

PART TWO 4. Land Management Agencies and Stakeholders

4.1 Roles and Responsibilities

Waterway corridors provide many environmental, recreational and social benefits to communities. As such, several stakeholders are involved in the management of waterway corridors, each with varying roles. The key public land managers of Melbourne's waterways and environs are Melbourne Water and Local Councils. Parks Victoria is responsible for the coordination of the metropolitan trail network and provision of regional open space, such as the new regional park near Caroline Springs.

The following organisational roles are indicative of local waterway management:

Organisation	Roles
Melbourne Water	Melbourne Water has three main functions in managing its waterways and drainage responsibilities. These are: <ol style="list-style-type: none"> Regional Drainage Management – Providing a safe, effective system for dealing with storm run-off, undertaking works to reduce the risks of flooding in priority areas and preventing inappropriate development in the flood-prone areas; River and Creek Management – Protecting, restoring and caring for the physical and environmental health of rivers, creeks and wetlands and regulating the amount of water available for diverters; and Water Quality Management – Working with government agencies, local councils, industry and the community to improve stormwater quality and protect rivers, creeks and bays.
Local Councils	Local Councils are: <ul style="list-style-type: none"> a significant land manager of open space and trails along creeks; responsible for stormwater management; the authority for local planning policy and permits, including native vegetation removal on private land.
Port Phillip and Westernport Catchment Management Authority (PPWCMA)	The PPWCMA is responsible for the overarching regional catchment strategy for the integrated management of catchment assets, including surface water such as creeks. This includes the Regional River Health Strategy.
EPA Victoria	EPA Victoria is responsible for protecting waterways from point sources of pollution.
Private landowners	Private land adjoining the creek corridor is held for commercial, agricultural and other uses. Some water extraction occurs in the upper reaches of the creek.
Friends groups, Waterwatch, Land Care.	Land Care, community and Friends groups undertake improvement works, monitor water quality and pursue environmental goals.
Parks Victoria	Parks Victoria provides services to the State for the management of Parks and Reserves, and is responsible for the co-ordination of the Metropolitan Trail Network (MTN) and planning for regional open spaces as proposed in the strategy for Melbourne's open space network – Linking People and Spaces.
Wurundjeri Tribe Land Compensation and Cultural Heritage Council Inc. Bunurong Land Council Aboriginal Corporation	This council has legislative responsibility for cultural heritage management and protection under the provisions of the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (permission required to disturb or destroy areas of significance to Aborigines).
Aboriginal Affairs Victoria	AAV hold information on known Aboriginal heritage places and it provides advice to land managers on indigenous heritage. Administers State and Commonwealth heritage legislation.
Heritage Victoria	Heritage Victoria is responsible applications which affect places of post-contact State heritage.
VicRoads	VicRoads has a role in regional trail planning and construction through the Principal Bicycle Network.
Department of Sustainability and Environment	This department: <ul style="list-style-type: none"> administers planning, catchment management, biodiversity, river health, Crown land.
The Commonwealth Department of Heritage and Environment	This department is responsible for administering the Environment Protection and Biodiversity Conservation Act 1999.

Figure 52: Lawrence Street Footbridge in Ardeer



4.2 Private Landowners

There are significant sections of Kororoit Creek corridor, which are held in private ownership. The land use of private properties within the creek corridor includes agricultural, industrial and other commercial activities. As a group, private landowners play an important creek management role. However, the capacity of this group to manage the creek corridor to desirable standards varies. It should be recognised that the values and priorities of this group will not be the same as public agencies responsible for the stewardship of public land. This matter is discussed in the issues section of this Strategy.

4.3 Community Groups

Several community and friends groups are active in relation to Kororoit Creek and its environs.

The Friends of the Lower Kororoit Creek is a well organised and active organisation, which focuses its efforts on improving the creek corridor to the south of the Princes Highway. The group has an ongoing revegetation program, and has also tackled infrastructure issues such as advocating the construction of the Barnes Road Bridge. The group has been effective in securing support and sponsorship from local business and industry, Hobsons Bay City Council and Melbourne Water.

The Friends of Kororoit Creek is a similarly well organised group, established in 1994 to make improvements to Buckingham Reserve in Sunshine. The group was re-formed in 1999 and now concentrates on improvements to the creek corridor in the suburbs of Deer Park, Ardeer, Cairnlea and Sunshine. Other roles include advocacy in relation to creek issues, and 'Water Watch' to monitor water quality.

The Friends of Altona Coastal Park are a small, vibrant group of volunteers who are working to restore Altona Coastal Park to its former glory. Ongoing revegetation and protection of the riparian, salt marsh and mangrove communities are the group's major goals. The group is also keen to encourage community appreciation of these valuable habitats.

The Toolern Vale Landcare group is a vibrant, active group which was formed in April 1989. The group is working to reduce the degradation caused by pest plants and animals and erosion and to restore indigenous vegetation. Toolern Vale Landcare is striving to develop an informed, productive and friendly community that is able to work effectively with other organisations to improve the local area.

Other community groups of note include the Friends of the Black Powder Mill, the Sunshine Historical Society and the Friends of Williamstown Wetlands.

4.4 Project Consultation and Methodology

Project Steering Committee

The consultant team regularly met with the Project Steering Committee over the course of the project to review and discuss issues arising from extensive analysis and consultation. The Kororoit Creek Regional Strategy was developed in partnership with the Project Steering Committee.

Preliminary Consultation

The consultant team undertook targeted, preliminary consultation to become better informed about local issues. An extensive series of one-on-one discussions with stakeholders and government bodies took place over April / May 2003. Groups and organisations that were consulted included:

- Parks Victoria
- Melbourne Water
- VicRoads
- Habitat Trust
- Hobsons Bay City Council
- Brimbank City Council
- The Shire of Melton
- Wyndham City Council
- The Department of Sustainability and Environment
- Kulin Nation
- The Friends of the Lower Kororoit Creek
- The Friends of Kororoit Creek
- The Friends of Altona Coastal Park
- VicUrban (Cairnlea)
- Delfin Lend Lease (Caroline Springs)
- Caroline Springs Residents Association
- The Sunshine Historical Society

Earlier reports and plans relating to Kororoit Creek were reviewed as part of background information gathering. Following the preliminary consultation, a series of drawings and reports were prepared to record and discuss issues relating to: recreation; the shared trail; waterway management; biodiversity; town planning controls and land ownership.

An extensive series of analysis drawings were prepared on issues and opportunities existing along the creek corridor. The analysis diagrams, which are contained in this draft Strategy, covered the following:

- the linear parkland and trail system
- landscape character;
- biodiversity;
- planning;
- Aboriginal and European Heritage; and
- waterway management.

First Stakeholder Workshop

The preliminary consultation culminated in a workshop in early June 2003, held at the Council Hall in Sunshine. At this workshop, each of the sub-consultants presented their findings on the existing 'State of Kororoit Creek', followed by informal, one-on-one and small group discussions. Attendees were invited to comment on a series of drawings, showing the findings of the consultant team's research. These drawings confirmed the various issues raised by stakeholders and identified a number of opportunities. The workshop was well received.

Following the stakeholder workshop, an information flyer was distributed through municipal service centres and libraries to raise awareness of the proposed Kororoit Creek Regional Strategy, as well as invite comment on issues.

Community Consultation – Draft Kororoit Creek Regional Strategy 2005–2030

Community consultation for the Draft Kororoit Creek Regional Strategy 2005–2030, was held during March 2006, comprising a meeting with community groups, which was held at the Habitat Trust in Altona, and an informal open house evening, which was held at the Albion Park Tennis Club, Selwyn Park, Ardeer. The consultation forums enabled members of the community to view the strategy and to meet the members of the Project Steering Group.

During the consultation period, copies of the draft strategy were available to read at the main offices of Hobsons Bay, Brimbank, Melton and Wyndham Councils, and on the Department of Sustainability and Environment web site.

The Project Steering Group analysed and considered the feedback provided in the submissions as valuable input to guide the completion of the strategy.

5. Planning and Policy Context

5.1 The Policy Context

Melbourne's waterways are highly valued natural assets but have been under significant environmental and development pressure for decades. An extensive policy framework already exists at State and local government levels to address the many issues encountered along waterways. However, the condition of waterway assets and community aspirations requires further strategies and more effective action.

The broader environmental issues of climate change and anticipated metropolitan growth require ongoing policy responses from the Victorian Government. Victoria's Environmental and Sustainability Framework 2005 and Our Water Our Future action plan 2004 are recent examples of significant policy reform. These policies support significant improvements to the health of Melbourne's waterways.

Policy development is critical to addressing issues of community concern. It provides legislative protection for environmental values, provides management frameworks, confirms government priorities, and provides a strategic basis on which action plans can be prepared.

The range of policies relevant to waterway corridors reflects the varied issues encountered in waterways: biodiversity; open space; stormwater and drainage; water quality; cultural heritage and development control. Policies relevant to waterways, and Kororoit Creek in particular, are detailed in this section. Policies range from international agreements to protect migratory birds, Commonwealth provisions to protect Indigenous cultural heritage, State policy to enhance open space and protect native vegetation, and various municipal policies.

Victorian Government policy relating to Victorian waterways is summarised below:



Figure 53: Parkland adjacent to Kororoit Creek next to Millbank Drive, Deer Park

5.2 Victorian Government Policy

Victoria's Environmental Sustainability Framework 2005

This framework sets directions, objectives and interim targets for the fundamental elements of Victoria's environment. A key target applying to waterways is the significant improvement of the health of Victoria's waterways by 2010. In relation to biodiversity and ecosystems, the Framework aims to increase the extent and quality of native vegetation, and also reduce the impact from pests and weeds.

'Securing our Water Future' Action Plan 2004

Securing our Water Future provides a comprehensive framework for managing Victoria's water resources.

The Action Plan commits to the Victorian River Health Strategy (VRHS) as the policy framework for managing the health of Victoria's rivers, wetlands, floodplains and estuaries. It recognises regional river health strategies as the mechanism for establishing regional priorities and programs.

The Action Plan identifies new statutory management arrangements for those parts of Port Phillip Bay and Westernport Catchment that do not have a waterway management authority. Melbourne Water has since become the waterway management and drainage authority for Kororoit Creek, and other waterway systems in the former 'gap' area. The new arrangements will remedy this situation.

Port Phillip and Western Port Regional Catchment Strategy 2004–2009

The Port Phillip and Westernport Catchment Management Authority has responsibility, under the Catchment and Land Protection Act 1994, to prepare the Regional Catchment Strategy (RCS). The RCS describes the catchment assets, with the main focus on management of land, water and biodiversity in the region. The RCS is intended to:

- focus, integrate, coordinate and monitor government and community effort on catchment management issues;
- provides goals and targets, based on consistent rationale, which are used for government funding programs;
- integrate policy and fulfil the purposes of several related Acts, including the Environment Protection Act 1970, Water Act 1989, Planning and Environment Act 1987, and Coastal Management Act 1995.

Victorian River Health Strategy

Under the Victorian River Health Strategy, individual strategies are being developed on a regional basis, with the Port Phillip and Westernport Regional River Health Strategy drafted in 2004.

The strategy applies an asset valuation and risk assessment based approach. Waterway assets are categorised as environmental, social or economic. The risk assessment of assets informed the development of programs to manage the risks. A prioritisation process then guided the preparation of an implementation program. Generally, priority has been given to protecting existing high-value rivers and creeks that are in good condition and improve rivers and creeks in areas where there is either:

- the highest environmental and community gain for the resources invested; or
- community commitment towards long-term improvement of river health.



Figure 54: Saltmarsh areas and Port Phillip Bay at the creek mouth in Altona

Melbourne 2030

Released in 2002, Melbourne 2030, is a whole-of-Victorian Government policy to manage metropolitan Melbourne, urban growth and transport over the next 30 years. As an overarching policy, Melbourne 2030 provides several policies relevant to managing waterways:

- Promote good urban management to make the environment more liveable and attractive. This includes improving landscape qualities, open space linkages and environmental performance in conservation areas;
- Improve the quality and distribution of local open space and ensure long-term protection of public open space. This includes strategic open space planning with relevant agencies, consistent with the Linking People and Spaces strategy.
- Improve the environmental health of the bays and their catchments;
- Recognise heritage places and values for both indigenous and post-contact cultures;
- Give higher priority to cycling and walking, including strengthening the Principal Bicycle Network;
- Integrated management of metropolitan growth through Smart Growth Committees and identifying an Urban Growth Boundary. The planning for growth corridors will need to protect the environmental values of waterways. This is relevant for Kororoit Creek in the case of the Melton Growth Corridor.

Linking People and Spaces

Linking People and Spaces: A Strategy for Melbourne's Open Space Network (Parks Victoria, 2002) is a vision for the continued growth and enhancement of Melbourne's open space system. The vision is of a linked network of open space for all underpinned by the five guiding principles of partnerships, diversity of recreational opportunities, flexibility and responsiveness to changing and emerging community needs, sustainability and 'equity of access' to open space.

Implementation of the strategy will involve partnerships and the cooperation of a number of agencies and the community. Several actions proposed for Melbourne's west apply to Kororoit Creek and its environs:

- Investigate options and define park boundaries for the development of a Regional Park along Kororoit Creek west of Caroline Springs, to meet existing demand and ensure diversity of recreational opportunity.
- Complete the gaps in the Kororoit Creek Trail, and extend the shared use trail from Caroline Springs to Melton Highway as development occurs.
- Protect and enhance riparian vegetation along Kororoit Creek.
- Develop new areas of open space, where possible, and give priority to protection of Grassland and Coastal Grassy Woodland vegetation communities.
- Foster community appreciation for, and awareness of, environmental and cultural values within the open space network through interpretation and involvement in planning for open space.

Regional River Health Strategy

The primary goal of the Regional River Health Strategy (RRHS) is to ensure the region's rivers and creeks are healthy, with increased numbers of native fish, platypus and plants. The RRHS recognises rivers and creeks will continue to be a hub for recreation and that local communities will actively participate in improving their condition. The Strategy sets a target of all natural rivers and creeks being in good or better condition by 2025.

The Port Phillip and Westernport RRHS provides a five-year blueprint for Melbourne Water, the Port Phillip and Westernport Catchment Management Authority, Local Councils, community groups and environmental and industry associations to work together to improve



Figure 55: Ancient Red Gums in Melton Shire

rivers and creeks. The strategy is an important part of the Port Phillip and Westernport Regional Catchment Strategy, which sets the framework for the overall coordination of natural resource management in the region.

The tables that follow outline the Regional River Health Strategy's assessment of Kororoit Creek within the Strategy study area. Since the release of the draft RRHS in late 2004, representations have been made about the omission of Kororoit Creek for actions recommended for the first five years of RRHS implementation. This view has been considered and the final version of the RRHS due in late 2006 will upgrade Kororoit Creek to show that recommended actions will take place in the first five years.



Figure 56: Deep Pools

5 Werribee catchment information

Lower Kororoit Creek (40)

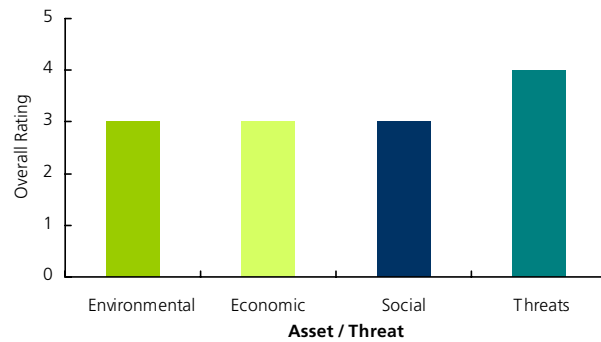
The Lower Kororoit Creek Management Unit includes the lower reaches of Kororoit Creek.

One sub-management units is contained within the management unit:

- Kororoit Creek (51)

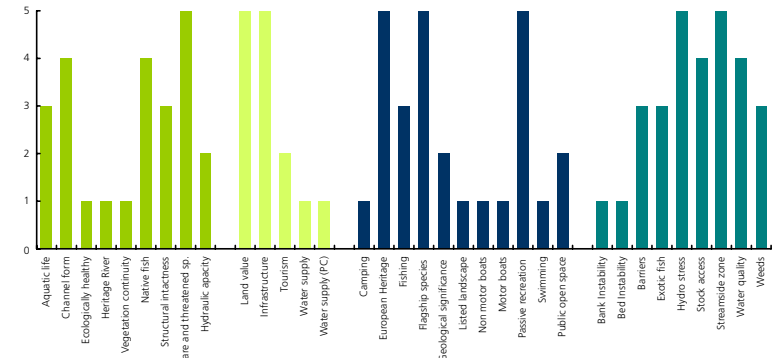
Kororoit Creek (51)

The lower reaches of Kororoit Creek, downstream of the confluence of Kororoit Creek East Branch and Kororoit Creek West Branch are included in the Kororoit Creek management unit.



Overall asset and threat rating for Kororoit Creek sub-management unit. A score of 5 represents very high, 4 high, 3 moderate, 2 low and 1 very low.

5 Werribee catchment information



Ratings for asset and threats in the Kororoit Creek sub-management unit. A score of 5 represents very high, 4 high, 3 moderate, 2 low and 1 very low.

Risk posed by threats and additional issues to environmental, economic and social assets for the Kororoit Creek sub-management unit

Asset	Asset Threat								Additional Issues						
	Bank instability	Bed instability	Barriers	Exotic fish	Hydro stress	Stock access	Streamside zone	Water quality	Weeds	Flood/drainage	Urban growth	Habitat loss	Sewerage	Groundwater	Toxicants
Environmental			M	M	VH	M	VH	VH							
Economic					VH	H	VH			✓		✓			✓
Social			M	M	VH	M	VH	VH							

Index of Stream Condition for ISC reaches in Kororoit Creek sub-management unit

ISC reach	Water quality	Aquatic life	Physical form	Streamside zone	Flow	Overall condition
132	Poor	Moderate	Excellent	Very Poor	Very Poor	Poor



5 Werribee catchment information

Kororoit Creek sub-management unit long-term plan

Management Unit	Lower Kororoit Creek	Number	40	Sub-management unit	Kororoit Creek	Number	51
Significance	Low			Objective	Rehabilitate Low		
Values	<ul style="list-style-type: none"> Land Value Infrastructure Channel Form Native Fish Rare and Threatened Species Non-Indigenous Heritage Flagship Species (striped legless lizard, coastal vegetation community, white mangroves, river red gums) Passive Recreation Indigenous Values – highly sensitive waterways and floodplain 			Risks	<ul style="list-style-type: none"> Hydrology (Environmental, Social, Economic) Streamside Zone (Environmental, Social, Economic) Water Quality (Environmental, Social) Stock Access (Economic) Barriers (Environmental, Social) Exotic Fish (Environmental, Social) <p>Additional issues identified in the literature and/or which are not in the STREAMS risk assessment</p> <ul style="list-style-type: none"> ID&A (1998) – litter, in stream woody debris, drainage and flood management (flood capacity) Loss of habitat Chucking (2000) – salinity Pettigrove pers. comm. 2004 – toxicants 		
Program	Action	Priority	Lead Responsibility	Partners			
AH	Investigate extent of fish barriers in Kororoit Creek	Low	Melbourne water				
AH	Investigate opportunities for improving native fish habitat including investigation of the feasibility of reintroducing large woody debris	Low	Melbourne Water				
FD	Consider implementing urgent and high priority drainage and flood management recommendations proposed in Kororoit Creek Waterway Activity Plan, 2003 Revised edition	Guiding	Melbourne Water				
FM	Develop and implement Kororoit Creek local management rules to manage private licensed water use	Moderate	Melbourne Water	Private diverters			
HE	Protect heritage values within this sub-management unit and investigate additional measures under local Planning schemes	Low	Project partners				
INV	Undertake platypus investigation	Low	Melbourne Water				
RE	Implement actions to close the gaps in the Kororoit Creek Trail as recommended in the Linking People and Space Strategy 2002	High	Local Government	Parks Victoria			
RM	Create opportunities to protect river red gum and white mangrove communities	Guiding	Melbourne Water	Local Government			
RM	In partnership with local managers, landholders, Landcare and community groups implement stream frontage management addressing revegetation and stock access	Low	Melbourne Water	Community			
WQ	Implement stormwater management actions proposed in Brimbank Stormwater Management Plan, 1999 and the Hobsons Bay Stormwater Management Plan, 1999	Low	Local Government	EPA Victoria, Melbourne Water			

5.3 Statutory Framework

The following Commonwealth, State and Local Government legislation and policy is concerned with the protection and management of waterway assets. These provisions are relevant to the Kororoit Creek corridor.

Environment Protection and Biodiversity Conservation Act 1999

This Commonwealth legislation provides a process for assessing proposed actions that could impact on Nationally protected species and ecological communities. The objectives of this Act are generally concerned with protecting aspects of the environment that are of National environmental significance and promoting biodiversity. Several Nationally listed species exist within the Kororoit Creek corridor. In some cases proposed works would need to be assessed for potential impact and referred to the Commonwealth Department of Environment and Heritage.

International Migratory Bird Agreements

Australia is a signatory to international agreements relating to migratory birds. In the case of Kororoit Creek, the Altona Coastal Park provides habitat for a diversity of migratory waders, many of which are identified in either the Japan Australian Migratory Bird Agreement (JAMBA) or the China Australian Migratory Bird Agreement (CAMBA).

Flora and Fauna Guarantee Act 1988

The Flora and Fauna Guarantee Act (FFG) is the primary legislation for the protection of Victoria's flora and fauna and applies to government owned land. It aims to ensure that Victoria's flora and fauna can survive, flourish and retain its potential for evolutionary development in the wild. It encourages cooperative management of flora through land management cooperative agreements under the Conservation, Forests and Lands Act 1987, and provides incentives to landowners to conserve flora and fauna.

As required by the FFG Act, Victoria's Biodiversity Strategy 1997 was prepared to guarantee the survival, abundance and development in the wild of all taxa and communities of flora and fauna in Victoria. The goals for biodiversity management include the reversal of the long-term decline in the extent and quality of native vegetation, leading to a net gain. It also provides that the ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments should be maintained and restored. The Act also identifies risk management principles.

Victoria's Native Vegetation Management Framework (Net Gain) 2002

The Native Vegetation Management, A Framework for Action addresses native vegetation from a whole-catchment perspective, with the focus on private land. The framework recognises the retention and management of remnant native vegetation is the primary way to conserve the natural biodiversity across a landscape. The conservation of native vegetation and habitat in a landscape is also dependent on the maintenance of catchment processes.

The primary goal of native vegetation management is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a 'net gain'. The priority is to avoid clearing where possible, minimise clearing where removal is necessary, and provide 'off-sets' for vegetation losses to provide a net gain.

Planning and Environment (Planning Schemes) Act 1996

The Planning and Environment (Planning Schemes) Act 1996, provides for the Minister to prepare a set of standard provisions for planning schemes, the Victoria Planning Provisions (VPPs). The VPPs are a comprehensive set of planning provisions and provides the framework, standard provisions and State planning policy. The VPPs provide the legislative mechanism for controlling the removal of native vegetation. A permit is generally required to remove, destroy or lop native vegetation (exemptions apply) on land which has an area greater than 0.4 hectares.

Catchment and Land Protection Act 1994

The Catchment and Land Protection Act 1994 provides a framework for the integrated management and protection of water catchments within Victoria. It requires Catchment Management Authorities (CMAs) to prepare regional catchment strategies, which provide the framework for several action plans including Pest Plants and Animals, and Biodiversity Action Plans. The CMAs advise the Victorian Government on the condition and management of land and water resources in the regions. The Act also enables the preparation of special area plans, which can be incorporated into planning schemes and State Environment Planning Policies (SEPPs).

Cultural Heritage Legislation

Indigenous and post-contact cultural heritage is protected at all three levels of government.

The Victorian Heritage Act 1995 provides protection for a wide range of cultural heritage places and objects, including historic archaeological sites and artefacts, historic buildings, structures and precincts, and cultural landscapes. The Act establishes a Heritage Council and a Victorian Heritage Register. A permit must be obtained for works which affect a registered place.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)

The Commonwealth Act deals with Aboriginal cultural property in a wider sense and provides blanket protection to any places, objects and folklore that 'are of particular significance to Aboriginals in accordance with Aboriginal tradition'. Places may include archaeological sites or historical/spiritual places of contemporary significance to Aboriginal people. Unlike the State Act, the Commonwealth Act grants significant powers over Aboriginal cultural heritage to Aboriginal communities. *Part IIA* of this Act is specific to Victoria. The Aboriginal and Torres Strait Islander Heritage Protection Act 1984:

- provides legal protection for all Aboriginal cultural property including Aboriginal places, objects and folklore.
- prohibits anyone from defacing, damaging, interfering with or endangering an Aboriginal place unless the prior consent of the local Aboriginal community has been obtained in writing.
- includes a hierarchy of declarations for the protection of Aboriginal sites considered to be under threat.

Archaeological and Aboriginal Relics Preservation Act 1972

This Act adopts an archaeological approach and provides legal protection for the physical evidence of the past Aboriginal occupation of Victoria.

Specifically the State Act:

- provides legal protection for all materials relating to the past Aboriginal occupation of Australia (with the exception of human remains interred after 1834).
- extends protection to both known (recorded) and unknown (unrecorded) Aboriginal archaeological sites.
- establishes administrative procedures for archaeological investigations and the mandatory reporting of the discovery of Aboriginal sites to AAV.

It is anticipated that the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth) and the Archaeological and Aboriginal Relics Preservation Act 1972 (Victorian) will be replaced by the Aboriginal Heritage Act 2006, when it is proclaimed.

All Aboriginal objects, sites and places (whether registered or unknown) are protected by legislation, whether on private or public land. Prior consents to disturb, destroy or interfere with an object, site or place needs to be obtained from the relevant local Aboriginal community.

The Victorian Planning Provisions, through the Heritage Overlay, enables municipalities to conserve heritage places of natural or cultural significance. The Overlay can ensure that development does not adversely affect the significance of heritage places identified in a schedule to the Overlay. Places of cultural significance are primarily of local significance, but can include places on the Victorian Heritage Register, as well as Aboriginal heritage places.

5.4 Planning Schemes

Planning Controls and Kororoit Creek

Land use and development along the Kororoit Creek is controlled by municipal planning schemes. Recognition of the environmental values of the creek varies considerably across municipalities. A range of zones and overlays apply to different sections of the creek, indicating that a consistent approach to planning policy has not been applied. Planning policy and overlays are seen as a key tool to support the objectives of the Kororoit Creek Regional Strategy 2005–2030. Planning schemes can provide protection for the environmental values of the creek corridor, strengthen open space objectives, strengthen the protection and conservation of places of cultural heritage and support flood controls. A program of appropriate planning scheme amendments is one of this Strategy's actions.

State Planning Policy Framework (SPPF)

The SPPF provides the overarching policy for protecting the range of environmental values relevant to waterways.

Clause 15 (Environment) addresses the themes of Protecting Catchments, Waterways and Groundwater, Floodplain Management, Coastal Areas, Conserving Native Flora and Fauna, Open Space and Heritage.

Local Planning Policy Framework (LPPF)

The recognition of Kororoit Creek within the four relevant municipalities is summarised as follows.

The Shire of Melton emphasises the values of the Kororoit Creek in its planning scheme and the need to protect it from inappropriate development. Important values include the open space and recreational elements of the creek corridor, which are to be treated as a feature in the Melton East growth area. The planning scheme also proposes to develop the creek with open space linkages and control stormwater drainage into the creek.



The City of Brimbank identifies Kororoit Creek as a significant waterway within the municipality and acknowledges that environmental issues exist. Council considers the creek will be an increasingly important element of the City, with plans to protect and enhance the public open space system. The planning scheme identifies the need to develop better pedestrian / bicycle systems, provide for the proper management of stormwater, protect environmental systems from inappropriate development and address salinity and erosion issues.

The Wyndham Planning Scheme does not specifically address Kororoit Creek as only a small section of creek abuts the north east corner of the municipality. The scheme acknowledges the importance of increasing the amount of open space and improving the public space network. It also recognises that much of Wyndham's natural environment has been neglected in the past and requires great efforts of rejuvenation.

The Hobsons Bay Planning Scheme identifies Kororoit Creek as significant and highlights the need to enhance open space in the municipality. It proposes integration of public open space networks centred on Kororoit Creek. The scheme addresses development along waterways and in particular acknowledges the need to mitigate the impact of industrial development adjacent to Kororoit Creek. Proper stormwater management is identified as an important means to protect the quality of the waterways and Port Phillip Bay.

Planning policies of Hobsons Bay, Brimbank, Wyndham and Melton municipalities which apply to Kororoit Creek are summarised in Appendix B of this document.

Municipal Environmental Policies

Brimbank City Council environmental policy is guided, in part, by its Natural Heritage Strategy. It provides further direction to Brimbank City Council's Municipal Strategic Statement, which provides protection of important natural assets and discourages development that diminishes the environmental significance of Brimbank's remnant native grasslands and other areas of importance including Kororoit and Taylors Creeks.

The Hobsons Bay City Council contains extensive areas of coastal reserves and conservation areas, including rare inter-tidal and bird habitats of State and National significance. These areas include Cherry Lake, Altona Coastal Park, Kororoit Creek, Truganina Swamp, Cheetham Wetlands, Laverton Creek, Skeleton Creek and the Stony Creek Backwash. Protecting flora and fauna, preserving water quality and promoting ecologically sustainable development are important objectives of the Hobsons Bay community and its Council.

Environmental considerations for the Shire of Melton are expressed in its Municipal Strategic Statement, Catchment Planning, and Land Management and Waterways. Most relevant to Kororoit Creek are the biodiversity objectives contained in the Port Phillip and Westernport Native Vegetation Plan, which identifies native grasslands in the Werribee Catchment as important habitat for Victorian Rare and Threatened Flora species. Melton's Grassy Ecosystems Report 2002 identifies grassy ecosystem remnants, including 13 sites of State to National significance. The Melton Planning Scheme applies Environmental Significance Overlay schedules to remnant grasslands (ESO1), and to wetlands, waterways and riparian strips (ESO2).

5.5 Earlier Kororoit Creek Studies And Management Plans

The Kororoit Creek Regional Strategy examines a range of previous plans and brings these actions together in a single strategy.

Metropolitan Town Planning Commission, Plan of General Development, Melbourne 1929

In 1929 the Metropolitan Town Planning Commission produced a Plan of General Development for Melbourne that proposed a planning scheme to prevent 'misuse' of land and protect property values, highlighting traffic congestion, the distribution of recreational open space and haphazard intermingling of land uses.

The 1929 Plan identified a number of major parklands in Melbourne, including Kororoit Creek Corridor, south of the railway line. Soon after this Plan was released Melbourne was hit by the social and economic impacts of the Depression and World War 2, and consequently, the purchase of regional parklands was delayed. The purchase of major parklands, such as Dandenong Valley parklands did not begin to occur in earnest until the mid 1970s.

Altona Coastal Park Management Plan (City of Altona, 1992)

This Management Plan reviews the resources and uses of this 70 hectare reserve next to Port Phillip Bay, examining management issues and principles, as well as detailing specific actions.

The report's main priorities are for improvements to park safety and the management of inappropriate uses within the reserve, along with general improvements to the biodiversity values of the reserve. The preservation and interpretation of the remaining vestiges of the old Williamstown Racecourse are also discussed in this study, which will also be advanced as part of the Kororoit Creek Regional Strategy.

Figure 57: Creek Pools at Caroline Springs

Cherry Lake Lower Kororoit Creek Truganina Swamp Management Plan

(Melbourne Metropolitan Board of Works, 1991)

This Management Plan contains historical and background information on the lower section of Kororoit Creek, north of Kororoit Creek Road.

Draft Kororoit Creek Waterway Plan

(Melbourne Parks and Waterways, 1995).

This plan was not brought to completion due to changes in institutional arrangements at the time. It contained concepts and recommendations for planning waterway management along Kororoit Creek.

The study area for this plan was north of Princes Highway to upstream of Sinclairs Road, Rockbank, essentially leaving out the reaches of the creek that run through the City of Hobsons Bay. The focus of the study was on identifying key issues and actions along the creek, with a focus on recreational and habitat issues, rather than in-stream water quality, flood management and drainage issues.

The Kororoit Creek Regional Strategy will replace and expand on this document.

Kororoit Creek Trail Plan

(Board of Works & Ministry for Planning and Environment, 1989)

This Plan summarised the detail of an investigation into a trail link between the mouth of Kororoit Creek and Gillespie Road in St Albans. It recommended that a path be built in three stages over successive financial years and estimated the total cost at \$5.25 million.

As per the requirements of this Strategy, the Kororoit Creek Trail Plan sought to protect significant features and areas of environmental, geomorphological and archaeological importance.

A key feature of the trail proposal was the construction of a 300 metre section of boardwalk in the 'Wide-Bend' area downstream of Kororoit Creek Road.



Kororoit Creek: Planning Study and Linear Park Proposal (Ministry for Planning and Environment and Melbourne Western Region Commission, November: 1984).

This is one of the earliest studies examining issues associated with planning and management of Kororoit Creek. The plan provided guidelines for the development of the Kororoit Creek Valley from a degraded urban area to a 'naturally' vegetated environment and recreation resource.

The study included guidelines for the creation of a continuous path along Kororoit Creek, as well as other recreational facilities such as local parks, equestrian centres and artificial lakes. The plan was less focused on issues such as the environment, flooding and drainage. It primarily addressed enhancement of recreational areas especially through vegetation management, improved water quality and the investigation of community attitudes.

5.6 Current Kororoit Creek Management Plans

Kororoit Creek Waterway Management Activity Plan (Melbourne Water, March. 1998 & Revised Edition: 2004).

Waterway Management Activity Plans are primarily prepared to guide Melbourne Water's management of waterways and have a strong focus on issues associated with the stream, its condition, water quality, riparian zone flora and fauna, as well as stream and catchment related flooding and drainage issues. However, the Plans also examine stream corridor issues that have an interface with the waterway. Issues such as public safety are matters that can fall within the ambit of these plans. The Plans are useful for Local Councils and other agencies as they offer a definitive view of Melbourne Water's issues and proposed rehabilitation activities. They also provide a framework for planning the development of open space and other facilities along the creek corridor.

The study area of the Kororoit Creek Waterway Management Activity Plan is from Melbourne Water's former drainage boundary at Rockbank (between Deanside Drive and Gray Court) to Port Phillip Bay. It therefore differs from the area covered by the Kororoit Creek Regional Strategy, which extends to Holden Road.

In addition, the different focus of the two documents needs to be acknowledged. The Strategy generally adopts a higher level strategic approach to assessment of issues within its broader study area. The Waterway Management Activity Plan, while having a strategic perspective, also includes numerous site-specific actions for its much

smaller waterway reaches. This permits the Activity Plan to have a finer level of resolution in its recommended actions. While the Activity Plan focuses clearly on waterway related matters, the Strategy concentrates on planning scheme amendments, open space, trail and recreation development, biodiversity and cultural heritage matters. There is some overlap of key study areas between the Activity Plan and the Strategy, and reference to the Activity Plan should be made where further detailed information is required about waterway management issues. Overall, the Strategy and Activity Plan are broadly compatible and can be read in conjunction with one another to gain a wide understanding of issues and rehabilitation requirements of the corridor.

The Activity Plan states that Melbourne Water's focus for rehabilitation activities will be concentrated around nine packages of capital works and a further seven sites where recurrent funds will be required to achieve rehabilitation objectives. The nine sites of future capital works are, in priority order:

1. Main Road West to Station Road
2. Cairnlea Frontage – Station Road North Drain to Western Highway
3. Upstream of Esmond Street to Ardeer Reserve
4. Norwood Street, Albion to Kosky Street Footbridge
5. Footbridge downstream of Wright Street to Glengala Drain Floodway
6. Grieve Parade to McArthurs Road
7. Millers Road to Altona rail line
8. Derby Street to Wright Street
9. McArthurs Road to Werribee Rail line

Works at these sites would absorb the vast majority of the Activity Plan's estimate costs for capital expenditure by Melbourne Water. The Activity Plan indicates that estimate capital costs for Melbourne Water are in excess of \$5 million over the 15 year life of the plan.

The Activity Plan highlights the critical importance of protecting and enhancing stream features such as escarpments and associated pools, along with key fauna species such as Growling Grass Frogs and Water Rats. Both of these species are thought to exist in significant numbers along parts of Kororoit Creek. A surprisingly diverse range of fish species have also been recorded with a recent record of Tupong at Caroline Springs, the first since 1894. Overall, the Activity Plan takes a position that Kororoit Creek is worthy of considerable rehabilitation effort as its values elevate it to a position as a priority waterway in the urban area.

Figure 58: Residential Properties backing onto the Creek Corridor

Catchment Management Plans and Programs

The Werribee Catchment Action Program 1999 (CAP), was developed by the Werribee Catchment Implementation Committee and the Port Phillip Catchment and Land Protection Board. The CAP is used to promote partnerships in the catchment and to guide the development of annual works programs by agencies, municipalities, community groups and other stakeholders by identifying priorities for local action. The CAP focuses on the priority natural resource management needs of the catchment, including:

- pest plant and animal control;
- waterway management and flood protection;
- water quality protection;
- integrated land management; and
- native vegetation and habitat protection.

The CAP identifies 65 essential actions within the catchment.

The Upper Maribyrnong and Werribee Catchments Waterway Management Plan (Condina, Craigie and Brizga, 2000), was developed by the Port Phillip and Westernport Catchment and Land Protection Board (CALP Board). It was developed to consider waterway management issues in areas outside the Melbourne Water Corporation district. This includes the upper sections of the Kororoit Creek catchment. The plan identifies a framework of activities, which were mostly assigned to the Port Phillip and Westernport CALP Board, on a temporary basis until future waterway arrangements were resolved.

Municipal Stormwater Management Plans

Like many other similar Plans, the Melton Shire Council Stormwater Management Plan (KBR 2003) recommended that additional litter traps be installed to protect receiving waterways. However, there was little specific local research to identify where such traps could most effectively be placed.

The Plan encouraged a range of educational activities and supported the adoption of Water Sensitive Urban Design (WSUD) for new developments including continued use of wetlands and grass swales to treat stormwater. It also recommended that Council adopt more stringent planning conditions requiring higher standards for stormwater management in new developments. The Plan also urged the employment of a Stormwater officer to undertake implementation of the Plan.

Brimbank City Council Stormwater Management Plan (AWT, 1999) This report was one of the initial pilot Stormwater Management Plans prepared in 1998/9 when Brimbank City Council received incentive funding from Melbourne Water. It emphasised the need for stormwater to become more central to Council's activities and committed Council to changes to its Municipal Strategic Statement and Local Policy to incorporate reference to improved stormwater management.

It sought wider promotion of Water Sensitive Urban Design (WSUD) for new developments and the seizing of opportunities to increase awareness in the community of littering and impacts of polluted stormwater on local receiving waters. As one of the early Stormwater Management Plans, it contained only general references to investigation of litter trapping opportunities in the municipality and failed to identify sites where traps could be installed to address reduction of gross pollutants entering Kororoit Creek.

Brimbank Council has recently undertaken a review of its 1999 Stormwater Management Plan.

Wyndham City Council Stormwater Management Plan (WBM, 2000) A comparatively small frontage (about 700 metres) to Kororoit Creek lies within the City of Wyndham.

Given its high percentage of growth areas, Wyndham has seen large areas of recent residential development over the last 10 years especially. The Plan noted there was little evidence of developers using management techniques to control pollutants at their source or integrate water management as part of subdivision design (ie. in accordance with the principles of Water Sensitive Urban Design).

The Plan recognised the Kororoit Creek frontage within Wyndham contained some extensive industrial premises generating potential pollution problems for the stream. In response, the Plan recommended: a major Gross Pollutant Trap upstream of Pipe Road; development of specific guidelines for stormwater management in industrial areas; stormwater management workshops for industrial operators to improve waste management practices; the formation of a local environmental management group for the Laverton industrial sector to provide a forum for targeted education; development of a spill prevention and containment plan for emergency responses; and the undertaking of individual audits of industrial operators to identify the current state of play.

Hobsons Bay City Council Stormwater Management Plan (AWT, 1999) This was also one of the five pilot Stormwater Management Plans prepared by local municipalities. While it lacked the detailed analysis of subsequent Plans, it provided a commitment by Council to protection of key downstream areas through improvements to planning regulations, community education and litter trapping. Hobsons Bay City Council has completed its Stormwater Management Plan in 2006 and has linked its Strategies to the regional Strategy.



Figure 59: Rock Escarpments, Pools and Revegetation Works in Deer Park



Figure 60: Shared Trail in Sunshine West

6. Kororoit Creek: Existing Conditions, Issues and Strategies

6.1 Condition Assessment: Summary of Key Findings

The key findings revealed in investigations for this strategy are summarised under the following headings:

Biodiversity

The environment of Kororoit Creek has changed greatly since settlement. The processes of urbanisation, industrial development and grazing have impacted on its condition. The central section of the creek, bounded by an urbanised and industrial setting, retains little pre-European vegetation and fauna habitat. The highest floral and faunal values of the creek exist in the least modified, rural areas to the north.

The native vegetation of the creek corridor is highly degraded. Many plant species have become extinct within the creek corridor and populations of most remaining species are critically endangered. Of the 445 plant species recorded in the creek corridor 53% are indigenous. The proportion of exotic plants is high and weed invasion is prevalent along the entire length of the creek. Nevertheless, the surviving indigenous vegetation along the creek corridor is still significant. All native species have at least local significance, with several having State and National significance. Remnant vegetation has been identified at approximately 60 sites along the creek corridor.

The faunal diversity along Kororoit Creek is relatively low and is dominated by introduced species. Some 112 species of fauna have been recorded along Kororoit Creek, most of which are birds. Indigenous species include 73 bird; 11 reptile; four frog; four fish; two mammal; and one crustacean. Of these, two species are of National significance and six are of State significance. The Growling Grass Frogs, a key species of the riparian zone, has been recorded at various locations along the creek.

The in-stream and aquatic zones of Kororoit Creek provide relatively high faunal habitat compared to the terrestrial habitat corridor. Several sections of Kororoit Creek contain deep pools which provide important habitat, especially for frog species. The primary impacts on aquatic values include riparian zone disturbance and invasion of aquatic pests.

Kororoit Creek still functions as a minor habitat corridor for the movement of wildlife within the region.

The coastal salt-marsh areas in Altona near Cherry Lake and at Altona Coastal Park are home to thousands of water birds and waders that migrate annually to the inter-tidal flats at the mouth of the Creek. These birds are recognised by international treaties.

Indigenous and post-contact heritage

The western Basalt Plains were home to the Woiworing and Bunurong communities of the Kulin Nation. Waterways were a focus of Aboriginal life and there are many sites along Kororoit Creek with archaeological material. Kororoit Creek has significant archaeological material, particularly lithic scatters. The alluvial sediments of the creek in the upper reaches may contain significant Aboriginal archaeological material. Less than 15% of the creek corridor has been investigated for Indigenous archaeological material. Aboriginal Affairs Victoria has recorded 171 sites to date and it is expected many more sites are yet to be identified.

The post-contact heritage found along Kororoit Creek reflects the activities of pastoralists, industrialisation and the gold rush. There are 24 known heritage sites, which cover the themes of the pastoral industry, recreation sites and overland travel to the Ballarat goldfields.

Geomorphology

Kororoit Creek crosses the northern edge of the Werribee Plains, a generally flat area formed by volcanic geology two to four million years ago. The modern channel lies in a broad valley, often with steep slopes that fall five to ten metres below the basalt plain. The natural basalt escarpments and deep pools of Kororoit Creek are a distinguishing characteristic of this waterway and are amongst the most significant examples in urban waterways of Melbourne's west and north. These characteristics are a valued feature worthy of protection. The geomorphology of this waterway contains many landforms that illustrate the processes that shaped the landscape. These forms include an extensive alluvial deposit at Rockbank, where the valley floor is up to one kilometre wide and covered with a complex sediment.

Kororoit Creek has been subject to significant channel modification works. However, the basalt soils have provided a level of resistance to major physical change and the impacts of urbanisation along its lower reaches. The retention of much of the original valley form means the task of rehabilitation of Kororoit Creek can proceed from a sound basis.

Waterway Condition

The Index of Stream Condition (ISC) has been developed as a tool for Victorian waterway managers to benchmark waterway condition, assess the long-term effectiveness of rehabilitation programs and to develop priorities to facilitate targeting of resources. It offers a snapshot of a waterway at a particular point in time – a snapshot which could change rapidly for various reasons (eg. a major flood event). The ISC therefore has limitations as a key tool upon which waterway analysis and management can be based.

Melbourne Water uses the ISC to monitor the environmental condition of waterways with the Index combining information on flow regime, water quality, condition of the channel, the riparian zone and aquatic life. The sub-indices are measured out of a maximum score of 10. Urban reaches final scores are calculated by summing together each sub-index for a score out of fifty. ISC Field Assessments for sub-indices Streamside Zone and Physical Form are undertaken annually for the Melbourne Water area, in a five-year rolling program as a part of Melbourne Water's Operating Charter commitments.

Kororoit Creek had an ISC survey undertaken in 2000. The major waterway issues evident from the survey were: the catchment wide depauperate nature of riparian vegetation and indigenous riparian vegetation in particular; the presence of litter, both instream, and on some sections of bank; lack of suitable densities of woody debris; and weed infestations. Litter was a problem in the lower catchment more than the upper reaches due to easier access for the public and high flows washing litter downstream. Weeds were a recurring issue throughout the catchment.



Figure 61: Forrest Street Bridge over Kororoit Creek in Sunshine West

Melbourne Water has revised its Kororoit Creek Waterway Management Activity Plan (WMAP) in 2004. This plan assesses: the flooding and drainage issues; stream system values; water quality and vegetation management. The WMAP provides a framework from which Melbourne Water is able to prioritise works planning for the next 15 years. Nine packages of works have been identified in the WMAP, which have the potential to provide a significant boost to the rehabilitation of the Kororoit Creek corridor.

At the time of publication of this Strategy, Melbourne Water only recently became the waterway manager for Kororoit Creek following enabling legislation being passed by the Victorian Parliament designating Melbourne Water as the responsible authority for waterway, regional drainage and floodplain management for the majority of the Port Phillip and Westernport catchment. In terms of this Strategy, Melbourne Water is now the waterway manager throughout the study area and beyond to the top of the catchment near Gisborne. Prior to that, Melbourne Water was the waterway manager only for those parts of Kororoit Creek downstream of Rockbank – specifically from where Tributary 4142 enters Kororoit Creek on the north side.

Land Management

Land along the Kororoit Creek corridor is managed by both private and public owners and varies considerably across the municipalities. Different owners use the land in different ways. The management of each property can vary in terms of its land use, the owners' values, resources and priorities. These circumstances present significant challenges to implement overall objectives for Kororoit Creek as a single, natural asset.

The consequence of private ownership of sections of the creek corridor is that public access to those areas is restricted. Public access would be desirable for recreation purposes, particularly the creation of a continuous trail and linear parkland. Access would also enable public bodies to record and monitor the condition of environmental and heritage values. The management standard of privately owned property is also limited to the undertakings private owners are prepared to make.

Public land along the creek is also managed by various bodies including Melbourne Water; Parks Victoria and Local Councils. Varied public ownership involves management regimes that differ in their purposes, resources, capacities and priorities.

Open Space and Trails

The parkland and trail along the Kororoit Creek corridor is fragmented. There are a number of local parks located within a short distance of the creek, but these are not well connected to the creek corridor.

A continuous shared trail along the creek with local trail connections is an effective means of providing public access to this valued open space. This Strategy identifies several locations for new local parks or recreation nodes along the creek corridor to provide a greater diversity of recreational experiences and new opportunities for access to the creek. The new regional park proposed along Kororoit Creek

west of Caroline Springs will be a major open space and recreational destination along the creek corridor.

While historic land use and development often turned its back on waterways, today such waterways, including the Kororoit Creek, are seen as a significant open space resource. This resource can be broadly seen as having two components:

- parks and reserves
- shared trails.

Parks and Reserves

Existing parks and reserves along Kororoit Creek are mainly associated with long established residential and industrial areas downstream of Deer Park, (although new open space is also being established in the developing suburb of Caroline Springs). These existing reserves range from important regional parks such as Altona Coastal Park and Cherry Lake, near the mouth of the creek, to established local parks between Altona North and Deer Park.

While all of these parks are located within a short distance of the creek, they are not well connected to it and do not contribute to a recognisable Kororoit Creek Park system.

Shared Trail

A coordinated shared trail network would be an effective means of providing public access to the valuable open space located along the creek corridor, but would also integrate existing and proposed parks and reserves into a linked system.

At present, as with the individual parks, the shared trail along the creek corridor is fragmented, consisting of a series of individual disconnected paths, rather than a network. Consequently, there are a number of significant 'trail gaps' where trails are responding to local demand, rather than maximising the regional context and wider recreational opportunities presented by the creek.

As a result, the development of preferred alignments to fill these trail gaps and create an integrated trail network will be a key outcome of the Strategy.

The creation of this network will be achieved through two broad strategies:

- Upgrade of existing trails – identified in the reach analysis and actions in Chapter 2.
- Filling of trail gaps through new trails, identified in the reach analysis and actions in Chapter 2.

Landscape Character

The landscape character of Kororoit Creek reflects its varied settings. In the upper reaches the character is open and rural, the suburban reaches are often confined to a narrow creek corridor, the landscapes of Brooklyn and Altona North are industrial, and the Altona Coastal Park has an estuarine setting. River Red Gums, some of which are ancient, survive in the upper reaches and were once a key feature of the creek corridor. The vegetation within the suburban reaches is highly modified, with some areas having no remnant vegetation and the

corridor defined by the poor subdivision practices of the past. In a few sections of the creek corridor, including landfill sites, the creek landform has been modified.

Kororoit Creek and other waterways in the western region of Melbourne are now highly valued open spaces. Even where waterways are modified they are usually the only natural element in urban areas. The social value placed on waterways is high and provides support for improving management of the landscape qualities and the landscape character along them.

In response to the high community value placed on waterways, this Strategy envisages the creation of a consistent landscape along Kororoit Creek, created mainly through revegetation. This rejuvenated landscape will unify the various land uses occurring along the creek. It will become the 'green thread' tying diverse communities together and will have a strong and consistent visual and vegetative character that embraces adjoining open space wherever possible.

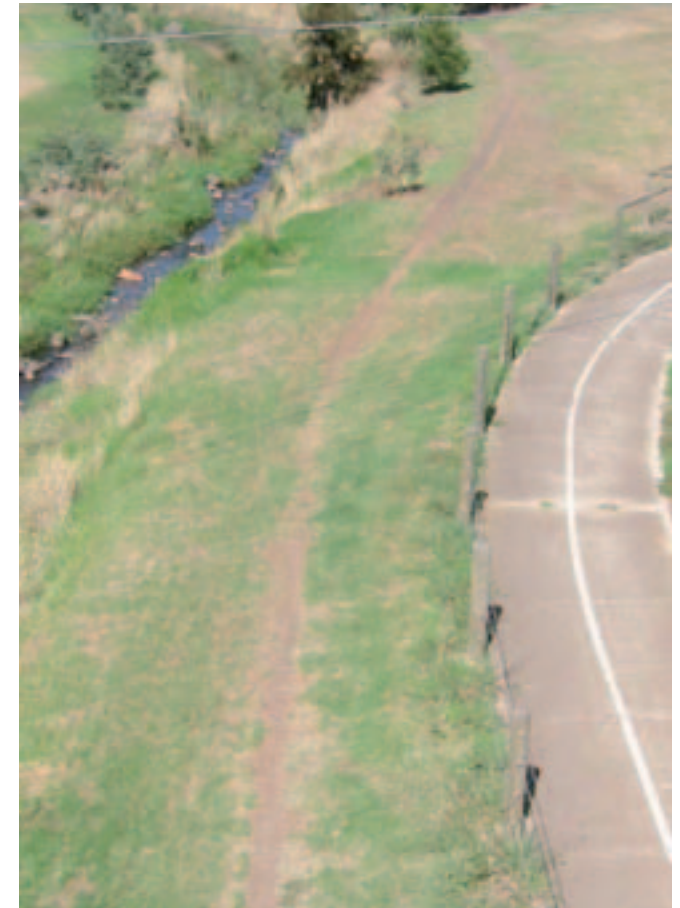


Figure 62: Shared Trail and Kororoit Creek in Sunshine West

6.2 Biodiversity

Overview

Kororoit Creek lies within the Victorian Volcanic Plain bioregion (DNRE 2002) and prior to European settlement the broader area was predominantly Plains Grassland (more or less treeless and dominated by Kangaroo Grass (*Themeda triandra*)) on volcanic soils with Plains Wetland occurring in wet depressions (Oates and Taranto 2001; Muir et al. 1997). Vegetation associated with the creek would have been characterised by woodland dominated by River Red Gum (*Eucalyptus camaldulensis*) (Creekline Grassy Woodland and Riparian Woodland Ecological Vegetation Classes (EVCs)) with shrubland dominating the rocky escarpments. The creek would have varied in morphology from narrow reaches to broad, deep pools and riffle sequences. The coastal section of the creek would have carried Mangrove Shrubland and Coastal Saltmarsh with Calcarene Dune Woodland on the coastal dunes (Oates and Taranto 2001).

Agriculture (mostly grazing), and urban and industrial development have greatly changed the Kororoit Creek environment. In the southern section of the study area, coastal reserves (Altona Coastal Park and Cherry Lake) have ensured the retention of the original vegetation and provide habitat for numerous significant species (both resident and vagrant). However, the vegetation and fauna habitat are in a state of decline due to weed invasion, feral animals, access and other management issues. The central region of the study area includes both industrial and urban environments. This section of the creek has been greatly impacted by development and retains only a semblance of the pre-European vegetation and fauna habitat. Due to an established pedestrian/bike trail and areas of open space, particularly in residential areas, this section of the creek currently has the greatest recreational use and hence visitation. This highlights the need to protect surviving flora and fauna values and also provides an opportunity for enhancing the biodiversity values of the area. The northern section of the creek has been predominantly utilised for agricultural purposes although there has been some residential development in recent times. The lack of development in this area means this area contains the highest flora and fauna values within the creek corridor, both in-stream and terrestrial.

Although the flora and fauna values of Kororoit Creek have been modified and degraded, the creek corridor still continues to function as a minor habitat corridor for the movement of wildlife within the region and provides habitat for a number of significant flora and fauna species. As such, there are sound reasons to protect, manage and enhance the Kororoit Creek environment.

Plant Species

A total of 445 plant species has been recorded for the Study Area (DSE 2003c). Of these, 238 (53%) are indigenous species and 207 (47%) are naturalised exotics. Eight species of State and three species of National significance and one vegetation community listed under the Flora and Fauna Guarantee Act 1988 have been recorded for the study area (Table 1).

Numerous Regional species have been recorded for the Study Area (Muir et al 1997; Kunert 1991, Schulz 1992), but confirmation of the presence and status of most of these species is beyond the scope of the Strategy.

The vegetation of the study area is now highly degraded as a result of land-use history and weed invasion. Many plant species have become extinct within the study area and populations of most of the remaining species are critically endangered (Muir et al. 1997). All species recorded for the study area have at least local significance given the massive depletion of vegetation regionally.

Ecological Vegetation Communities (EVCs)

Ecological Vegetation Classes (EVCs) comprise one or more floristic vegetation communities which exist under a common regime of ecological processes and are linked to broad landscape features (Woodgate et al. 1994, Muir et al. 1995). Each vegetation type is identified on the basis of its floristic composition (plant species present), vegetation structure (eg. woodland, forest, grassland), landform (eg gully, foothill, plain) and environmental characteristics (eg soil type, climate).

Eight Ecological Vegetation Classes (EVCs) including one vegetation community of State significance have been recorded for the study area (Oates and Taranto 2001). Table 2 details the eight EVCs identified within the study area and their conservation status. However, the vegetation representing these EVCs is now fragmented and highly degraded with only a semblance of the former vegetation persisting.

Table 1: State and Nationally significant plant species and Ecological Vegetation Classes

Botanical name	Common name	State	National	Flora and Fauna Guarantee Act 1988	Environment Protection & Biodiversity Conservation Act 1999	Action Statement	Distribution in study area	Location (Planning Unit)
<i>Atriplex paludosa</i> ssp. <i>paludosa</i>	Marsh Saltbush	r					S	9
<i>Avicennia marina</i> ssp. <i>australasica</i>	White Mangrove	r					S	9
<i>Cullen parvum</i>	Small-Scurf-pea	c	E	L	E	✓	S	4
<i>Cullen tenax</i>	Tough Scurf-pea	e		L			S	4, 7
<i>Desmodium varians</i>	Slender Tick-trefoil	k					S	4
<i>Dianella amoena</i>	Matted Flax-lily	e	E		E		S	3
<i>Pimelea spinescens</i> ssp. <i>spinescens</i>	Spiny Rice-flower	e	V	L	V		S	4, 9
<i>Tripogon loliformis</i>	Rye Beetle-grass	r		L			S	3
Western (Basalt) Plains Grassland				L		✓	M	XX

Key

State: Ross and Walsh (2003). r = Rare; e = Endangered; k = Poorly known and suspected, but not definitely known to belong to one of the rare or threatened categories within Victoria.

National: Ross and Walsh (2003). E = Endangered; V = Vulnerable

FFG: Victorian Flora and Fauna Guarantee Act 1988. L = Listed taxon.

EPBC: Commonwealth Environment Protection & Biodiversity Conservation Act 1999. E = Endangered; V = Vulnerable

Distribution: DSE (2003c). S = Sparse; M = Moderate; D = Dense.

Mangrove Shrubland

Mangrove shrubland is confined to protected low energy coastal environments where there is sufficient shelter from strong wave action and currents to allow the accumulation of fine sediments, generally on mud flats within the tidal zone. It is dominated by the State significant White Mangrove (*Avicennia marina* var. *australasica*) and is usually associated with Coastal Saltmarsh (Oates and Taranto 2001).

Within the study area, Mangrove Shrubland is represented by a sparse stand of White Mangrove and is confined to the mouth of Kororoit Creek (Reach 9).

Coastal Saltmarsh

Coastal Saltmarshes are restricted to flats on low energy coastlines subject to the influence of daily inundation of salt water and poor drainage. Coastal Saltmarsh vegetation is generally very strongly zoned along a salinity / wetness elevation gradient seaward to landward. (Carr et al. 2000). The lowest and most frequently inundated zones are dominated by Beaded Glasswort (*Sarcocornia quinqueflora* ssp. *quinqueflora*), shrubby Glasswort (*Sclerostegia arbuscula*) and Austral Seablite (*Suaeda australis*). The next most landward zone is dominated by herbs and salt-tolerant grass including (*Distichlis distichophylla*), Creeping Brookweed (*Samolus repens*) Rounded Noon-flower (*Disphyma crassifolium*) and Southern Sea-heath (*Frankenia pauciflora* var. *gunnii*). Taller plants such as Sea Rush (*Juncus kraussii*), Chaffy Saw-sedge (*Gahnia filum*) and Salt Club-sedge (*Bolboschoenus caldwellii*) dominate the most landward zone (Oates and Taranto 2001).

Within the study area Coastal Saltmarsh is restricted to the lower sections of Kororoit Creek (Reach 9) around Cherry Lake and Altona Coastal Park.

Creekline Grassy Woodland

Creekline grassy woodland occurs on low-gradient ephemeral to intermittent drainage lines. It is dominated by River Red Gum (*Eucalyptus camaldulensis*) over a scattered shrub layer including Black Wattle (*Acacia mearnsii*), Blackwood (*Acacia melanoxylon*), Sweet Bursaria (*Bursaria spinosa*) and sometimes Swamp Paperbark (*Melaleuca ericifolia*). The ground layer is dense with grasses and sedges, most commonly Tall Sedge (*Carex appressa*), Common Tussock-grass (*Poa labillardierei*), Weeping Grass (*Microlaena stipoides* var. *stipoides*), Kangaroo Grass (*Themeda triandra*), Common Wheat-grass (*Elymus scabra*), Common Blown-grass (*Agrostis avenacea*) and Rushes (*Juncus* spp.) (Oates and Taranto 2001).

Few intact remnants survive in the Port Phillip region due to industrialisation and urban development (Oates and Taranto 2001). Fragmented Creekline Grassy Woodland remnants persist in the northern half of the study area (Reaches 1–3).

Aquatic Herbland

Aquatic Herbland is represented by permanent to semi-permanent wetlands dominated by aquatic herbs and/or sedges (sedges are more likely to dominate shallower verges). Aquatic Herbland is dominated by Tall Spike-sedge (*Eleocharis sphacelata*), Water-ribbons (*Triglochin procerum*) and water-milfoil (*Myriophyllum* spp.). Other aquatics such as Floating Pondweed (*Potamogeton tricarlinatus*) and Running Marsh Flower (*Villarsia reniformis*) are sometimes conspicuous (Oates and Taranto 2001).

Aquatic Herbland was previously more widespread within restricted areas of suitable habitat across the Port Phillip region but is now greatly reduced through draining and use for agriculture. This EVC is represented across the study area and also the broader area.

Plains Grassland (Western Basalt Plains Grassland)

Plains grassland (Western Basalt Plains Grassland) occurs on lowland plains on Quaternary basalt. Historically, the most significant feature of Plains Grassland was the Kangaroo Grass (*Themeda triandra*)-dominated ground cover. This was associated with a variety of other grasses such as Weeping Grass (*Microlaena stipoides* var. *stipoides*), a range of Wallaby-grasses (*Austrodanthonia* spp.), Common Wheat-grass (*Elymus scabra*) and Knead Spear-grass (*Austrostipa bigeniculata*). Other species include Rush-lily (*Tricoryne elatior*), Blue Devil (*Eryngium ovinum*), Pink Bindweed (*Convolvulus erubescens*), Lemon Beauty-heads (*Calacephalus citreus*), Common Bog-sedge (*Schoenus apogon*), Toad Rush (*Juncus bufonius*) and Common Everlasting (*Chrysocephalum apiculatum*) (Oates and Taranto 2001).

Plains Grassland was once the dominant vegetation type across much of the Victorian Volcanic Plain but has been reduced to less than 1% of its former ruir (McDougal 1987) and is endangered in a State context (Muir et al. 1997). Fragmented and highly modified remnants persist in the broader area surrounding Kororoit Creek, some of which have been reserved for protection. These remnants are concentrated in the northern half of the study area (Reaches 1–3). Plains Grassland is listed as a threatened community under the Victorian Flora and Fauna Guarantee Act 1988.

The proposed new regional park may incorporate and protect some of this valuable tussock grassland.

Riparian Woodland

Riparian Woodland occurs beside permanent streams, typically on narrow alluvial deposits. It is dominated by River Red Gum (*Eucalyptus camaldulensis*), with occasional Manna Gum (*Eucalyptus viminalis* ssp. *viminalis*) over a Common Tussock-grass (*Poa labillardierei* var. *labillardierei*) dominated understorey. Other major woody species include Black Wattle (*Acacia mearnsii*), Swamp Paperbark (*Melaleuca ericifolia*), Tree Violet (*Hymenanthera dentata*) and Sweet Bursaria (*Bursaria spinosa*) (Oates and Taranto 2001). Riparian Woodland was formerly widespread along major creeks and rivers mostly on the Victorian Volcanic Plains. It is now greatly reduced due to clearing for agriculture and urban and industrial development (Oates and Taranto 2001). Prior to European settlement Riparian Woodland would have dominated the creekline of Kororoit Creek in the southern half of the study area (Reaches 4–8). It now only persists in a degraded state in Reach 6.

Grassy Wetland

Grassy Wetland occurs in swampy drainage lines and seasonally waterlogged depressions on swamp deposits within basalt, and Quaternary and Tertiary sediments.

Grassy Wetland is usually treeless, but in some instances can include sparse Red Gum (*Eucalyptus camaldulensis*) or Swamp Gum (*Eucalyptus ovata* var. *ovata*). A sparse shrub component may also be present. The characteristic ground cover is dominated by grasses and small sedges. The vegetation is typically species-rich on the outer verges but is usually species-poor in the wetter central areas, where Common Spike-sedge (*Eleocharis acuta*) or Australian Sweet-grass (*Glyceria australis*) may form virtually monospecific stands, sometimes in association with aquatic herbs such as Floating Pondweed (*Potamogeton tricarlinatus*) and Water-milfoil (*Myriophyllum* spp.).

Major grasses are Brown-back Wallaby-grass (*Austrodanthonia duttoniana*), Common Swamp Wallaby-grass (*Amphibromus nervosus*), Australian Sweet-grass (*Glyceria australis*) and Common Tussock-grass (*Poa labillardierei* var. *labillardierei*).

Prior to European settlement Grassy Wetland would have been scattered across the Victorian Volcanic Plains. It is now only found in Reach 5 of the study area, where it is surrounded by Plains Grassland.

Escarpment Woodland

Escarpment Woodland is an open shrubland associated with steep embankments beside major watercourses in low rainfall areas. The escarpments tend to be associated with the edges of basalt flows or where watercourses have cut deeply into the bedrock.

Apart from the occasional Drooping Sheoak (*Allocasuarina verticillata*) along the escarpment rim, the tallest stratum is the shrub layer. Common shrub species include Tree Violet (*Hymenanthera dentata*), Black Wattle (*Acacia mearnsii*), Lightwood (*Acacia implexa*), Hedge Wattle (*Acacia paradoxa*), Sweet Bursaria (*Bursaria spinosa*) and Sticky Hop-bush (*Dodonaea viscosa*). The ground layer consists of a few grasses and herbs such as Striped Wallaby-grass (*Austrodanthonia racemosa* var. *racemosa*), Weeping Grass (*Microlaena stipoides* var. *stipoides*), Kidney-weed (*Dichondra repens*), Kangaroo Grass (*Themeda triandra*) and Nodding Saltbush (*Einadia nutans* ssp. *nutans*). The floristics of Escarpment Shrubland may vary according to whether they are occurring on sheltered or exposed aspects. Sheltered sites may include ferns and sometimes broad-leaved shrubs (Oates and Taranto 2001).

Escarpment Shrubland previously had a localised and restricted habitat in the Port Phillip region. It is now almost entirely cleared (Oates and Taranto 2001). The only remnants that persist in the study area are small or very small and highly degraded as a result of weed invasion.

All of the EVCs recorded for the study area are classified as significant within the Victorian Volcanic Plain bioregion by the Department of Sustainability and Environment (DSE).

Fauna Species

A total of 112 species of fauna were recorded in the study area, which comprised 84 bird species (11 nonnative), seven mammal species (five non-native), 11 reptile species (all native), four frog species (all native), five fish species (one introduced), and one crustacean species.

Overall, faunal diversity along Kororoit Creek is relatively low and is dominated by introduced taxa, constituting 13% of the bird species and 71% of the mammal species occurring in the study area. The high proportion of introduced taxa present reflects the generally highly degraded nature of the faunal habitat values of the Kororoit Creek study area.

Arboreal mammals (possums) are rare or absent from the study area, while ground-dwelling mammals are predominantly introduced species. Fish and macro invertebrate species diversity decreases with increasing distance from the creek mouth (Close 2003).

Nationally Significant Fauna

A list of significant species is given in Table 3 and includes those species that are:

- listed under schedules of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999,
- listed under the Victorian Flora and Fauna Guarantee Act 1988,
- listed as threatened at the State level by DSE (2003).

Two species of National and six species of State significance were recorded for the study area from the database search (see Table 3), and three of these species are also listed under the FFG Act.

Fauna Habitat Values

As mentioned previously, despite being generally degraded, Kororoit Creek continues to function as a minor habitat corridor for the movement of wildlife within the region. It is likely to be utilised by a range of birds species and possibly also by some mammal species (such as bats and water rats), and reptiles such as the Tiger Snake (*Notechis scutatus*), Marbled Gecko (*Phyllodactylus marmoratus*), Cunningham's Skink (*Egernia cunninghami*) and the Common Long-necked Tortoise (*Chelodina longicollis*).

Instream /Aquatic

The in-stream/aquatic zones of Kororoit Creek provide relatively high values for faunal habitat, when compared to the terrestrial habitat types.

Several sections of Kororoit Creek contain deep pools, well vegetated with macrophytes. These pools are known to provide suitable breeding habitat for the Nationally significant Growling Grass Frog (*Litoria raniformis*), as well as other frog species such as the Striped Marsh Frog (*Limnodynastes peronii*), the Spotted Marsh Frog (*Limnodynastes tasmaniensis*) and the Common Froglet (*Crinia signifera*).

Other in-stream sections provide rock and riffle zones which specifically provide habitat for fish, invertebrates and frogs. Some bird and bat species would also use this habitat zone, feeding on insects that occur within the aquatic environment.

In-stream habitat would also be provided for fish species such as the Shortfin Eel (*Anguilla australis*), Australian Smelt (*Retropinna semoni*), Common Galaxias (*Galaxias maculatus*), Flatheaded Gudgeon (*Philypnodon grandiceps*), the introduced Mosquitofish (*Gambusia holbrooki*), and also the Common Freshwater Shrimp (*Paratya australiensis*) (DSE 2003a).

The primary impacts upon the aquatic values of Kororoit Creek include riparian zone soil disturbance with resulting erosion and sedimentation, and invasion of exotic aquatic fauna (Close 2003).

Grasslands

The grassland habitat once present in this area would have generally consisted of open grassland dominated by Kangaroo Grass (*Themeda triandra*) on cracking soils with numerous basalt rocks at the surface. This habitat is suitable for a wide range of native fauna and is predominantly of value to reptiles (eg Striped Legless Lizard (*Delma impar*), Little Whip Snake (*Suta flagellum*) and small mammals (eg Fat-tailed Dunnart (*Sminthopsis crassicaudata*)). In particular, the surface rocks and deep cracks that occur in the soils during the drier months of the year provide ideal shelter for these animals. Grassland plains are also a favoured foraging zone for raptors (eg Wedge-tailed Eagle (*Aquila audax*), Black Shouldered Kite (*Elanus notatus*) and grassland passerines (eg Richard's Pipit (*Anthus novaseelandiae*)).

Coastal Saltmarsh

Coastal Saltmarsh potentially provides high values for faunal habitat where it is associated with Kororoit Creek. This faunal habitat is considered to be significant principally due to the value it provides to support avian diversity, in particular for water birds and migratory waders. The intertidal flats that are exposed at low tide are used extensively by wader species for foraging, largely upon the macrobenthos.

There are records of 20 species of water birds and waders occurring in the relatively small area of coastal saltmarsh at the mouth of Kororoit Creek, indicating the importance of this area to such species.

Rocky Escarpment / Stony Knoll

Rocky escarpment / stony knoll habitat is characterised by an abundance of surface rocks. This habitat is particularly important for reptile fauna that frequent the abundant shelter sites provided in this habitat, and would include the Marbled Gecko, Cunningham's Skink and Little Whip Snake.

The riparian corridor also potentially provides a habitat link allowing wildlife to move between other suitable habitats. In areas where there is intact understorey (particularly the presence of Tangled Lignum) this habitat will be frequented by undergrowth birds such as White-browed Scrubwren (*Sericornis frontalis*), Brown and Yellow-rumped Thornbill (*Acanthiza pusilla* and *Acanthiza chrysorrhoa*), and Red-browed Finch (*Neochmia temporalis*).

Unfortunately this habitat also provides refuge for foxes and rabbits.

Riparian zone

Native fauna which utilise the riparian vegetation would include a range of birds (eg Crakes and Rails) and some reptile species (eg Tiger Snake). The high proportion of introduced mammalian taxa would largely utilise the riparian zone for movement along the creek corridor.

Associated with the riparian zone is the presence of River Red Gum (*Eucalyptus camaldulensis*). The high faunal habitat value provided

by mature River Red Gum trees is the production of large quantities of nectar, and the abundance of hollows. The nectar provides a food source for nectarivorous species, and the hollows provide nesting sites for a range of bird species (eg parrots, but also the exotic Common Starling and Common Myna), arboreal mammals (possums) and bats.

Exotic Grassland

Exotic grassland has replaced vast areas of Plains Grassland on the Victorian Volcanic Plains. This habitat type is characterised by dense exotic grass swards and is structurally homogenous, often infested with Artichoke Thistle (**Cynara cardunculus*) and numerous other weed species. These structural and floristic attributes suit few indigenous faunal species. However, areas of exotic grassland which contain a considerable indigenous grass component can often support native species, especially if there are large areas of indigenous grassland nearby. The indigenous fauna which utilise true exotic grasslands are generally 'ecologically tolerant' species (eg Australian Pipit and Australian Magpie (*Gymnorhina tibicensis*)) which are widespread and abundant in urban and rural areas.

Table 2: Conservation status of the EVCs recorded from the Kororoit Creek study area

Ecological Vegetation Class	Conservation Status (in the Bioregion)	Location (Planning Unit)
9. Coastal Saltmarsh	Endangered	9
68. Creepline Grassy Woodland	Endangered	1 and 2
125. Grassy Wetland	Endangered	5
132. Plains Grassland	Endangered	2, 3, 5 and 6
140. Mangrove Shrubland	Vulnerable	9
641. Riparian Woodland	Endangered	5
653. Aquatic Herbland	Endangered	8 and 9
895. Escarpment Woodland	Endangered	1–8

Table 3: Significant fauna recorded from within the Kororoit Creek Data Review Area

EPBC	DSE	FFG	LRO	Planning Unit	Common name	Scientific name
Vul	End	L	M/H	All units	Growling Grass Frog	<i>Litoria raniformis</i>
Vul	End	L	L/M	2, 3, 4, 5, 6	Striped Legless Lizard	<i>Delma impar</i>
M	Vul	L	M	2, 4, 9	Great Egret	<i>Ardea alba</i>
	NT		M	2, 4, 9	Brown Quail	<i>Coturnix ypsilophora</i>
M	NT		L/M	4, 9	Nankeen Night Heron	<i>Nycticorax caledonicus</i>
M	NT		M	4, 9	Whiskered Tern	<i>Chlidonias hybridus</i>

Key

EPBC: Commonwealth Environment Protection & Biodiversity Conservation Act 1999. CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Marine overfly or Migrant.

DSE: DSE (2003). CE = Critically Endangered; End = Endangered; Vul = Vulnerable; NT = Never Threatened.

FFG: Victorian Flora and Fauna Guarantee Act 1988. L = Listed taxon.

LRO: Likelihood of regular occurrence. H = High; M = Moderate; L = Low.

6.3 Cultural Heritage

Background

Seen in a regional context, the cultural inventory in central Victoria relates to both an ancient and widespread habitation that occurred.

The earliest signs of Aboriginal occupation date from the Late Glacial Maxima, a period of lower annual temperatures and rainfall affecting much of the southern hemisphere. Dated deposits on the lunette at Lake Tyrell near Sea Lake, in a rock shelter high in the Grampians, and at Karadoc Swamp near Red Cliffs, capture brief time slices of Aboriginal life more than 20,000 years ago in a variety of environmental settings well before Port Phillip Bay existed.

The picture is much the same for the grasslands of the Basalt Plains in the Western Region of Melbourne. In the Maribyrnong River Valley in Brimbank Park, at Green Gully, and again further upstream at Dry Creek – right at the parameter of this study – alluvial deposits have yielded a suite of artefacts and campsite residues dating to the period 10,000–30,000 years ago (Tunn 1998; Bowler 1970; Bowler et al 1967; Wright 1970). Preliminary analysis of erosion features in deep alluvium at Dry Creek suggests that future investigation may prove an even greater antiquity (Munro 1998) for habitation. Two sites with human remains were also found in the river sediments: one at Dry Creek with a radiocarbon age of c. 13,000 BP (Gill 1955, 1966) and the other at Green Gully with an age of less than 6000 BP (Bowler et al 1967, Casey and Darragh 1970). There is every expectation that a similar record of occupation occurs in all adjoining stream systems, including Kororoit Creek.

A site on the Eastern Kororoit Branch (AAV 7822–0488), the only example yet excavated of cultural material in the creek bed itself, contains an assortment of stone spear accessories and wood working implements belonging to the Small Tool Tradition that were used c. 2160 and 1460 years ago (du Cros 1993; du Cros, Long, and Rhodes 1993).

The arrival in Victoria of new immigrants in the first half of the 19th century dramatically altered the character and scale of land use along the creek. While other metropolitan centres in Australia underwent similar expansion, there can be no doubt that the 19th century heritage of the basalt plains of the Western Metropolitan Region reflects complex and intense interaction with the land that was to shape the very core of its social and economic development starting in the Colonial Period. Pastoralists were the first to capitalise on the abundance of rock for construction, permanent water holes, and a fertile soil to graze sheep for an emergent colony. Water catchment and storage systems were central strategies for success in this settlement and quarries, initially for local use, were imperative in this open plains country. Melbourne at this time was a mere village with a fledgling port facility and almost wholly dependent on foreign markets.

With the discovery of gold in 1851, the advent of local manufacturing in the following decade, and the establishment of a buoyant industry in primary production, Victoria experienced one of the most spectacular periods of growth ever recorded in an industrialized country of its size. Infrastructure growth, especially by road and rail networks and the emergence of regional centres gave impetus to a westward expansion of the Melbourne industrial districts that were to be the scenes of local invention and technological experimentation. Two decades later, large land holdings operated by influential owners with strong commercial incentives greatly improved production capabilities and set impressive records in the world market despite the fact that a portion of the upper catchment used for grazing was semi-arid.

The end of World War I witnessed another expansion of the Victorian manufacturing industry that introduced new technologies and a more intensive land use in the lower reaches of river systems that emptied into Port Phillip Bay. Neighbourhoods of warehouses and factories and working class people spread outwards into former pastoral country such as Sunshine and Keilor bringing together new clashes of rural and urban conflict. Factories involved in the production of glass, farm implements, machinery, chemicals, explosives, beverages, and electrical components – all needing proximity to central transportation hubs – claimed valuable land that was generally unsuitable for residential development and included the banks of major stream systems such as Kororoit Creek.

The purpose of this analysis has been to compile an inventory of the known heritage material associated with Kororoit Creek and prepare strategies to safeguard its future in light of an anticipated development framework.

Indigenous Heritage

The cultural heritage of the Western Region continues to be a primary focus for Indigenous people. The Kororoit Creek corridor runs through the community areas of the Wurundjeri and Bunurong tribal groups, whose representative organisations are given custodial authority by the Aboriginal and Torres Strait Islander Heritage Protection Regulations of the Aboriginal and Torres Strait Island Heritage Protection Act, 1984 listed in the schedule. An ongoing concern for Aboriginal groups is maintaining cultural links with ‘country’ and safeguarding cultural heritage that demonstrates a connection for hundreds of generations. The involvement of Aboriginal people in heritage conservation strategies is regarded as a valuable step towards good management outcomes. Consent must be obtained from the Wurundjeri.

Archaeological studies in the last decade demonstrate that Aboriginal sites are most prominent on the basalt plains close to waterways. The highest density is likely to occur in three sub-units of the Kororoit Creek sediments. These are:

- The basalt plain within a 100 m wide strip running parallel to the edge of the creek, where artefact density is the highest.
- The creek embankment amongst rocky outcrops.
- The alluvial plains and boulder fields in the floor of the creek.

Since records began, 171 Aboriginal sites have been reported from within this zone of Kororoit Creek. A breakdown of this inventory by site type is:

Lithic Scatter	160
Sub-surface Deposit	9
Art Site	1 (rock grooves on boulder)
Scarred Tree	1 (toe holes in River Red Gum at waterhole)

There is a special case, based on the criteria of great antiquity and preservation status to consider alluvial sediments in the creek as highly significant for their heritage values.



Figure 63: Historic Western Outfall Sewer Bridge (Future Site of Federation Trail)

The inventory of historical materials on Kororoit Creek identified by this study contains the following:

Shire of Melton

- Historic Bluestone bridge, Holden Road, Toolern Vale
- Keilor/Melton stone bridge:
- Mt Kororoit Homestead;
- Hume and Hovell crossing point;
- Clarkes Road and Water Reserve;
- Drovers Hut;
- Neale Road Ford;
- Shed;
- CS-HS Ford
- CS-HS Stone walls;
- Cobbled Roadway

Brimbank City Council

- Black Powder Mill, former Albion Explosives Factory site, now Cairnlea;
- Kororoit Creek Swimming hole, near Selwyn Park, Sunshine;
- Tree at swimming hole, Brimbank;
- Metropolitan Outfall Sewer;

Hobsons Bay City Council

- Historic Bridge, Brooklyn Reserve;
- The Pines Boy Scout Camp, Altona;
- The former Williamstown Racecourse, Altona Coastal Park.
- BP Pipe Bridge and historic buildings on Toll Estate;
- The former Commonwealth Oil Refinery administrative office; and
- Tramway Bridge over Kororoit Creek.

Wyndam City Council

- Metropolitan Outfall Sewer.



Impacts

It is clear from field inspection that the cultural heritage values of Kororoit Creek, once outstanding, are now heavily compromised, particularly in certain stretches of the system. These are the result of the following impacts:

- Natural weathering that contributes to the decay of fabric.
- Residential development encroaching on the edge of the creek during construction resulting in soil disturbances, removal, and/or burial of a disproportionately high number of Aboriginal sites.
- Infrastructure development, especially roadways, pipelines, and recreational centres.
- Landfill sites that have obliterated underlying heritage values.
- Revegetation programs impinging on the surface archaeology, especially Aboriginal sites.

Coverage

An ideal cultural heritage inventory should contain fabric from all points of the study area and from each significant period of habitation and every representative event.

The inventory of Indigenous heritage materials on Kororoit Creek is compiled from field survey, historical research, and oral history. An analysis of field searches of Indigenous sites takes into account the total area covered in reported searches as a means of quantifying the sample size, with confidence levels increasing with sample size and ground visibility.

Kororoit Creek from the Bay to Holden Road is approximately 56.2 km long, as measured on the centreline, and throughout this distance traverses an often sinuous corridor that ranges in width from 70 – 700m as measured from the top of opposite banks. Including a 100m zone offset from the upper creek embankment thought to contain the greatest amount of Aboriginal materials, 21.4 square kilometres of Kororoit Creek in the study area is archaeologically the most sensitive. Of this area, 2.4 km² or 11.2% has been searched for Aboriginal materials. In other words, more than 85% of the study area remains archaeologically unknown.

Most information is derived from the mid-stream area in Deer Park, Caroline Springs and Rockbank, whereas almost no records exist for Altona North, Brooklyn, parts of Sunshine, and most of the creek north of the Melton Highway. The most notable trends in the Aboriginal occupation of Kororoit Creek and adjacent drainage systems are:

- A large number of sites relate to habitation dating to the last 5000 years.
- Logistical strategies in stone tool manufacture involved reduction processes that commenced at some location away from Kororoit Creek.
- Spear accessories for hunting and possibly fighting are common in the tool assemblage.
- Dated evidence is currently exceedingly rare in the inventory.
- Rocky outcrops and other local features may influence the location of campsites and hence the concentration of discarded materials.



Figure 64: Ruin of the Former Rockbank Inn on Beattys Road in Plumpton

Figure 65: Historic Black Powder Mill in Cairnlea

Shortfalls in the Indigenous Site Inventory are the following:

- The temporal and spatial attributes of Aboriginal sites are poorly documented for the sample population as a whole and therefore the distinctive character and antiquity of Aboriginal occupation at any one location remains largely unknown.
- The nature of Aboriginal activity in the past, as measured by variation in artefact density and distribution patterns, and the industrial character of habitation as demonstrated from functional analysis are difficult to describe from the available records.
- The functional relationship between sites on Kororoit Creek and adjacent areas is undetermined.

Notable positive thematic trends in the Post-Contact Heritage Inventory are suggested by the identification of the following fabric:

- A small but impressive cross-section of the pastoral industry, i.e. stone walls, fords, wells, farm buildings, dams, and cobble roads.
- Recreational sites reflect the common life, i.e. racecourse and swimming holes.
- Bridges, inns, and sections of roadways represent early overland travel and accommodation.
- A single example of a highly significant technological development in the explosives industry is represented.

Shortfalls in Post-Contact Heritage Inventory are the following:

- No known fabric from the colonial period (early 19th century) is represented.
- Informal residential use of creek corridor is not represented for any historical period.
- Fabric from the manufacturing industry is poorly represented relative to its role on Kororoit Creek.
- An over-arching historical framework is unavailable to integrate the environmental features of the creek in respect to industrial and pastoral developments.
- Primary documentation and background research upon which to establish statements of significance for reported fabric is poor or inconsistent.



6.4 Geomorphology

Catchment

Kororoit Creek has a small, well-defined catchment bounded by the Maribyrnong and Werribee River systems, west of Melbourne. The two major tributaries of Kororoit Creek, (West Branch and East Branch), rise on the low volcanic hills of Mount Aitken, Deverall Hill and Beattie Hill, and the Palaeozoic sedimentary rocks that form Gilbey Hill and the steep north-south ridge at Gap Hill, west of Sunbury. The confluence of the West Branch and East Branch, just north of Holden Road Bridge, marks the northern boundary of the study area. All tributaries of Kororoit Creek in the study area, including Jones Creek at Ardeer, have limited and low catchments and are ephemeral in flow.

Kororoit Creek crosses the northern edge of the Werribee Plains – a broad, flat to gently undulating surface created by lava flows of Newer Volcanics basalt that erupted between four million and two million years ago. The pre-volcanic geology is exposed only in parts of the upper catchment, such as at Gilbey Hill and Gap Hill, that were probably not covered by lava, but elsewhere, the volcanic rocks blanket the pre-existing topography. The bulk of the catchment has been shaped by the initial form of the eruption points and the subsequent denudation of the volcanic materials.

The volcanoes comprise two main subgroups that vary slightly in composition and have different landscape expression. One subgroup is the cluster of distinctive flat-topped, steep-sided hills, such as Mount Kororoit and Mount Aitken, capped by a mound of fragmental lava (scoria) with prominent narrow rocky ridges and low escarpments below the summit. The second subgroup, including Mount Cottrell, Mount Atkinson and Diarmurid Hill, has gentle, rounded upper slopes rising above broad, undulating plains formed of numerous, thin overlapping lava flows. Irregular lobes and benches mark the edge of lava flows.

Part Two 6. Kororoit Creek: Existing Conditions, Issues and Strategies

Antecedent streams of Kororoit Creek have been progressively modified over the period of volcanic activity as lava filled and diverted the former channels. The thickest lava units (more than 60 metres) occur in these buried channels. Cooling, shrinking and sagging of the basalt produced initial depressions and fractures in the rock and these guided the development of surface drainage, lakes and swamps.

The modern stream follows a complex course across the study area with three major changes in direction. South of Holden Road the valley is narrow and relatively steep confined between lava ridges from Mount Kororoit and Wood Hill before turning east following the broad shallow depression at the northern boundary of the Mount Cottrell and Mount Atkinson lavas. At Caroline Springs the valley is incised into the broad low slopes of lava from Diarmuid Hill and Round Hill and tends southerly and south easterly to Altona where the estuarine sector has been shaped by the curving, parallel sand ridges at the head of Altona Bay.

Valley and Channel Features

The modern channel of the Kororoit Creek lies in a broader valley, the margins clearly defined by abrupt steepening or break of slope that falls five to ten metres below the level of the basalt plain. Escarpments with exposed rock faces rising directly above the channel alternate with regolith-covered bluffs that grade onto a flat or gently sloping alluvial terrace. Basalt is the only hard rock material exposed in the escarpments and pavements on the channel floor. Strong vertical and horizontal jointing determines the size and shape of boulders and the slope of the escarpments.

In the steeper and more deeply incised sectors, the valley typically has an asymmetric cross profile. Kororoit Creek displays entrenched and ingrown valley meanders as well as meander sections in the alluvial channel. Valley meanders are the planform position of the break of a slope, marking the edge of the lava plain where stream bends are incised into hard rock. An entrenched meander has a symmetrical cross-profile indicating a channel history of vertical incision without lateral migration. The term 'ingrown meander' is applied to a valley sector with an asymmetric cross-profile – a rocky escarpment on the outer part of the bend lies opposite a narrow, gently sloping spur on the inside of the bend – indicating lateral migration of the channel during incision. No Agooseneck meanders (an exaggerated meander loop with a narrow neck) occur but there are several fine examples of Aانvil head meanders at Caroline Springs and at Wright Street in Sunshine.

For the most part, the stream channel is flanked by a narrow floodplain and in places by a higher alluvial terrace. The alluvium is typically a gravelly basalt rubble mixed with a silty clay. There is very little sand in the alluvial sediments as weathering of basalt produces either blocks and remnant corestones. Alluvial terraces mark the position of a former, higher level floodplain surface now perched above most flood levels as a result of stream incision.

Figure 66: Deep pools, rock escarpments and footbridge near Beachley Reserve in Sunshine

Two extensive alluvial sectors occur along the Kororoit Creek in the study area, illustrating different aspects of the development of the stream:

The most extensive is between Beattys Road (Rockbank Road) and Melton Road where the valley floor is up to one kilometre wide covered with a complex of colluvial, alluvial, lake and swamp sediments. The stream channel is deeply incised into this sediment and has developed a sinuous channel with steeply cut banks. Immediately downstream from this sector the creek is constrained in a relatively deep and narrow trench cut into massive basalt. No detailed study of this extensive alluvial sector has been undertaken and the thickness of alluvial sediments is not known. A possibility is that thick, resistant lavas from Mount Cottrell initially formed a structural barrier to valley development here. However, at lower sea level times, the ability of the stream to incise the bed is increased and eventually a narrow, deep channel was cut into the resistant rock. The upstream sector was also incised, but in the thinner, less resistant rock the valley margins were widened. At some later stage (possibly at higher sea level), a natural choke or rock and log dam developed across the narrow valley creating a depositional basin in the wider upstream valley in which lake and swamp sediments accumulated. Breaching of the choke and draining of the basin exposed the alluvial sedimentary body and the stream is now incised into the valley floor sediments.

A second elongate alluvial sector commences south of Blackshaws Road extending to the estuary. Here, alluvial sediments are overlain by coastal sand and shell deposits.

Representative Geological and Geomorphological Sites

Seventeen locations along the creek, south of Holden Road, have been selected to represent the varied landform character of Kororoit Creek and illustrate the landform history and geomorphological processes shaping this landscape. The sites have been selected by viewing from areas of public access, supplemented by aerial photography and map interpretation. This represents a minimal inventory as potentially significant features on private land may not be evident on the imagery.

6.5 Waterway Management

Location

In terms of catchment identification and management, Kororoit Creek is considered to lie within the Werribee River basin. Kororoit Creek is one of the larger waterway systems in the Port Phillip and Western Port catchment having a catchment size of just under 300 square kilometres. The upper reaches of Kororoit Creek comprise two major tributaries – the West Branch and East Branch. These rise on the low volcanic hills of Mount Aitken, Deverall Hill and Beattie Hill, and the Palaeozoic sedimentary rocks that form Gilbey Hill and the steep north-south ridge at Gap Hill west of Sunbury (Rosengren, 2003). The study area for this Strategy includes those sections of Kororoit Creek downstream of the confluence of the West Branch and East Branch just north of Holden Road.

Channel Form & Urbanisation

Like many urban waterways, Kororoit Creek has been subject to some significant channel modification works, especially during the 20th century through to about the mid 1980s. Sections within the urban area have been deepened and widened with some trapezoidal shaping of banks. These treatments are especially evident downstream of the Western Highway. Such works were undertaken in response to a need to manage conveyance of flood flows and provide increased levels of protection for properties developed within former floodplain areas. The construction of trunk sewers along waterways often accompanied these stream works and resulted in additional modifications and the installation of access tracks often alienating escarpments from the stream.

In addition to bank modification at a number of locations, the section of Kororoit Creek between Main Road West and Station Road has been subject to construction of numerous riffle structures. These structures have facilitated the development of pools and appear to have been responsible for an increase in aquatic vegetation and a possible consequent improvement in habitat. However, a number of these structures were neither adequately designed nor constructed and re-set works are now required as indicated in the Kororoit Creek Waterway Management Activity Plan (Melbourne Water, 2005).

Despite these works, Kororoit Creek remains a stream with significant waterway values. Its natural escarpment areas, although often more distant from the stream than may have been the case prior to channel modification, are a valued feature of the stream environment. Amongst the urban waterways of Melbourne's west and north, perhaps only Kororoit and Merri Creeks, along with sections of Maribyrnong River, possess such significant basalt escarpment areas. The retention of some of the original valley morphology means the task rehabilitating Kororoit Creek commences from a sound base.

Water Quality & Aquatic Fauna

While water quality in Kororoit Creek, especially in its urban reaches, may be assumed to be poor due to extensive industrial development in nearby areas, overall water quality has now been shown to be on a par with many other urban streams (McGuckin, 2000). Water quality appears to have improved significantly since the 1980s. The diversion of two drains which discharged directly to Kororoit Creek from industrial premises in the lower catchment and which impacted negatively on the biological condition of the stream (see Reed, 1990), appears to have significantly improved water quality in the lower reaches (McGuckin, 2000). The water quality of Kororoit Creek through the urban area from Deer Park to Altona is considered to be in fair condition with most water quality parameters generally within State Environment Protection Policy (SEPP) objectives (EPA, 1988). Further monitoring is required in the middle reaches of Kororoit Creek to determine the extent of saline groundwater intrusion.

The aquatic fauna of Kororoit Creek have been surveyed in recent years with five native fish species recorded from five sites (all within the current study area of this Strategy) (Close, 2000). The recording of Spotted Galaxias was the first documented record of this species in Kororoit Creek (Close, 2000). An additional species collected in an earlier study was Tupong (see McGuckin, 1999). The low abundance of Tupong recorded by McGuckin and its absence, along with that of Southern Pygmy Perch, in the survey by Close was thought to be of conservation concern (Close, 2000). Only one barrier to fish movement has been documented for Kororoit Creek and although this barrier may allow fish passage at some high flows (see McGuckin 1999) its presence, along with other possible barriers, may contribute to the low abundance of Tupong by inhibiting recruitment of young fish migrating upstream from estuarine areas (Close, 2000).

The survey of aquatic fauna of Kororoit Creek offered an assessment of stream health describing the condition of aquatic fauna as generally moderate to good with sites located in the mid to upper catchment scoring higher ('healthier') ranks than the lower two sites (Close, 2000).

Growing Grass Frogs have long been recognised as a key species of the riparian zone of Kororoit Creek. Their presence along Kororoit Creek has been recorded in a survey commissioned by Melbourne Water from sites as far apart as Racecourse Road in Altona to Beattys Road, Rockbank and numerous sites in between (see Organ, 2005). Water Rats are also thought to be relatively abundant along Kororoit Creek (Williams and Serena, 2004), although an additional survey will be required to confirm the populations of these species and to develop recommendations for their management. Melbourne Water will investigate undertaking such a survey in the near future.

The Planning Framework – Melbourne Water’s Waterway Management Activity Plan

Melbourne Water has recently revised its Kororoit Creek Waterway Management Activity Plan, first developed in 1998. The revised Plan includes an assessment of flooding and drainage issues; stream system values, water quality and vegetation management. Waterway Management Activity Plans are designed to provide information about these key areas of interest in an easily accessible form for users. Waterway Management Activity Plans are both strategic and focussed on actions to address key issues associated with specific reaches of the waterway. They set a framework from which Melbourne Water is able to prioritise works planning for the next 15 years – a timeframe which falls within the timeframe of this Strategy. It should also be noted that while Waterway Management Activity Plans are predominantly works oriented, they only include estimates of works and not detailed costing.

The revised Kororoit Creek Waterway Management Activity Plan indicates nine separate packages of capital works which Melbourne Water plans to undertake, providing budget support can be obtained. These projects in listed priority order are:

- Main Road West to Station Road (re-set of riffle structures, re-profile banks, ensure discouragement of informal crossing, redesign outlet of Billingham Road Drain, investigate stormwater treatment of Cherry’s Diversion Drain within Burnside Park and undertake bank and aquatic revegetation).
- Cairnlea Frontage – Station Road North Drain to Western Highway (waterway rehabilitation works associated with Cairnlea development, ie. enhancement of natural pools, remnant vegetation protection and enhancement, weed control and revegetation).
- Upstream of Esmond Street to Ardeer Reserve (enhancement of pool upstream of Esmond Street, vegetation management works on escarpment opposite pool upstream of Esmond Street, improved connection of Council drain upstream of Esmond Street, rehabilitation of stream morphology and removal of ford crossing between Esmond and Yallourn Street footbridges, Elm sucker control at Jones Creek confluence, enhancement of natural pool upstream of Ardeer Reserve, weed control and revegetation throughout).
- Norwood Street, Albion to Kosky Street Footbridge (enhancement of escarpment and pool below mid point of Dalworth Street, enhancement of pool at Selwyn Park, enhancement of long pool downstream of Forrest Street, pool and riffles and associated bank re-profiling downstream of long pool through to Kosky Street footbridge, weed control and revegetation throughout).
- Footbridge downstream of Wright Street to Glengala Drain Floodway (enhance two natural pools upstream and downstream of Kellaway Street Drain outfall, investigate re-engagement of old course and stormwater treatment ponds on Kellaway Street Drain, improve Glengala Drain connection, pool and riffles between Glengala Drain outfall and Glengala Drain floodway, investigate stormwater treatment in Glengala Drain floodway, weed control and revegetation throughout).

- Grieve Parade to McArthurs Road (energy dissipation at Burgess Street Drain and improved connection, investigate stormwater treatment in W.L.J Crofts Reserve, re-activate old stream course opposite Hosken Reserve, pool and riffles and associated bank re-profiling, supplementary planting of existing revegetation east side, enhancement of existing pool upstream of McArthurs Road, weed control and revegetation throughout).
- Millers Road to Altona rail line (investigate measures to naturally encourage, or construct, braided channels between Altona rail line and Millers Road, remnant vegetation management and revegetation throughout).
- Derby Street to Wright Street (enhancement of pool downstream of Derby Road, pool and riffles and associated bank re-profiling, weed control and revegetation throughout).
- McArthurs Road to Werribee Rail line (investigate enhancement of existing pool upstream of McArthurs Road, pool and riffles and associated bank re-profiling between Barnes Road and Doherty Road, weed control and revegetation throughout).

These projects have the potential to provide a significant boost to rehabilitation of the Kororoit Creek corridor. In addition, the Activity Plan has identified seven areas where future operational projects can be undertaken. It is hoped Councils may be able to identify projects in adjacent areas so that value can be added to some of these major projects and benefits can accrue to the wider corridor beyond the stream and its riparian margins.

Constraints on Rehabilitation of the Kororoit Creek Corridor

Rural Frontages

With the introduction of Melbourne Water’s Stream Frontage Management Program to areas upstream of Rockbank, rural land owners along Kororoit Creek will have the opportunity to seek grant monies from Melbourne Water for stock exclusion fencing, weed control and revegetation. Engagement of landowners through this mechanism is critical to achieving improvements along rural sections of Kororoit Creek. However, it must be noted that take up rates for the program are often no more than 20%, and due to the voluntary nature of the program, no predictions about rural waterway improvement can be made.

Urban Areas

In developing areas such as Caroline Springs, it is critical to waterway and corridor health that adequate stream reserves are created at the time of subdivision. This helps ensure that adequate buffer areas are created between developments and the stream corridor. This permits surveillance by house lots addressing the corridor; provides some opportunity for survival of significant flora and fauna within areas of relative potential protection; offers some protection of the valley form of the stream; and provides preservation of opportunities for stormwater treatment and recreation provision.

Within developed areas the task of urban waterway corridor rehabilitation is one that has numerous constraints, many of which border on the intractable due to the gross impacts of urban environments. It has been hypothesised that once catchment imperviousness exceeds about 5% in the case of some streams, stream health declines markedly (see for example Walsh and Breen, 1999). This is a reflection of changes to the connectedness of drainage systems, hydrology, hydrodynamics and water chemistry, all of which combine to present an irrevocable and sustained pressure upon instream conditions and organisms which reside in the stream. The importance of catchment drainage connection and its alleviation through increased application of Water Sensitive Urban Design methods has been highlighted in a number of recent papers (see Walsh, 2003). Once 5% catchment imperviousness has been exceeded, allowing for some specific factors associated with the particular stream, it is generally thought that stream management becomes more a matter of remediation and mitigation to try to hold a semblance of naturalness.

While it may not be possible to maintain a fully functioning natural stream ecosystem in an urban environment, it is a challenge to implement those activities which maintain and moderately improve the existing values, plus retain the stream’s appearance as a predominantly natural waterway in the eyes of the community. Two such activities which can provide significant improvement to the environment of the broad stream corridor (ie. the waterway and its associated open space) are vegetation management and litter trapping.

Improved vegetation management can provide benefit to the stream through increased shading from overhanging vegetation reducing summer water temperatures, as well as provision of leaf litter to in-stream organisms for feeding. A good cover of aquatic and semi-aquatic vegetation can also assist with protection of the streambed and banks from the scouring effects of hydrologic regimes resulting from highly developed, impervious catchments. In relation to revegetation, this Strategy includes information about recommended vegetation communities for use in revegetation. The species lists are modifications of designated Ecological Vegetation Classes (EVCs) for the region.

Terrestrial areas away from the top of stream bank are often extensive along Kororoit Creek. Such areas have been subject to weed invasion from a variety of sources over many decades. It will be a major challenge for Local Councils to manage these reserves effectively and improve their amenity. While there have been improvements to a number of areas and considerable enthusiasm from the volunteer sector, the size of the task facing Councils in managing large, often undeveloped and highly degraded sites, should not be underestimated.

One area in which Local Councils have become increasingly involved in over recent years is stormwater management. Of the six municipalities located within the catchment, all have developed stormwater management plans to address stormwater quality issues. The stormwater management plans have been developed to respond to existing issues and to take a proactive role in addressing future development, such as the development occurring in the middle to lower parts of the catchment (eg. Caroline Springs and Burnside).

Stormwater Management Plans also offer the opportunity for municipalities to identify litter generating sources in their municipality and develop strategies and actions to improve litter trapping and community education. A number of plans are currently under review or about to be reviewed. It is anticipated further refinement of litter strategies will be undertaken at that time. The completion of the three-year Victorian Stormwater Action Program may in the short-term constrain the ability of Local Councils to pursue some stormwater management and litter trapping opportunities. In circumstances where there is little external assistance available, Local Councils will need to increasingly look to generating their own resources to improve stormwater management.

Review of the stormwater management plans for the two municipalities with the greatest urban frontages to Kororoit Creek (Brimbank and Hobsons Bay) indicated they have very similar priority issues. These can be summarised as:

- Improve the planning framework to enable integrated stormwater management.
- Improve coordination of stormwater management between councils and relevant authorities.
- Reduce litter entering receiving waterways.
- Increase awareness of stormwater management and facilitate community participation in stormwater management.
- Refine and up-date a monitoring program.
- Improved site management of point sources.
- Improve site management of construction activities.
- Promote water sensitive design principles.

Details associated with specific structural activities indicated the number of litter traps should be increased over the next two to four years. No specific locations for litter traps were provided.

Waterway Management

At the time of publication of this Strategy, Melbourne Water had only recently become the waterway manager for the whole of Kororoit Creek following enabling legislation being passed by the Victorian Parliament designating Melbourne Water as the authority responsible for waterway, regional drainage and floodplain management for the Port Phillip and Westernport catchment. In terms of this Strategy, Melbourne Water is now the waterway manager throughout the study area and beyond to the top of the catchment near Gisborne. Prior to that, Melbourne Water was the waterway manager only for those parts of Kororoit Creek downstream of the Rockbank area – specifically from where Tributary 4142 enters Kororoit Creek on the north side.

While Melbourne Water's ability to deliver services to these new areas will, in the short-term, be limited until funding arrangements are fully resolved, investigations and initial overview planning will need to commence in anticipation of the capacity to deliver improvements to stream frontages in the future. In addition, Melbourne Water will seek opportunities to engage private landowners in its Stream Frontage Management Program (SFMP) in coming years. This grants program seeks to fund and assist rural landowners to undertake fencing, weed management and revegetation along rural frontages. Its success will be dependent on the goodwill and voluntary contributions of landowners. While the SFMP is just one of a number of approaches to waterway rehabilitation possible along rural frontages, in the short-term it will be a major mechanism through which Melbourne Water will undertake waterway management in these rural parts of the Kororoit Creek corridor.

6.6 Landscape Open Space and Trails

Kororoit Creek Trail

One of the key aims of the Kororoit Creek Regional Strategy is to create a continuous linear shared use trail system along the entire length of the creek corridor and connecting to the new regional park. A series of parkland 'nodes' will provide starting or finishing points for walking or cycling journeys along Kororoit Creek and provide diverse open spaces for recreation.

Six sections of the Kororoit Creek Trail have been completed.

At present, none of these sections are linked to each other. The constructed sections of trail are:

- Altona Coastal Park (Hobsons Bay) – this section of trail provides a concrete loop trail within the area previously occupied by the Williamstown Racecourse. This loop trail connects to the Coast Trail. A concrete trail provides access from the loop to Millers Road; Cherry Lake (Hobsons Bay) – A loop trail exists around Cherry Lake in Altona. The adjacent 'Wide Bend' portion of Kororoit Creek has no trail access;
- G.J.Hosken Reserve (Hobsons Bay) – A short section of asphalt trail is located next to G.J.Hosken Reserve off Blackshaws Road in Altona North, providing a connection past the 'Urban Forest' to the West Gate Freeway Bridge, where it reverts to an informal, dirt maintenance pathway;
- Sunshine (Brimbank) – The longest section of existing formal trail along the creek corridor. This section runs from just south of Buckingham Reserve in Sunshine to More Park in Ardeer, near the junction of the Western Ring Road and the Western Highway. The trail is a mixture of concrete and asphalt and is in poor condition in some locations, especially the asphalt sections;
- Cairnlea (Brimbank) – The new Cairnlea development contains a short length of gravel trail, providing access to Millers Road and to the historic Black Powder Mill;
- Deer Park (Brimbank) – Deer Park contains a section of concrete shared trail, running from Millers Road to the Davitt Drive footbridge and looping back on the southern side of the creek to the Miles Street footbridge;

- Caroline Springs (Melton) – Delfin have provided concrete shared trail access along the southern side of the creek corridor within their development.

Metropolitan Trail Connections

There are three existing or proposed regional shared trails that intersect with Kororoit Creek. They are as follows:

- Bay Trail (Hobsons Bay) – The Coastal Trail is an excellent and highly patronised resource that provides cyclists with the opportunity to ride from Williamstown to Point Cook. The Coastal Trail also provides links to current and future trails on Skeleton Creek, Stony Creek and Laverton Creek;
- Federation Trail – The Federation Trail is a future shared trail to be constructed on the reserve easement that lies above the Melbourne Water Outfall Sewer. The trail will provide a connection all the way to Werribee from Millers Road in Brooklyn;
- Western Ring Road Trail – The Western Ring Road trail is a concrete shared trail located alongside the freeway. It provides a connection from Laverton North to Bundoora with numerous trail links connecting to it.

Connection to these trails will be important to create an integrated regional open space network.

Trail Development along Waterways

Planning and development of new sections of trail and interconnecting trails within the creek corridor must assess the public safety implications of constructing trails within the floodplain and meet Melbourne Water's guidelines for the development of safe paths and crossings. Melbourne Water is a referral authority for any planning approvals for construction of trails within the floodplain.

Melbourne Water's Activity Plan has also identified the need to assess the existing shared trail sections with the City of Brimbank that are located within the floodplain.

Parkland

There are a number of local parks located within a short distance of the creek, but many of these are not well connected to the creek, trails or other open spaces.

The Kororoit Creek Regional Strategy identifies the opportunity for several new local parks or recreation nodes along the creek corridor to enhance community access to the creek and diversity of open space and recreation experiences.

Recreation Nodes

New Regional Park to be located along Kororoit Creek near Caroline Springs

The proposed network of recreation nodes along the Kororoit Creek is summarised in the drawing overleaf.

This network will be made up of open space falling into one of three categories:

Existing Regional Open Space to be further Enhanced as Recreation Nodes

- Cherry Lake

Existing Local Open Space to be Developed and Upgraded as Recreation Nodes

- J.T.Gray Reserve, Williamstown North
- G.J.Hosken Reserve, Altona North
- Buckingham Reserve, Sunshine
- Selwyn Park, Albion
- Station Waters and the Historic Black Powder Mill, Cairnlea
- Isabella Williams Memorial Reserve, Albanvale

Proposed Recreation Nodes to be Created at High Potential Sites along Kororoit Creek

- Caroline Springs Boulevard Bridge Precinct, Caroline Springs
- Possible Future Regional Park, west of Caroline Springs
- Historic Deanside Property, Plumpton
- The Rockbank Inn Ruins Site, Plumpton
- Leakes Road Bridge Precinct, Rockbank / Plumpton
- Melton Highway Bridge Precinct, Rockbank / Melton / Plumpton
- Kororoit Creek Farm, Plumpton
- Holden Road Bridge Precinct, Plumpton / Toolern Vale / Diggers Rest

Landscape Character

In some areas, the Kororoit Creek is the only vestige of the original landscape recognisable to the community – the only ‘natural’ element remaining in an otherwise modified landscape. In this regard, improvements to the landscape character of the Kororoit Creek and its valley should also be based primarily on elements of the original landscape, particularly indigenous vegetation.

Development / improvement of the creek landscape (particularly through planting) should also reflect the landform / geomorphology of the creek valley, through careful and responsive design.

The Kororoit Creek functions as a connecting element within the diverse urban form which it bisects. This role should be reinforced through the creation of an integrated and unified landscape character, based on the use of indigenous materials and landscape elements.

Where important heritage elements (such as bridges, old buildings, exotic plantings) interact with the creek landscape, these should be preserved and treated as distinct events or nodes, contrasting with the pre-dominantly ‘natural’ character of the creek.

Important views (including structure and trees), must be protected from the visual intrusion of inappropriate elements, such as new development, utilities, signage.

While the spatial character of the creek varies along its length, adjoining spaces should be visually interlinked to lead visitors through the valley landscape, reveal key attractions and nodal points, and highlight linkages

6.7 Land Management

Land along the Kororoit Creek corridor, like other waterways, is managed by both private and public land owners. The pattern of ownership varies considerably along its length. In the Melton Shire much of the land is rural and in private ownership. There are several Crown properties leased privately. In the Brimbank City Council area a significant amount of land is either owned or managed by Council. Melbourne Water, private owners and Parks Victoria also manage land in this municipality. In Hobsons Bay, Melbourne Water and Council are the prominent land managers. The varied ownership along Kororoit Creek is reflected in the different purposes for which land is used. Areas of land in public ownership are treated as public assets. Private land holdings are generally used for agricultural or commercial uses, and the land is managed to maintain those activities.

Different ownership and management of the creek corridor presents significant challenges to implement waterway objectives and treat Kororoit Creek as one linear natural asset. Each ownership type involves different land use, values, resources and priorities.

The implications of private ownership of parts of the creek corridor include:

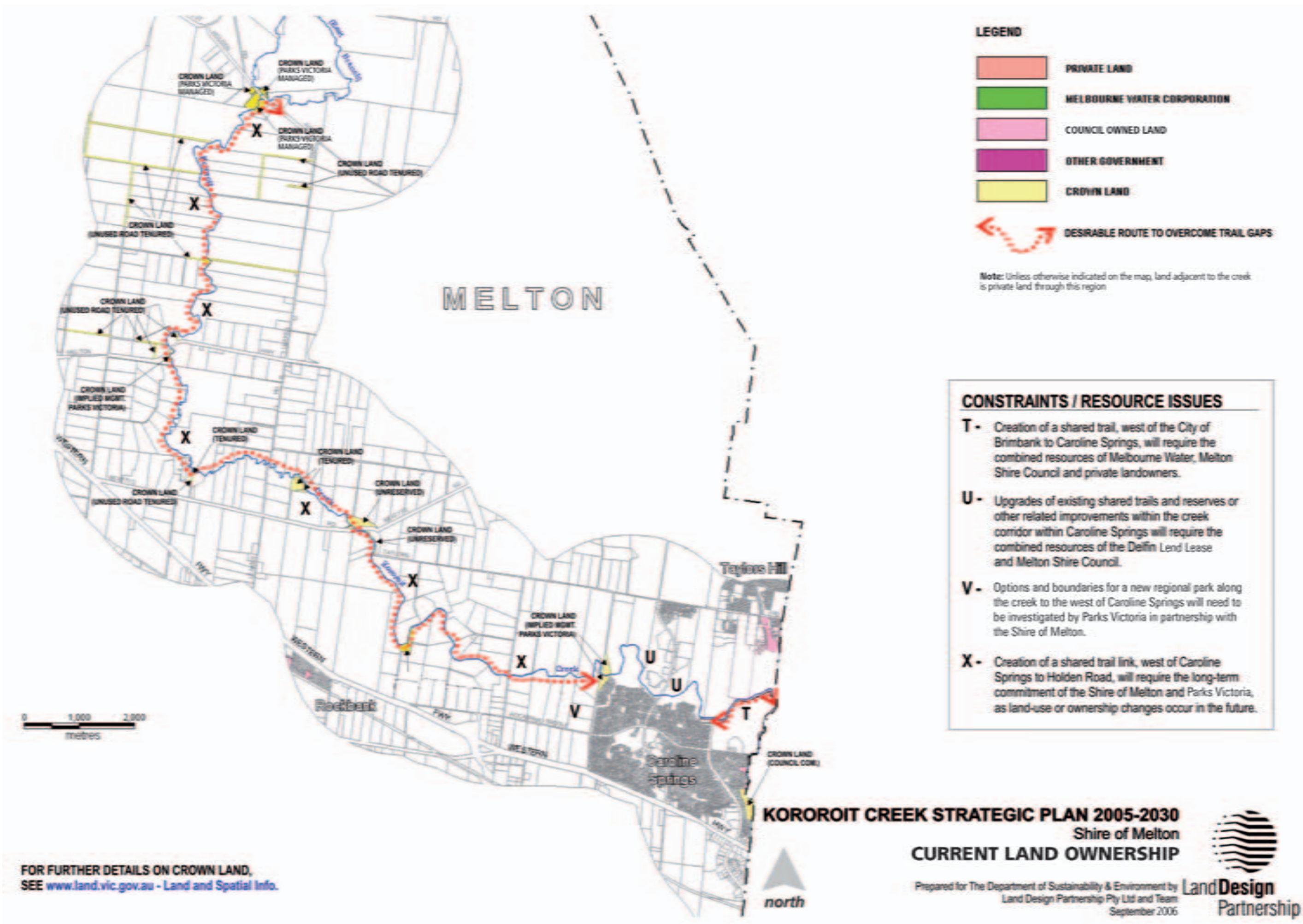
- restrictions on the planning of a continuous trail and linear park along the creek corridor. The preferred trail alignment is restricted in sections, while public access is not available on either side of the creek in other locations, such as the Orica site;
- restricted access to survey environmental values and Aboriginal archaeological sites;
- restricted access for public agencies to monitor the condition of the waterway and any adverse impacts on environmental and cultural heritage values. These values are at risk of being disturbed or destroyed;
- implementation of waterway improvement programs is limited to those owners prepared to make such undertakings (notwithstanding assistance programs such as the Tackling Weeds on Private Land Initiative);

Issues of public ownership arrangements of the creek corridor include:

- the resources of public agencies vary considerably, which may reflect in different standards of property management. A desirable standard of management may not be attainable;
- the limited capacity of agencies will restrict the ability to acquire private land to assemble a continuous trail and linear park. This issue is linked to zoning anomalies where private land is zoned Public Park and Recreation Zone where no public acquiring authority has been identified;
- the priorities of public agencies can vary and should be aligned where possible;
- leased Crown land may not be managed to desirable environmental standards. These leases provide the opportunity for review.

These constraints and issues will require a variety of responses. The role of partnerships and shared responsibility between public agencies, private land owners and community groups is an approach that should be expanded where possible.

The following plans provide an overview of land ownership along the Kororoit Creek, based on municipality.



LEGEND

- PRIVATE LAND
- MELBOURNE WATER CORPORATION
- COUNCIL OWNED LAND
- OTHER GOVERNMENT
- CROWN LAND
- DESIRABLE ROUTE TO OVERCOME TRAIL GAPS

Note: Unless otherwise indicated on the map, land adjacent to the creek is private land through this region

CONSTRAINTS / RESOURCE ISSUES

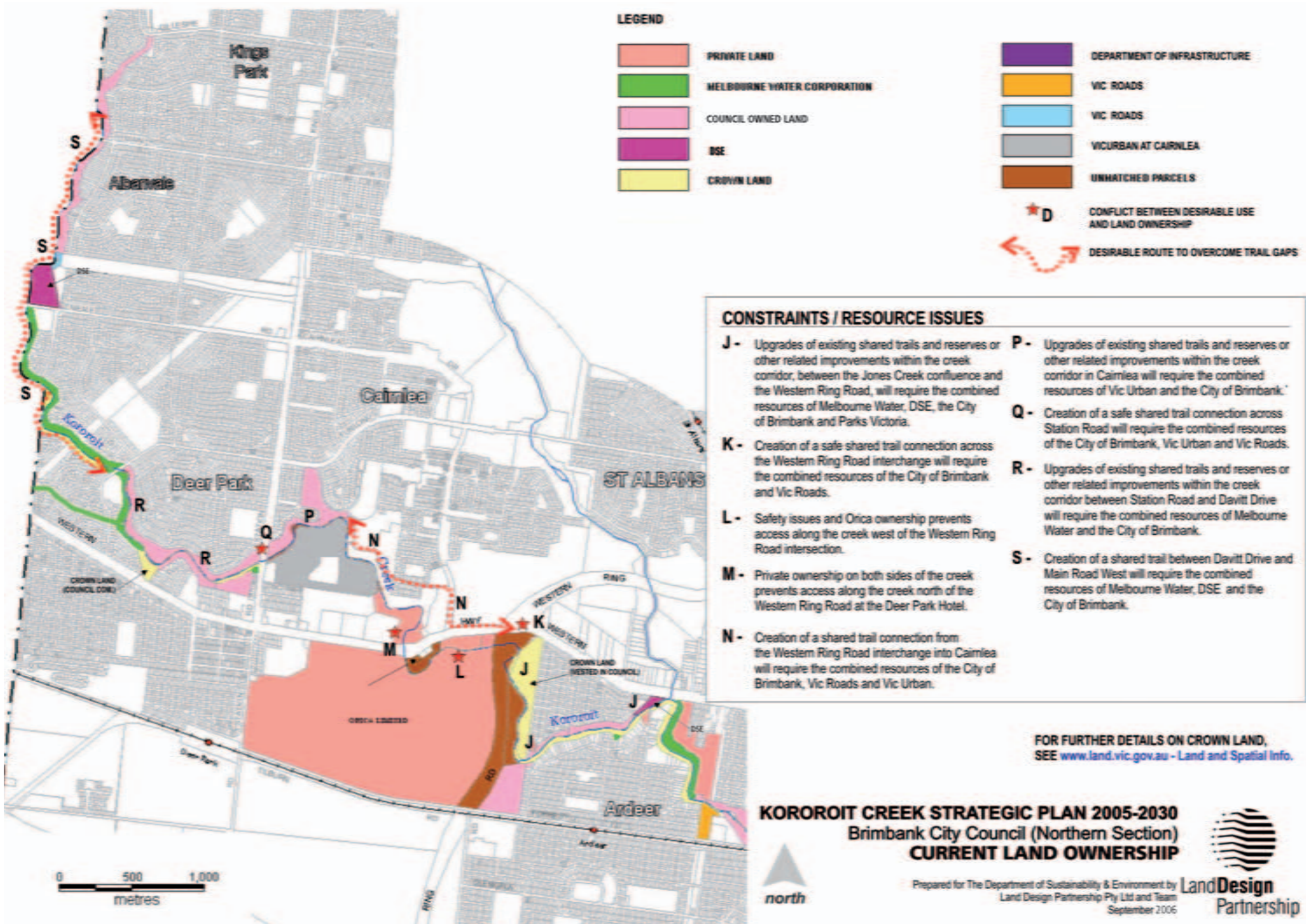
- T** - Creation of a shared trail, west of the City of Brimbank to Caroline Springs, will require the combined resources of Melbourne Water, Melton Shire Council and private landowners.
- U** - Upgrades of existing shared trails and reserves or other related improvements within the creek corridor within Caroline Springs will require the combined resources of the Delfin Lend Lease and Melton Shire Council.
- V** - Options and boundaries for a new regional park along the creek to the west of Caroline Springs will need to be investigated by Parks Victoria in partnership with the Shire of Melton.
- X** - Creation of a shared trail link, west of Caroline Springs to Holden Road, will require the long-term commitment of the Shire of Melton and Parks Victoria, as land-use or ownership changes occur in the future.

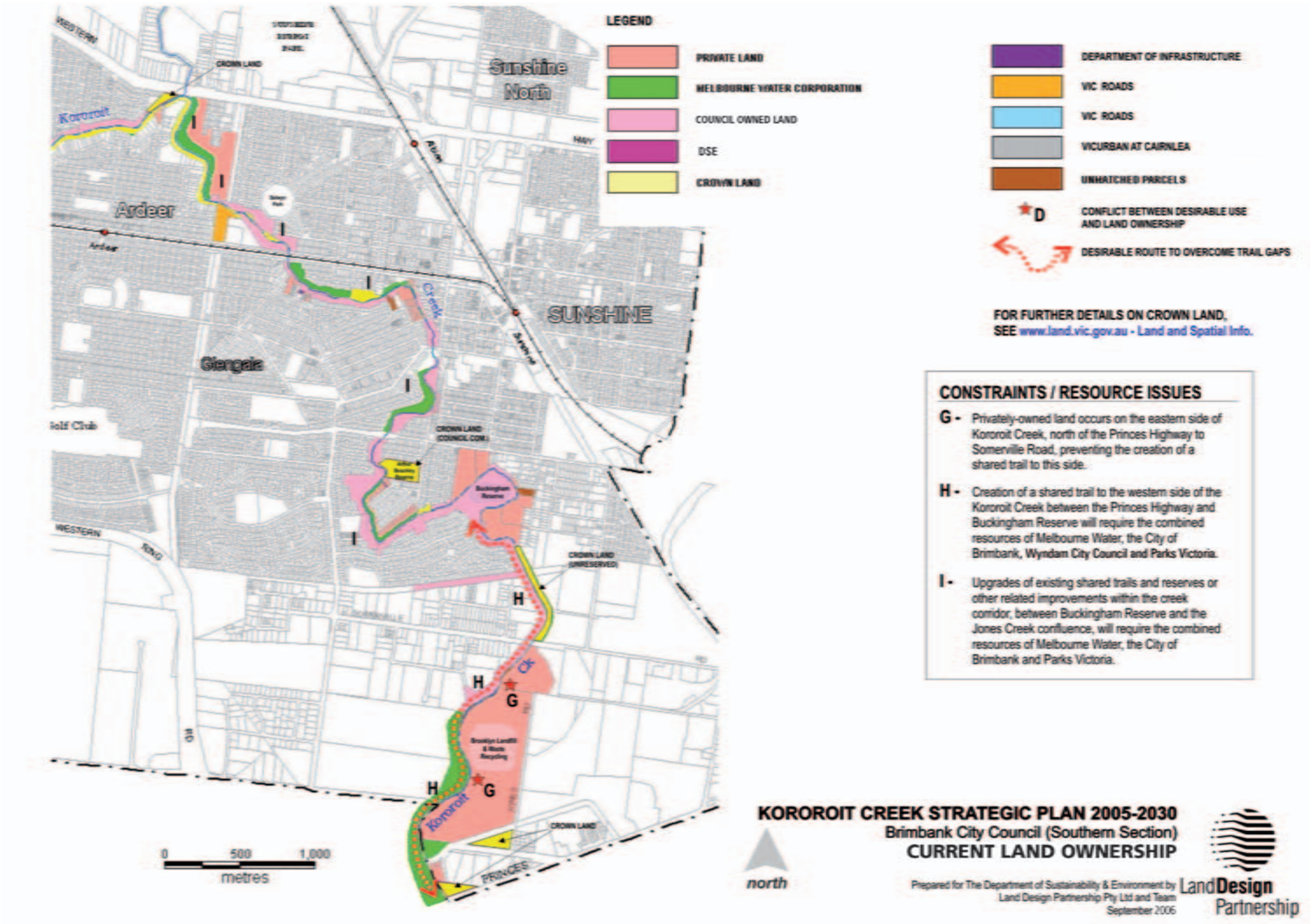
FOR FURTHER DETAILS ON CROWN LAND, SEE www.land.vic.gov.au - Land and Spatial Info.

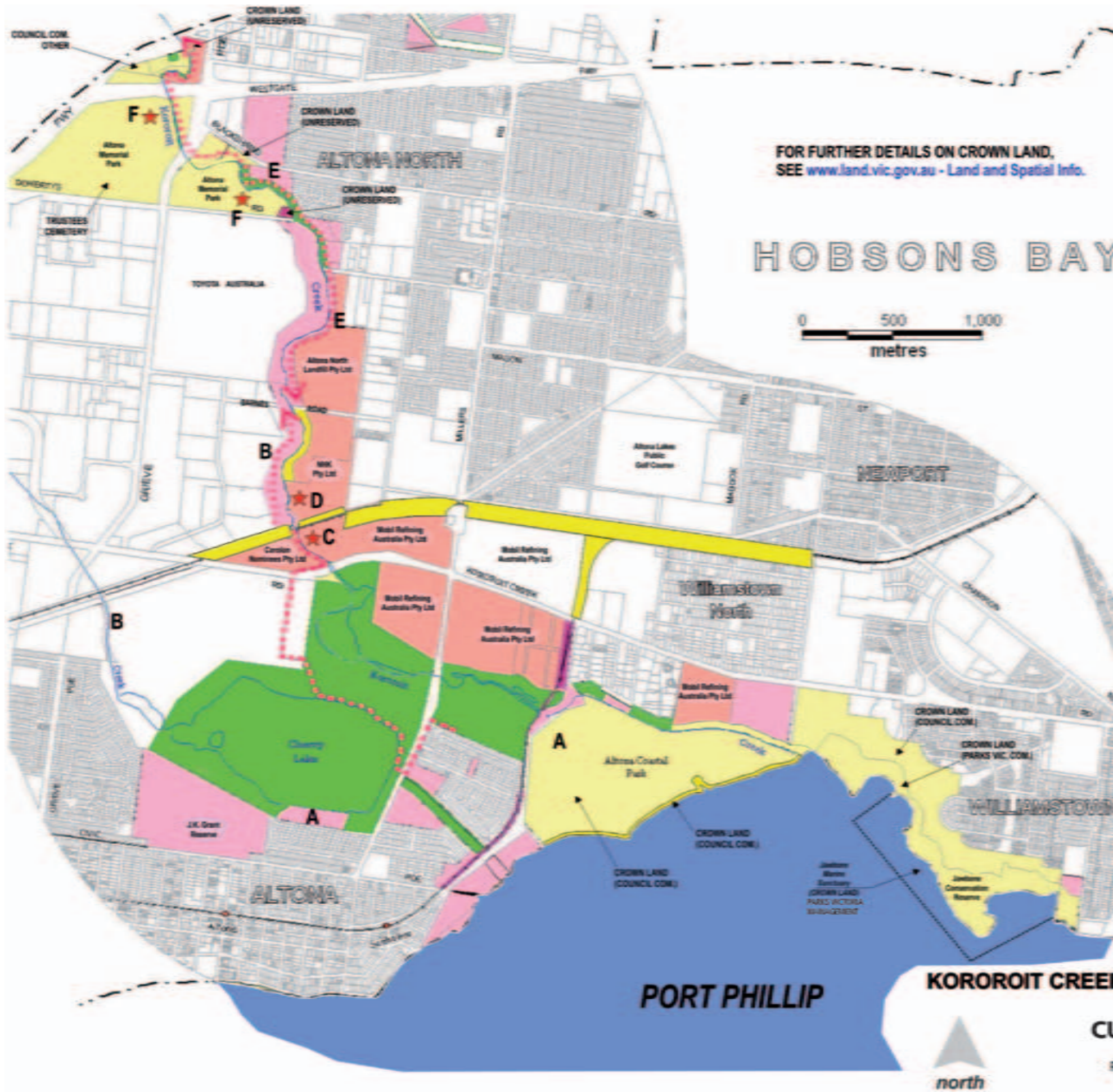
KOROROIT CREEK STRATEGIC PLAN 2005-2030
Shire of Melton
CURRENT LAND OWNERSHIP

Prepared for The Department of Sustainability & Environment by LandDesign Partnership Pty Ltd and Team
September 2006









FOR FURTHER DETAILS ON CROWN LAND, SEE www.land.vic.gov.au - Land and Spatial Info.

LEGEND

- PRIVATE LAND
- MELBOURNE WATER CORPORATION
- COUNCIL OWNED LAND
- OTHER GOVERNMENT
- CROWN LAND
- ★ D CONFLICT BETWEEN DESIRABLE USE AND LAND OWNERSHIP
- DESIRABLE ROUTE TO OVERCOME TRAIL GAPS

CONSTRAINTS / RESOURCE ISSUES

- A-** Upgrades of existing shared trails and reserves or other related improvements within the creek corridor, between Cherry Lake and the Bay, will require the combined resources of Melbourne Water, Hobsons Bay City Council and Parks Victoria.
- B-** Creation of shared trail link from Cherry Lake to the new Barnes Road Bridge will require cooperation between and/or resourcing from organisations including Melbourne Water, VicRoads, Vic Track and Hobsons Bay City Council.
- C-** Privately-owned land occurs on either side of Kororoit Creek between Kororoit Creek Road and the Melbourne / Geelong railway, with only a narrow portion (bank to bank) controlled by Melbourne Water.
- D-** Privately-owned land prevents trail creation on the eastern side of the creek, just north of the Melbourne / Geelong railway.
- E-** Creation of a shared trail link from the new Barnes Road Bridge to the Princes Highway will require cooperation between and/or resourcing from organisations including Melbourne Water, Parks Victoria and Hobsons Bay City Council.
- F-** Altona Memorial Park prevents trail creation on the southern side of the creek corridor, north of Dohertys Road.

KOROROIT CREEK STRATEGIC PLAN 2005-2030
Hobsons Bay City Council
CURRENT LAND OWNERSHIP

Prepared for The Department of Sustainability & Environment by
 Land Design Partnership Pty Ltd and Team
 September 2006

