the reserve was sprayed in spring 2005.

2.3 Native fauna

During the current condition mapping, five western ringtail possum (*Pseudocheirus occidentalis*) dreys were found within the reserve. Four of the dreys were located near the Cape Naturaliste Road end of the reserve where the overstorey is predominantly peppermint trees. The western ringtail possum is listed as a Schedule 1 species ('Fauna that is rare or likely to become extinct') under the Western Australian *Wildlife Conservation Act* (1950), and is a trigger species under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (1999), listed as 'vulnerable'.

Increased numbers of small birds and waterbirds have been recorded in areas of thick vegetation within Melaleuca Park (downstream of the study area) which was replanted by DCALC in 2002 (Ron Glencross, DCALC, pers. comm.). In particular, sightings of thornbills (*Acanthiza* spp.), Jacky Winters (*Microeca leucophaea*), silvereyes (*Zosterops lateralis*), splendid blue wrens (*Malurus splendens*) and the water birds purple swamphens (*Porphyrio porphyrio*), several egrets and herons (*Ardea* spp.) and native duck species (Family Anatidae) have increased.

Aquatic macroinvertebrates were sampled within the pool and stream channel immediately upstream of Naturaliste Terrace, using a sweep net, on December 9th, 2005. A total of 13 taxa were recorded during the sampling, including seven insects, four crustaceans, one arachnid and one annelid, which is a reasonable diversity for an urban stream. The following aquatic macroinvertebrate taxa were found within the Dugalup Brook:

PHYLUM ARTHROPODA	
CLASS INSECTA	
Trichoptera (order)	Caddisfly larvae
Odonata (order)	Dragonfly larvae
Odonata (order)	Damselfly larvae
Notonectidae (family)	Backswimmers
Dytiscidae (family)	Predatory diving beetle adult/larvae
Culicidae (family)	Mosquito larvae and pupae
Chironomidae (family)	Non biting midge larvae
CLASS CRUSTACEA	
Parastacidae (family)	Freshwater crayfish
Amphipoda (order)	Amphipod
Ostracoda (class)	Ostracod
Copepoda (class)	Copepod
CLASS ARACHNIDA	
Araneae (order)	Water spider
PHYLUM ANNELIDA	
Hirudinea	Leeches

2.4 Areas of erosion

Within the reserve, the Dugalup Brook has four areas of active erosion which require stabilisation, and a section of the brook which flows outside of the reserve boundaries, into Lot 25 Clark Street, is also unstable and eroding (figure 1). The worst erosion in the reserve is occurring along the boundary of Lot 106 Cyrillean Way, where increased flows have led to channel incision

and erosion of the toe of the bank resulting in undercutting and bank slumping. Several mature peppermint trees have been undermined and have either fallen into the brook or are adding weight to the shoulder of the bank and increasing the likelihood of further bank collapse. The outside bend of the brook near the area proposed for a playground is also incising and undercutting, however this erosion is not as severe as that which is occurring near Lot 106 (figure 1). Another section of the brook near Lot 22 Clarke St is also actively eroding, primarily due to the lack of fringing vegetation on the bank, and this area is less severe than the two downstream areas of erosion (figure 1). There is also a minor area of erosion on the outside of a bend near Cape Naturaliste Road, also due to lack of fringing vegetation (figure 1).

Within Lot 25 Clark Street, there has been considerable erosion of the embankment along the rear of the lot which a former landholder has attempted to arrest by dumping truckloads of soil and rock fill to form a steep but unstable batter on the outside of the bend (figure 1). Although this area requires stabilisation, it is beyond the scope of this plan to recommend remedial actions to rectify the erosion within Lot 25. However, it is possible to undertake remedial actions within the reserve that may ameliorate erosion of the embankment within Lot 25 Clarke Street.

2.5 Current stormwater outlets

Within the study area, the Dugalup Brook carries stormwater from urban areas upstream of Cape Naturaliste Road (the ‘Naturaliste Heights’ residential estate), parts of Cape Naturaliste Road, the Clarke Street light industrial area, and Cyrillean Way.

There are currently two stormwater detention basins and one ‘bubble-up’ located within the reserve to treat run off from Cyrillean Way (figure 1). These detention basins were installed and planted with locally occurring native riparian species in 2002. The detention basins appear to be functioning within their capacity as the upstream basin rarely overflows and, at most times, stormwater appears to percolate through the soil instead (Chris Hoskins, DCALC, pers. comm.). The downstream basin overflows regularly, however it appears to detain a significant amount of stormwater before overflowing and the sedges within the basin are thriving.

Along the Clarke Street side of the reserve there are at least three stormwater pipes that drain directly into the brook and there may be more pipes that are hidden by the dense weed cover. Two of these pipes drain car parking areas of Lots in Clarke Street. It was not possible to establish the catchment of the third pipe.

Stormwater from Cape Naturaliste Road drains into the brook at the upstream end of the reserve via a channel of pitched stone that is without any vegetation.

On the southwest side of Cape Naturaliste Road there is a substantial drain which discharges stormwater from the ‘Naturaliste Heights’ subdivision into the brook. Stormwater within this drain has been detained for some period on

site before entering the brook, however the detention basin, which is located alongside Cape Naturaliste Road, is devoid of vegetation.

2.6 Current community uses

Currently there are numerous informal paths within the reserve, providing access to town from businesses in Clarke Street, and linking Cape Naturaliste Road to Cyrillean Way and Clarke Street. The path between Clarke Street and Cape Naturaliste Road is well worn indicating that it carries a substantial amount of pedestrian and possibly cycle traffic. There are also numerous informal creek crossings, most of which are makeshift constructions of wood and packing crates. Near the corner of Cyrillean way there is a fallen log that provides an all-weather crossing of the brook and the path that leads to this crossing also shows a regular usage (figure 1).

2.7 Heritage and cultural values

Traditionally, the Aboriginal people of the south-west were part of a cultural bloc distinguished by their initiation practices, which consisted of nasal septum piercing and scarring of the upper body rather than circumcision, which was practiced by their northern and inland neighbours (Bates, 1985). This cultural bloc has come to be known as Nyungar, however, prior to settlement these people recognised themselves and their culture as *Bibbulmun* (Bates, 1985). The Bibbulmun people occupied all of the land to the west of a line drawn roughly from Jurien Bay on the west coast to Esperance on the south coast (Bates, 1985). Within the Bibbulmun, there were around 13 tribes that were distinguished by linguistic differences. The Bibbulmun people who occupied the coastal areas from Bunbury to Augusta called themselves, and were called by their inland neighbours, *Waddarndi Bibbulmun* (Bates, 1985).

The Wardandi Bibbulmun (current spelling) migrated seasonally from the coastal plain to Nannup, Augusta and areas between, to exploit various food resources as they became abundant each year. Many of the tracks used by the Bibbulmun people were used by the early settlers to explore the land, and eventually to create roads. Many of these early roads still follow similar alignments, and often link areas of traditional importance, such as Busselton (known as *Yoonberup*), Augusta (*Talanup*) and Dunsborough (*Quedjinup*) (Collard, 1994). Quedjinup and the Yallingup Caves (*Ngilgi* Cave) were important places to the Wardandi Nyungars, providing good hunting and food gathering areas.

On May 31st, 1801, the French corvettes *Le Geographe* and *Le Naturaliste* (Baudin's Expedition) anchored off Dunsborough and observed smoke from Aboriginal fires. When a party went ashore at Wonnerup four days later, they found well used Nyungar walking tracks and established camp grounds where fires were freshly made (Baudin, cited in Collard, 1994). Descendants of the local Wardandi Aboriginals claim that the coastal walking path that links Dunsborough and Eagle Bay in the Meelup Regional Park is a traditional Aboriginal walk pad (Vilma Webb, Wardandi Elder, pers. comm.). As a result, it is possible that the traditional Wardandi Nyungars used the Dugalup Brook and surrounding Reserve.

3 A COMMUNITY VISION

3.1 Community consultations

A community meeting was held on the morning of Saturday, October 8th, 2005. Notices of the meeting were printed in the Busselton Shire community pages of the Busselton – Margaret River Times on Thursday, October 6th, 2005, and the Busselton – Dunsborough Herald on Tuesday, October 4th, 2005. Some DCALC members were also advised by telephone of the meeting. The community meeting was held at the picnic table at the Naturaliste Terrace end of the reserve and a walk and talk to discuss particular areas and issues followed.

A second community meeting was held on Saturday, December 17th, 2005, to review the draft concept plan. A notice advertising the meeting was published in the Busselton Shire community pages of the Busselton – Margaret River Times on Thursday, December 22nd, 2005, after the meeting, however the notice included contact details for the consultants and interested community members telephoned the consultant in the week following to provide additional suggestions. The consultants also attempted to contact all community members who attended the initial meeting by telephone to invite them to attend the second meeting.

All commercial stakeholders whose properties adjoin the study area were invited by letter to contact the consultants directly to comment on the proposed community vision and concept plan for the Dugalup Brook. Stakeholders were also advised of the planned community meeting. The owners of six of the adjoining commercial lots were also approached directly and asked to comment on their vision for the reserve.

Issues and concerns raised at the community meetings and stakeholder consultations have been addressed in the Key Management Actions section of this report (section 4)**.**

3.2 A community vision for the Dugalup Brook and Reserve 42673

The following is a guiding vision for the reserve, which was developed through consultation with stakeholders and the wider community, and with reference to relevant planning documents (section 1.3):

> *Future management of the reserve should enhance the natural features of the environment and their use by visitors to the town centre and the wider community. Visions for the future reserve are:*
>
> *- a meandering path that takes advantage of the more picturesque elements of the reserve and links to the Geographe Bay foreshore, the town centre and the surrounding residential areas;*
> *- enhanced native vegetation and a healthy, stable streamline;*
> *- some open areas of parkland clearing and areas of lawn;*
> *- areas of amenities including picnic tables and benches for quiet contemplation or to eat lunch at; and*

- *a children's playground.*

The reserve should become an asset to the town centre and future developments should be encouraged to utilize the reserve in their planning and design.

4 KEY MANAGEMENT ACTIONS

The following sections of the concept plan recommend key management actions which are required to fulfil the community's vision for the reserve (section 3.2), and includes measures to address issues and concerns raised by the community and stakeholders during the consultation process for this plan (section 3.1). Two figures have been prepared which show the proposed improvements to the reserve. Figure 2 identifies the areas proposed for revegetation, parkland clearing and lawns and shows the areas where revegetation commenced in 2002. Figure 3 shows the location of proposed amenities including the pathway, bridges, boardwalks, tables and benches, and the playground; the location of stream stabilisation measures including proposed pools and riffles; and the location of areas which are suitable to create additional off-stream stormwater detention wetlands. Detailed descriptions of each of the recommended improvements are given in the sections that follow.

4.1 Vesting and classification

Currently, reserve 42673 is vested with the Shire of Busselton as a 'C' class Reserve for the purpose of 'Public Recreation'. The level of protection afforded to the reserve by its current 'C' classification is probably inadequate, given the emphasis placed on preserving important environmental landscape elements in the two planning documents which are relevant to this area (see section 1.3). Under the Land Act (1933), only Ministerial approval is necessary to alter the vesting and purpose of 'C' Class land. Reclassifying the reserve to 'A' Class will afford the reserve greater protection as the approval of both houses of Parliament will be required to make further changes to either the vesting or purpose.

- *Action 1. Investigate reclassifying the status of the Reserve to 'A' class to provide the Reserve with greater protection.*

4.2 Revegetation areas

A key objective of this concept plan is to restore the ecological values (e.g. fringing vegetation, native fauna) and functions (e.g. water flow, nutrient stripping, flood control) of Dugalup Brook. To achieve this objective, all areas of the reserve which are not required for social function purposes will be replanted with appropriate, locally occurring native plant species. Figure 2 shows the location of areas proposed for revegetation.

Western ringtail possum dreys were recorded within the reserve during the condition mapping, and the peppermint woodland vegetation is suitable habitat for the species. The western ringtail possum is known to occur in greater densities in areas where dense native understorey is present (Jones et al., 1994a,b). Native species which that are frequently used by western

ringtail possums should be replanted in all areas of the reserve that are not subject to inundation (all areas excepting the brook banks and shoulders, seasonal wetland areas and the detention basins). These species, which form a vegetation association that is common on the southern Swan Coastal Plain, are:

SPECIES LIST 1

Peppermint Tree	*Agonis flexuosa*	(tree)
Candle Banksia	*Banksia attenuata*	(tree)
Swishbush	*Viminaria juncea*	(tall shrub)
Basket Bush	*Spyridium globulosum*	(shrub)
Kudjong	*Acacia saligna*	(shrub)
Shark-tooth Wattle	*Acacia littorea*	(shrub)
Spiked Beard-heath	*Leucopogon australis*	(shrub)
Cutleaf Hibbertia	*Hibbertia cuneiformis*	(small shrub)
Australian Bluebells	*Billardiera heterophylla*	(small shrub)
Native Wisteria	*Hardenbergia comptoniana*	(vine)
Coral Vine	*Kennedia coccinea*	(vine)
Coastal Sword Sedge	*Lepidosperma gladiatum*	(sedge)
Spreading Sword Sedge	*Lepidosperma effusum*	(sedge)
Kangaroo Paws	*Anigozanthos flavidus*	(herb)

The following species should be used to replant the riparian zone and areas subject to inundation, including the brook banks, the seasonal wetland areas and the detention basins:

SPECIES LIST 2

Peppermint Tree	*Agonis flexuosa*	(tree)
Blackbutt	*Eucalyptus patens*	(tree)
Flooded Gum	*Eucalyptus rudis*	(tree)
Stout Paperbark	*Melaleuca rhaphiophylla*	(tree)
Swamp Peppermint	*Taxandria linearifolia*	(shrub)
Astartea	*Astartea fascicularis*	(shrub)
Wonnich	*Callistachys lanceolata*	(shrub)
Soap Bush	*Trymalium floribundum*	(shrub)
Swamp Tea-tree	*Pericalymma ellipticum*	(shrub)
Native Wisteria	*Hardenbergia comptoniana*	(vine)
Jointed Twig-rush	*Baumea articulata*	(rush)
Blue Twig-rush	*Baumea juncea*	(rush)
River Twig-rush	*Baumea rubiginosa*	(rush)
Shore Rush	*Juncus kraussii*	(rush)
Pale Rush	*Juncus pallidus*	(rush)
Spreading Sword Sedge	*Lepidosperma effusum*	(sedge)
Four-sided Sword Sedge	*Lepidosperma tetraquetrum*	(sedge)

The overall density of plants used in the revegetation areas will be governed by the available budget, however the ratio of plants used should be 1:20 trees to understory plants in the dry areas (species list 1), and 1:10:50 trees to shrubs to rushes and sedges in the riparian zone (species list 2). To assist in nutrient and pollutant stripping from stormwater detention basins, or seasonal

wetlands created to function as such (see section 4.7), should be planted at a density of at least three sedges per square metre using the sedge species from species list 2.

The area of brook immediately upstream of Naturaliste Terrace was replanted in 2002 and low sedges (*Juncus kraussii, Baumea juncea* and *Ficinia nodosa*) were planted for a distance of about 2 m from the bank. The adjacent landholder (Lot 8 Naturaliste Terrace) has maintained a lawn next to the brook for many years, and continued mowing has seen the area of replanted sedges slowly reduced while the lawn area increases (figure 1). This area should be replanted with native sedges from species list 2 to a distance of 2 m from the bank.

Three species of sword sedge have been recommended for use within the seserve as they are ecologically important species, however they can be difficult to source from commercial nurseries and are often unavailable. Despite this, efforts should be made to obtain them, either from commercial or community nurseries (the Geographe Community Landcare Nursery or the Leschenault Community Nursery), or from development sites where they are being removed.

DCALC has previously collected blackbutt seed from within the reserve, and a locally occurring subspecies of flooded gum from a nearby coastal reserve (Dandatup Brook mouth). The Geographe Community Landcare Nursery has these seeds and can propagate them to order. Where possible, all other plant species to be used within the reserve should be local provenance or as close to local provenance as possible. The GCLN can supply local provenance stock for many of these species.

DCALC have requested that a shady area be set aside to trial revegetation of the native maidenhair fern (*Adiantum aethiopicum*). This area is shown on figure 3.

- *Action 2. All areas of the reserve that are not required for open spaces should be revegetated with appropriate, locally occurring native plant species. These areas are marked on figure 2.*
- *Action 3. All revegetation areas that are not subject to inundation should be replanted using the species in species list 1, with a ratio of 1:20 trees to understorey plants.*
- *Action 4. All of the remaining revegetation areas including the brook banks, seasonal wetland areas and detention basins should be replanted using the species in species list 2, with a ration of 1:10:50 trees to shrubs to rushes and sedges.*
- *Action 5. Detention basins or seasonal wetlands created to function as such should be replanted at a density of at least three sedges per square metre using the sedges in species list 2.*
- *Action 6. Part of the lawn area immediately upstream of Naturaliste Terrace should be replanted with native sedges from species list 2 to a distance of 2 m from the bank.*

- *Action 7. Efforts should be made to obtain the three species of sword sedge recommended for use within the reserve, either from commercial or community nurseries (The Geographe Community Landcare Nursery or the Leschenault Community Nursery), or from development sites where they are being removed.*
- *Action 8. Where possible, local provenance seed stock should be used for all revegetation within the reserve.*
- *Action 9. Local provenance blackbutt and flooded gum seeds held by the Geographe Community Landcare Nursery should be used within the reserve if possible.*
- *Action 10. DCALC should trial revegetation of the native maidenhair fern in a shady area near the proposed boardwalk (shown on figure 3).*

4.3 Open spaces

This concept plan recommends the establishment of both lawn areas and parkland cleared areas (figure 2). Lawn area have been sited where there are existing maintained lawns (immediately upstream of Naturaliste Terrace), or where there are thick infestations of kikuyu grass that could easily be turned into lawns.

Areas to be maintained as parkland cleared should have the weed understorey slashed in spring and autumn, prior to seed set, to reduce the spread of weed seed into adjacent areas of revegetation and to reduce fire risks. Where kikuyu is present in the parkland cleared areas it should be left to form a rough lawn.

Within areas proposed for open space, slashing and mowing will prevent the natural regeneration of tree species, which are important in providing the environmental character of both the reserve and the town centre. Therefore successive plantings of trees, especially peppermint and blackbutt trees, will be necessary to maintain a continuous canopy cover, and habitat and food for native fauna including western ringtail possums.

- *Action 11. Lawn and parkland cleared areas should be established in the areas shown on figure 2.*
- *Action 12. Parkland cleared areas should have the understorey slashed during spring and autumn each year.*
- *Action 13. Areas set aside for open space should have successive plantings of peppermint and blackbutt trees to ensure a continuation of the tree canopy into the future.*

4.4 Weed control

The reserve has two major weed infestations, arum lily and kikuyu grass, and another seven problem weeds, bridal creeper, watsonia, freesia, Tangier pea, nasturtiums, budding club rush and fleabane, that require control within the areas to be revegetated. Ideally, weed control should occur for a minimum of two seasons prior to planting.

arum lily should be carefully hand sprayed with chlorsulfuron 1g/10L water plus 25 mL Agral® wetting agent during spring (September or October), before

the flowers begin to wilt. Arum lily will require spraying for two to three successive years to eradicate it from the reserve.

kikuyu grass infestations should be sprayed with 1% glyphosate (Roundup Biactive® if spraying in the vicinity of water), during the growing season (spring, summer and autumn). For thick infestations, it will be necessary to spray the infestations two or three times over a single growing season. For best results, the grass should be actively growing when sprayed. Thick infestations can be effectively removed by burning the thatch of dried grass after spraying (either in spring or autumn, during the burning-off season) and then respraying the regrowth several weeks later.

There is only a small area of bridal creeper within the reserve. This can be controlled with the biological control agent bridal creeper leaf hopper, or by wiping the foliage of the plant with 1 part glyphosate (Roundup Biactive® if using in the vicinity of water) to 2 parts water.

Watsonia are difficult to hand weed because it is extremely difficult to remove the numerous corms. Watsonia should be controlled by wiping the foliage of the plant with 1 part glyphosate (Roundup Biactive® if using in the vicinity of water) to 2 parts water, applied when the flowering spikes begin to emerge, which is the stage of corm exhaustion.

Freesias, like watsonia, are difficult to hand weed and are not controlled well by glyphosate. Freesia infestations should be carefully spot sprayed using metsulfuron methyl 0.5g/10L water plus Pulse® 25 mL. This will need to be repeated for two to three years to remove the infestations.

Nasturtiums should be sprayed with 2% glyphosate (Roundup Biactive® if spraying in the vicinity of water), during spring and autumn. Removal of the adult plants will often lead to a mass germination of seedlings and subsequent control will be necessary.

Tangier pea can be controlled by scraping and painting the stems with 100% glyphosate (Roundup Biactive® if using in the vicinity of water).

All other weeds in the areas to be revegetated can be controlled by careful hand weeding or spot spraying with 1% glyphosate (Roundup Biactive® if using in the vicinity of water).

Areas to be revegetated will need twice yearly (spring and autumn) weed control, either hand weeding or spot spraying with 1% glyphosate (Roundup Biactive® in the vicinity of water) for at least two years following planting. Beyond this time, because of the small area of the Reserve and the close proximity of weed species, further weeds may become established in the revegetation areas. Occasional inspections of these areas should be undertaken and if necessary, additional hand weeding and spot spraying should occur.

Some weed control is needed in the areas replanted in 2002. Hand weeding and spot spraying with 1% glyphosate (Roundup Biactive® in the vicinity of water) should be undertaken during spring and autumn each year until the vegetation fully establishes and begins to naturally regenerate.

The areas that are to be maintained as lawn should have a vegetation-free 'dead zone' surrounding them to prevent the lawn from invading the native vegetation. This 'dead zone' should be created and maintained by hand spraying the perimeter of the lawn with 1% glyphosate (Roundup Biactive® in the vicinity of water) three times each growing season (i.e. spring, summer and autumn). Where possible, the path should be used to separate the areas of open space and the areas that are to be maintained as native vegetation.

- *Action 14. The reserve has two major weed infestations, arum lily and kikuyu grass, and another seven problem weeds, bridal creeper, watsonia, freesia, Tangier pea, nasturtiums, budding club rush and fleabane, that require control within the areas to be revegetated.*
- *Action 15. Weeds should be controlled in areas to be replanted for at least two seasons prior to planting.*
- *Action 16. Only Roundup Biactive® should be used in the vicinity of water.*
- *Action 17. Areas to be revegetated will need twice yearly (spring and autumn) weed control, either hand weeding or spot spraying with 1% glyphosate for at least two years following planting. Beyond this time, occasional inspections of the revegetated areas should be undertaken and if necessary, additional hand weeding and spot spraying should occur.*
- *Action 18. Some weed control is needed in the areas replanted in 2002. Hand weeding and spot spraying with 1% glyphosate should be undertaken during spring and autumn each year until the vegetation fully establishes and begins to naturally regenerate.*
- *Action 19. Lawn areas should have a vegetation-free 'dead zone' maintained around them by hand spraying the perimeter of the lawn with 1% glyphosate three times each growing season (i.e. spring, summer and autumn) to prevent the lawn from invading the native vegetation. Where possible, the path should be used as a weed barrier to separate open spaces from areas to be revegetated.*

4.5 Special landmark trees

Three large marri trees and four large blackbutt trees, two of which lie on Lot 106 and one of which lies on Lot 104, were identified by the community as landmark trees which should be preserved as defining parts of the townscape (figure 1). Protection of indigenous vegetation and its incorporation into development is policy 1 of the Dunsborough Structure Plan (DPUD, 1990:49), while preservation of mature trees was listed as guideline 6 for the creekline area in the Dunsborough Townscape Plan (Shire of Busselton, 2002). As there are only several individual blackbutt trees remaining within the study area and the two downstream reserves (Melaleuca Park and Redgum Place),

it is especially important that these landmark trees are preserved. Therefore, the Shire of Busselton should use the statutory planning process to ensure that the blackbutt trees on both private lots (Lots 104 and 106) are retained within any new development if possible.

- *Action 20. The Shire of Busselton use the statutory planning process to ensure that the blackbutt trees on both private lots (Lots 104 and 106) are retained within any new development if possible.*

4.6 Stream stabilisation and erosion control

Within the reserve, there are four areas along the brook that are actively eroding and require stream stabilisation works, and a section of the brook which flows outside of the reserve boundaries, into Lot 25 Clark Street, is also unstable and eroding (figure 1).

It is beyond the scope of this plan to recommend remedial actions to rectify the eroding embankment within Lot 25 Clark Street however, it is possible to undertake remedial actions within the reserve that may ameliorate erosion of the embankment. Figure four shows the proposed earthworks and design details to address both the erosion in Lot 25, and the erosion occurring along the boundary of Lot 106 Cyrillean Way. To relieve the pressure of damaging high water flows on the embankment in Lot 25, a channel should be cut on the inside of the bend to create an island. This island should be replanted using the species in species list 2 of section 4.2, and selecting several tall shrubs such as wonnich or swamp peppermint to screen the view of the embankment on Lot 25 from pathway users.

To address the undercutting occurring on the boundary of Lot 106 Cyrillean Way and retain the significant stand of the native sedge four-sided sword sedge, an on-stream pool should be excavated in the centre of the reserve (figure 4). The excavated spoil should be used to fill the old eroded channel which should then be replanted with native species from species list 2 of section 4.2 of this plan. To stabilise the stream channel and pool, riffle structures will need to be installed at the head and tail of the pool (figure four), and rock hardening will be needed both upstream and downstream of the bridge as well. A stream survey will be required to appropriately engineer the riffle structures which should be designed to handle predicted 1/100 year storm flows plus predicted peak stormwater inputs.

All of the remaining areas of active erosion can be arrested with some rock hardening of the toe of the bank combined with the use of log deflectors (figure 3). These areas can then be stabilised by replanting with native riparian vegetation from species list 2 of section 4.2 of this plan.

Rock hardening and small riffles may be needed to stabilise the stream both upstream and downstream of bridges.

- *Action 21. To relieve the pressure of damaging high water flows on the embankment in Lot 25 Clark Street, a channel should be cut*

on the inside of the bend to create an island which should be replanted with tall shrubs and sedges from species list 2 (section 4.2) to screen the embankment from pathway users.

- *Action 22. To address the undercutting occurring on the boundary of Lot 106 Cyrillean Way and retain the significant stand of the native sedge four-sided sword sedge, an on-stream pool should be excavated in the centre of the reserve and the old eroded channel should be filled and replanted with native species from species list 2 (section 4.2).*
- *Action 23. To stabilise the stream channel and pool, riffle structures will need to be installed at the head and tail of the pool and rock hardening will be needed both upstream and downstream of the bridge.*
- *A stream survey will be required to appropriately engineer the riffle structures which should be designed to handle predicted 1/100 year storm flows plus predicted peak stormwater inputs.*
- *Action 24. All remaining areas of active erosion can be arrested with some rock hardening of the toe of the bank combined with the use of log deflectors and replanting with native riparian vegetation from species list 2 (section 4.2).*
- *Action 25. Rock hardening and small riffles may be needed to stabilise the stream both upstream and downstream of bridges.*

4.7 Stormwater management

The Dugalup Brook carries a substantial volume of urban stormwater at times and, although the exact volume is unknown, the ability of the brook to remove nutrients and pollutants from the water before it enters Geographe Bay can be improved in a number of ways. Firstly, the function of riparian vegetation in nutrient stripping is well known, so restoration of the brook's native riparian vegetation has been recommended earlier in this plan (section 4.2). Secondly, the ability of a waterway to effectively remove nutrients and other pollutants from stormwater is a function of retention time, or the time span in which the water flows through the system. Retention time can be increased by providing pools and shallow inundated areas where the water flow is reduced, allowing settling of sediment, sand, and silt, whilst also allowing the native vegetation and associated bacteria to strip nutrients from the water. This is the same principle by which detention basins work.

Three areas along the brook have been identified as suitable for the creation of seasonally inundated wetlands or sumps which can increase the retention time of water within the brook (figure 3). These areas are suitable as places that could be slightly modified to increase the biological 'effectiveness' of the brook rather than areas that can be dug out and turned into deep stormwater detention basins. By slightly reducing the height of the stream bank at these locations, high winter flows could be allowed to flood low lying depressions in the ground that are probably parts of an old stream channel. These areas should be revegetated with appropriate riparian species from species list 2 in section 4.2 of this plan. Creating the seasonally flooded wetlands would also increase the overall stream capacity during periods of high flow.

During the community consultation process for this plan, concerns were raised regarding the quality of the water in the brook, particularly leaching of pollutants and nutrients from septic tanks in Clark Street. This needs to be rectified by connecting Clark Street to the reticulated sewer system. It is a mandatory requirement that where sewer is available to a property that any new development is connected.

At least three pipes drain stormwater from properties in Clark Street directly into the brook. Small, shallow stormwater detention basins should be created at each outlet and revegetated with sedges from species list 2 in section 4.2 of the plan to assist with nutrient and pollutant removal before the water enters the brook. The owners and tenants of the properties which are serviced by the drains should be made aware of the fact that the drains flow directly into the brook to ensure that no inappropriate wastes are flushed down them.

Stormwater entering the brook from Cape Naturaliste Road could receive additional treatment by passing it through a sedge filter bed rather than allowing it to flow via a pitched stone channel directly into the brook. The stone channels draining Cape Naturaliste Road should be retrofitted to allow planting with native sedges from species list 2 in section 4.2. Jute matting should be used to line the channels and plants should be planted at a density sufficient to ensure that channel incision cannot occur.

- *Action 26. Seasonally inundated wetland areas should be created in three areas along the brook by slightly reducing the height of the stream bank at these locations to allow high winter flows to flood naturally low lying depressions (figure 3).*
- *Action 27. Commercial properties in Clark Street should be connected to the reticulated sewer system.*
- *Action 28. Small, shallow vegetated stormwater detention basins should be created at each piped stormwater outlet that flows directly into the brook.*
- *Action 29. The owners and tenants of properties with stormwater drains that discharge directly into the brook must ensure that no inappropriate wastes are flushed down them.*
- *Action 30. The stone channels that drain stormwater from Cape Naturaliste Road into the brook should be retrofitted to allow planting with native sedges from Species List 2 in section 4.2. Jute matting should be used to line the channels and plants should be planted at a density sufficient to ensure that channel incision cannot occur.*

4.8 Fire management

Fire breaks and access through the reserve for fire fighting is impractical due to the nature of the terrain. The reserve is narrow and in places, the Dugalup Brook winds close to the reserve boundaries, creating ‘pinch points’. Allowing access for fire trucks would require the path to be constructed to an appropriate width and bridges crossing the brook would also need to be built stronger than would otherwise be required for a dual use path. The Shire of Busselton considers that there is a sufficient number of access points, from

the rear of properties located in both Clarke St and Cyrillean Way, to fight a fire in the reserve if required (Will Oldfield, Shire of Busselton, pers. comm.)..Water is available from local street hydrants.

Along Clark Street, there are a number of properties which have buildings situated directly on the reserve boundary. Firebreaks will not be installed within the reserve, if landowners have concerns that a fire in the reserve may damage their property, they should seek consideration by the Shire to allow them to maintain an area of slashed or reduced vegetation extending no more than three meters from their property boundary.

- *Action 31. The Shire of Busselton should liaise with the adjacent landholders and the Dunsborough Fire Brigade to develop a fire management strategy for the reserve.*
- *Action 32. Adjacent landholders who are concerned about fire damaging their property may seek the Shire's consideration for approval to maintian an area of slashed or reduced vegetation extending no more than three metres from their property boundary.*

4.9 Pathway, boardwalks and bridges

A possible location for the proposed path was initially decided by examining the aerial photograph of the reserve and then modified by walking sections of the path where possible. Through the community consultation process, it was decided that the path should wind through the reserve rather than follow the reserve boundaries or road verges (figure 3). This is consistent with the Dunsborough Structure Plan which suggests that the dual use path system should increase the segregation between motorists and pedestrians (DPUD, 1990:48).

Rather than have the proposed path follow the existing path alongside Cyrillean Way, it was agreed that the path should cross the brook to allow users to view the existing pool (figure 3). Community members were concerned that the existing path alongside Cyrillean Way (at the Naturaliste Terrace end) was too narrow to be safe as a dual use path because of the low limestone wall along the reserve side of the path which forces overtaking cyclists and pedestrians onto the road. This should be remedied along the section proposed for the new pathway by widening the existing path.

At least two sections of the path will need to be boardwalks due to the low lying ground which it must cross over (figure three). The reserve boundaries are narrowest at the corner of Lot 8 Naturaliste Terrace and to negotiate the corner of the block it is necessary to build a deck or boardwalk. The boardwalk should be made slightly wider at this point to serve as a viewing deck for the pool. Another small viewing deck should be installed at the southern end of the second boardwalk to allow users to enjoy a view of the proposed new pond, riffles and island (figure four). A new, recycled plastic decking material was suggested as an alternative to timber for use in the bridges and boardwalks.

The path should be constructed to a high quality and surfaced. As the existing paths in the reserves downstream are a bitumen surface it was suggested the path should also be bitumen to match. The path should have a wooden edge or similar to assist in preventing invasion by kikuyu grass. The path should be wide enough to serve as a dual use path for cyclists and pedestrians and also suitable for prams and wheelchairs. The path should be lit at night to provide safety to pedestrians and cyclists using the path at night. Bollard lighting was suggested as an inconspicuous way of lighting the path, which is consistent with guideline 11 of the Dunsborough Townscape Plan (Shire of Busselton, 2002).

The chosen pathway requires the installation of five bridges across the brook (figure 3). Bridges should be light weight constructions that do not rely on piers to support them but that are capable of spanning the brook and resting on buttresses located near or above the shoulder of the bank. During the community consultations, there was strong opposition to the use of box culverts as a method of crossing the brook. Some of the bridges may require rock hardening of the river channel immediately upstream and downstream of the bridge to help to protect the bridges. The actual size and design of the rock hardening will need to be determined by surveying the river channel and the structure will need to vary according to the location of the bridge on the brook.

- *Action 33. A dual use path should be installed within the reserve following the route shown in figure three.*
- *Action 34. The section of the existing path alongside Cyrillean Way that is proposed for inclusion in the new pathway should be widened to improve public safety (figure 3).*
- *Action 35. Two boardwalks should be installed along the pathway to cross low lying areas (figure 3).*
- *Action 36. A viewing deck should be installed alongside Lot 8 Naturaliste Terrace to allow users to view the existing pool (figure 3).*
- *Action 37. A viewing deck should be installed at the southern end of the second boardwalk to allow users to view the proposed new pond, riffles and island (figures 3 & 4).*
- *Action 38. The path should be lit at night using bollard lighting.*
- *Action 39. Five bridges should be constructed across the brook to allow the path to follow the chosen route (figure 3). Box culverts should not be used to construct the bridges.*

4.10 Picnic tables and BBQs

Four sites including the area proposed as a playground were identified as suitable locations for timber picnic tables and benches (figure 3). A table and bench was suggested for the area near Naturaliste Terrace that was re-vegetated in 2002 (figure 3). This table should be placed on a mulched surface to assist in keeping the area weed free. The other tables are to be located in areas proposed for lawn. A BBQ should be installed adjacent to the picnic table located at the playground.

- *Action 40. Four picnic tables and benches and one BBQ should be installed within the reserve in the locations shown on figure 3.*

4.11 Playground

An area near the corner of Cyrillean Way was identified as a good location for a childrens playground (figure 3). The area proposed for a playground is currently covered by a thick infestation of kikuyu grass which should be turned into a lawn by slashing and leveling with sand. Because of the proximity of the proposed playground to both Cyrillean Way and the brook, the playground should be fenced with a safety rail similar to that installed at the Fish Rock playground alongside the boat ramp in Old Dunsborough.

- *Action 41. A childrens playground should be installed, with safety rail, in the area shown on figure 3.*

4.12 Rubbish collection

Rubbish such as plastic bags and drink bottles are blown, thrown and washed into the brook and there is a need to collect this rubbish on a regular basis. A pile of rubbish including an old rainwater tank near Lot 106 also needs to be removed from the reserve. Rubbish bins will also need to be installed in the reserve to prevent littering by users of the reserve.

- *Action 42. Existing rubbish within the reserve needs to be removed and regular rubbish collection should be undertaken.*
- *Action 43.Investigate placement of rubbish bins within the reserve.*

4.13 Interpretive signage

Small, unobtrusive interpretive signs should be installed along the pathway identifying flora and animal habitat, and describing the ecological importance of wetlands and creeks for removing pollutants and nutrients from the water before it discharges to Geographe Bay. This is listed as guideline 15 in the Dunsborough Townscape Plan (Shire of Busselton, 2002).

- *Action 44. Small, unobtrusive interpretive signs describing the ecology of the brook and its importance to Geographe Bay should be installed along the pathway.*

4.14 Incorporating the reserve into future developments

During the stakeholder consultations for this plan, responses regarding the future use of the premises adjacent to the reserve were mixed. Some of the stakeholders had no immediate plans to develop their properties and wanted to continue with their current activities and uses for the foreseeable future, whereas others were in the process of developing their land. Most of the stakeholders were supportive of the idea that improvement of the reserve could be an asset to their future developments and the town. Both of the relevant planning documents emphasise the importance of incorporating the environmental elements of the town into developments (section 1.3, DPUD, 1990 and Shire of Busselton, 2002). Therefore, the Shire of Busselton should use the statutory planning process to ensure that future developments along

both Clark Street and Cyrillean Way are compatible with and utilise the visual quality of the reserve.

- *Action 45. The Shire of Busselton use statutory planning process to ensure that future developments along Cyrillean Way and Clark Street are compatible with and utilise the visual quality of the Reserve.*

4.15 Visual impact of the Dunsborough Centrepoint shopping centre

Both the Dunsborough Structure Plan (DPUD, 1990) and the Dunsborough Townscape Plan (2002) emphasise the importance of maintaining the environmental character of Dunsborough. Specifically, Policy 4 of the Dunsborough Structure Plan states that "*Development which results in the protection of vegetation, minimises impacts on views while maximising the opportunity of occupants to enjoy the environment should be encouraged*" (DPUD, 1990:49). During the community consultation process for this plan, the Dunsborough Centrepoint shopping centre was referred to as an eyesore which imposes itself on the view from the reserve, and an inappropriate scale development for the town. It was suggested that this could be somewhat remedied by landscaping the walls facing the reserve with climbing plants and trees and/or painting to reduce its visual impact. The Shire of Busselton should liase with the owners of the shopping centre to reach a suitable outcome.

- *Action 46. The Shire of Busselton should encourage the owners of the Dunsborough Centrepoint shopping centre to landscape the walls that face the reserve with climbing plants and trees, and/or painting to reduce its visual impact on the reserve.*

4.16 Aboriginal heritage

The Department of Indigenous Affairs Sites Registry lists two Aboriginal heritage sites whose buffered extents lie within the reserve (Site ID 21144 and Site ID 20018). Site ID 21144 is a closed site, which means that it is necessary to consult the custodian of the site to determine if any works within the reserve will impact on the site. Site ID 20018 is an unrestricted site so information on the exact location can be obtained directly from the Department of Indigenous Affairs. As a formal Aboriginal heritage survey has not been undertaken within the reserve to date, Aboriginal heritage sites may exist that have not yet been recorded or entered onto the Sites Register. The *Aboriginal Heritage Act (1972)* protects all Aboriginal heritage sites in Western Australia, whether the department knows of them or not. Where any ground disturbing works or stream modification works, as recommended in this concept plan, may potentially impact on Aboriginal heritage sites, consultations with appropriate Aboriginal community representatives and archaeological surveys are necessary to fulfill the requirements of the *Aboriginal Heritage Act (1972)*.

- *Action 47. Where any ground disturbing works or stream modification works may potentially impact on Aboriginal heritage sites, consultations with appropriate Aboriginal community*

representatives and archaeological surveys are necessary to fulfill the requirements of the Aboriginal Heritage Act (1972).

- *Action 48 - The Aboriginal significance of the area be acknowledged by the installation of interpretive signage which would explain the areas past Aboriginal history, associations and significance to the broader community. As a part of this interpretation, Aboriginal art could also become a feature of the development.*

5 References

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Figure 1


Kunzea
Clark
St
Lepidosperma Tetra-Quetrum — A. LINEARFOLIA
AREAS OF EROSION THAT NEED STABILIZATION WORKS.
ARUM LILY - NASTURTIUM
PIPE/DRAIN
W. RINGTAIL POSSUM DREY
Freesia
Dense Kikuyu
AREA REPLANTED 2002
WATSONIA - KIKUYU.. ARUM
DENSE ARUM LILY
AREA OF EROSION SOME STABILIZATION NEEDED
PRICKLEY MOSES.
LARGE MARRI TREES
W. RINGTAL POSSUM DREYS.
PIPE/DRAIN
PIPE/DRAIN
ARUM LILY - DENSE KIKUYU NASTURTIUM
DENSE KIKUYU, ARUM LILY - BRIDAL CREEPER WATSONIA
AREA REPLANTED 2002
I. Prolifera
LARGE BLACKBUTTS
KIKUYU
LOG CROSSING
A. Linearfolia
E. Rudus
Sword sedge
ARUM LILY
ARUM LILY - NASTURTIUM
KIKUYU - LUPIN - BRIDAL CREEPER
DENSE ARUM.
DENSE KIKUYU - SOME ARUM LILY
RUBBISH/OLD WATER TANK
B. JUNCEA
J. PALLIDUS.
XANTHORRA / BLACK BOYS
Dense KIKUYU - FRESIAS WATSONIA.
AREA OF EROSION - N. STABILIZATION
AREA OF EROSION NEEDING STABILIZATION
SIGNIFICANT TREES + STANDS OF NATIVE VEGETATION
AREAS RE-VEGETATED 2002
AREAS OF ACTIVE EROSION NEEDING STABILIZATION
WESTERN RINGTAIL POSSUM DREYS.

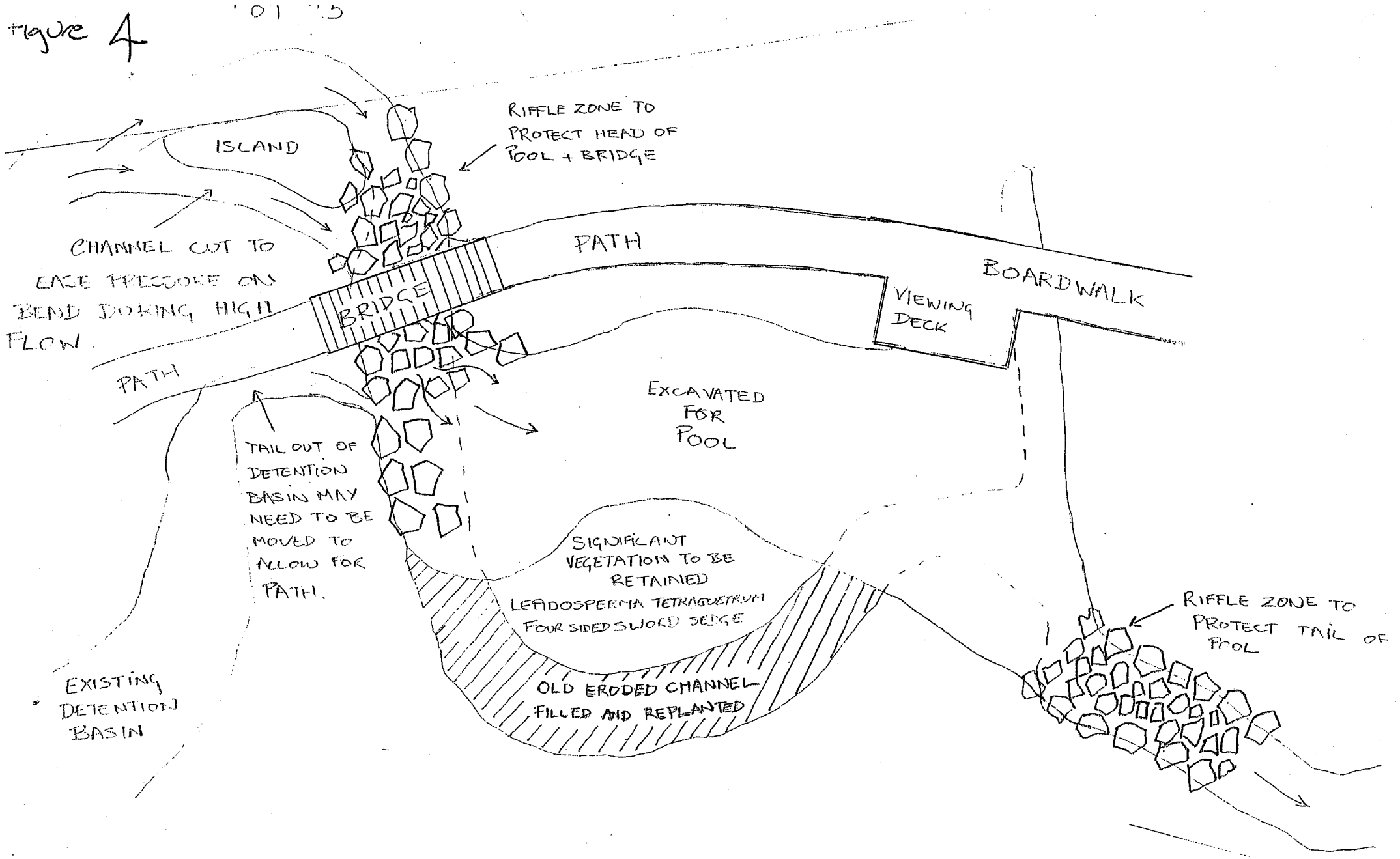
Figure 2


Kunzea
Clark
St
AREAS TO BE RE-VEGETATED OR MAINTAINED AS NATIVE VEG'
AREAS TO BE MAINTAINED AS LAWN
AREAS TO BE MAINTAINED AS PARKLAND CLEARED.
AREAS REPLANTED 2002 TO BE MAINTAINED AS NATIVE V.

Figure 3


Kunzea
Clark
AREA OF EROSION Requiring stabilization with rock hardening + log deflectors.
BRIDGE + RIFFLE TO PROTECT HEAD OF POOL
Boardwalk - trial area of maiden-hair fern. DCALC
WIDEN PATH WITH A VIEWING DECK TO NEGOTIATE TIGHT CORNER
BRIDGE
MAINTAINED AS LAWN INCREASE RIPARIAN VEGETATION (SEDGES) 2M FROM STREAM + PICNIC TABLE.
Bridge + pedestrian link to CLARK ST + KUNZEA WAY
Riffle to enhance EXISTING POOL + BANK STABILIZATION
Picnic table + bench - area of lawn.
BRIDGES.
Pool created to adress erosion on boundary of LOT 106
Picnic table + bench - area mulched.
WIDEN EXISTING PATH WITH A SMALL DECK INSTALL SAFETY? BARRIER
Riffle to protect tail of pool
Areas that could be made to fill over winter to create a seasonal wetland env'
AREA OF EROSION REQUIRING STABILISATION RE-BATTER BANK - ROCK HARDENING LOG DEFLECTORS.
Playground - LAWN Picnic Tables + benches. BBQ's
A SMALL AREA THAT COULD CREATE A SEASONAL WET-LAND ENVIRONMENT.
Planting effective screen to soften impact of D. centerpoint f'stream
sedge beds to filter road run off
PEDESTRIAN CROSSING
~~SAFETY SIGNS/FENCE~~

Figure 4



LOT 106

N.B. NOT DRAWN TO SCALE