HOBART CITY COUNCIL

# Queens Domain

## Fire Management Plan

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Prepared By

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# TERMINOLOGY

PLEASE NOTE: The bushfire terminology used in this plan can be confusing. A glossary of key terms has been included at the end of this fire management plan.

# 1. Introduction

The original fire management plan for the Queens Domain was prepared for Hobart City Council by J. B. Kirkpatrick and G. M. Blake of UNITAS Pty Ltd in 1995. The plan was first revised in March 2001 by the authors of the original plan. This revision has been prepared by AVK Environmental Management and is the second of the 5-yearly revisions recommended in the original plan. This revision follows a review of the implementation of the fire management plan carried out by AVK Environmental Management, and incorporates the changes recommended in the review (AVK Environmental Management, 2007). This includes an expansion of the plan, and other changes to bring it into line with the format of other recent fire management plans for Hobart City Council reserves.

This revised plan covers the area on the Queens Domain covered by native bushland, and some areas of exotic plantings. The total area covered by the plan is about 130 hectares (Figure 1). The plan is designed to be a working document, containing all the maps and information necessary for its immediate implementation.

To help overcome the lack of information on the long-term responses of indigenous vegetation to fire, this revised fire management plan has adopted the principles of 'adaptive management'. The plan contains a monitoring and evaluation component which will provide the information required to progressively refine the plan to ensure it is achieving its desired outcomes. In view of this, the scheduling of management burning in the fire management plan covers a 15 year period (2008 to 2023). This will allow sufficient time to implement the recommendations in the plan, and to collect enough information for an informed assessment and review. However, the plan also includes procedures to ensure that key components of the plan are continuously updated.

## 1.1 Aim of the Plan

The aim of this fire management plan for the Queens Domain is to:

a) provide recommendations for fire management practices and operational procedures which will minimise the fire threat to:
   - life and property;
   - ecological diversity;
   - the sustainability of natural systems; and
   - cultural and Aboriginal values.

b) be in accordance with Hobart City Council's policies and best management practice.

c) complement other Hobart City Council fire management plans.

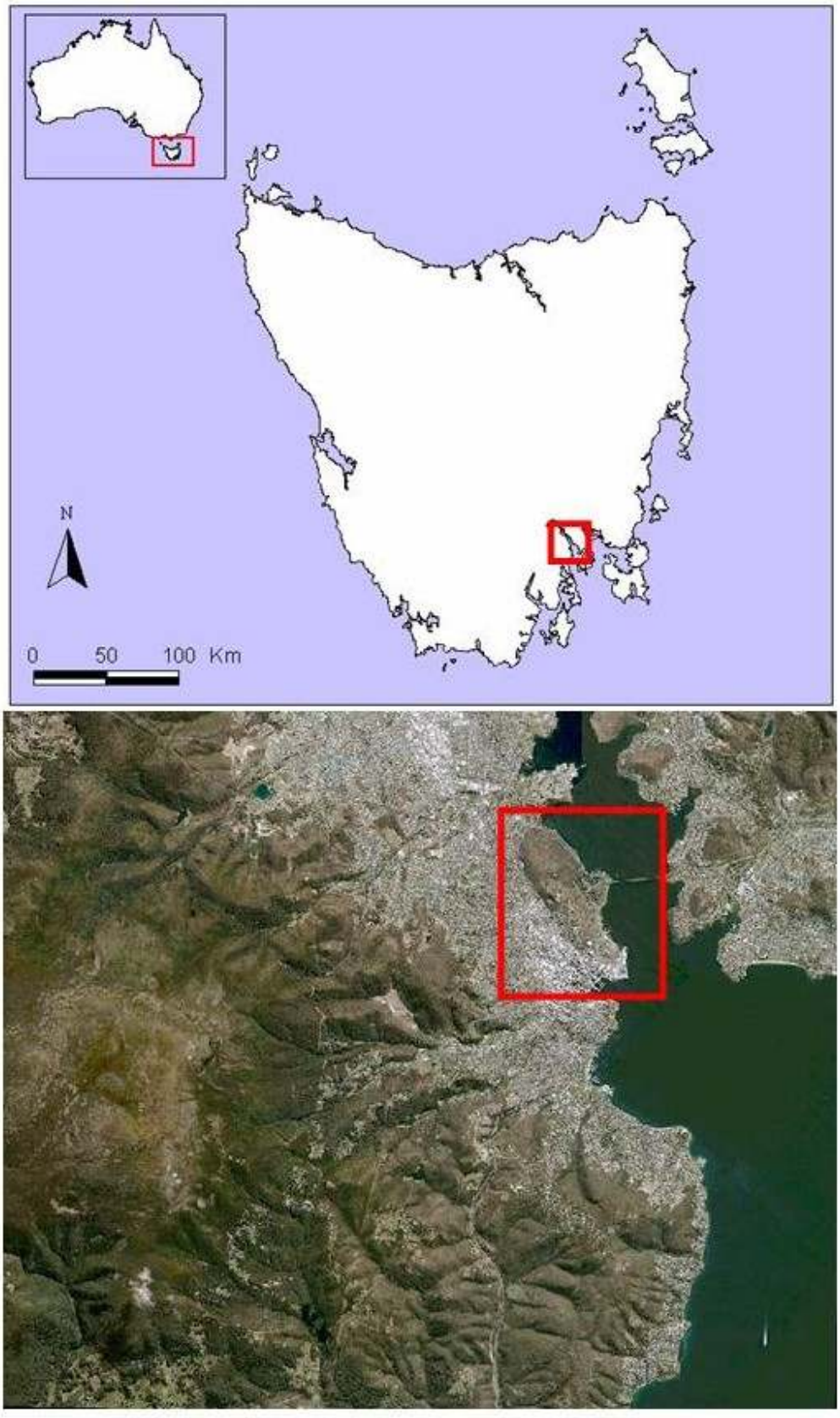



**Figure 1 – Location of the Queens Domain**

It must be noted that it will not be possible to prevent wildfires occurring on the Queens Domain. Unless these fires are suppressed when small there is a risk, depending on weather conditions, that wildfires may burn a substantial portion of the Domain causing damage to built and cultural heritage assets, environmental values, and even loss of life. This fire management plan aims to lessen these risks by minimising the risk of fires starting on the Domain, and minimising the risk of loss of life or damage to assets.

This plan also provides for the use of fire as a management tool to:

- reduce fire hazard to protect assets from wildfires
- maintain plant communities and individual species of conservation value that require fire in order to ensure their long-term viability
- assist in the removal of weeds and the regeneration of degraded bushland.

## 1.2 Structure of the Strategy

SECTION 1 outlines the AIM, SCOPE and STRUCTURE of the plan, and the necessity and advantages of fire management planning.

SECTION 2 outlines the LEGAL and POLICY FRAMEWORK for the plan including State government legislation and Council fire management policies and strategies that are relevant to fire management on the Queens Domain, as well as other relevant reports, standards and management plans. It also includes the statutory fire management responsibilities of Hobart City Council and other authorities with assets on the Domain.

SECTION 3 deals with BUSHFIRE RISKS including bushfire history and causes, hazard levels, and the risk to assets.

SECTION 4 provides an overview of FIRE MANAGEMENT ISSUES on the Queens Domain including, current bushfire management practices and community concerns.

SECTION 5 states the FIRE MANAGEMENT OBJECTIVES for this plan, based on the overall aims of the plan and specific fire management issues.

SECTION 6 covers PLAN IMPLEMENTATION, including prescribed burning, protection of assets, and evaluation and review.

SECTION 7 outlines RESEARCH that could improve fire management on the Domain.

SECTION 8 summarises the MANAGEMENT ACTIVITIES required to achieve the objectives of the plan in the form of an action table. This action table references the tables, maps and other parts of the plan needed for on-ground implementation. It should therefore be used as the primary document for implementing the plan.

Mapping of information relevant to fire suppression and fire hazard management has been done on a Geographic Information System (GIS). This will assist the Tasmania Fire Service (TFS) and other emergency services during wildfire events. The GIS maps and data fields can be updated regularly so that emergency services operating on the Queens Domain during a wildfire have access to the latest fire management information.

Use of a GIS to record the basic information for the plan will allow it to be easily updated and revised. This is essential to the adaptive management approach used in this plan, as there will be a need to modify the plan in response to:

- new information on the fire ecology of the flora and fauna species on the Domain
- the results of implementation monitoring and performance evaluations
- unplanned incidents, such as major wildfires
- changes in Council and government policy affecting fire management.

### 1.2.1 Risk Management Approach

This fire management plan broadly follows the 5Rs risk management framework recommended in the 2004 COAG inquiry into bushfire mitigation and management in Australia (Ellis et al, 2004). The COAG report adapted this from the more common PPRR framework (Prevention, Preparedness, Response and Recovery) used for emergency management in Australia to fit the requirements of bushfire management. The 5Rs framework as stated in the COAG report is:

**R**esearch, information and analysis;

**R**isk modification;

**R**eadiness;

**R**esponse; and

**R**ecovery.

The COAG report also states that: "Application of the 5Rs framework should be informed by a thorough understanding of the full range of assets that are threatened by bushfire; life and property, infrastructure and production systems, and environmental values."

It should be noted that this fire management plan is not an operations plan and does not deal directly with "Response" to bushfires. Operational procedures are dealt with in various documents prepared by the Tasmania Fire Service and other emergency services.

## 1.3 Landuse and Vegetation on the Queens Domain

The distribution of native and non-native vegetation on the Queens Domain is shown on Figure 2, and the conservation value of the native vegetation is given in Table 1. The

vegetation mapping is based on TasVeg 2000 mapping, corrected where necessary by field survey.

Table 1 – Conservation value of the native vegetation on the Queens Domain

| TASVEG COMMUNITY Version 1.0 | TASVEG Code V0.1 | STATE [1,2] | SOUTH EAST BIOREGION [1] |
|---|---|---|---|
| DPU – *Eucalyptus pulchella* forest and woodland | P | Not threatened | Not threatened |
| DGL – *Eucalyptus globulus* forest and woodland | GG | Vulnerable | Vulnerable |
| DVG – *Eucalyptus viminalis* grassy forest and woodland | V | Not threatened | Vulnerable |
| NAV - *Allocasuarina verticillata* forest | AV | Not threatened | Not threatened |
| NBA– Scrubby *Bursaria* - *Acacia* woodland and scrub | Tz | Not threatened | Not threatened |
| GTL – Lowland *Themeda triandra* grassland | Gt | Endangered | Endangered |
| GRP – Rock plate grassland | _ subsumed in Gn | Not formally assessed but likely to be significant (vulnerable?) [3] | Not formally assessed but likely to be significant (vulnerable?) [3] |

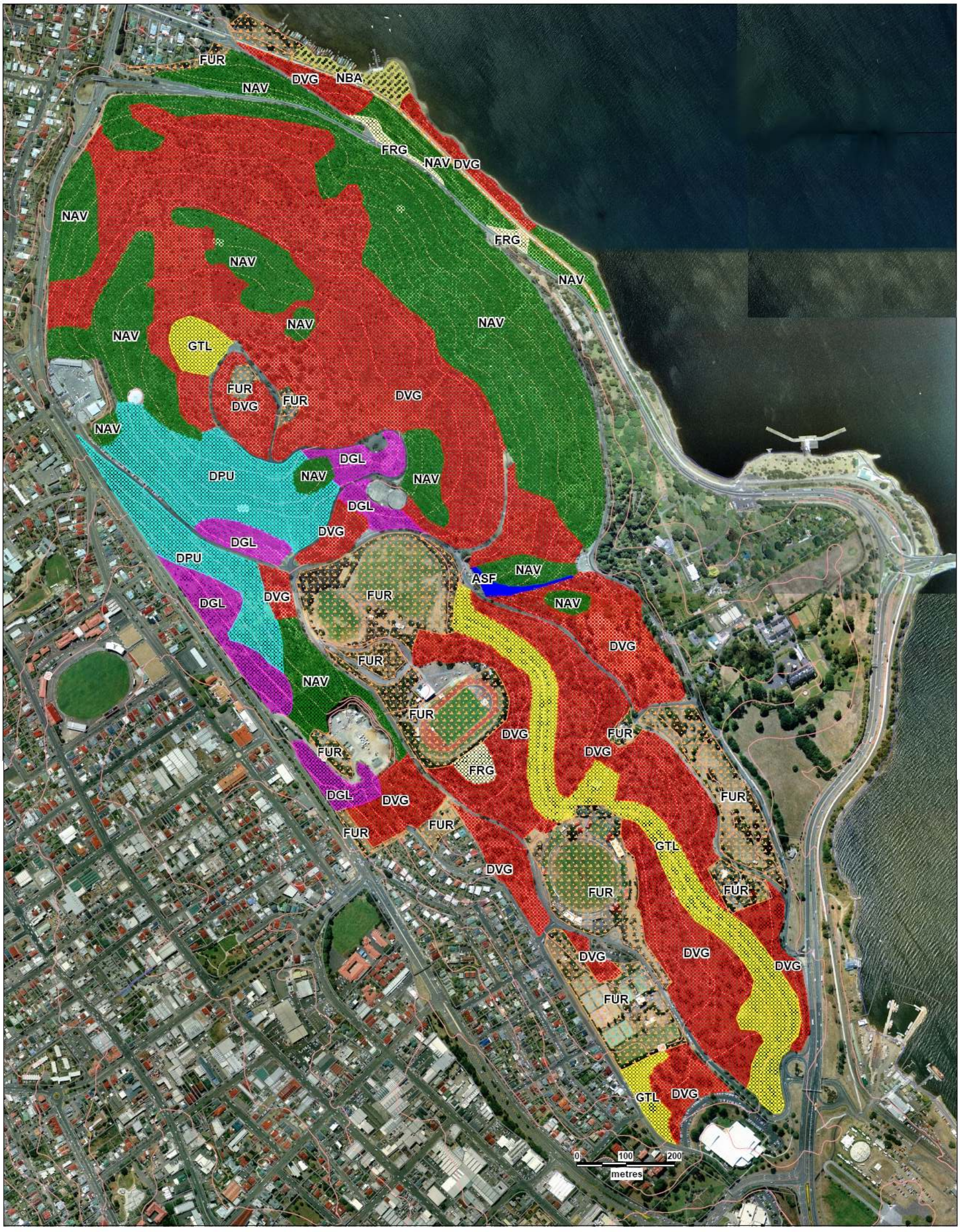
1 – CARSAG 2003 using equivalent old TASVEG mapping units, CARSAG 2004, DPIWE 2005

2 – Of these communities only DGL, *Eucalyptus globulus* forest and woodland, is listed as threatened in the Nature Conservation Act, 2002.

3 –These have been erected in the TASVEG Manual (Harris & Kitchener 2005) but have not been translated into the TASVEG map v1.0 so have not been assessed

Usage of the Queens Domain that is of particular relevance to this fire management plan are:

- residences located within or near areas of native vegetation
- sporting and other recreational activities that could be affected by fire management activities
- recreation activities that could result in people being injured by fires (eg, walking)
- infrastructure that could be damaged by wildfire (eg, buildings, fences, power lines)
- activities that increase the risk of fires starting (eg, picnicking, car dumping).




DPU - Eucalyptus pulchella forest and woodland

DGL - Eucalyptus globulus forest and woodland

DVG - Eucalyptus viminalis grassy forest and woodland

ASF – Freshwater aquatic sedgeland and rushland

NAV - Allocasuarina verticillata forest

NBA - Scrubby Bursaria - Acacia woodland and scrub

GTL - Lowland Themeda triandra grassland

FRG - Regenerating cleared land

FUR - Urban areas

**Figure 2 - Plant communities on the Queens Domain**

Revision 2, May 2008

*AVK Environmental Management*

## 1.4 Use of Fire in Sustainable Management of Bushland

Fire plays an important role in maintaining biodiversity in Australia. Changes in the fire regime (season, frequency and intensity of fire) can cause progressive changes in plant communities. Frequent fire and long-term exclusion of fire have both been shown to lead to progressive changes in plant community structure, and a reduction in biodiversity. Failure to use fire properly as a management tool can be considered a threat to some of the natural habitats on the Queens Domain.

Inappropriate fire regimes (season, intensity and frequency of fires) can cause progressive and sometimes irreversible changes in indigenous plant communities, including a loss of biodiversity. On the other hand, identification, prescription and implementation of an appropriate fire regime can be used to:

- manage indigenous flora and fauna habitats in a sustainable manner
- maintain biodiversity
- control selected weed species and promote natural regeneration in dry forest communities.

The potential risks to flora and fauna habitats from wildfire can be managed by minimising the risk of ignitions, maintaining adequate emergency vehicle access routes and other control lines, and by burning suitable areas of vegetation at different times to create a mosaic of vegetation units at different stages of recovery from fire. Adoption of a mosaic burning pattern has the following advantages:

- increases habitat diversity
- reduces overall fuel loads
- provides control lines to help in the suppression of wildfires
- reduces risk of a single, high-intensity wildfire burning large areas.

Within the mosaic of burning units the fire regime (frequency, season and intensity of fire) can be manipulated to achieve some or all of the following objectives:

- removal of woody and herbaceous weeds, and weed seeds from mid-storey, leaf litter, and soil surface
- reduction in the levels of plant nutrients, such as phosphorus and nitrogen, which may be contributing to weed invasion
- manipulation of ecological processes such as; species composition (via the promotion of selected species or communities), regeneration of senescent vegetation, and the creation of suitable conditions for native seed germination

- protection of species of conservation value by maintaining habitat elements that are critical for their survival.

It has been found that sites with accumulated forest litter support a larger and more diverse invertebrate fauna than sites where fire has reduced the litter (Suckling *et al*., 1985). If a wide range of invertebrate species is to be maintained on the Queens Domain, it is important that some patches of the different habitats on the Domain remain unburnt. These sites provide essential refugia from which recolonisation can occur (Campbell & Tanton, 1981). The optimal timing of fire for invertebrates in dry forest habitats maintained by relatively frequent burning is not known with certainty, although Hammer (1997) concludes that in dry sclerophyll forest late spring burning is likely to have the least adverse impact.

In bushland fire can be used to stimulate germination of indigenous plant seeds. She-oaks, most Eucalypts, Acacias, members of the pea family (*Fabaceae*) and many species from other plant families frequently germinate prolifically in areas which have been burnt. However, the burnt area will also be open to weed invasion and must be carefully monitored.

Frequent burning of native forests is known to reduce species diversity and make them more vulnerable to weed invasion (Williams, 1991). A high fire frequency (less than 5 years) will usually favour grasses in the understorey at the expense of shrubs, and severely restrict the re-establishment of canopy species.

In rural areas frequent burning is sometimes used to control woody weeds, and this method can also be helpful in native grasslands. However, in native bushland fire will generally increase an existing weed problem. Many woody weeds re-sprout rapidly from rootstock after fire, often coppicing densely (hawthorn, gorse). Herbaceous species (including many grasses) respond in a similar way, regenerating from growth buds on a network of robust underground rhizomes (pampas grass, bracken). Seed germination is usually prolific after fire, a response which necessitates prompt control measures, on-going monitoring, and site maintenance (gorse, boneseed, broom).

Therefore, where weeds are already a problem, prescribed burning should only be carried out after weeds have been treated, and follow up weed control can be carried out. In general, weed infested bushland areas should not be burnt if resources for post-fire weeding are not available. The exception to this is high fire hazard areas close to dwellings where burning is the only feasible method of hazard reduction.

## 1.5 Fire Hazard Reduction

As the intensity of a bushfire increases it becomes progressively more difficult to contain and suppress the fire. Very high intensity (> 4000 kW/m heat output at the fire front) fires with flame heights greater than 10 m are generally uncontrollable (NSW Rural Fire Service, 1997). The threat from a bushfire therefore increases as its intensity increases. Fire intensity is directly related to the quantity, type, and the distribution, of fine fuel (live and dead plant matter less that 6 mm diameter) available to the fire. Other factors, such as slope and moisture content of the fuel, also influence fire intensity, but the only factor that can be effectively controlled to limit fire intensity is fine fuel load.

The fire threat to infrastructure and built assets, such as dwellings, can be reduced by creating a buffer zone around the asset where fine fuel loads are maintained at low levels. Generally, these buffers consist of an inner zone around the asset with minimal fine fuel loads, and an outer zone with reduced fine fuel loads. The purpose of the outer zone is to reduce the intensity of any bushfire approaching an asset. The purpose of the inner zone is to protect the asset from flame contact and intense radiant heat. The inner zone is called the 'building protection zone', and the outer zone the 'fuel modified buffer zone'. The whole buffer can be termed a 'defendable space'. Slashing, mowing, or hand cutting of vegetation are generally the most effective methods for establishing and maintaining small defendable spaces around isolated assets, or long, narrow, defendable spaces along urban/bushland perimeters.

Protection of other assets and values, such as water catchments, views and threatened species, is generally more difficult and requires strategies that minimise the risk of wildfires starting and spreading. The main strategies are to:

- minimise the risk of wildfires igniting by removing or limiting as many potential causes of fire as possible, and
- maximising the ability of fire suppression agencies to detect and control any wildfires that do start.

Maintaining fuel loads at a low level will limit the intensity and rate of spread of wildfires, and make it easier for fire brigades to control and suppress them. Prescribed burning is generally the most effective way to reduce fuel loads over relatively large areas, or where other methods of fuel management, such as slashing, are not feasible. However, there is always a risk of prescribed burns escaping control lines and becoming destructive wildfires. In addition, some vegetation types accumulate fuel very rapidly and therefore require frequent burning to maintain fuel reduced conditions. Frequent burning can have adverse side affects, such as loss of plant communities and fauna habitat, increased erosion, and loss of visual amenity.

# 2. Policy and Legal Framework

This section outlines the statutory and policy responsibilities of Council for fire management on the Queens Domain.

## 2.1 Hobart City Council Fire Management Strategy

The Hobart City Council Fire Management Strategy was released in October 1998. This document sets out the strategic fire management objectives for the bushland areas in Hobart.

As stated in the Fire Management Strategy, Hobart City Council's Fire Management Policy is:

> "Hobart City Council will diligently exercise all its legislative responsibilities relating to fire management.
>
> Hobart City Council will implement 'Best Management Practice' fire management on all its land holdings in order to fulfil its responsibilities as a landowner, and in recognition of its role in natural area management.
>
> Fire management on property owned, or managed, by Hobart City Council will be based on sound ecological principles, and will take into account the objectives and principles of Ecologically Sustainable Development.
>
> Hobart City Council recognises the importance of regular communication between fire management agencies, landowners, and the community at large, in raising awareness of fire management issues and ensuring broad understanding of the responsibilities of different sections of the community in reducing the risk of dangerous bushfires."

The strategies for implementing this policy are stated as:

1. "Mapping of bushfire prone areas within the city to provide a basis for planning, and to ensure that development and building applications incorporate fire protection measures appropriate to the level of hazard.
2. Management of fire hazard on private property through regular inspection and issuing of Hazard Abatement Notices as required.
3. Preparation of detailed fire management plans for all bushland areas under Council's control which include provisions for the protection of life and property, fire hazard reduction, protection of threatened species and their habitats, and conservation of biodiversity.

4. Facilitate control and suppression of wildfires on Council property through provision of adequate resources for the construction, inspection and maintenance of fire trails, fire breaks, water supply points, and fire protection zones.
5. Develop and maintain a fire management data base for recording and monitoring fire history, fire hazard levels, vegetation condition, and fire management actions.
6. Monitoring of Council managed bushland areas during periods of high and extreme fire danger to quickly detect wildfires, notify the Tasmania Fire Service, and provide assistance to the Service in containing and suppressing the fire (assistance would not include active fire fighting as Council has neither the resources or appropriately trained personnel).
7. Consultation with the Tasmania Fire Service during development of fire management plans, assessment of development applications in fire prone areas, and assessment and reduction of fire hazards.
8. Consultation with affected landowners and the wider community during the development of fire management plans, and education of the community about Council's fire management practices, procedures and future directions."

## 2.2 Statutory Responsibilities

Hobart City Council has specific responsibilities under various Acts of Parliament for fire management, fire hazard abatement, and the conservation and management of native flora and fauna.

### Fire Service Act, 1979

The main responsibilities of landowners/occupiers under the Fire Service Act, 1979, are:

- to take all reasonable precautions to prevent any fire lit on their property from spreading onto neighbouring land (Section 63)
- to take diligent steps to extinguish or control any unauthorised fire on their property during a fire permit period, and to report that fire to the Tasmania Fire Service, or the Police
  (Section 64).

As well as the obligations that apply to all landowners/occupiers, Hobart City Council has a number of specific powers and obligations under this Act. These are:

- to nominate a representative to sit on the local Special Fire Area Committee (Section 55)

- to "cause the formation in its municipal area of such fire breaks as it considers necessary or desirable to arrest the spread, or to facilitate the suppression of, fires" (Section 56)
- to contribute towards the operating costs of fire brigades (Sections 79 to 95).

It should also be noted that Section 49 of the Act authorises officers of the Tasmania Fire Service to enter and inspect land for any fire hazard. Where a fire hazard is detected, the Act further empowers the State Fire Commission, or an authorised officer, to:

> "by notice in writing given to the council of the municipal area in which that land is situated, require that local council to deal with the fire danger, within such reasonable period of not less than 30 days as is specified in the notice, as if that fire danger were a nuisance under the Local Government Act, 1993."

Clause 18 (2) of the Fire Service (Miscellaneous) Regulations 1996 states that holders of permits under Section 66 of the Fire Services Act: "must, before lighting a fire in the open air that he or she is authorised by the permit to light during a fire permit period, give notice orally or in writing of the intention to light such a fire" to "the owner or occupier of any land adjoining, whether separated by a road or watercourse or not, the land on which the fire is to be lit."

### Threatened Species Protection Act, 1995

The Threatened Species Protection Act (TSPA), 1995, provides for "the protection and management of threatened native flora and fauna, and to enable and promote the conservation of native flora and fauna". Section 5 of the Act requires that:

> "A person who performs a function, or exercises a power, in the administration of a public authority must in so doing have regard to the objectives specified in Schedule 1 for the conservation and management of native flora and fauna".

Schedule 1 lists the objectives of the resource management and planning system of Tasmania, and the threatened species protection system established by the Act. These objectives include the principles of 'sustainable development'. The intent of this Act makes protection of threatened species a major objective of any fire management plan in the State.

Section 51 (a) of the TSPA states that: "A person must not knowingly, without a permit - take, trade in, keep or process any listed flora or fauna". The TSPA defines 'take' as including: "kill, injure, catch, damage, destroy and collect". Landowners and Councils may therefore be required to obtain a permit from the Department of Primary Industries and Water to carry out prescribed burning that may affect any of the species listed in the Act.

### Land Use Planning and Approvals Act, 1993

Hobart City Council has a responsibility under this Act to produce planning schemes, and other legal planning documents, to guide the development of the city. Although fire protection is not specifically mentioned in this Act, Section 20 - 1c & 2f of the Act allows a council planning scheme to define bushfire prone areas and require developments within these areas to include bushfire protection measures. Section 48 of the Act requires Council to enforce compliance with its planning scheme.

### Local Government (Building and Miscellaneous Provisions) Act, 1993

Under Section 55 of this Act, a council has the power to attach "any terms and conditions it considers appropriate" to a building approval. This would include provisions relating to fire protection. Section 56 of this Act gives a council the power to impose "any restrictions, limitations or conditions it considers appropriate" on developments.

### Local Government Act, 1993

Section 93 of the Act allows a council to impose a service rate on rateable land for the purpose of providing fire protection.

Section 200 of the Local Government Act requires a council to issue a hazard abatement notice whenever it is satisfied there is, or is likely to be, a fire risk on any privately owned land. If the person served with an abatement notice fails to comply with the notice within the specified time, the council is empowered under Section 201 of the Act to carry out the action specified in the notice, and recover the cost from the owner or occupier of the land.

### Environmental Management and Pollution Control Act, 1994

The objectives of the Act as stated in Schedule 1 of the Act includes;

> "3(c) to regulate, reduce or eliminate the discharge of pollutants and hazardous substances to air , land or water consistent with maintaining environmental quality"

Section 96C of this Act allows the Parliament to make environment protection policies for the purpose of furthering any of the objectives of the Act. Policies that affect fire management activities include the State Air Quality Policy and the State Water Quality Management Policy.

### Environment Protection Policy (Air Quality), 2004

Clause 17 of the State Air Quality Policy covers "planned burning" which includes low intensity burning for fuel reduction and ecological management, but does not include backburning to control wildfires. Clause 17 of the policy states that:

> "(2) Persons or organisations involved in the conduct of planned burning or in the preparation of management guidelines for such operations must take

account of the health and amenity impacts of smoke pollution on individuals and the community.

(3) Best practice environmental management should be employed by those persons undertaking planned burning to minimise the effects of smoke pollution on individuals and the community. This includes, but is not limited to, complying with the State Fire Management Council Guidelines on high intensity and low intensity burning.

(4) Where practicable, agencies, companies or organisations undertaking burning on a regular basis or on a large scale should:

(a) adopt efficient and effective air quality monitoring programmes;

(b) adopt a uniform approach to recording and assessing complaints;

(c) focus upon minimising the impact of smoke on the community in terms of health, amenity and safety;

(d) encourage the planning and execution of planned burning in a way that minimises the generation of smoke and improves the management of the effects of smoke; and

(e) require a responsible person involved in planned burning for land management to be competent in relevant burning procedures."

The State Fire Management Council Guidelines for low intensity prescribed burning advises that:

"The effects of smoke from planned fires should be considered when preparing burning plans, taking account of the probable wind direction. Where practicable, smoke mitigation strategies should be used including: prescribing favourable wind direction; ensuring that fuels are dry; limiting the size of the burning area; limiting the number of areas lit at the same time within the same airshed; allowing time for areas to burn out prior to evening inversions, particularly late in autumn ; avoiding planned fires coinciding with public events; avoiding week-ends and Public holidays; providing information to the public."

The State Air Quality Policy also requires that a uniform approach to recording and assessing complaints be developed. This will be implemented through the Tasmanian Air Quality Strategy.

### Tasmanian Air Quality Strategy, 2006

The Tasmanian Air Quality Strategy has been established under the Environment Protection Policy (Air Quality) to guide the management of air quality in Tasmania. The overall aim of the Air quality Strategy is to "to achieve compliance with the National Environment Protection (Ambient Air Quality) Measure Standard and Goal for $PM_{10}$ particles, in line with the stated requirements of the Environment Protection Policy (Air Quality)".

Objective 13 of the plan deals with smoke management from planned fires and aims to:

> "Improve the management of smoke from planned burning in accordance with the Environmental Protection Policy (Air Quality) 2004 by:
>
> (a) Establishing smoke management procedures for planned burning;
>
> (b) Incorporating smoke management procedures into the Forest Practices Code;
>
> (c) Improving the co-ordination of planned burning to minimise smoke impacts; and
>
> (d) Investigating the most appropriate way to manage and respond to complaints relating to planned burning."

The plan estimates that only about 3% of particulate ($PM_{10}$) emissions in Tasmania come from management burns and wildfires, however it also notes that poor planning and coordination of planned burns can lead to short-term exceedance of air quality targets.

The plan also notes that:

> "Although fuel reduction burns may impact on air quality, it is recognised that this practice reduces the likelihood of wildfires that could have more significant impacts such as property destruction."

It should also be noted that Section 66 of the Fire Service Act states that:

> "a person who lights and controls a fire in accordance with the conditions of a permit granted to that person under this section is exempt from the Environmental Management and Pollution Control Act 1994."

Implementing the air quality policy and plan will require management burns on the Queens Domain to be coordinated with other management burns in the area, and to be carried out when weather conditions will help to disperse the smoke.

### State Water Quality Management Policy, 1997

One of the objectives of the State Water Quality Management Policy is to:

> "6.1(b) Ensure that diffuse source and point source pollution does not prejudice the achievement of water quality objectives and that pollutants discharged to waterways are reduced as far as is reasonable and practical by the use of best practice environmental management"

Clause 31.4 of the policy under the section dealing with diffuse sources of pollution states that:

> "Codes of practice or guidelines required by this Policy in respect of specific activities with the potential to impact on stream-side land should pay specific attention to defining appropriate stream-side buffer strips and acceptable management practices within these strips. Strategies and incentives, including

economic instruments, to encourage the retention and/or improved management of streamside vegetation should be investigated."

In relation to the construction and maintenance of fire trails, Clause 35.1 of the policy states that:

"35.1 Road construction and maintenance operations will be carried out in accordance with the guidelines or code of practice developed pursuant to clause 31.3 of this Policy, or employ other measures consistent with best practice environmental management, to prevent erosion and the pollution of streams and waterways by runoff from sites of road construction and maintenance."

The only codes of practice under the Water Quality Management Policy that are relevant to construction and maintenance of service trails is the *Wetlands and Waterways Works Manual* (DPIWE, 2003).

### Aboriginal Relics Act, 1975

Section 14 of the Act provides for the protection of sites with Aboriginal relics:

**"14. Protection of relics**

(1) Except as otherwise provided in this Act, no person shall, otherwise than in accordance with the terms of a permit granted by the Minister on the recommendation of the Director –

**(**a) destroy, damage, deface, conceal, or otherwise interfere with a relic;

(b) make a copy or replica of a carving or engraving that is a relic by rubbing, tracing, casting, or other means that involve direct contact with the carving or engraving;

(c) remove a relic from the place where it is found or abandoned;

(d) sell or offer or expose for sale, exchange, or otherwise dispose of a relic or any other object that so nearly resembles a relic as to be likely to deceive or be capable of being mistaken for a relic;

(e) take a relic, or cause or permit a relic to be taken, out of this State; or

(f) cause an excavation to be made or any other work to be carried out on Crown land for the purpose of searching for a relic.

(2) A permit under subsection (1) is of no effect if, to the knowledge of the holder thereof, the relic to which it relates has been acquired or dealt with in contravention of this Act.."

A permit will therefore be required for any fire management works that may affect Aboriginal relics on the Domain.

### Weed Management Act, 1999

This act provides a legislative framework for weed management throughout Tasmania. It includes a list of "Declared Weeds" which have statutory "Weed Management Plans" outlining how they are to be controlled. Actions in Weed Management Plans can be enforced through the Act.

## 2.3 National Standards and Guidelines

The following documents prepared by Standards Australia deal with bushfire protection issues at a national level:

- Australian Standard 3959 - 1999, Construction of Buildings in Bushfire Prone Areas
- Standards Australia Handbook 36 - 1993, Building in Bushfire Prone Areas.

Australian Standard 3959 is referenced in the Building Code of Australia and provides construction techniques to improve building resistance to varying levels of bushfire attack by wind-blown burning debris, radiant heat and direct flame contact. The Standards Australia Handbook 36 (Ramsay and Dawkins, 1993) provides general advice on siting, landscaping, design and construction of buildings in bushfire prone areas.

## 2.4 1995 Fire Management Plan

The first fire management plan for the Queens Domain was prepared by J. B. Kirkpatrick and G. M. Blake of UNITAS Pty Ltd in 1995. This plan was revised in March 2001 by the authors of the original plan. The original fire management plan included all the areas of indigenous vegetation on the Queens Domain. The Hobart Botanic Gardens and the grounds of Government House were not included in the plan.

The 4 objectives of the 1995 fire management plan were:

1. "To use planned fire, or the planned absence of fire, to maintain the native biodiversity of the Domain, with particular emphasis on rare or threatened species and communities.
2. To use planned fire as one tool in an integrated process for the control of threatening exotic plant species.
3. To maintain large exotic and native trees that provide habitat for rare and threatened species and to ensure their long-term replacement.
4. To maintain fallen logs that provide an important habitat for invertebrate species."

The fire management plan proposed 8 actions to achieve these 4 objectives:

1. "Burn the compartments shown on Figure 2 at the times indicated in Appendix 1
2. After any unplanned fires vary the fire action plan in Appendix 1 using the rules in Appendix 3.
3. Herbicide gorse (*Ulex europaeus*) and other invasive woody weeds that resprout after fire in the year before each burn and in the year after each burn.

4. In the three months before any burn ensure that any large eucalypts with hollows at the base of their trunk have a low fuel zone of 2 m radius from the hollow taking care not to damage native plants in the process.
5. In the three months before each burn ensure that planted exotic conifers have a low fuel zone that would protect them from fire, while ensuring that rare and threatened species beneath their canopies are not damaged.
6. At the time of burning ensure that any large logs on the ground are in a low fuel zone.
7. Monitor the impacts of different fire regimes by setting up paired replicate permanent monitoring plots over the boundaries of compartments.
8. Review this plan in 2005."

The 1995 fire management plan was implemented by dividing the native vegetation on the Domain into 24 fire management compartments (see figure 3), and prescribing a fire regime for each. To meet action 8 in the 1995 fire management plan, the plan was reviewed in 2006 by AVK Environmental Management (AVK Environmental Management, 2007). The review found that, in general, the plan has only been partly implemented, particularly in the first 5 years of its operation when only a few of the scheduled burns were carried out. The review made 20 recommendations for revising the original fire management plan. These form the basis for this revised plan.

## 2.5 Other Management Plans

Three management plans (other than the bushfire management plan) address bushfire management issues on the Queens Domain.

### 2.5.1 Queens Domain Management Plan

The Queens Domain Management Plan (de Gryse 1996) was prepared in 1996 and is currently being reviewed and revised. The plan confirmed the high conservation value of the indigenous vegetation on the Domain, as well as its cultural heritage values. The plan speculated that the grassy woodland vegetation covering much of the Domain is a remnant of a more extensive land system along the Derwent Valley that Aborigines maintained by frequent burning. The plan recommended implementation of the original fire management plan, and the linking of weed control with management burns.

### 2.5.2 Soldiers Memorial Avenue Management Plan

The Soldiers Memorial Avenue Management Plan was prepared by Hobart City Council in 2004. The main aims of the plan are the rehabilitation and on-going management of the avenue. This includes replacement of commemorative plaques, and replanting of memorial trees that have died, or are in poor condition. The plan notes that there is evidence of damage to some of the memorial trees due to past fires. The plan also notes that the management burns carried out in the Domain will not achieve sufficient hazard

reduction to protect the memorial trees on the Soldiers Memorial Avenue. Recommendation 12 in the plan deals with fire management and has two parts:

> "(a) The next revision of the Queens Domain Fire Management Plan to incorporate Soldiers Memorial Avenue as a separate vegetation management unit where burning is excluded.
>
> (b) Slashing of Soldiers Memorial Avenue to extend seven metres beyond the outer row of cedars to provide fire protection.

This recommendation has been incorporated into this revised plan.

### 2.5.3 Cultural Heritage Management Plan

The Queens Domain Cultural Heritage Management Plan was prepared for Hobart City Council by Austral Archaeology Pty Ltd in 2002. This plan includes an Aboriginal cultural heritage assessment of the Domain (Stanton, 1999). Recommendations on the management of Aboriginal heritage that are relevant to fire management include:

> "1. That steps be taken to ensure that, in future, Aboriginal sites and values of the Queens Domain are protected and managed in conjunction with the Aboriginal community, by ensuring the effective and proper involvement of the TALSC in future management processes."
>
> "2. All future ground disturbing activities or physical works should avoid the areas of known sites, and any such activities which are proposed in the sensitive zone between the foreshore and the 50 m contour should be preceded by consultation with the TALSC in order to determine if a physical assessment by an Aboriginal Heritage Officer is required prior to works being undertaken.
>
> "4. That native grasslands on the Queens Domain be maintained as an important Aboriginal cultural value which provides an association between the modified landscape today and the Aboriginal landscape which was sustained in the area for many thousands of years."
>
> "5 In the event that any Aboriginal sites are located during any surface, subsurface or general landscape disturbances arising from works or other activities on the Queens Domain, then work must cease and the TALSC and the PWS informed in order to enable further assessment of the situation."


**Figure 3 - Fire management compartments in the 1995 fire management plan**

# 3. Bushfire Risks

## 3.1 Fire Climate and Fire Weather

Bad fire weather can be expected from time to time in southern Tasmania when dry winters and springs are followed by summers where fuels are very dry. The strong north-westerly winds that often precede cold fronts in summer can contain dry air from the interior of the Australian mainland. These winds pick up some surface moisture crossing Bass Strait, but as the air stream descends from the Central Highlands dry air at a higher altitude descends to the surface resulting in extremely low humidity. This combination of strong winds and low humidity creates the ideal meteorological conditions for major wildfires. Fires that start under these conditions can be expected to move quickly downwind, and then move more or less at right angles on a broad front when the subsequent south-westerly wind change arrives. These fires can reach a very high intensity in a short time, even in areas with relatively low fuel loads, and are very difficult to control until the weather conditions abate.

If a high pressure system is blocked in the Tasman Sea, strong dry northerly winds can persist for days (Kirkpatrick, 1996). These were the conditions that produced the 1967, 1998 and 2006 bushfires around Hobart. North-west to south-east orientation of the Queens Domain means that it is particularly vulnerable to a major fire running the whole length of the Domain.

## 3.2 Bushfire History

The fire history of the Queens Domain before the arrival of Europeans is not known precisely, however, it is accepted that fire over a period of thousands of years has been instrumental in affecting the present distribution of vegetation types in Tasmania (Tasmanian Fire Review Committee, 1994) with more fire resistant types in drier areas, and less fire tolerant species in wetter sheltered sites.

Generally, Aboriginal Tasmanians were shrewd users of fire and used it widely for hunting and access. Relatively frequent Aboriginal burning in the region was noted by early visitors and settlers (McConnell et. al., 1998). It is known that the frequency of fires in some Tasmanian vegetation types increased after Europeans arrived, at least until the 1980s.

### 3.2.1 Recent fires

The draft development and management plan for the Domain prepared by Hobart City Council in 1982 (Green, 1982) states that:

> "In 1971 – 1972 almost the entire Domain was burnt by a series of fires which were deliberately lit. In 1974 the majority of the Domain was burnt to remove the fire hazard. Since 1974 only small areas have been burnt and no large scale burning for hazard reduction has occurred over the last four years."

There is no record of the actual area burnt by the fires referred to in this draft plan. Kirkpatrick (1986) stated that: "Fires burned most of the north-west of the park between 1965 and 1974" and mapped areas burnt from a series of aerial photos taken between 1965 and 1984. The fire information in Kirkpatrick (1986) does not support the statement by Green (1982) however there are no aerial photos available for 1971 or 1972 and it is possible that fires in grassland areas during these years would not be visible in the next available photo taken in 1973.

The 1995 fire management plan includes information on the extent of fires during the 1980s and 1990s. The Tasmania Fire Service has records from 1993 to the present, however they have only recently started to map the actual area burnt. Recent wildfires and management burns on the Domain are shown on figure 4.

There are no records of any damage to built assets from fires on the Domain.

## 3.3 Bushfire Causes

Data supplied by the Tasmania Fire Service were used to analyse the causes of fires on there Domain, from 1993 to 2006. As well as vegetation fires, the records for vehicle fires were also examined to determine if car dumping is an important cause of wildfires on the Domain.

Tasmania Fire Service records show 60 vegetation fires and 7 vehicle fires were attended on the Domain between 1993 and 2006 (figure 4). Note that the TFS only records the location of fires to the nearest 100 m, so the fire locations on Figure 3 only indicate the general area of the fire.

A breakdown of the causes of the vegetation fires is given in Table 2.

**Table 2 - Causes of vegetation fires on the Queens Domain from 1993 to 2006**

| CAUSE | NUMBER | % |
|---|---|---|
| Unknown | 20 | 33 |
| Malicious/suspicious | 19 | 32 |
| Burning off | 9 | 15 |
| Discarded cigarette | 4 | 6 |
| Re-ignition of previous fire | 3 | 5 |
| Spark from equipment, cutting, grinding, welding etc. | 3 | 5 |
| Camp fire | 1 | 2 |
| Short circuit | 1 | 2 |
| **Total** | **60** | **100%** |

The analysis in Table 2 shows that deliberate lighting of fires is by far the major cause of vegetation fires on the Queens Domain. The relatively high percentage of ignitions classified as "burning off" may not indicate a problem with control of management fires, as this category probably includes a number of management burns where the TFS provided assistance. This indicates that it should be possible to achieve a significant reduction in fire through public education and vigilance.

Ignition points are fairly well scattered over the whole Domain though there are noticeable concentrations on the lower north-eastern slopes, and just to the north of the TCA ground. Vehicle fires are not frequent enough to be considered a significant risk factor on the Domain.


★ Vegetation fire

◆ Vehicle fire

Records supplied by the Tasmania Fire Service.
Actual location may be up to 100 m from the point shown.
Note that this figure only shows records within the Domain.

**Figure 4a - Past wildfires on the Queens Domain**

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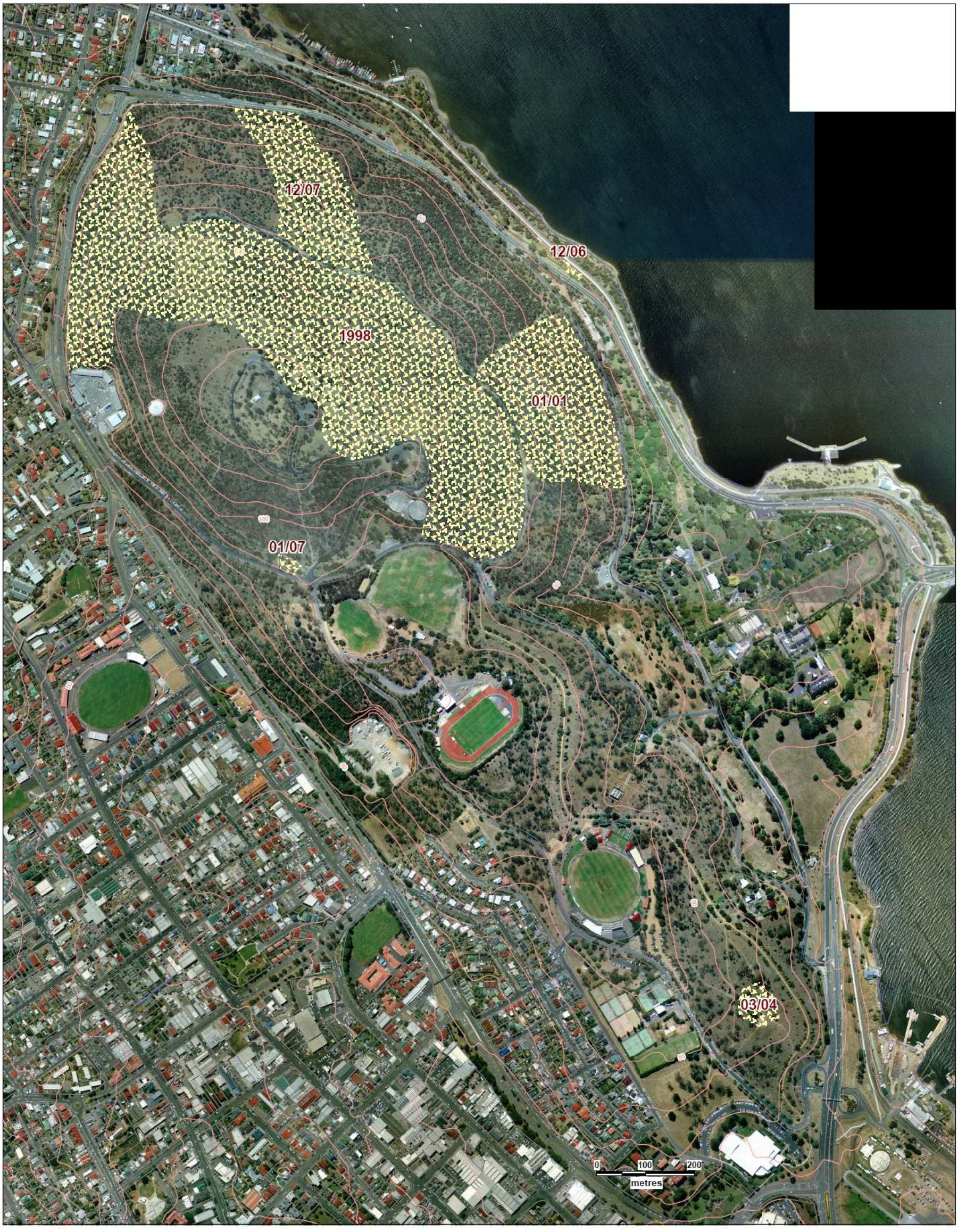
Fires before 1995

**Figure 4b - Past bushfires on the Queens Domain**




Wildfires between 1995 and 2007

**Figure 4c - Past bushfires on the Queens Domain**

Note that this figure only shows wildfires whose extent is known. Figure 4a shows that other wildfires have occured on the Domain during this period, but either the area burnt was relatively small, or the extent of the fire was not recorded.

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Management burns between 1996 and 2006

**Figure 4d - Past bushfires on the Queens Domain**

## 3.4 Current Hazard Levels

The higher the intensity of a wildfire the greater its destructiveness and the more difficult it is to control. Fire intensity is a function of the heat content of the fuel, the quantity of fuel (fuel load), and the rate of spread of the fire. The heat content of vegetation fuels is roughly constant, so fire intensity is largely determined by slope and weather conditions (wind speed and relative humidity), and fuel quantity and distribution.

Fine fuels are the main factor influencing fire behaviour (larger fuels burn during a fire but do not contribute significantly to the spread of main fire front, though they may be a source of embers that start spot fires ahead of the main fire front). Fine fuels consist of live and dead plant matter (including grasses, bracken, leaves, bark, and twigs and branches) less than 6 mm in diameter. This measure normally includes any fine fuel in the understorey as well as litter on the ground. Fine fuel load (measured in tonnes per hectare) is therefore used as a convenient measure of the underlying fire hazard in a particular area. The fine fuel load at any given time is a balance between the rate of fuel build up, and factors that remove fuel, such as litter decomposition and fire. In the absence of fire, fuel loads build up to a maximum level where the rate of fuel production equals the rate of decomposition. This theoretical maximum varies for different vegetation types, however it is rare for dry eucalypt forests and woodlands to reach their maximum fuel loadings due to relatively frequent fires.

Fuel loads can be roughly categorised in terms of the potential threat they pose as follows:

Low - < 5 tonnes per hectare

Medium - 5 to 15 tonnes per hectare

High - >15 tonnes per hectare.

Fine fuels over most of the Domain are dominated by grasses, except where there is a dense cover of she oak. With grass fuels the degree of curing of the grass is generally a more important component of the bushfire hazard than fuel loads. Curing refers to the gradual drying out of grass leaves and stems during summer. Grasses are usually fully cured at the end of summer and become highly flammable. Seasonally, variations in rainfall can alter the usual annual cycle of grass growth and curing. Sometimes a standing crop of cured grass can persist over winter and be a fire hazard in spring. Grass fuels decompose in a few years and there is generally not a long-term build-up of fuels as occurs in forest vegetation. However, in grassy woodlands such as occur on the Domain, there is a steady build up of litter, particularly under trees, which increases the fire hazard when the grasses are cured.

## 3.5 Bushfire Threat

The main bushfire threat to the Queens Domain is considered to come from fires starting around the northern perimeter, or on the northern slopes of the Domain. Under extreme fire weather conditions, a fire starting in this area would be very difficult to control and could run the whole length of the Domain.

Although it should be possible to reduce the incidence of ignitions on the Queens Domain, the threat of a large bushfire will remain. Therefore one of the aims of this plan is to improve the ability of the TFS to quickly contain any fires that start on the Domain.

## 3.6 Assets at Risk from Fire

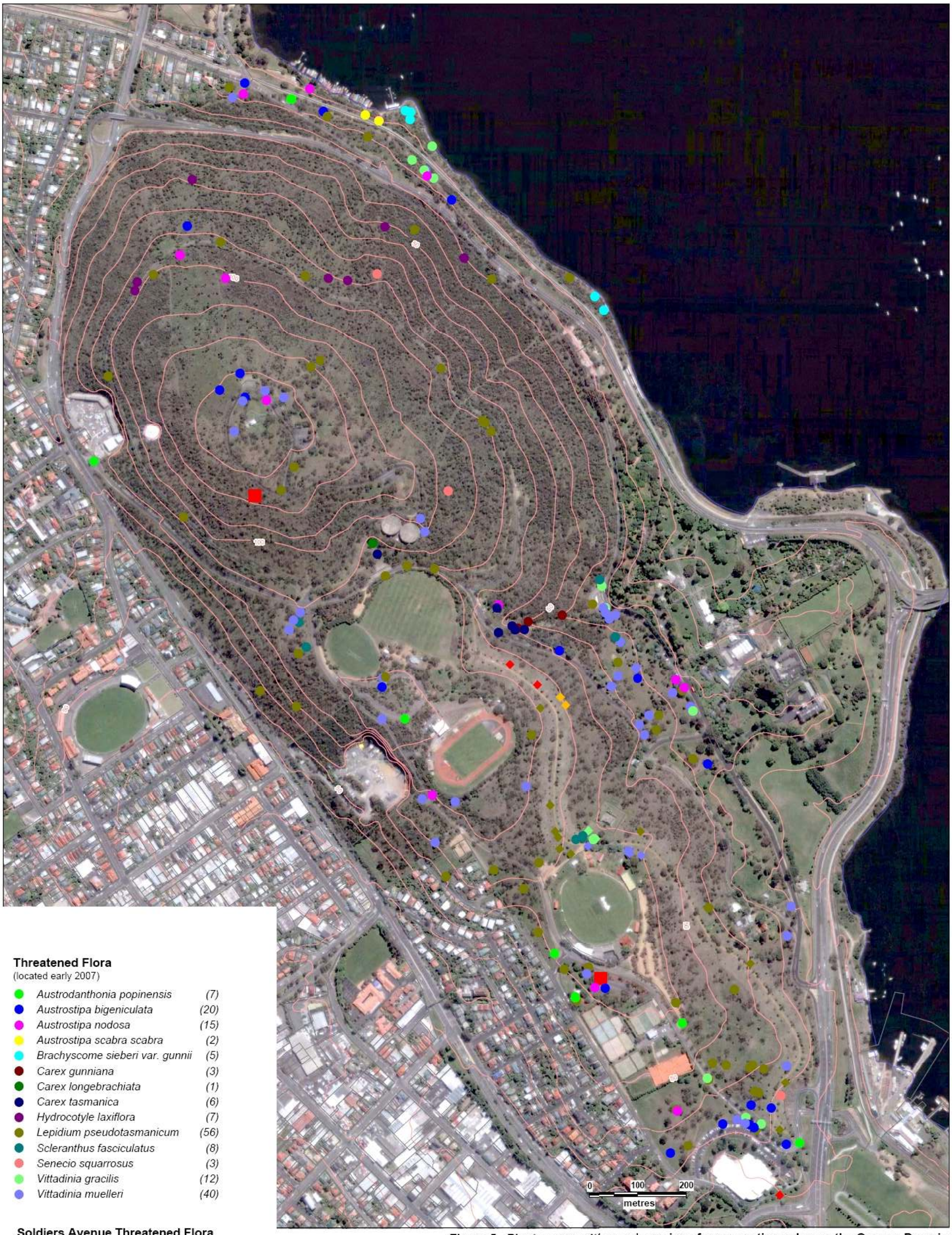
Assets potentially at risk from fire include; dwellings, infrastructure, and other items (such as ornamental plantings) which would cost money to replace; as well as items of scenic, cultural and natural heritage value which could be damaged or destroyed by fire, or fire suppression activities.

### 3.6.1 Bushfire Risk to Natural Heritage Assets

Natural heritage assets include native flora and fauna, as well as scenic values. This plan minimises the risk of fire damaging these assets through measures to minimise the risk of wildfires starting, and ensuring that any prescribed burns are of low intensity to limit canopy scorch, and not so frequent as to prevent the existing tree cover regenerating.

The location of known plant communities and species of conservation value on the Domain is shown on figure 5 and in appendix A. Figure 5 shows the location of species that were located during this study, not previous records. Figure 5 also shows the results of the latest survey of threatened species along the Soldiers Memorial Avenue by Jamie Kirkpatrick in December 2006. Note that this survey did not record the number of individuals found. Appendix B compares the results of the 2006 survey of the Soldiers Memorial Avenue with earlier surveys. An obvious conclusion of this comparison is the ephemeral nature of many of the species disappear from some locations and appear at others. Many of these species are adapted to disturbed sites, or sites with low levels of competition, and will move around the area to exploit habitat changes such as burning or other forms of disturbance.

Known fauna of conservation value and important habitats are shown on figure 6. The likely response to fire of the flora and fauna species of conservation value known to occur on the Domain is given in tables 3 and 4.




**Threatened Flora**
(located early 2007)

| | |
|---|---|
| *Austrodanthonia popinensis* | (7) |
| *Austrostipa bigeniculata* | (20) |
| *Austrostipa nodosa* | (15) |
| *Austrostipa scabra scabra* | (2) |
| *Brachyscome sieberi var. gunnii* | (5) |
| *Carex gunniana* | (3) |
| *Carex longebrachiata* | (1) |
| *Carex tasmanica* | (6) |
| *Hydrocotyle laxiflora* | (7) |
| *Lepidium pseudotasmanicum* | (56) |
| *Scleranthus fasciculatus* | (8) |
| *Senecio squarrosus* | (3) |
| *Vittadinia gracilis* | (12) |
| *Vittadinia muelleri* | (40) |

**Soldiers Avenue Threatened Flora**
(J B Kirkpatrick 2006)

| | |
|---|---|
| *Lepidium hyssopifolium* | (3) |
| *Lepidium pseudotasmanicum* | (11) |
| *Podolepis jaceoides* | (2) |
| *Scleranthus fasciculatus* | (1) |
| *Vittadinia gracilis* | (2) |
| *Vittadinia muelleri* | (3) |

**Figure 5 - Plant communities and species of conservation value on the Queens Domain**

Rock plate grassland (2)

See appendix A for the location of threatened flora and population size.
See appendix B for the location of threatened flora along the Soldiers Memorial Avenue.

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**Figure 6 - Fauna habitat of conservation value on the Queens Domain**

**Table 3 – Flora species of conservation value on the Queens Domain**

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Austrodanthonia popinensis* blue wallaby grass | ENDANGERED endangered | Widespread scattered records from generally disturbed sites on margins of the Domain. Not present in intact native grassland. This species continues to be discovered at more and more sites around Hobart and is clearly much less threatened than considered even 5 years ago.<br>Total population approx 1000. | Likely to regenerate from rootstock and establish from seed. |
| *Austrostipa bigeniculata* double-jointed spear grass | rare | Widespread and relatively common in open grassy environments on the warmest aspects and confirmed in current study.<br>A species of native grassland and grassy woodland.<br>Total population between 2000 and 10000. | Likely to regenerate from rootstock and establish from seed.<br>This species is considered to benefit from regular burning. |
| *Austrostipa nodosa* knotty spear grass | rare | Widespread records scattered across the Domain although often represented by relatively small populations in current study.<br>A species typically of native grassland.<br>Total population approx 200. | Likely to regenerate from rootstock and establish from seed.<br>Woody invasion of grasslands may limit habitat potential. |
| *Brachyscome perpusilla* tiny daisy | rare | Historic collection record in Tasmanian Herbarium from Rodway Nov 1892. | Annual; likely to benefit from reduced competition in frequently burnt areas. |

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Brachyscome sieberi var gunnii* forest daisy | rare | Small numbers at Pipeclay Point and above Cornelian Bay walking track.<br><br>Some uncertainty with taxonomy of this species which is like a robust *B. aculeata* present elsewhere on the Domain.<br><br>Total population approx 10-20. | Perennial – regenerates from seed. |
| *Carex gunniana* mountain sedge | rare | Previous records from 'Grassland Gully' able to be confirmed. Records from moist hollow below twin water tanks unable to be relocated.<br><br>A species of occasional but widespread distribution generally associated with moist soils.<br><br>Total population approx 200. | Likely to regenerate from rootstock and establish from seed.<br><br>Loss from one site likely to be a consequence of drought, or confusion with *C. longebrachiata* / *C. iynx* which is apparently abundant. This site has been long unburnt as it is outside previous burning units. |
| *Carex longebrachiata* drooping sedge | rare | 'Moist hollow' below twin water tanks (200+ plants). This species is superficially very similar to the common and widespread *C. iynx*. Characteristics of plants on the Domain are intermediate between the two.<br><br>Previous record from Grassland Gully unable to be relocated.<br><br>Total population approx 200. | Likely to regenerate from rootstock and establish from seed. |

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Carex tasmanica* curly sedge | VULNERABLE | Previous records from 'Grassland Gully' reconfirmed although apparent decline from 1995 (100 to 40 in 2007). Population in moist hollow below twin water tanks very scarce with only 3 plants of poor vigour observed in 2007 (100 in 1995).<br>Approx 50 plants in roadside ditch opposite Grassland Gully interpretation shelter.<br>This plant has been used in plantings in beds above and below the Grassland Gully walk.<br>Typically a species of grassy valley flats.<br>Total population approx 100. | Likely to regenerate from rootstock and establish from seed.<br>Decline in QD36 is likely to be a consequence of drought, in combination with competition with aggressive tussock forming grasses, notably cocksfoot. This site has been long unburnt and was outside previous burning units.<br>Recommend use of fire to open up ground layer. Herbicidal treatment of exotic grasses also likely to be beneficial. |
| *Cynoglossum australe* southern houndstongue | rare | Historic collection record in Tasmanian Herbarium from Rodway Nov 1891. No records since. | Regenerates from seed. Unlikely to be adversely affected by fire. |
| *Eryngium ovinum* blue devil | endangered | Single observation of one plant in early 1990s from disused sports field. Not sighted since (JBK pers. comm.). | Regenerates from rootstock after medium intensity fire. |
| *Hyalosperma demissum* moss sunray | endangered | Historic collection records in Tasmanian Herbarium from Rodway 1898 and Curtis undated.<br>This is a species of grassy crests and rockplates. | Annual; likely to regenerate from seed. |

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Hydrocotyle laxiflora* stinking pennywort | vulnerable | Confined to only a few sites on the Queens Domain which is the only known location in Tasmania, from which it was only first collected in 1958. Being rhizomatous each patch may represent only a single plant.<br>Total population; 7 confirmed, estimated less than 20. | This plant dies down above ground in dry weather regenerating from rhizomes. Likely to respond similarly following fire. Fire may be beneficial through removing excessive leaf litter. |
| *Isoetopsis graminifolia* grass cushions | endangered | Historic collection records in Tasmanian Herbarium from Rodway spring 1893 and 1894.<br>This is a species of native grassland. | Annual, likely to regenerate from seed. |
| *Lepidium hyssopifolium* basalt peppercress | ENDANGERED endangered | Introduced to the Domain near Grassland Gully in early 1980s, but also observed from several other locations subsequently (JBK pers. comm.) and more recently along Soldiers Memorial Avenue, although unable to be confirmed by this study. | Perennial, likely to regenerate from taproot and seed after fire.<br>Dependent on maintenance of growth suppression zone through retention of tree cover. Mowing is likely to have an adverse impact. |
| *Lepidium pseudotasmanicum* shade peppercress | rare | Widespread records particularly within the growth suppression zone beneath eucalypts and planted trees.<br>Total population approx 600 confirmed (estimate 1000) although likely to fluctuate wildly. | Biennial or short-lived perennial. Regenerates, sometimes prolifically, from seed after fire. Dense patches of large plants observed in years immediate subsequent to burns on the north-east slopes of the Domain. |

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Scleranthus fasciculatus* spreading knawel | vulnerable | Scattered in at least three locations in grassy habitat. Confirmed from all locations - this species appears to tolerate mowing and requires some form of biomass reduction as it is being closed out by thickening grass at one site in QD27.<br><br>Population approx 200. | Likely to regenerate from seed after fire.<br><br>This prostrate herb is known to tolerate and indeed benefit from a mowing regime. |
| *Senecio squarrosus* Leafy fireweed | rare | Historic collection records in Tasmanian Herbarium from Curtis Oct 1958.<br><br>Confirmed during this survey from two recently burnt sites.<br><br>Total population; 3 confirmed, est. 100+ and likely to fluctuate wildly. | Known to proliferate in years subsequent to a fire. This effect has been observed in several HCC reserves (A. North pers obs.). Likely to regenerate from long-lived soil stored seed. |
| *Vittadinia gracilis* woolly new holland daisy | rare | Localised to a few sites of which most are represented by very small populations that appear to be in decline. The single most healthy and vigorous population numbers approximately 50 plants beneath a cedar close to the Aquatic Centre.<br><br>Total population; confirmed 80, estimated total less than 100. | Regenerates from seed following fire. |

| SPECIES | CONSERVATION STATUS [1] | OCCURRENCE (see figure 5 and appendices A & B) | RESPONSE TO FIRE AND MANAGEMENT |
|---|---|---|---|
| *Vittadinia muelleri* narrow leaf new holland daisy | rare | Widespread and common on the Domain although the largest population on the summit has declined significantly over the past decade, possibly a consequence of reduced mowing.<br>Total population confirmed approx 5000. | Regenerates from seed following fire. |

1 - UPPER CASE - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* - lower case - Tasmanian *Threatened Species Protection Act* 1995.

**Table 4 - Fauna species of conservation value on the Queens Domain**

| SPECIES | CONSERVATION STATUS[1] | HABITAT AND PREFERRED FIRE MANAGEMENT |
|---|---|---|
| **Mammals** | | |
| Eastern Barred Bandicoot<br>*Perameles gunnii* | VULNERABLE | Grasslands (both native and introduced) and grassy woodlands. Habitats supporting open grassy areas with plenty of dense patches of low vegetation for cover – eg low shrubs, tussocks etc. Dense cover of regrowth is likely to be unsuitable habitat.<br>**Mosaic burning will ensure open habitats are maintained and help mitigate devastating wildfires.** |
| **Birds** | | |
| Swift Parrot<br>*Lathamus discolor* | Endangered<br>ENDANGERED | Nests in hollows in old growth eucalypts (Brereton, 1997).<br>Known to forage in blue gums (*Eucalyptus globulus)* and planted eucalypts where they occur on the Domain.<br>**Management should aim to avoid crown damage to larger trees and ensure adequate recruitment. Spring burning should be avoided in Vegetation Management Units when blue gums are in flower.** |
| **Reptiles** | | |
| Tussock skink<br>*Pseudemoia pagenstecheri* | Endangered | A fully terrestrial skink that does not climb unlike the similar and common *P. entrecasteauxii*.<br>Confined to dry lowland native tussock grassland generally lacking in trees. Most preferred habitat includes *Poa* tussocks, although *Themeda* and other tussock forming species are utilised where it is not heavily grazed.<br>**Management requires the maintenance of open grassland with adequate shelter in the form** |

| SPECIES | CONSERVATION STATUS[1] | HABITAT AND PREFERRED FIRE MANAGEMENT |
|---|---|---|
| **Mammals** | | |
| | | **of dense tussocks, rocks, logs or other, possibly artificial, structures.**<br><br>**Burning should be conducted over smaller patches to maintain good quality cover and reduce the risk of mortality.** |

1 –- lower case - Tasmanian *Threatened Species Protection Act* 1995, UPPER CASE - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

### 3.6.2 Fire and Vegetation Management on the Domain

The Queens Domain has been the subject of one of the most far reaching, long-term studies into the floristic composition of lowland temperate grassy woodlands anywhere in Australia (Kirkpatrick, 2004). This has afforded a clear appreciation of changes in both floristic composition and vegetation structure over that period. Kirkpatrick (2004) found that twenty five percent of the native vegetation experienced structural change between 1974 and 2000. Generally these changes were successional where the limiting forces of biomass reduction have been lessened. Grassland has changed to grassy woodland, open grassy woodland has changed to shrubby woodland/forest. Vegetation exhibiting the greatest change is associated with areas of more frequent fires although this association may not necessarily be causal. More stable climax vegetation is less likely to burn as easily, or be targeted for burning where there is a perception amongst managers that grassy vegetation needs frequent burning.

Floristically the most prominent increases are reported for tree and shrub species including *Eucalyptus viminalis, Allocasuarina verticillata, Acacia mearnsii* and *Bursaria spinosa* (Green, 1982) (Kirkpatrick, 2004), although there is also some indication that *Acacia melanoxylon* is locally increasing (A. North pers. obs.). A shrub species on the increase, most notably on the western slopes, is *Olearia ramulosa*. Green (1982) compared tree crown density between 1945 and 1981 and found there had been a dramatic increase in tree crown density over this 35 year period, particularly in the northern section of the Domain. Green (1982) and Kirkpatrick (2004) observed that the most profound change was an increase in density and dominance of *Allocasuarina verticillata*. Recognition of this trend influenced much of the burning prescriptions for the 1995 fire management plan which prescribed a frequent and regular burning regime for much of the Domain. The relative success of this regime has unfortunately not been tested due to the inability to keep up with the burning program which required 5 to 8 management units to be burnt each year. Since 1995 all but one unit (QD16) timetabled for a prescribed burn has been burnt once with only QD1 having two burns (see figure 3 for the location of the original fire management units). Wildfires in 1998 and 2001 provided a second unplanned burn for all or parts of units QD 1, 2, 3, 4, 18 and 22 in 1995 fire management plan. The original plan prescribed annual burns for QD1 and 3-5 yearly burns for most other units.

### 3.6.3 Threatened Flora

The Queens Domain plays a significant role in the conservation of several lowland temperate grassy woodland and grassland species of high conservation value. This includes two nationally endangered species, one nationally vulnerable, two state vulnerable species, and nine rare species. In addition, there are historic records and thus moderate potential for three other endangered and two rare species to be present, although none

could be located during the fieldwork for this revision. The Domain is most important for the stinking pennywort *Hydrocotyle laxiflora,* as it provides the only known site for this species in Tasmania. According to the Australia's Virtual Herbaria website there is also a record of *H. laxiflora* form Flinders Island held in the Victorian herbarium, however this has not been verified.

The Domain is also likely to contain the largest reserved populations of *Carex tasmanica* and *Austrostipa bigeniculata.*

### *Hydrocotyle laxiflora*

This species was first collected on the Domain in 1958. There is some justification for thinking that this species may have been introduced as it has never been collected from anywhere else in Tasmania. On the mainland it is widespread and secure in all eastern mainland states. Given the attention of early botanists, notably Rodway who repeatedly returned to collect specimens of other rare species through the 1890s, some no longer present, it is somewhat surprising that *Hydrocotyle laxiflora* was not collected earlier. In the absence of evidence to the contrary this population should be recognised for its potential significance. The widely distributed locations of plants today, some of which are in stable environments well away from disturbed sites provides some support to the view of it being a natural species to the area. Currently plants are confirmed from only six sites, one of which includes two patches. This is a rhizomatous plant suggesting that each patch, as much as 15 m across in one instance, may well be a single plant. Consequently the currently confirmed population may be as low as six or seven plants. Previously known locations could not be verified, and others are known to have disappeared. Given the low numbers of plants the current status on the Tasmanian *Threatened Species Protection Act 1995* for *Hydrocotyle laxiflora* of 'vulnerable' may warrant upgrading to 'endangered'.

It is recommended that concerted efforts are made to locate additional plants. Any searching needs to respond to opportunities as well as the weather. Following a flush of growth in spring the above ground parts of the plant then die back in the absence of wet conditions such that by early summer there may be no evidence of the plants. In bare ground beneath *Allocasuarina verticillata* canopies the plants are easily to locate when in leaf. However, where they grow amongst grassy understoreys they are cryptic and easily overlooked. Burning however provides an opportunity to exploit the improved but temporary ground visibility and searches should be timed to exploit these occurrences. This process should also be formalised as part of the fire management plan. It is further recommended that known locations are periodically monitored to review the need for site specific management eg weed control or biomass reduction. Monitoring should be carried out at the same time as a targeted search of a burning unit. The most likely habitats are on

the northern part of the Domain where the existing records are – these include vegetation management units 2, 3, 6, 18, 19, 22 and 23.

*Ex situ* conservation is also recommended to maintain what is currently known to be a small genetic resource. There are several managed garden beds planted out with native species on the Domain adjacent to car parks at the top and bottom of Grassland Gully. These have already been used for growing listed plants including *Scleranthus fasciculatus* and *Vittadinia gracilis*. It is recommended that these are used to grow plants from each parent plant. The growth habitat for *H. laxiflora* makes it easy to propagate. Each bed should be selected to represent a single parent plant and the relationship documented. Ten segments from each plant should be propagated and planted out in designated beds.

There may be additional benefit from collaboration with the Royal Tasmanian Botanic Gardens which has a significant native garden that includes a number of threatened species. Segments from one individual could be propagated for establishment in the gardens.

### *Lepidium hyssopifolium*

This is apparently confined to the growth suppression zones in the shade of several cedars long the Soldiers Memorial Avenue. The species has not been found at a number of previously recorded sites for several years despite repeated searches. Management of threatened flora on the Soldiers Memorial Avenue has been considered by Kirkpatrick (2003 and 2006). In these studies plants of *L. hyssopifolium* were recorded beneath the canopies of six trees in 2003 and at least two in 2006. No individuals of the species could be found in early 2007. The decline has been explained by the prevalent drought conditions but has also driven management recommendations for the vegetation around the relevant trees (Kirkpatrick, 2006). Ongoing monitoring is recommended every 3 years in spring (except following winter drought).

### *Scleranthus fasciculatus*

This has been confirmed from four key locations with a number of other outliers. Populations vary from 30 to 80 plants at each site. At least two of the populations are in decline probably due to a cessation of mowing which has lead to smothering from a dense grassy sward. It is advised that the confirmed populations are slashed and raked annually at a height just above the plants.

### *Carex tasmanica*

This species was found at two locations; the Grassland Gully, and a soak below the twin water tanks. The latter location is in significant decline with only 3 suppressed plants located despite estimated populations of over 50 plants during previous surveys. It is

recommended that the sedge habitat is maintained for this species and for *Carex longebrachiata / iynx* also found at this location. Management should involve the removal of tree saplings including one vigorous blue gum which will suppress the sedge habitat further. Biomass reduction is also required, best implemented through periodic slashing or burning every 2 to 3 years.

### *Vittadinia gracilis*

The Queens Domain is important for the conservation of this daisy as it is the only known reserve where it occurs. Other known populations are on private land, and in grassland remnants on road reserves. In Hobart the only other known occurrence is on private land at the top end of Pottery Road, Lenah Valley.

Most sites where *Vittadinia gracilis* occurs on the Domain support very small numbers of plants. All locations are in modified landscapes and generally plants are reliant on growth suppression zones around planted cedars. The population on the Soldiers Memorial Avenue is in decline and represented by senescent plants with no obvious evidence of recruitment. Kirkpatrick (2006) recommends pruning of plants. However habitat appears to be in decline at this site as the canopy closes out light. Outside the tree canopy grass growth is too vigorous reflecting the ample moisture availability at this site. What is needed is open ground with reduced moisture, this can be beneath the canopies of trees, but only where there is sufficient light available. Plants of this species have already been propagated and established in garden beds on the Domain. This exercise should be continued, although documentation of the origin of the parent plants is recommended so as to formalise the *ex situ* conservation effort. Kirkpatrick (2006) also suggest introducing plants to suitable sites beneath other cedars.

### Other Species

The conservation of other threatened flora that occur on the Domain is considered adequate. Either the Domain is not a significant site for their conservation, or no specific management actions are required to ensure their survival. These, and other species previously recorded, should be monitored/searched for at least every 10 years. An adaptive management approach could be taken whereby a decision based on comparisons with the baseline data collected for this study is used. This could form part of a review of fire management and other vegetation management practices on the Domain.

### Grassland Gully

This area is significant as it contains populations of both *Carex tasmanica* and *Carex gunniana.* The removal of woody weeds from the vicinity of the drainage line in recent years has facilitated the proliferation of ground cover species including aggressive grasses, such as *Dactylis glomerata* and *Arrhenatherum elatius*, and exotic herbs such as

*Helminthotheca echioides* and *Cirsium arvense*. The long term health of this habitat for sedges requires some habitat management. This should include measures to reduce weed biomass through slashing, targeted spraying with a grass specific herbicide such as fusillade, and/or hand pulling the aforementioned herbaceous weeds. Interplanting with *Poa labillardierei* may be an effective means of closing out non-native grasses. Regenerating woody weeds, notably willow (*Salix* sp) should also be removed by cutting and pasting with herbicide.

The extent of the introduced reedmace, *Typha latifolia,* should also be monitored. First impressions are that it is expanding its cover. This has the potential to close out the *Carex gunniana* which occurs on the wettest sites. It is recommended that outlying *Typha* are removed and the current extent mapped and photo monitored to determine whether or not it is spreading. The native cumbungi *Typha domingensis*, an altogether more slender plant, is also present at one site. This should be retained

Plantings around the Grassland Gully shelter and car park could be modified to better reflect contemporary native vegetation management on the Queens Domain. The garden beds located adjacent to the shelter and the car parks could be used to grow representative examples of all threatened flora from the Domain. These would provide a dual role as a refuge for repopulation if required, plus opportunities for interpretation and education.

### 3.6.4 Threatened Fauna

A survey of the vertebrate fauna on the Queens Domain was undertaken in 1996 by Brereton, Taylor & Rhodes, (1996). Notable findings from this survey were the discovery of the rare tussock grass skink (*Pseudemoia pagenstecheri*), considered in more detail below, and the observation that the native mammal fauna appeared to be limited to the brushtail possum and three species of bats.

During the fieldwork undertaken for this revision of the plan there was ample evidence of bandicoot diggings, as well as an unidentifiable bandicoot carcass. It may be that less intensive vegetation management has improved availability of cover and allowed a previously small population to increase, or (less likely) individuals may have recolonised the site from outside (bandicoots are common on Knocklofty and surrounding suburbs). A. North has also observed an individual ring tail possum near the Aquatic Centre site in the late 1990s.

Brereton, Taylor and Rhodes (1996) comment that the tidy management regime at the time of their survey was having an adverse effect upon habitat suitability for many ground dwelling vertebrates. They consider the Domain poorly suited for conserving mammals due to its size, its isolation, and the impacts of road kill associated with the surrounding highways. They recommended focusing on improving habitat management for reptiles,

particularly the retention of fallen timber, and resisting the urge to 'tidy up' areas of native vegetation. They also noted that a frequent fire regime (3 to 5 years) was likely to reduce potential shelter sites and consequently increasing reptile mortality.

### *Pseudemoia pagenstecheri*

The tussock grass skink, *Pseudemoia pagenstecheri,* is considered one of Tasmania's most threatened reptiles, due to a decline in its preferred habitat (Rounsevell and Swain, 1993). It appears to be confined to dry, lowland tussock grasslands that are generally lacking in trees and dominated by the genera *Danthonia, Themeda, Poa, Agropyron* and *Microlaena*. A small number of *P. pagenstecheri* have been captured in the Domain in grassland and open woodland in management units QD1, QD5 and QD35, with additional unconfirmed sightings in QD27. These animals have been captured using hand-searching techniques, so it is difficult to estimate population size and extent across the Domain, although it appears that they are well distributed across the Domain. Live-capture pitfall trapping may prove useful in better determining the population size, although this is labour intensive and results can be patchy.

The preferred microhabitat of *P. pagenstecheri* is characterised by medium to tall grasses, with exotic grasses not thought to be a deterrent. The vegetation provides cover from predators when foraging and basking and shelter when torpid during cool weather (Kathryn Pugh pers. comm.). It is recommended that periodic hand-searching is undertaken as part of the fire management plan to ensure that populations recover after burning events.

*P. pagenstecheri* is unique amongst the reptiles on the Domain in that its preferred habitat is open grassland rather than wooded vegetation. It is assumed that it has behavioural mechanisms for surviving fires, however these are not know. It is also not known how soon after burning that an area of grassland becomes suitable habitat for the skink. However, the recent record of the skink in QD1 was about 2 years after this area was burnt, and earlier records in QD5 and QD35 were approximately one and two years after a fire respectively. It is recommended that units with habitat suitable for *P. pagenstecheri* are not burnt more often than every second year, and in patches in order to retain sufficient vegetation cover for *P. pagenstecheri*.

### *Lathamus discolor*

There are no known swift parrot (*Lathamus discolor*) nesting sites on the Domain although there are areas of blue gum (*Eucalyptus globulus*) which are an important food source for the species. The swift parrot feeds in the tree canopy and therefore an extensive, high-intensity fire which scorched the canopy could reduce the potential food resources for this

species on the Domain. However, a temporary loss of food resources on the Domain due to fire is unlikely to have a significant impact on regional food sources for this species. The fire regimes prescribed in this fire management plan aim to minimise canopy scorch, as well as reducing the risk of major wildfires.

***Perameles gunnii***

The eastern barred bandicoot (*Perameles gunnii*) is listed as nationally vulnerable (Schedule 1 of the Commonwealth Environment Protection and Biodiversity Protection Act, 1999), but is not listed in the Tasmanian Threatened Species Protection Act, 1995. In Tasmania the eastern barred bandicoot is often found in highly modified landscapes, and populations known to inhabit native vegetation are considered important. This species requires areas of dense grass and shrub cover for shelter. This species has been reported from QD14, and diggings were also observed in the recently burnt QD6. The mosaic burning pattern that will be implemented in this fire management plan will help to ensure that there will always be some areas with suitable cover for this species on the Domain.

### 3.6.5 Fire and Threatened Species

The Queens Domain has been subject to a diverse range of burning regimes combining controlled elements along with the vagaries of wildfire. Consequently the plants that occur on the Domain have survived along with fire for a relatively long period. Indeed many are associated with vegetation types for which fire is an integral part of habitat management. For example, individuals of *Hydrocotyle laxiflora* would survive fire due to their rhizomatous habit, and fire will reduce litter cover and competition to the species' benefit. Regular burning is therefore likely to be an important tool for managing the habitat for this species. Likewise grasses and sedges will regenerate from rootstock following most fires.

Regular burning ensures the rejuvenation of plants and is likely to extend their age. Long unburnt grasslands can lead to such rank growth that larger and possibly longer lived tussocks such as *Themeda triandra* along with introduced species close out the *Austrostipa* spp. and *Austrodanthonia* spp. as well as the smaller *Carex tasmanica*. The successional processes of grassland to woodland, and woodland to forest, also reduce habitat suitability for many typical grassland species as shade closes out the ground layer. Frequent burning can retard this transition to the benefit of the grassland species.

Other threatened flora present on the Domain are likely to be killed by most fires. However, their seed germinates after fire. This is exemplified by *Lepidium pseudotasmanicum* which has germinated in sometimes large numbers after past fires. However, as with several other species, its most stable populations occur in the growth suppression zones around mature eucalypts, and beneath the canopies of planted cedars

and cypresses. These habitats do not require fire for maintenance and indeed fire would be difficult to prescribe in those situations, and is more likely to be harmful than beneficial.

Localised environments, such as rockplates and rock pavements, favour short-lived perennials and annuals that can exploit the specific edaphic environment that maintains open ground due to frequent drying out of the soil and subsequent death of most other plants. Drought adapted species with underground tubers and rhizomes can also persist in these habitats. However, exotic species have colonised these habitats and effectively out competed many of the more ephemeral and less aggressive native plants. The most effective species at doing this have been *Petrorhagia nanteuilii,* which has increased quite significantly over past decades (Kirkpatrick, 2004), and the iris *Romulea rosea* var. *australis*. Although this species is reported to have declined over the same period, the decline is probably a result of reduced mowing and is not so much from these localised environments. None of the rare annual daisies associated with these habitats have been recorded for many years. Some perennials, notably *Vittadinia muelleri,* have persisted in some situations (eg the rock outcrops in QD36 just east of the water reservoirs) but have disappeared from others. These habitats can barely carry a fire so burning does not play a significant role in their management.

The fauna of conservation value on the Domain require critical habitat elements to be protected from fire. These include, old trees with hollows, logs on the ground, patches of dense vegetation and flowering trees and shrubs.

The main fire risk to natural heritage assets on the Queens Domain is considered to be from fire regimes that are outside the thresholds within which a particular plant community, or habitat for flora and fauna species, has viability in the long-term. Fire regimes within the thresholds of a particular plant community will help maintain its long-term viability, whereas fire regimes outside the thresholds are likely to lead to progressive changes in the structure and floristics of the plant community, and loss of habitat for the fauna favouring that plant community. Similarly large, high intensity wildfires can destroy fauna habitat over a wide area. Species may be lost from the area if they cannot recolonise from nearby areas, or survive in unburnt patches.

Management burning of the native plant communities on the Domain at the optimum frequency for their long-term viability is considered the best way to conserve important habitat for both flora and fauna. Management burning in a mosaic pattern will also reduce the risk of high intensity wildfires burning large sections of the Domain. The fire management requirements of the different plant communities/habitats on the Domain are given in table 5. Table 5 groups these plant communities into 4 types with similar fire management requirements.

This fire management plan is based on current knowledge of the effects of fire on the flora and fauna species known, or considered likely, to occur on the Queens Domain. Where there is a lack of information about the fire ecology of a particular threatened species or plant community, a fire regime has been applied that aims to conserve their habitat by maintaining the structure and floristics of the particular plant community in which they occur. Additional species of conservation value may occur on the Domain. If any such species are discovered this plan may need to be modified to incorporate the fire management requirements of the new species.

Although the management burns prescribed in this plan may kill some individuals of particular threatened species, the management prescriptions should have an overall beneficial effect on species of conservation value by ensuring the long-term conservation of their habitats, and reducing the risk of large wildfires eliminating isolated populations. The monitoring and review procedures in the plan will allow fire regimes to be modified as new information on the ecology of any of the flora and fauna species of conservation value on the Domain becomes available.

**Table 5 – Fire management requirements of the plant communities on the Domain**

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| **Grassy dry sclerophyll forests/woodland** | | |
| DVG – *Eucalyptus viminalis* grassy forest and woodland<br><br>DPU – *Eucalyptus pulchella* forest and woodland | *E. viminalis* grassy woodland<br><br>*E. viminalis – A. verticillata – Acacia mearnsii* grassy woodland<br><br>*E. pulchella – E. globulus – E. viminalis* grassy/shrubby dry sclerophyll forest | Woodland dominates the southern half of the Queens Domain where the open character has been partially maintained by mowing. Fire frequency in this area has also influenced structural diversity.<br><br>The south-west facing slopes on the city side of the Domain above the Brooker Highway support a shrubby forest structure which includes diffuse boundaries between *E. viminalis* woodland on the upper slopes, *E. pulchella* dominated forest/woodland (*E. viminalis* and *E. globulus* usually also both present) grading to pure stands of *E. globulus* forest generally on the lowest slopes.<br><br>*Allocasuarina verticillata* has colonised much of the eucalypt woodland on the 'upper' Domain, especially on the eastern and northern slopes. Increased fire frequency appears to be coincident with increased colonisation (Kirkpatrick, 2004). Elsewhere in Australia it has been hypothesised that a reduction in fire frequency has resulted in increases in shrubs and small trees (Lunt, 1998). |

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| DGL –*Eucalyptus globulus* dry forest and woodland | *E. pulchella – E. globulus – E. viminalis* grassy/shrubby dry sclerophyll forest | Kirkpatrick (1995) suggest that fires of higher intensity than those usually used in management burning would be required to suppress the *A. verticillata,* however these usually cannot be applied for safety reasons. Kirkpatrick (2004) suggests a high fire frequency (every 1-2 years) would prevent regenerating *A. verticillata* from establishing as shrubs. This however brings with it other management implications.<br><br>Alternative options for controlling *A. verticillata* – eg cut and paste with herbicide are worth trialling.<br><br>Infrequently burnt sites develop a dense shrubby understorey. Kangaroo Grass (*Themeda triandra*) can die out after an extended absence of fire, or other method of biomass reduction (Lunt & Morgan, 1998).<br><br>Frequent fires (< 5 years) can inhibit tree regeneration and eliminate the shrubby component. Extended absence of fire can result in a build up of fuel increasing the risk of intense and damaging wildfires.<br><br>A temporal and spatial mosaic burning pattern would assist with tempering the effects of a devastating wildfire.<br><br>Low fire sensitivity and high flammability – appropriate fire interval 3-50 years. Suppression not usually an ecological priority except in specific situations (Pyrke & Marsden-Smedley, 2005)<br><br>**Optimal fire frequency is 5-20 years.**<br><br>**Exclude fire from representative areas to provide controls for monitoring the effects of fire.** |

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| **Non eucalypt woodland** | | |
| NBA – *Bursaria/Acacia* woodland and scrub | | Localised in the vicinity of Pipe Clay Point and the boat sheds along Cornelian Bay.<br>This community is typically a degradation phase of eucalypt woodland, often associated with extended periods of biomass reduction, possibly through clearance and use for other purposes. In recent years neglect has allowed for the regeneration of shrubs<br>Fire regimes will influence the nature of regeneration. It is important to allow for a period of absence from fire where eucalypts can re-establish if desired.<br>Low fire sensitivity and high flammability – appropriate fire interval 3-50 years. Suppression not usually an ecological priority except in specific situations (Pyrke & Marsden-Smedley, 2005)<br>**Optimal fire frequency is 5-20 years.**<br>**Exclude fire from representative areas to provide controls for monitoring the effects of fire.** |

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| **She-oak forest** | | |
| NAV - *Allocasuarina verticillata* forest | *Allocasuarina verticillata* low forest | Saplings resprout from the base after fire. Low intensity burning will not eliminate mature established she oaks<br><br>Frequent fires (< 5 year intervals) are likely to suppress she oak colonisation (Kirkpatrick & McDonald, 1996).<br><br>Infrequent fires (> 20 year intervals) allow a dense canopy to form that may exclude the grassy component (Kirkpatrick & McDonald, 1996) plus many of the constituent herb species.<br><br>Grassy sites require fire at least every 10 years to maintain an open canopy**.** Rocky sites are difficult to burn and do not require fire (Kirkpatrick & McDonald, 1996).<br><br>Low fire sensitivity and moderate flammability – appropriate fire interval 3-50 years. Suppression not usually an ecological priority except in specific situations (Pyrke & Marsden-Smedley 2005)<br><br>**Optimal fire frequency for maintaining she oak forest is 15-25 years.**<br><br>**Exclude fire from representative areas to provide controls for monitoring the effects of fire.** |

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| **Native Grassland** | | |
| GTL – Lowland *Themeda* grassland | *Themeda triandra* tussock grassland | Native grasslands have diminished in area largely through the invasion of shrubs and trees. Succession on the Domain has been to *E. viminalis* woodland (Kirkpatrick, 2004). Open grasslands observable in 1960s aerial photos likely to have been originally maintained by mowing or grazing?<br><br>Kangaroo Grass (*Themeda triandra*) can die out after an extended absence of fire, or other method of biomass reduction. Fire intervals > 5 years may lead to a loss of biodiversity in grassy sites (Lunt & Morgan, 1988) and facilitate colonisation by shrubs and trees.<br><br>Frequent fires (< 5 year intervals) may lead to a loss in diversity of invertebrates and small vertebrates notably the tussock skink *Pseudemoia pagenstecheri.*<br><br>Burning of grasslands in the absence of other means of biomass reduction (eg grazing) maintains higher species diversity. Optimal burning to maintain species richness in native grassland is 2-5 years (McDougall, 1989)<br><br>Low fire sensitivity and high flammability – appropriate fire interval 3-50 years. Suppression not usually an ecological priority except in specific situations (Pyrke & Marsden-Smedley, 2005)<br><br>**Optimal fire frequency is 3-5 years.** |

| TASVEG MAPPING UNITS [1] | PLANT COMMUNITIES INCLUDED [2] | FIRE IMPACTS AND FIRE MANAGEMENT AIMS |
|---|---|---|
| **Riparian/wetland** | | |
| ASF – Freshwater aquatic sedgeland and rushland | *Typha – Juncus – Carex* wetland | Localised to a drainage line which may be receiving additional water flow as runoff from irrigation of sports fields and possibly from reservoir overflow.<br><br>Colonised by various sedges and rushes but also heavily infested with weedy grasses which may be suppressing native sedges.<br><br>**Exclude fire for the duration of the plan.** |

1 – TASVEG v 1.0 Harris & Kitchener 2005

2 – Communities mapped by Kirkpatrick (1995 and 2004)

### 3.6.6 Bushfire Risk to Built and Cultural Assets

Public infrastructure on the Queens Domain includes: power lines, roads, water reservoirs, playing fields and associated buildings, the Hobart tennis and aquatic centres, and the Civic Solutions Depot. There are four dwellings on the Domain, as well as a number of dwellings in the Glebe that back onto the Domain.

The Aboriginal heritage assessment of the Domain (Stanton, 1999) identified 21 sites recorded in the Tasmanian Aboriginal Sites Index within and near the Queens Domain. Most of these sites are middens along the foreshores of the Derwent River. Stanton (1999) also defined a zone of high cultural sensitivity between the river foreshores and the 50 m contour. The report also identified the remnant foreshore vegetation and native grasslands on the Domain as being culturally significant to the Aboriginal community.

The Queens Domain Cultural Heritage Management Plan (Austral Archaeology P/L, 2002) concluded that the Domain is a complex cultural landscape of outstanding heritage significance. Heritage items listed in the Heritage Management Plan that may be at risk from fire include:

- the TCA grounds and some of the associated buildings
- the powder magazine and nearby guard house
- the Wireless Institute
- the former guard house, No. 1 Carriage Drive
- the Beaumaris Zoo curator's cottage
- The Royal Tasmanian botanical Gardens- with particular reference to the Pinetum area
- Government House and associated buildings.

The degree of fire threat at any particular time is a combination of fine fuel quantity, slope, and the prevailing weather conditions. The actual risk of a fire causing damage to an asset is a function of the degree of threat, the probability of a fire starting, and any measures taken to prevent the fire causing damage.

The four major modes of attack by bushfires that can cause damage to assets are:

1. wind-blown burning debris
2. radiant heat which can ignite flammable materials ahead of the fire front and shatter glass
3. flame contact
4. strong winds generated or intensified by the fire.

The potential for damage to buildings and other assets in the path of large fires depends largely on:

- whether the fire will approach upslope or downslope
- the quantity and distribution of fuel surrounding the building
- whether they are defended during the fire
- their design and the materials from which they are constructed
- how well they have been maintained.

### 3.6.7 Bushfire Risk Assessment

The fire risk to the built and cultural heritage assets on the Domain has been assessed using a procedure developed from Australian Standard 4360 – 2004 *Risk Management*. In general there is insufficient data available to assess the likelihood of a high intensity fire starting on the Domain, however in most years there will be sufficient fine fuel to sustain a high intensity fire on days of extreme fire danger. The likelihood of ignition is therefore taken as constant in the assessment, i.e. it is certain to occur at some time. Where there are a number of possible fire approaches to an asset at risk, the approach with the highest threat is used in the assessment.

The assessment is based on three main factors:

1. fire threat in terms of fuel loads and fire approach
2. vulnerability to damage of the asset
3. potential consequences of a fire damaging or destroying the asset.

The assessment is carried out by assigning each factor a relative score, and multiplying the scores to determine a relative level of risk.

0 – minimal risk of fire damage

1 to 250 – low risk

251 to 2000 – moderate risk

2001 to 11664 – high risk.

Scores are weighted where it is considered that the factor would have a major influence on fire risk. The purpose of this assessment is to rank the risk to various assets so that risk reduction works can be prioritised. The score numbers are only multiplied so that assets that are not at risk from fire have a score of zero. The scores allow the level of risk to be placed in the broad risk categories of low, medium and high. These risk categories have the following general meanings:

LOW – low levels of burning ember attack, possible spotfires and/or asset is of low value.

MODERATE – asset likely to be impacted on by the main fire front but has features that will reduce the intensity of the fire attack, or provide some protection from fires.

HIGH – asset likely to be impacted on by the main fire front with few, if any, features that would reduce the intensity of fire attack.

### Fuel Loads

Vegetation type is used as a surrogate for fuel loads as actual fuel loads vary with time after the last fire, but reach different maximum levels in different vegetation types.

| (A) VEGETATION TYPE | SCORE |
|---|---|
| Wet and mixed forests | 6 |
| Dry forest & woodland, shrub or heath understorey | 5 |
| Heathland and shrubland | 4 |
| Dry forest, grass understorey | 3 |
| Grassland and grassy woodland | 2 |
| Rainforest | 1 |

Scores are halved where the vegetation threatening the asset is less than 1 ha in area, or the potential fire run is less than 20 m.

### Fire Approach

Fire approach has two aspects, slope and wind direction. Fires burning downslope generally have a lower intensity than fires burning upslope in the same fuel type. Extreme fire weather generally occurs with hot, dry, northerly to north-westerly winds. These winds are usually generated ahead of cold fronts which cause the winds to back round to the west and south as the front passes. This wind change can turn the previous flank of the fire into the headfire which can continue to burn with high intensity until the cooler temperatures and higher humidity brought by the change increase fuel moisture levels. The two fire approach factors are scored as follows:

| (B) FIRE APPROACH - SLOPE | SCORE |
|---|---|
| Up slopes greater than 5 degrees | 3 |
| Across slopes – 5 degrees to + 5 degrees | 2 |
| Down slopes greater than 5 degrees | 1 |

| (C) FIRE APPROACH - DIRECTION | SCORE |
|---|---|
| North through west to south-east | 3 |
| North-east and east | 1 |

### Vulnerability to Damage

Vulnerability to damage is assessed using three factors; the combustibility of the asset, fire protection measures in place in the form of a defendable space, and whether the asset is accessible by fire brigade vehicles. A defendable space is a managed area around an asset where there is insufficient fuel to carry a fire even under extreme conditions. The width of the defendable space determines the likely severity of bushfire attack. Where there is no defendable space an asset can be subjected to flame contact, intense radiant heat, and wind-blown burning embers. With an inadequate defendable space in terms of the recommended widths in the Tasmania Fire Service document *Guidelines for Development in Bushfire Prone Areas of Tasmania,* an asset could be subjected to intense radiant heat and wind-blown burning embers. With an adequate defendable space the asset should only be subjected to attack by wind-blown burning embers.

| (D) COMBUSTIBILITY | SCORE |
|---|---|
| Asset constructed of non combustible materials capable of maintaining structural integrity during a bushfire | 0 |
| Asset contains structural elements that are combustible, or may fail at the temperatures likely to be generated by a bushfire (all dwellings have been included in this category) | 2 |
| Asset is constructed primarily of combustible material | 3 |

| (E) DEFENDABLE SPACE | SCORE |
|---|---|
| None (flame contact, intense radiant heat, burning embers) | 3 |
| Present but inadequate (intense radiant heat, burning embers) | 2 |
| Adequate (wind-blown burning embers) | 1 |

### Accessibility

This factor assesses the ability of the fire brigades to actively defend an asset during a bushfire. The assessment is in terms of the ability of fire brigade vehicles to access that asset, and assumes that there will be sufficient water available to at least extinguish spotfires on or around the asset. It should be noted that in a major fire where fire fighting

resources are heavily committed, there may not be enough crews available to defend every dwelling in the path of a fire. It is also possible that in high intensity fires it may not be safe for fire fighters to actively defend an asset.

This factor also provides an indication of the likely danger and difficulty in evacuating residents during a major bushfire. It should be noted that in all areas near bushland evacuation becomes progressively more dangerous as the fire front approaches.

| (F) ACCESSIBILITY | SCORE |
|---|---|
| No fire brigade vehicle access | 4 |
| Dead end, light tanker only | 3 |
| Dead end, light and heavy tanker | 2 |
| Through road or fire trail | 1 |

### Potential Consequences

The following potential consequences of fire were used in the assessment:

| (G) CONSEQUENCES | SCORE |
|---|---|
| CATASTROPHIC; potential loss of life; complete loss of important structures, equipment and infrastructure; high financial loss. | 6 |
| MAJOR; potential serious injury, some loss or major damage to structures, equipment and infrastructure; medium financial loss. | 4 |
| MODERATE; localised damage; possible minor injury, total loss of structures, equipment and infrastructure unlikely; low financial loss if any. | 2 |
| MINOR; no injury, superficial damage to structures, equipment and infrastructure, if any; very low financial loss if any. | 1 |
| INSIGNIFICANT; no injury or damage likely. | 0 |

The injury factor in the consequences assessment assumes that the structure is a dwelling and residents will be sheltering in it during a bushfire. Some assets, such as the Aboriginal heritage sites on the Domain, may not be directly damaged by fire but may be damaged by fire management and fire suppression activities, such as construction of fire control lines.

Active protection of an asset during a fire can greatly reduce the fire risk. From a planning point of view it is not possible to determine if this will be available, although the potential for active protection by the Tasmania Fire Service is incorporated into the assessment under Factor F “accessibility”.

This risk assessment allows fire protection measures to be implemented that are appropriate to the level of risks. Recommendations for fire protection are given in Table 6.

There are numerous minor assets within the Domain such as timber bollards and barriers, signage, picnic tables etc. that could be damaged by fire but where the cost of replacing the asset, should it be damaged in a fire, is far less than the cost of protecting it from wildfire. However, care will need to be taken to prevent damage to these assets during management burns. This includes the blue valve marker signs along the Hobart Water pipeline through the Domain.

Table 6 – Fire Risk Assessment for Built and Cultural Assets on the Queens Domain

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| Houses bordering the Domain along Bellevue Parade | 4 | 1 | 1 | 2 | 1 | 1 | 6 | 48 LOW | | Continue regular slashing of old road formation between the houses and bushland in QD21. |
| Boat sheds along Cornelian Bay | 2 | 1 | 3 | 3 | 3 | 1 | 4 | 216 LOW | | Limit fuel loads in vegetation between the boat sheds and the railway line to 10 tonnes per hectare by manual removal of surface fuel. |
| Wireless Institute (cultural heritage value) | 2 | 3 | 3 | 2 | 1 | 2 | 4 | 288 MODERATE | | Regularly maintain the building, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls.<br>Regularly mow the grass inside the fence around the institute.<br>Slash QD34 annually.<br>No further planting of trees and shrubs in QD34. |
| Water reservoir on the jogging track | 4 | 3 | 3 | 0 | 3 | 1 | 1 | 0 | | No bushfire protection measures required. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| Civic Solutions' Cleary's Gates depot | 4 | 2 | 3 | 2 | 2 | 1 | 4 | 384 MODERATE | | No works required within the Domain.<br>Regularly maintain buildings, keep gutters clean.<br>Remove old tyres and other combustible materials from the rear of the Plant Workshop.<br>Store combustible materials within buildings, or at least 10 m from buildings. |
| Power line to the wireless station | 4 | 2 | 3 | 3 | 3 | 4 | 2 | 576 MODERATE | | Maintain existing easement to Aurora Energy standards.<br>Clear at least 1 m around the base of each pole. |
| Twin water reservoirs | 4 | 1 | 3 | 0 | 3 | 2 | 1 | 0 | | No bushfire protection measures required. |
| Power line to the twin reservoirs | 4 | 2 | 3 | 3 | 3 | 4 | 2 | 576 MODERATE | | Maintain existing easement to Aurora Energy standards.<br>Clear at least 1 m around the base of each pole. |
| Grassland gully interpretation pavilion | 4 | 1 | 3 | 3 | 3 | 1 | 2 | 216 LOW | | No protection measures required, replace if damaged by fire. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| Buildings at the Crossroads Sports Ground | 4 | 2 | 3 | 2 | 1 | 1 | 1 | 48 LOW | | No protection measures required if current condition maintained. |
| Buildings at the Domain Athletic Centre | 4 | 2 | 3 | 2 | 1 | 1 | 4 | 192 LOW | | Regularly maintain the buildings, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls. |
| Buildings at the TCA Ground (cultural heritage value) | 2 | 2 | 3 | 2 | 1 | 1 | 4 | 96 LOW | | Regularly maintain the buildings, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls. |
| Mobile phone tower to the east of the TCA Ground | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 96 LOW | | No bushfire protection measures required. |
| The powder magazine (cultural heritage value) | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 48 LOW | | Regularly slash the area within the perimeter fence. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| The powder magazine guard house<br>(cultural heritage value) | 2 | 1 | 3 | 2 | 2 | 1 | 6 | 144<br>LOW | | Regularly maintain the building, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls.<br>Establish and maintain a 20 m wide Building Protection Zone on the northern side of the house with fine fuel loads less than 5 tonnes per hectare, or grass below 100 mm high. |
| The former guard house, No. 1 Carriage Drive<br>(cultural heritage value) | 2 | 2 | 1 | 2 | 1 | 1 | 6 | 48<br>LOW | | Regularly maintain the building, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| The Beaumaris Zoo curator's cottage<br>(cultural heritage value) | 2 | 2 | 3 | 2 | 2 | 1 | 6 | 288<br>MODERATE | | Regularly maintain the building, clean gutters twice during the bushfire danger period, screen any vents with wire flyscreen mesh, regularly clear leaves and other flammable material away from walls.<br>Establish and maintain a 20 m wide Building Protection Zone on the northern side of the house with fine fuel loads less than 5 tonnes per hectare, or grass below 100 mm height. |
| Dwellings bordering the Domain along Allambie Street, Glebe | 2 | 2 | 3 | 2 | 1 | 2 | 6 | 288<br>MODERATE | | Maintain existing fire break on the northern side of this area (QD32) with fine fuel loads less than 5 tonnes per hectare, or grass below 100 mm height.<br>Establish a 5 m wide fire break along the eastern boundary of QD25 with fine fuel loads less than 5 tonnes per hectare, or grass below 100 mm height. |
| Dwellings bordering Domain along Shoebridge Street, Glebe | 2 | 2 | 3 | 2 | 1 | 2 | 6 | 288<br>MODERATE | | Maintain existing fire break on the northern side of this area (QD32) with fine fuel loads less than 5 tonnes per hectare, or grass below 100 mm height. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| The Domain Tennis Centre | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 48 LOW | | No bushfire protection measures required. |
| The Hobart Aquatic Centre | 2 | 1 | 3 | 2 | 1 | 1 | 4 | 48 LOW | | No bushfire protection measures required. |
| Government House | 2 | 1 | 3 | 2 | 1 | 1 | 6 | 72 LOW | | No bushfire protection measures required. |
| Aboriginal heritage sites | | | | | | | | | Minimal risk from fire but may be damaged by any fire management activity that disturbs the ground surface. | Contact the TALSC prior to any fire management activities likely to disturb the ground surface in VMUs 17, 18, 20, 24, and 27 |
| Soldiers Memorial Avenue | | | | | | | | | Planted exotic pines and conifers can be damaged or killed by relatively low intensity fires. | Ensure that the grass within the Soldiers Memorial Avenue is maintained at less than 100 mm in height during the bushfire danger period. |

| ASSET AT RISK | RISK ANALYSIS (See Section 3.6.6 of the Fire Management Plan) | | | | | | | | OTHER FIRE RISKS | PROPOSED BUSHFIRE MANAGEMENT STRATEGIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | Level of Risk | | |
| Royal Tasmanian Botanical Gardens | | | | | | | | | The Botanical Gardens are separated from the Domain by a two lane sealed road. Wind blown burning embers form bushfires could ignite combustible mulches and other flammable materials within the Gardens. | The risk of fire spreading into the Botanical Gardens from the Domain is considered to be low. The risk could be further minimised by not using combustible mulches on garden beds along the road dividing the Gardens from the Domain. |

# 4. Fire Management Issues

## 4.1 Management Responsibilities

Control of fires on the Queens Domain is the responsibility of the Tasmania Fire Service. The closest TFS brigade is at the Hobart Fire Station on the corner of Argyle and Melville Streets, Hobart. The Domain is easily visible from surrounding urban areas and it is likely that any fires would be quickly reported. Response time from the Hobart Fire Station would be less than 5 minutes.

Hobart City Council is responsible for managing the fire hazard on the Domain and ensuring that life and property are protected. Hobart City Council is responsible for managing community recovery after a major bushfire.

## 4.2 Vegetation Management Units

The 1995 Fire Management Plan for the Queens Domain divided the areas dominated by native vegetation into 24 fire management compartments (see figure 3). To bring this revision of the fire management plan into line with Hobart City Council's current practice all vegetated areas of the Domain have been divided into Vegetation Management Units (VMUs). The criterion for the division is that each unit contains vegetation with similar management requirements to which the same management objectives and actions can be applied. The VMUs include areas that will not be burnt, but excludes areas of introduced, special purpose vegetation such as playing fields. The existing fire management compartment boundaries and numbers have been retained as much as possible to ensure continuity with the original fire management plan, however some changes have been made to provide drivable boundaries for management burns, and to separate areas in the old compartments which are now considered to have different management objectives or actions (eg slashing instead of burning). The new Vegetation Management Units (VMUs) are shown in figure 7

Wherever possible existing roads, tracks and suitable natural features have been used for VMU boundaries. This will reduce the amount of preparation required prior to burning. In some instances natural features or plant community boundaries have been used as boundaries. Some of the recommended burns do not have existing control lines and suitable lines will have to be established prior to each burn.

The management objectives for each VMU are given in section 5.


**Figure 7 - Vegetation Management Units on the Queens Domain**

## 4.3 Fire Hazard Management

Fire hazard on the Domain is currently managed by a combination of slashing and management burning. The main fuel for fires over most of the Domain is grass. This fuel is replaced rapidly after removal, usually within one year, so burning is not usually an effective means of hazard reduction. In contrast to slashing, burning requires a hazard to be present (i.e. cured grass) so it is not suitable for maintaining low fuel loads for the protection of assets during the fire danger period.

## 4.4 Fire Management Assets

### 4.4.1 Firebreaks and Defendable Spaces

It is important to note the difference between a "firebreak" and a "defendable space". A firebreak is a strip of cleared or partly cleared bushland constructed and maintained to slow, or stop, the progress of a bushfire so as to assist in its control. Firebreaks in grassland can be effective in stopping fires if cleared down to mineral earth, but where trees and shrubs are present wind-blown burning embers will usually carry a bushfire across a firebreak. Therefore in bushland with shrubs and trees the only benefit of a firebreak is to provide access for firefighters and a boundary for backburning operations. Currently there are no standards or guidelines for firebreaks in Tasmania.

A defendable space is an area of managed vegetation around an asset likely to be at risk from fire which protects it from direct flame contact and intense radiant heat, as well providing an area where fire fighters can defend the asset. The Tasmania Fire Service document *Guidelines for Development in Bushfire Prone Areas of Tasmania* recommends that a defendable space be established and maintained on the hazard side of dwellings in bushfire-prone areas. The defendable space consists of an inner building protection zone with minimal fine fuel, and an outer fuel modified buffer zone where fine fuel loads are kept in a reduced state (less than about 5 tonnes per hectare litter and shrubs, or grass less than 100 mm high). Fine fuel comprises live and dead plant matter less than 6 mm in diameter on the ground and in the shrub layer.

The building protection zone provides a space around buildings with minimal fine fuel that allows them to be defended from bushfires. It also reduces the risk of wind-blown burning debris from bushfires starting spot fires close to buildings. The building protection zone extends outwards from the walls of the building being protected.

The fuel modified buffer zone forms a concentric ring around the building protection zone and has fine fuel loads reduced sufficiently to isolate the building protection zone from direct flame attack, radiant heat, and the majority of wind-borne burning embers.

The minimum recommended width of the defendable space varies with fuel type and slope as follows:

**Minimum Defendable Space Component Widths** (from Tasmania Fire Service, 2005)

| **Slope**[1] (degrees) | **Building Protection Zone Width**[2] | **Fuel-modified Buffer Zone Width** | |
|---|---|---|---|
| | | **Grassland** | **Forest** |
| 0 | 20 m | 10 m | 15 m |
| 5 | 20 m | 15 m | 25 m |
| 10 | 25 m | 20 m | 30 m |
| 15 | 30 m | 30 m | 45 m |
| 20 + | 40 m | 40 m | 50 m |

1 – For downslope and across slope fire approaches use the widths for 0 degrees.
2 - Distances are measured outwards from the wall of the building towards the fire hazard.

At present there are no firebreaks maintained solely for fire control on the Queens Domain although all the roads, car parks and playing fields on the Domain can be used as firebreaks. There are also a number of defendable spaces maintained on the Domain adjacent to dwellings both on and adjoining the Domain. The locations of these are shown on figure 8, and their dimensions and maintenance discussed in table 6.

### 4.4.2 Emergency Vehicle Access Routes

The network of sealed roads on and surrounding the Domain provides good access for TFS and other emergency service vehicles during a bushfire. This network is supplemented by a number of other tracks and trails that can be used for light vehicle access during fire fighting or for conducting management burns. These are shown on figure 8 and are described below. The minor routes should be slashed annually (3 m wide) to ensure they do not become overgrown.

The key vehicle access tracks are:

| ID | Description | Class | Capacity | Management required |
|---|---|---|---|---|
| QD1 | Runs from the Crossroads north over the summit, continues along western edge of QD1, crosses Q5 and ends at the northernmost fireplug. It also has a side-track that meets the summit road. | 3 | Single lane, Alternate entrances, Heavy Tanker capable | Keep surface in good repair, groom trackside and overhanging vegetation |
| QD2 | Runs from opposite the twin reservoirs carpark northwards over the summit and along the eastern edge of QD1, ends at Q5. Q2 also has a short link connecting to the summit | 4 | Single lane, Alternate entrances, Light Tanker capable | Periodic inspection |

| | | | | |
|---|---|---|---|---|
| | carpark. | | | |
| QD3 | Powerline track. Runs from near the southern end of Q2 eastwards to the Lower Domain Road. Note section below Q5 is dead-end. | 4 | Single lane, Alternate entrances, Light Tanker capable. **No exit onto Lower Domain Road** | Periodic inspection |
| QD4 | Upper section runs from Q2 northeast downhill to Q5.<br>Lower section runs north downhill from Q5 to near the Domain Highway. Note this section is dead-end. | 4 | Single lane, Alternate entrances, Light Tanker capable. **No exit onto Domain Highway** | Periodic inspection |
| QD5 | The 'Joggers Loop' | 1 | Dual lane, Alternate entrances, Heavy Tanker capable | Keep surface in good repair, groom trackside and overhanging vegetation |

A number of VMUs adjoin the Brooker Highway and the Domain Highway, which creates major safety issues for Council's burning crew and motorists (smoke, collisions, falling trees etc.) As it is not necessary to completely burn a VMU to achieve management objectives, it is possible to leave unburnt strips up to 20 m wide along the edges of the Brooker and Domain Highways. To facilitate burning these VMUs (8, 9, 11, 19, 22 and 23) it is recommended that a vehicle access or a foot track be constructed that will form a control line approximately 20 m from the edge of the main roads. If a vehicle access is constructed it does not have to be a formed fire trail, but merely a cleared strip through the bush sufficient to allow 4WD vehicle access. The access route should be constructed by clearing vegetation with minimal ground disturbance and can be allowed to grow over between burns. As these routes will generally run along the contour they are unlikely to cause any erosion problems. The new access routes should be surveyed for Aboriginal heritage sites, and rare or threatened species, prior to clearing.


**Figure 8 - Fire Management Assets on the Queens Domain**

### 4.4.3 Gates

Access to service trails and roads on the Domain is well controlled by locked gates or bollards, and there do not seem to be any problems with unauthorised access. No additional gates are considered necessary for fire management purposes.

Hobart Fire Station should be provided with keys to the gates controlling vehicle access on the Domain.

### 4.4.4 Water Supply

Reticulated water for fire fighting is available from fire hydrants at various points on the Domain, and on suburban streets adjoining the Domain. The location of these hydrants is shown on figure 8. This supply is considered adequate for fire fighting and management burning.

## 4.5 Bushland Management

Fire can provide the disturbance that many introduced species need to spread to new areas, as well as to expand existing populations. Other fire management activities, such as construction and maintenance of emergency vehicle access routes, and construction of control lines during fire suppression, can also provide opportunities for weeds to colonise native bushland. Fire can also be used as a tool to manage weed infestations. Some species are best controlled by herbicide application to regrowth following a fire. Other species can sometimes be controlled by the application of a fire regime that stimulates germination of seed but kills the regrowth before it has been able to flower.

Green (1982) refers to extensive infestations of weeds such as gorse and boneseed on the Domain, particularly the northern section. During fieldwork for this revision of the fire management plan woody weeds were observed but only as scattered, small individuals or clumps, except in fenced off areas around the Civic Solutions depot and the old quarry. This indicates that woody weed control on the Domain has been very successful. The likely response to fire of introduced species on the Domain is given in table 7.

## 4.6 Conservation of Biodiversity

Fire plays an important role in maintaining biodiversity in Australia. Changes in the fire regime (season, frequency and intensity of fire) can cause progressive changes in plant communities. Frequent fire and long-term exclusion of fire have both been shown to lead to progressive changes in plant community structure, and a reduction in biodiversity. Failure to use fire properly as a management tool can be considered a threat to the native vegetation habitats on the Domain.

**Table 7 - Response to fire of the main weed species on the Queens Domain**

Priority Weeds are identified in **bold**.

| WEED SPECIES | WHOLE PLANT LIKELY KILLED | RE-SPROUTS FROM ROOTSTOCK[3] | RE-SPROUTS FROM EPICORMIC BUDS | SEED GERMINATION LIKELY AFTER FIRE | COMMENTS |
|---|---|---|---|---|---|
| *Arctotheca calendula*. (African daisy) | | X | | X | |
| *Briza maxima* (quaking grass) | X | | | X | |
| *Briza minor* (shivery grass) | X | | | X | Seeds may remain viable for up to 40 years |
| *Bromus spp* (brome grasses) | | X | | X | |
| *Carduus spp. / Cirsium sp.* (thistles) | X | | | X | |
| *Centranthus ruber* (red valerian ) | X? | X? | | | Response to fire unknown. Occasional infestations on rocky sites especially below the Domain Highway on an embankment. |
| ***Chrysanthemoides monilifera ssp. monilifera* (boneseed)** | | X | | X | Scattered records; intense infestation around two disused quarry sites on Brooker Highway – QD 10 and Clearys Gates.<br>Resprouts if fire is not hot enough to kill plant. Hard fire tolerant seed accumulates in large quantities in soil germinating in large quantities after fire.<br>Any prescribed burning should include active pre- and post-fire management, or back to back fires within 2 years of each other. |

| WEED SPECIES | WHOLE PLANT LIKELY KILLED | RE-SPROUTS FROM ROOTSTOCK[3] | RE-SPROUTS FROM EPICORMIC BUDS | SEED GERMINATION LIKELY AFTER FIRE | COMMENTS |
|---|---|---|---|---|---|
| *Coprosma repens* (mirror bush) | | | X | | |
| *Cortaderia selloana* (pampas grass) | | X | | X | Occasional occurrences especially on quarry walls. |
| *Cotoneaster* spp. (cotoneaster) | X | X | | | Mature plants will generally be killed by moderate intensity fires, but may resprout after low intensity fires. |
| *Crataegus monogyna* (hawthorn) | | X | | X | |
| *Crocosmia x Xcrocosmiiflora* (montbretia*)* | | X | | | |
| *Cytisus palmensis* (tree lucerne) | X | | | X | |
| *Dactylis glomerata* (cocksfoot) | | X | | X | |
| *Euryops abrotanifolius* (winter euryops) | | X | | X | Proliferates after fire. Localised area of occurrence behind Cornelian Bay boatsheds. |
| *Foeniculum vulgare* (fennel) [2] | | X | | | Widespread especially on disturbed grassy firebreaks. |
| ***Genista monspessulana* (canary broom)** [2] | | X | | X | Occasional. The seed is long lived and fire tolerant. Any prescribed burning should include active pre- and post-fire control. |

| WEED SPECIES | WHOLE PLANT LIKELY KILLED | RE-SPROUTS FROM ROOTSTOCK[3] | RE-SPROUTS FROM EPICORMIC BUDS | SEED GERMINATION LIKELY AFTER FIRE | COMMENTS |
|---|---|---|---|---|---|
| *Holcus lanatus* (yorkshire fog grass) | | X | | X | |
| *Hypochoeris radicata* (rough catsear) | | X | | X | |
| *Leontodon taraxacoides* (hairy hawkbit) | | X | | X | |
| ***Lycium ferocissimum* (African boxthorn)** | | X | | X | Occasional records only. |
| ***Nassella neesiana* (Chilean needle grass)** | | X | | X | A newly recorded species that is highly invasive. |
| ***Pinus radiata* (Monterey pine)** | X | | | X | Occasional wildlings associated with numerous mature trees. Fire adapted and potential to proliferate after a wildfire. |
| *Pittosporum undulatum* (sweet pittosporum) | X | X | | | Very occasional being introduced from bird sown seed. Mature plants will generally be killed by moderate intensity fires, but may resprout after low intensity fires. |
| *Pyracantha crenulata* | | X | | | Localised infestations on the Domain and around Cornelian Bay. |
| *Rapistrum rugosum* (giant mustard) | X | | | X | This is an annual which proliferates following fire. Control is best focused on young seedlings utilising low dose herbicide in autumn. |

| WEED SPECIES | WHOLE PLANT LIKELY KILLED | RE-SPROUTS FROM ROOTSTOCK[3] | RE-SPROUTS FROM EPICORMIC BUDS | SEED GERMINATION LIKELY AFTER FIRE | COMMENTS |
|---|---|---|---|---|---|
| *Reseda alba* (white mignonette) | | | | X | This weed threatens habitat for the rare native forest daisy *Brachyscome sieberi* var *gunnii* in QD24 not proposed for burning. Control by spot spraying of mature plants and of seedlings with low dose in autumn. |
| ***Rhamnus alaternus* (Italian buckthorn)** | | X | | | Spreads from bird sown seed. Fire likely to be useful management tool although hand treatment necessary where burning not prescribed. |
| *Rosa rubiginosa* (briar rose) | | X | | | Widespread on grassy sites - introduced from bird sown seed. |
| ***Rubus fruticosus* (blackberry)** [1 2] | | X | | | Widespread on disturbed sites especially on embankment below the Domain Highway, and along drainage lines and roadsides. |
| *Scabiosa atropurpurea* (garden pincushion) | X | | | X | Control of this species will be very difficult. It colonises weedy open sites and also native grassland. Select control in the vicinity of high conservation sites and threatened species. |
| *Sisymbrium officinale* (hedge mustard) | | | | | This annual proliferates following fire. Control is best focused on young seedlings utilising low dose herbicide in autumn. |
| ***Ulex europaeus* (gorse)** [1 2] | | X | X | X | Seed may remain viable for up to 40 years. Present as scattered individuals, has may form dense thickets if weeding is discontinued. |

| WEED SPECIES | WHOLE PLANT LIKELY KILLED | RE-SPROUTS FROM ROOTSTOCK[3] | RE-SPROUTS FROM EPICORMIC BUDS | SEED GERMINATION LIKELY AFTER FIRE | COMMENTS |
|---|---|---|---|---|---|
| *Urospermum dalechampii* (false dandelion) | | X | | X | Extensive infestations on the Domain, although not thought to be spreading. Perhaps reduction in mowing has reduced the spread of this species. Its control is not considered appropriate in the absence of a concerted eradication plan for the larger area. Eradication may prove to be impossible as it is associated with open native grassland. |
| *Vinca major* (periwinkle) | | X | | | |

1 WONS = Weed of National Significance – National Weed Strategy 1999 (Thorp 1999)

2 Declared Weed – Tasmanian *Weed Management Act 1999*

3 Some plants may resprout after low intensity fires but will be killed by high intensity fires.

Frequent burning of native forests will generally reduce species diversity and make it more vulnerable to weed invasion. A high fire frequency (less than 5 years) will usually favour grasses in the understorey at the expense of shrubs, and severely restrict the re-establishment of canopy species.

Fire can adversely affect fauna by killing individual animals, removing their habitat, or removing specific elements in their habitats, such as nest sites and feeding areas. This fire management plan aims to conserve the known habitats of fauna species of conservation value by prescribing an appropriate fire regime to ensure the long-term viability of the species, and ensuring the critical habitat elements are protected as much as possible.

The dry forest, woodland and grassland plant communities on the Domain are considered to be dependent on fire to maintain their present structure and floristics in the long term. Periodic burning will help to maintain diversity in the understorey, and allow fire dependent species to germinate and establish. However, there is a need to minimise damage to important habitat elements (such as dead trees, old logs and stumps) during these burns, and to ensure adequate retention of unburnt patches of each forest type to act as refugia for recolonisation of burnt areas.

Currently there is some debate over the optimal season for burning dry forests, grassy woodlands and grasslands. In fact, it is likely that they benefit from a varied fire regime. The season of burning specified in this plan has therefore been deliberately varied, except where there has been a specific need, such as avoiding the flowering time of a threatened species.

### 4.6.1 Spread of She Oak (*Allocasuarina verticillata*)

Green (1982) and Kirkpatrick (2004) observed that there has been a profound change in density and dominance of she oak (*Allocasuarina verticillata*} on the Domain. Although she oak occurs naturally on the Domain, its continuing spread is of concern due to its habit of forming dense stands with very sparse groundcover. Continued spread of she oak will be at the expense of the diverse range of ground cover species, many of which are rare or threatened. Recognition of this trend influenced the burning prescriptions for the 1995 fire management plan which prescribed a frequent and regular burning regime for much of the Domain. However this was not implemented so it is not possible to conclude if it would have worked.

Theoretically frequent burning (at least every 3 years) should control the spread of she oak where it is not already well established. Although she oak can germinate prolifically after fire, and its saplings will resprout at the base after cool fires, frequent burning should be able to suppress sapling growth if the fire is hot enough to fully scorch the canopy. If the

canopy of the she oak saplings is not fully scorched it will continue to grow. The taller the saplings get the hotter the fire required to fully scorch the canopy, however the continued growth of the she oak saplings also starts to suppress the ground cover underneath reducing fuel loads and making it progressively harder to achieve a controlled burn that will be hot enough to scorch the canopy. This is currently the situation in many of the she oak stands on the Domain. A good example is VMU QD19. This unit was burnt recently, however she oak regrowth was already 2 m to 3 m high and the fire was not hot enough to scorch the canopy over much of the unit. The result is that, apart from a short-term reduction in bushfire hazard, little was achieved. This revision of the plan addresses the she oak issue by recommending units in which its spread should be controlled and those in which it can be allowed to spread. This revision also proposes other methods of controlling the spread of she oak which can be used on their own, or together with fire.

## 4.7 Community Consultation

During the review of the 1995 fire management plan in 2006, a letter was delivered to all residents on the Domain, and to residents in the Glebe whose houses front or back onto the Domain (AVK Environmental Management, 2007). A similar letter was circulated internally within Hobart City Council and also sent to government agencies, organisations and community groups with an interest in the management of the Domain. The main issues raised by those who responded were:

- Protection of recorded Aboriginal heritage sites in compartments 17, 20 and 27 on the Domain, and involvement of an Aboriginal heritage consultant to assess their vulnerability to damage during management burns, and advise on suitable protection measures.
- Management burns are killing young saplings and preventing recruitment of canopy trees.
- Need to ensure that smoke from management burns does not disrupt activities at the various sporting facilities on the Domain.
- Hobart Water needs to be contacted prior to any burns in units containing their infrastructure.
- Protect trees on the Soldiers Memorial Avenue from wildfires, and from scorching during burns of adjoining vegetation management units.

Interested stakeholders were invited to comment on the draft of the revised fire management plan.

# 5. Fire Management Objectives

The specific fire management objectives recommended for the Queens Domain for the 15 year duration of this fire management plan are as follows:

### Research, Monitoring and Review

1. Monitor the impact of fire management activities on the Queens Domain. Adjust practices to achieve relevant objectives, and periodically review the fire management plan.

### Risk Modification

2. Minimise the risk of wildfires starting and spreading on the Queens Domain.
3. Minimise the risk of fire to residents on, and surrounding, the Queens Domain.
4. Minimise the risk of wildfire damaging built and cultural heritage assets on the Queens Domain.
5. Minimise the impact of smoke from management burns on sporting activities and nearby residents.

### Readiness

6. Maintain existing vehicle tracks shown in Figure 8 in a trafficable condition for 4WD vehicles.
7. Establish additional vehicle access routes shown in Figure 8 to facilitate management burns in VMUs 19, 22 and 23.
8. Minimise damage to the emergency vehicle access route system by preventing unauthorised vehicle access.
9. Ensure an adequate and accessible water supply for fire fighting.
10. Ensure all personnel carrying out fire management activities on the Queens Domain are suitably trained, equipped and supervised.
11. Develop, assist development of, or utilise existing education programs and materials aimed at:
    - reducing arson
    - informing residents of fire safety issues, and measures to improve protection of themselves and their property.
12. Maintain up-to-date information on; emergency vehicle access routes and their condition, defendable spaces, and areas burnt in management burns and wildfires.

### Response

13. Coordinate fire management activities on the Queens Domain amongst the various stakeholders.

### Recovery

14. Ensure that all roads, trails and other infrastructure are checked after a fire to ensure they are safe prior to allowing use by the public.

### Conservation of Biodiversity

15. Minimise the fire risk to fire sensitive vegetation and threatened flora and fauna.
16. Implement a mosaic burning program in selected plant communities to maintain and enhance existing habitat diversity, and reduce overall fuel loads in bushland areas.
17. Control unwanted plant species through minimising the spread of weeds.
18. Manage individual vegetation management units to achieve the objectives in table 8.

The actions recommended to achieve these objectives are given in the management action summary table in section 8.

**Table 8 – Management objectives for vegetation management units on the Queens Domain**

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD1 | GTL<br>DVG | *Austrostipa nodosa* – occasional towards jogging track on lower slopes.<br>*Austrostipa bigeniculata* – abundant on upper slopes close to summit.<br>*Pseudemoia pagenstecheri* (tussock grass skink). | Previously cleared and planted with Australian natives in 1960s – most have died out.<br>Previous fires; 1983, 1993, 1998, 2005. | a) Maintain as native grassland by limiting total tree and shrub canopy cover to less than 20%.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. |
| QD2 | DVG<br>NAV | *Hydrocotyle laxiflora* – historic records (Kirkpatrick, 1995) unable to be confirmed this study.<br>*Lepidium pseudotasmanicum* - evident in post fire flush of regeneration.<br>*Austrostipa nodosa* – small numbers on shallow soils on lower slopes. | Rockier terrain than QD1 favouring she oaks. Dense regeneration of blackwood and she oak saplings to 2 m.<br>Previous fires; 1983, 1993, 1998, 2004. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD3 | DVG | *Hydrocotyle laxiflora* – historic records (Kirkpatrick 1995) unable to be confirmed this study.<br>*Lepidium pseudotasmanicum* – under she oaks above jogging track. | Rockier than QD2 – and dominated by she oaks. Dense regeneration of saplings of blackwood and she oak<br>Previous fires; 1977, 1983, 1993, 1998, 2003. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. |
| QD4 | DVG | *Vittadinia muelleri* - small populations near picnic site.<br>*Lepidium pseudotasmanicum* - in growth suppression zone beneath white gums. | Upper slopes have been historically mown with a prominent grassy understorey.<br>Prickly box is regenerating in local dense patches.<br>Previous fires; 1983, 1991, 1998, 2005. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 20% total canopy cover. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD5 | DPU<br>DGL<br>NAV | *Lathamus discolor* (swift parrot) foraging habitat.<br>*Pseudemoia pagenstecheri* (tussock grass skink). | Grassy woodland structure with patches of dense forest with she oak prominent in understorey.<br>Previous fires; 1983, 1993, 2004. | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. |
| QD6 | NAV<br>DPU<br>DVG | *Lepidium pseudotasmanicum* - (Kirkpatrick, 1995) not relocated from original location but small population recorded above jogging track.<br>*Austrostipa nodosa* - (Kirkpatrick, 1995) not relocated in this study.<br>*Vittadinia muelleri* – Kirkpatrick, 1995) not relocated in this study. | Dense patches of she oak in northern half, typically to 3-4 m high. Most not killed by recent burn and regenerating at base.<br>Previous fires; 1983, 1993, 2006. | a) Maintain as eucalypt and she oak forest.<br>b) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD7 | DPU<br>DGL<br>NAV | *Lathamus discolor* (swift parrot) foraging habitat.<br>*Lepidium pseudotasmanicum* - on embankment of jogging track road. | Narrow strip of vegetation between two roads.<br>Boneseed and gorse seeding in from infestations in the Cleary's Gate Depot.<br>Previous fires; 1969?, 2003. | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata)* to less than 40% total canopy cover. |
| QD8 | DGL<br>DPU | *Lathamus discolor* (swift parrot) foraging habitat.<br>*Austrostipa nodosa, Austrostipa bigeniculata, Austrodanthonia popinensis* in slashed area opposite entrance to Clearys Gate depot.<br>*Lepidium pseudotasmanicum* –near zig zag track. | Dense regeneration of shrubby understorey particularly of *Olearia ramulosa.*<br>Previous fires; 1979, 1983, 1990, 2002. | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD9 | NAV<br>DPU<br>DGL | *Lathamus discolor* (swift parrot) foraging habitat.<br>*Vittadinia muelleri* - (Kirkpatrick, 1995) – not relocated during current study.<br>*Lepidium pseudotasmanicum* - 30 below zig zag track. | Dense understorey of *Allocasuarina verticillata* on upper slopes grading to open forest below.<br>Previous fires; 1983, 2005. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Avoid damaging swift parrot foraging resource.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts.<br>f) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. |
| QD10 | DGL<br>NAV | *Lathamus discolor* (swift parrot) foraging habitat.<br>*Vittadinia muelleri* - 100 within 0.5 m of road edge outside quarry fence. | Site of former quarry.<br>Unburnt for an extended period.<br>Dense understorey of shrubs including numerous weed species.<br>Lower slopes occupied by squatters camps with consequent rubbish. | a) Control weeds.<br>b) Exclude fire for the duration of the plan. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD11 | DVG<br>DGL | *Austrostipa nodosa* - 30 on old dump site.<br>*Vittadinia muelleri* - 3 as above, 50 on rocky outcrop.<br>*Lathamus discolor* (swift parrot) foraging habitat. | Dense understorey of *Allocasuarina verticillata* on upper slopes grading to open forest below with dense understorey of *Olearia ramulosa.*<br>Previous fire; 2000. | a) Maintain as eucalypt forest.<br>b) Maintain habitat for threatened species.<br>c) Avoid damaging swift parrot foraging resource.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts.<br>f) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. |
| QD12 | DVG (Ev3)<br>FRG | *Vittadinia muelleri* – two locations on shallow soils.<br>*Lepidium pseudotasmanicum* - occasional in growth suppression zones of large eucalypts. | Previous fires; 1995 and 2004 although not extending over all of the unit eg northern and western sectors.<br>Evidence of good recruitment of eucalypts likely to result in transition from woodland to forest.<br>Shrubby incursion notably of *Acacia mearnsii.* | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD13 | DVG (Ev3) | *Carex tasmanica* - approximately 50 plants in roadside drain opposite Grassland Gully interpretation shelter. | Open grassy woodland structure.<br>Previous fires; 1995 (south), 2002. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |
| QD14 | DVG (Ev3) | *Lepidium pseudotasmanicum* – approximately 30 under pines at the southern end of the unit. | This unit has a more dense shrubby character than surrounding VMUs.<br>Previous fires; 1995, 2006 leaving out broad central band as habitat for bandicoots. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Maintain area of dense shrub cover for bandicoot habitat.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD15 | DVG (Ev3)<br>GTL | *Lepidium pseudotasmanicum* - 15, 20, 50, 10, 30, 10, 5, 30 in growth suppression zones of eucalypts and wattles.<br>*Austrostipa bigeniculata* - extensive areas adjacent to Davies Ave supporting many hundreds of plants.<br>*Eryngium ovinum* – single observation in 1980s - not relocated since (J.B. Kirkpatrick pers. com.). | Evidence of shrubby incursion with an over abundance of regenerating seedlings following the last burn.<br>Plenty of eucalypt saplings 2 to 4 m high.<br>Previous fires; 1994 (north), 2005. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |
| QD16 | DVG (Ev3) | *Lepidium pseudotasmanicum* – occasional in growth suppression zones under eucalypts and under wattles in car park planting beds.<br>*Austrodanthonia popinensis* – small patch in disturbed grassland. | Evident regeneration of eucalypts would be retarded by a burn.<br>Previous fires; 1994. | a) Encourage further establishment of shrubby understorey to contrast with management of adjacent units and to screen TCA ground and car park from the Soldiers memorial avenue.<br>b) Use as a 'control' unit; exclude fire for the duration of the plan.<br>c) Maintain habitat for threatened species.<br>d) Control weeds. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD17 | NAV<br>DVG (Ev2) | *Lepidium pseudotasmanicum* – 2 plants on edge of car park.<br>*Vitadinia gracilis* - 3 planted in mulch adjacent to car park.<br>*Scleranthus fasciculatus* – 10 plants on edge of Lower Domain Road.<br>*Austrostipa nodosa* – 6 plants near grassland gully car park. | This unit is riddled with informal walking tracks with associated impacts.<br>Previous fires; 1975, 1983, 1990, 2002. | a) Maintain as combination of eucalypt and she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. |
| QD18 | NAV | No records. | Dense regeneration of saplings of blackwood and she oak.<br>This unit includes some non native eucalypts planted along lower boundary.<br>Previous fires; 1975, 1977, 1983, 1990, 2004. | a) Maintain as she oak forest, with regular burning regime.<br>b) Control weeds. |
| QD19 | NAV | *Hydrocotyle laxiflora* – two large patches, one extending across track on boundary with QD22.<br>*Lepidium pseudotasmanicum* – very occasional under dense cover of she oaks. | Previous fires; 1977, 1983, 1991, 2006. | a) Maintain as maturing she oak forest with long fire interval.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD20 | NAV<br>DVG (Ev2)<br>FRG | *Austrostipa bigeniculata* – many hundreds of plants.<br>*Austrodanthonia popinensis* – small patch on sewerage easement.<br>*Austrostipa nodosa* – 5 plants<br>*Lepidium pseudotasmanicum* – localised patches in forest flourishing as a result of previous burn.<br>*Vittadinia gracilis* – small nos. (6 plants) on lower slope just bellow sewerage easement.<br>*Vittadinia muelleri* – localised patch of approximately 50 plants.<br>Swift parrot habitat – single large blue gum. | Species records from 2005/6 survey for Cornelian Bay for Bushcare Plan (HCC 2007).<br>Previous fires; 1985, 1990, 2004. | a) Maintain as combination of eucalypt and she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds and proliferation of non-native seedlings.<br>d) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD21 | NAV | *Vittadinia muelleri* – common on road formation that follows the north-western boundary between the reserve and residences.<br>*Austrostipa bigeniculata* – small numbers of plants on old road formation.<br>*Austrostipa nodosa* - small numbers of plants on old road formation.<br>*Lepidium pseudotasmanicum* – very occasional. | Mature she oaks falling over and allowing re-establishment of grassy patches.<br>Large range of herbaceous weeds.<br>Previous fires; 1985, 1990. | a) Maintain as she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. |
| QD22 | DVG (Ev3)<br>NAV | *Hydrocotyle laxiflora* – present in at least three locations. Some sites are under pressure from grass tussocks as sheltering effect of trees is being lost due to a number of deaths of eucalypts.<br>*Lepidium pseudotasmanicum* – occasional in growth suppression zones.<br>*Senecio squarrosus* – single plant.<br>*Austrostipa bigeniculata* – small numbers of plants in open grassy site. | Open grassy woodland structure with patches of she oak.<br>Previous fires; 1975, 1984, 1991, 2003. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) ensure shrub canopy cover (including (*Allocasuarina verticillata)* does not exceed 30%. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD23 | DVG (Ev2)<br>NAV | *Hydrocotyle laxiflora* – single large patch on bank below Jogging Track Road.<br>*Lepidium pseudotasmanicum* – very occasional in growth suppression zones. | Evidence of drought induced dieback in eucalypts.<br>Regenerating shrubs (*A. verticillata* and *B. spinosa*) to 2m.<br>Previous fires; 1984, 1991, 1998, 2002. | a) Maintain as combination of she oak forest, and grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 60% total canopy cover. |
| QD24 | NBA<br>NAV<br>DVG (Ev2) | *Vittadinia gracilis* – 1 plant.<br>*Brachyscome sieberi* var. *gunnii* – 8 Pipe Clay Point; 7 at southern end of the unit.<br>*Austrostipa nodosa* – small nos. on track edge and railway embankment.<br>*Austrostipa scabra* - small number on railway embankment.<br>*Lepidium pseudotasmanicum* – 20 plants in shady site near seat on edge of track. | Unburnt for 40 years?<br>Species records from 2005/6 survey for Cornelian Bay for Bushcare Plan (HCC, 2007). | a) Maintain as combination of eucalypt and she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds and proliferation of non-native seedlings.<br>d) Ensure adequate recruitment of eucalypts. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD25 | DVG (Ev3) | *Lepidium pseudotasmanicum* – occasional in growth suppression zones.<br>*Austrodanthonia popinensis* – common close to southern end of unit in disturbed grassland.<br>Swift Parrot habitat – 3 old blue gums. | No record of recent fires | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts and wattles to maintain Lepidium pseudotasmanicum habitat.<br>e) Protect adjoining dwellings from fire. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD26 | GTL | See appendix B for threatened species records.<br>*Austrodanthonia popinensis*<br>*Austrostipa bigeniculata*<br>*Lepidium hyssopifolium*<br>*Lepidium pseudotasmanicum*<br>*Senecio squarrosus*<br>*Scleranthus fasciculatus*<br>*Vittadinia gracilis*<br>*Vittadinia muelleri* | Soldiers Memorial Avenue<br>Has been addressed in separate assessment and management plans (HCC, 2004 and Kirkpatrick, 2006) | a) Refer to Soldiers Memorial Avenue Management Plan (HCC, 2004).<br>b) Protect memorial trees from fire. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD27 | DVG (Ev3)<br>NAV | *Vittadinia muelleri* - significant numbers with some local dense patches totalling several hundred plants and smaller nos. scattered throughout.<br>*Vittadinia gracilis* - 4 in car park bed - apparently not planted, plus a single plant opposite entrance to Botanic Gardens.<br>*Austrostipa nodosa* – large population occupying 15,000 sq m reported (Kirkpatrick, 1995). Only small localised patches evident in current study.<br>*Austrostipa bigeniculata* - scattered in low numbers.<br>*Lepidium pseudotasmanicum* - numerous populations in growth suppression zones.<br>*Scleranthus fasciculatus* - two natural populations of which one appears to be in decline with most plants senescent and closed out by competitive grasses.<br>*Pseudemoia pagenstecheri* (tussock grass skink) – unconfirmed sightings. | Old pinetum with various planted conifers. Part used as a golf practice range in the past and managed by regular mowing until 1990s.<br>Includes a combination of open areas of *Themeda* dominated grassland and various growth suppression zones maintained beneath eucalypts and planted conifers creates a heterogeneity of habitat.<br>Requires periodic biomass reduction through selective mowing or slashing. | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Protect exotic trees from fire, particularly conifers.<br>e) Ensure adequate recruitment of canopy trees to maintain woodland habitat. |
| QD28 | FUR | Not surveyed | Site of former Beamaris Zoo and naval fuel store. | Maintain low fuel loads. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD29 | DVG (Ev3) | *Vittadinia muelleri* - each side of Carriage Drive at the northern end of unit.<br>*Lepidium pseudotasmanicum* – previous records could not be reconfirmed in recent survey. | Requires some form of biomass reduction through regular burning (every 3 year cycle) or through annual slashing.<br>Previous fires: 2005. | a) Burn every 3-year period, alternatively slash every year<br>b) Protect eucalypt saplings during burns<br>c) Carry out regular weed control including pre-and post-burn. |
| QD30 | DVG<br>GTL | *Vittadinia gracilis* – confined to growth suppression zone of select cedars along Davies Avenue. Includes largest population of over 50 plants.<br>*Vittadinia muelleri* - confined to growth suppression zone of select cedars along Davies Avenue.<br>*Lepidium pseudotasmanicum* - occasional in small number beneath cedars and white gums.<br>*Austrostipa nodosa* – small numbers at one location.<br>*Austrostipa bigeniculata* – several patches in *Themeda* grassland and elsewhere. | Fire history unknown.<br>Includes mature white gums over grassy understorey with very little evident recruitment.<br>Northern and western boundaries support modified grassland.<br>Dog exercise area slashed each year.<br>Requires regular biomass reduction by slashing. | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of canopy trees to maintain woodland habitat. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD31 | DVG | *Vittadinia muelleri* - confined to growth suppression zone of select cedars along Davies Avenue.<br>*Lepidium pseudotasmanicum* – occasional in growth suppression zones.<br>*Austrostipa nodosa* – small nos. at one location.<br>*Austrostipa bigeniculata* – a moderate patch on grassy slope below car park.<br>*Austrodanthonia popinensis* – scattered population through avenue and elsewhere. | Unit includes remnant of cedar avenue and is maintained by regular mowing. Notable for abundance of threatened flora.<br>Ivy at base of one cedar capable of spreading under others and affecting habitat for threatened flora.<br>Regular mowing coupled with growth suppression provided by mature trees maintains habitat for several threatened species. | a) Maintain as mown parkland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. |
| QD32 | FUR | *Lepidium pseudotasmanicum* – at base of isolated *Acacia mearnsii* at bottom of slope. | Mown grassy slope. | Maintain as a defendable space to protect adjoining dwellings. |
| QD33 | DVG<br>DPU | *Vittadinia muelleri* - approx 60 plants under blue gums in north of unit.<br>*Scleranthus fasciculatus* - 30 plants near southern boundary and a single plant in area that is fenced off each Targa.<br>*Lepidium pseudotasmanicum* - 60 beneath large she oak.<br>Swift parrot foraging habitat. | This area at 'Fiveways' is used during Targa and is maintained by annual mowing. | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of canopy trees to maintain woodland habitat. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD34 | DVG (Ev3) | *Vittadinia muelleri* - small numbers. – once abundant across entire unit (JBK pers. com.).<br>*Austrostipa bigeniculata* - small patch at northern end in area planted out to she oaks.<br>*Austrostipa nodosa* – a few plants northern end.<br>*Lepidium pseudotasmanicum* – single plant in roadside drain – southern end. | Includes the wireless station.<br>Significant decline in population of *V. muelleri* coincident with cessation of frequent mowing (J B Kirkpatrick pers com). Planted she oaks likely to close out patch of *Austrostipa bigeniculata* as they mature.<br>Relative frequency of *V. muelleri* elsewhere does not require return to costly frequent mowing regime. | a) Protect wireless station from fire<br>b) Maintain as grassy eucalypt woodland.<br>c) Maintain habitat for threatened species.<br>d) Control weeds.<br>e) Ensure adequate recruitment of canopy trees to maintain woodland habitat. |
| QD35 | DVG (Ev2)<br>NAV | *Senecio squarrosus* - single observation.<br>*Lepidium pseudotasmanicum* - 25 close to lower road.<br>*Pseudemoia pagenstecheri* (tussock grass skink). | Formerly part of unit QD3.<br>Includes patches of dense regenerating she oaks, prickly box coppice and native hop seedlings.<br>Previous fires; 1993, 1998, 2003. | a) Maintain as combination of she oak forest, and grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD36 | DGL<br>DVG | *Carex gunniana* record (Kirkpatrick, 1995)? – possible misidentification of *C. longebrachiata* (JBK pers. com.)<br>*Carex longebrachiata* – approx 200 plants – some taxonomic uncertainty with identification between this and the common *C. iynx*.<br>*Carex tasmanica* – small numbers.<br>*Vittadinia muelleri* – 200 + plants east of reservoirs on rock plate and extending into adjacent habitat.<br>Swift Parrot foraging habitat. | No record of recent fires.<br>Head of drainage line supporting sedges amongst dense grass tussocks.<br>Sedges in swale require periodic biomass reduction to prevent large tussocks closing out inter tussock spaces.<br>Need to prevent heavy shading in swale by preventing encroachment of shrubs and saplings. | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts, except in the damp swale below the twin water tanks. |
| QD37 | ASF | Grassland Gully – *Carex tasmanica, Carex gunniana, Carex longebrachiata.* All apparently in decline due to incursion of aggressive non native grasses. | Limit burning in Grassland Gully to specific areas as directed to manage for weedy grass invasion into rare *Carex* habitat. | a) Maintain habitat for threatened species.<br>b) Control weeds. |

| VMU | Vegetation Community[1] | Species or Habitat of Conservation Value (see figure 5) | Comments | Vegetation Management Objectives |
|---|---|---|---|---|
| QD38 | FUR | *Austrostipa bigeniculata* – dry bank in car park.<br>*Austrodanthonia popinensis* – occasional on road margin.<br>*Vittadinia muelleri* – base of trees above cricket pitch.<br>*Lepidium pseudotasmanicum* – scattered in small numbers within growth suppression zones. | Mostly characterised by land fill which has been planted out with a mixture of Tasmanian and Australian natives.<br>Acts as a refuge for weeds to reinvade adjacent areas. | a) Maintain habitat for threatened species.<br>b) Control weeds.<br>c) Exclude fire. |

**1** – TASVEG v1.0 codes (Harris & Kitchener 2005). Codes in brackets refer to floristic communities described and mapped by Kirkpatrick (1995):

Ev2 – *Eucalyptus viminalis – Allocasuarina verticillata – Acacia mearnsii* grassy woodland
Ev3 – *Eucalyptus viminalis* grassy woodland
DVG – *Eucalyptus viminalis* grassy forest and woodland
DPU – *Eucalyptus pulchella* forest and woodland
DGL - *Eucalyptus globulus* dry forest and woodland
NAV – *Allocasuarina verticillata* forest
NBA – *Bursaria/Acacia* woodland and scrub
GTL – Lowland *Themeda* grassland
ASF – Freshwater aquatic sedgeland and rushland
FRG – Regenerating cleared land
FUR – Urban areas

# 6. Strategy Implementation

## 6.1 Bushfire Risk Reduction Strategy

The overall bushfire risk reduction plan recommended for the Queens Domain can be summarised as follows:

- Reduce ignitions through community education, and prosecution of those who start fires.
- Maintain access for the Tasmania Fire Service so they can quickly suppress wildfires.
- Improve protection of built assets on the Domain.
- Provide information to residents to help them reduce the fire risk to their assets.
- Schedule and sequence ecosystem management burns so as to provide the maximum hazard reduction advantage.

## 6.2 Community Education, Awareness and Involvement

It was noted in section 3.3 that at least 30% of fires on the Domain over the last 15 years were maliciously lit. If this source of ignitions is reduced it will substantially reduce the risk of major fires. Along with on-going awareness of this fire management plan, it will be necessary to increase residents' and users' awareness of the risks of bushfires.

## 6.3 Management Prescriptions for Vegetation Management Units

Management prescriptions for the VMUs in the Domain are given in table 9. In this revision frequent burning is only recommended for a small number of VMUs thus increasing the likelihood that the burning schedule can be adhered to. Units selected for frequent burning include those supporting grassland and grassy woodland on the northern slopes of the Domain. Surrounding units have been selected for a varying frequency regime. Given the absence of grazing as a form of biomass reduction, the role of burning is seen as a significant means of achieving this effect. In most typical situations a burnt patch of woodland or grassland would attract an increased intensity of marsupial grazing which would contribute to arresting processes of succession and dominance by species which germinate prolifically after fires, such as *Allocasuarina verticillata*. Conversely the absence of this following fire is likely to result in intensification of the woody vegetation due to unconstrained fire coppicing of trees and shrubs coupled with fire stimulated germination.

The southern Domain includes significant areas of grassland and open grassland. Burning is likely to be more contentious here (eg Soldiers Memorial Avenue) and this area also is subject to a reasonable frequency of mowing and slashing which is an alternative means of biomass reduction to burning.

**Table 9 – Management prescriptions for vegetation management units**

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD1 | 3.84 | a) Maintain as native grassland by limiting tree and shrub canopy cover to less than 20%.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. | 1 Control the incursion of trees and shrubs through burning in every 3-year period.<br>2 Do not burn in the same year as QD2 or QD6.<br>3 Carry out pre-and post-burn weed control. | | Burn | Burn | Burn | Burn | Burn |
| QD2 | 4.47 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. | 1 Trial the targeted removal of she oak saplings (*Allocasuarina verticillata*) from grassy areas through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period if she oak controlled by manual removal, otherwise burn every 3-year period.<br>3 Do not burn in the same year as QD1.<br>4 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>5 Carry out regular weed control including pre-and post-burn. | | | Burn | | Burn | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD3 | 5.60 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. | 1 Trial the targeted removal of she oak saplings (*Allocasuarina verticillata*) from grassy areas through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period if she oak controlled by manual removal, otherwise burn every 3-year period.<br>3 Do not burn in the same year as QD2.<br>4 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>5 Carry out regular weed control including pre-and post-burn. | Power line easement on southern boundary. | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD4 | 4.01 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds<br>d) Limit density of she oak (*Allocasuarina verticillata*) to less than 20% total canopy cover. | 1 Trial the targeted removal of she oak saplings (*Allocasuarina verticillata*) from grassy areas through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period if she oak controlled by manual removal, otherwise burn every 3-year period.<br>3 Do not burn in the same year as QD2 or QD3.<br>4 Slash open grassy areas annually. Remove slashed grass.<br>5 Carry out regular weed control including pre-and post-burn. | Protect timber seats during burns. | | Burn | | Burn | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD5 | 5.84 | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 30% total canopy cover. | 1 Trial the targeted removal of she oak saplings (*Allocasuarina verticillata*) from grassy areas through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period, if she oak controlled by manual removal, otherwise burn every 3-year period.<br>3 Do not burn in spring.<br>4 Carry out regular weed control including pre-and post-burn. | Power line easement on western boundary.<br>Power pole with transformer near eastern boundary. | Burn | | Burn | | Burn |
| QD6 | 5.70 | a) Maintain as eucalypt and she oak forest.<br>b) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn every 3rd 3-year period.<br>2 Do not burn in the same year as QD1.<br>3 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>4 Carry out regular weed control including pre-and post-burn. | Protect blue markers along water pipeline during burns.<br>Power line easement on southern boundary. | | | Burn | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD7 | 1.87 | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 40% total canopy cover. | 1 Control she oak (*Allocasuarina verticillata*) spread, as required, through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 3rd 3-year period.<br>3 Do not burn in spring.<br>4 Carry out regular weed control including pre-and post-burn. | Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns.<br>Avoid burning under power lines. | | Burn | | | Burn |
| QD8 | 4.59 | a) Maintain as grassy eucalypt woodland.<br>b) Avoid damaging swift parrot foraging resource.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn every 3rd 3-year period.<br>2 Do not burn in spring.<br>3 Carry out regular weed control including pre-and post-burn. | Leave 20 m wide unburnt strip along the Brooker Highway.<br>Avoid burning under power lines. | Burn | | | Burn | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD9 | 1.81 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Avoid damaging swift parrot foraging resource.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts.<br>f) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. | 1 Control she oak (*Allocasuarina verticillata*) spread, as required, through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 3rd 3-year period.<br>3 Do not burn in spring.<br>4 Carry out regular weed control including pre-and post-burn. | Leave 20 m wide unburnt strip along the Brooker Highway. | | | Burn | | |
| QD10 | 2.15 | a) Control weeds.<br>b) Exclude fire for the duration of the plan. | 1 Remove weeds.<br>2 No burning apart from pile burns of weeds. | Steep and precipitous slopes, fall hazard. | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD11 | 1.98 | a) Maintain as eucalypt forest.<br>b) Maintain habitat for threatened species.<br>c) Avoid damaging swift parrot foraging resource.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts.<br>f) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. | 1 Control she oak (*Allocasuarina verticillata*) spread, as required, through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 3rd 3-year period.<br>3 Do not burn in spring.<br>4 Carry out regular weed control including pre-and post-burn. | Steep slopes, fall hazard. | Burn | | | Burn | |
| QD12 | 4.02 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn in first 3-year period, then every 2nd 3-year period.<br>2 Carry out regular weed control including pre-and post-burn. | Do not scorch memorial trees in adjoining VMU 26 | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD13 | 3.90 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn every 2nd 3-year period.<br>2 Carry out regular weed control including pre-and post-burn. | Do not scorch memorial trees in adjoining VMU 26. | | Burn | | Burn | |
| QD14 | 3.46 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Maintain area of dense shrub cover for bandicoot habitat.<br>d) Control weeds.<br>e) Ensure adequate recruitment of eucalypts. | 1 Burn every 2nd 3-year period.<br>2 Do not burn area with a dense shrub cover to maintain bandicoot habitat.<br>2 Carry out regular weed control including pre-and post-burn. | Do not scorch memorial trees in adjoining VMU 26.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD15 | 2.63 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn every 3-year period, alternatively, slash grass annually.<br>2 Carry out regular weed control including pre-and post-burn.<br>3 Selectively thin out eucalypt saplings to prevent succession to forest, retain saplings with the best growth form. | Do not scorch memorial trees in adjoining VMU 26.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | Burn | Burn | Burn | Burn | Burn |
| QD16 | 3.48 | a) Encourage further establishment of shrubby understorey to contrast with management of adjacent units and to screen TCA ground and car park from the Soldiers memorial avenue.<br>b) Use as a 'control' unit; exclude fire for the duration of the plan.<br>c) Maintain habitat for threatened species.<br>d) Control weeds. | 1 Do not burn for the duration of this plan.<br>2 Carry out regular weed control. | | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD17 | 4.46 | a) Maintain as combination of eucalypt and she oak forest..<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts. | 1 Burn every 2nd 3-year period.<br>2 Carry out regular weed control including pre-and post-burn. | Traffic hazard on Lower Domain Road.<br>Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns.<br>Protect recorded Aboriginal heritage site[3].<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD18 | 6.93 | a) Maintain as she oak forest.<br>b) Control weeds. | 1 Burn every 3rd 3-year period.<br>2 Carry out regular weed control including pre-and post-burn.<br>3 Search for *Hydrocotyle laxiflora* in spring following a burn. | Power line easement on northern boundary.<br>Traffic hazard on Lower Domain Road.<br>Protect recorded Aboriginal heritage site[3].<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | Burn | | |
| QD19 | 8.05 | a) Maintain as maturing she oak forest with long fire interval.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. | 1 Exclude fire for the duration of the plan<br>2 Carry out regular weed control.<br>3 Monitor condition of existing *Hydrocotyle laxiflora*.<br>4 Search for *Hydrocotyle laxiflora* in spring following a wildfire. | Protect power line poles southern boundary during burns.<br>Leave 20 m wide unburnt strip along Domain Highway.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD20 | 2.96 | a) Maintain as combination of eucalypt and she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds and proliferation of non-native seedlings.<br>d) Ensure adequate recruitment of eucalypts. | 1 Limit burning to small weed patches and piles of weeds.<br>2 Carry out regular weed control.<br>3 Slash grassy habitats supporting threatened grass species annually. | Ensure smoke does not blow across Domain Highway.<br>Protect recorded Aboriginal heritage sites[3].<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |
| QD21 | 1.62 | a) Maintain as she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. | 1 Carry out regular weed control.<br>2 Limit burning to small weed patches and piles of weeds.<br>3 Maintain firebreak by annual slashing. This will also assist with maintaining threatened species habitat. | Contact Hobart Water prior to burns.<br>Ensure smoke does not blow across Domain Highway.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD22 | 12.14 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) ensure shrub canopy cover (including (*Allocasuarina verticillata*) does not exceed 30%. | 1 Control she oak (*Allocasuarina verticillata*) and other shrub spread, as required, through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period.<br>3 Monitor condition of existing *Hydrocotyle laxiflora*.<br>4 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>5 Carry out regular weed control including pre-and post-burn. | Leave 20 m wide unburnt strip along Domain Highway.<br>Ensure smoke does not blow across Domain Highway.<br>Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD23 | 5.64 | a) Maintain as combination of she oak forest, and grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 60% total canopy cover. | 1 Control she oak (*Allocasuarina verticillata*) through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period.<br>3 Monitor condition of existing *Hydrocotyle laxiflora*.<br>4 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>5 Carry out regular weed control including pre-and post-burn. | Leave 20 m wide unburnt strip along the Brooker Highway.<br>Ensure smoke does not blow across the Brooker Highway.<br>Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns. | | Burn | | Burn | |
| QD24 | 1.97 | a) Maintain as combination of eucalypt and she oak forest.<br>b) Maintain habitat for threatened species.<br>c) Control weeds and proliferation of non-native seedlings.<br>d) Ensure adequate recruitment of eucalypts. | 1 Limit burning to small weed patches and piles of weeds.<br>2 Carry out regular weed control. | Ensure smoke does not blow across the Domain Highway.<br>Protect recorded Aboriginal heritage sites[3].<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD25 | 1.63 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts and wattles to maintain *Lepidium pseudotasmanicum* habitat.<br>e) Protect adjoining dwellings from fire. | 1 Burn every 2nd 3-year period, alternatively slash every 2 years<br>2 Protect eucalypt saplings during burns<br>3 Carry out regular weed control including pre-and post-burn.<br>4 Maintain slashed fire break along the western boundary of the unit. | Avoid burning under power lines. | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD26 | 10.31 | a) Refer to Soldiers Memorial Avenue Management Plan (HCC, 2004).<br>b) Protect memorial trees from fire. | 1 Exclude fire.<br>2 Slash grass in summer to keep height < 100 mm. Remove slashed grass. Extend slashing 7 m beyond the canopy of the outer row of cedars to protect them from fire.<br>3 Count populations of threatened species every 3 years in optimum season (usually spring).<br>4 Mowing and raking required to prevent grasses closing out rare herbs, notably *Vitadinia. gracilis* and *Scleranthus fasciculatus*. | Take precautions to avoid scorching memorial trees when burning adjoining VMUs. | | | | | |
| QD27 | 5.51 | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d)Protect exotic trees from fire, particularly conifers.<br>e) Ensure adequate recruitment of canopy trees to maintain woodland habitat. | 1 Exclude fire.<br>2 Slash grass in summer to keep height < 100 mm to reduce biomass and protect conifers from fire. Remove slashed grass. | Protect recorded Aboriginal heritage site[3].<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD28 | 2.46 | Maintain low fuel loads. | 1 Exclude fire.<br>2 Slash grass in summer to keep height < 100 mm. | High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |
| QD29 | 1.45 | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of canopy trees to maintain woodland habitat. | 1 Burn every 3-year period, alternatively slash every year<br>2 Protect eucalypt saplings during burns<br>3 Carry out regular weed control including pre-and post-burn. | Do not scorch memorial trees in adjoining VMU 26.<br>Do not burn strip between path and the Tasman Highway.<br>Ensure smoke does not blow across Tasman Highway.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | Burn or slash | Burn or slash | Burn or slash | Burn or slash | Burn or slash |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD30 | 2.20 | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of canopy trees to maintain woodland habitat. | 1 No burning<br>2 Continue regular slashing of grass. Remove slashed grass. | | | | | | |
| QD31 | 1.38 | a) Maintain as mown parkland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds. | 1 No burning<br>2 Continue regular mowing. Remove slashed grass.<br>2 Remove ivy | | | | | | |
| QD32 | 0.63 | Maintain as a defendable space to protect adjoining dwellings. | 1 No burning<br>2 Slash grass in summer to keep height < 100 mm. Remove slashed grass. | | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD33 | 0.69 | a) Maintain as grassy woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of canopy trees to maintain woodland habitat. | 1 No burning<br>2 Continue regular slashing of grass. Remove slashed grass. | | | | | | |
| QD34 | 1.82 | a) Protect wireless station from fire<br>b) Maintain as grassy eucalypt woodland.<br>c) Maintain habitat for threatened species.<br>d) Control weeds.<br>e) Ensure adequate recruitment of canopy trees to maintain woodland habitat. | 1 No burning<br>2 Maintain defendable space around the wireless station (see Table 6).<br>3 Continue annual slashing of grass. Remove slashed grass. | | | | | | |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD35 | 4.95 | a) Maintain as combination of she oak forest, and grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts.<br>e) Limit density of she oak (*Allocasuarina verticillata*) to less than 50% total canopy cover. | 1 Control she oak (*Allocasuarina verticillata*) through cut and herbicidal paste methods (see section 6.3.2).<br>2 Burn every 2nd 3-year period.<br>3 Search for *Hydrocotyle laxiflora* in spring following a burn.<br>4 Carry out regular weed control including pre-and post-burn. | Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns. | | Burn | | Burn | |
| QD36 | 2.16 | a) Maintain as grassy eucalypt woodland.<br>b) Maintain habitat for threatened species.<br>c) Control weeds.<br>d) Ensure adequate recruitment of eucalypts, except in the damp swale below the twin water tanks. | 1 Burn every 2nd 3-year period, alternatively slash swale every year. Do not burn in spring.<br>2 Remove small eucalypt saplings in the swale.<br>3 Carry out regular weed control including pre-and post-burn. | Contact Hobart Water prior to burns. Protect blue markers along water pipeline during burns. | Burn | | Burn | | Burn |

| VMU | AREA (ha) | MANAGEMENT OBJECTIVES (from Table 8) | MANAGEMENT ACTIONS | PRECAUTIONS DURING BURNING | BURNING SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2008 to 2010 | 2011 to 2013 | 2014 to 2016 | 2017 to 2019 | 2020 to 2022 |
| QD37 | 0.55 | a) Maintain habitat for threatened species.<br>b) Control weeds. | 1 Prepare a bush regeneration plan for the VMU.<br>2 Use fire, as required, to assist with weed control. | Protect timber boardwalk if any burning carried out.<br>High sensitivity for Aboriginal heritage, consult with TALSC before any works that will disturb the ground. | | | | | |
| QD38 | 2.27 | a) Maintain habitat for threatened species.<br>b) Control weeds.<br>c) Exclude fire. | 1 No burning.<br>2 Carry out regular weed control. | | | | | | |

NOTES:

1 The optimal season for low intensity burning is autumn or winter. However, early spring burning is not necessarily unsuitable and can be implemented if the opportunity for autumn burns has been missed, or vegetation is too damp to burn at this time of year.

2 It will generally not be possible to achieve a uniform fire intensity and flame height during a burn due to variations in topography and fuel loads, however the overall intensity should be low to limit canopy scorch, except in areas where one of the objectives of burning is to control she oak in which case a higher intensity burn is desirable.

3 See the *Queens Domain Cultural Heritage Management Plan* (Austral Archaeology Pty Ltd., 2002).

### 6.3.1 Prescribed Fire Regimes

Prescribed burns in this plan will be carried out through spot or line ignition within established containment lines (trails or previous burns). These burns can be easily controlled within the containment lines in mild conditions (FDR – Low).

To allow for flexibility in budgeting and planning, burns have been scheduled within five 3-year periods as shown in table 9. The burns can take place at any suitable time during the specified 3-year period, except where specified in table 9.

General desired outcomes for all burns:

- Low to moderate intensity.
- Exclusion of fire from riparian plant communities.
- No fire fighting foam used near known populations of threatened plants without prior consultation with the DPIW Threatened Species Section.
- Exclusion of fire from any fuel modified buffer zones that are close to dwellings and are being actively managed by other means
- Retention of fallen logs, dead trees and stumps where possible. If difficult to protect, trial the use of fire retardant by spraying on logs, stumps and in hollow trees prior to burning.
- Burn coverage greater than 80%
- Fine fuel loads reduced to less than 5 tonnes per hectare overall
- Minimal smoke over nearby urban areas and sports venues.

The following fuel and weather conditions are considered to be optimal for safe, low intensity burning of dry forests and grassy woodlands:

- Fuel Moisture Content (FMC) of surface fine fuels 13% to 16%
- Soil Dryness Index (SDI) - 25 to 50
- Fire Danger Index (FDR) - Low
- Wind Speed - < 20 km per hour in the open
- Relative Humidity - 40% to 60%
- Temperature - < 20˚ C

Burning can be undertaken when weather conditions are outside these prescriptions if the officer in charge is confident (based on past experience) that the desired outcomes can be safely achieved.

Burns should only be undertaken when forecast winds will not carry smoke towards nearby urban areas, or sports facilities if these are in use. On calm days burns should be timed so

that they burn out before inversions form in the evening. Burns on the Queens Domain need to be coordinated with other planned burns in the area to avoid excessive levels of smoke in the Derwent Valley.

In order to create a mosaic of native bushland with different fire histories, adjoining VMUs should generally not be burnt in the same 3-year period, certainly not in the same year. Fire management units scheduled for burning should be inspected some months prior to the proposed burn to check that the scheduling and burning prescriptions are still appropriate. It should be noted that areas excluded from the prescribed burning program will still be vulnerable to wildfires. In fact wildfires in these areas are likely to be of higher intensity, and cause greater damage, than in areas included in the prescribed burning program due to higher fuel loads.

### 6.3.2 Control of She Oak (*Allocasuarina verticillata*)

As noted in section 4.6.1 one of the major changes in the vegetation on the Domain over the last 30 years has been a steady increase in the area and density of she oak on the northern portion of the Domain. The 1995 fire management plan attempted to address this issue through a regime of relatively frequent burning. However, for reasons explained in section 4.6.1 this was not successful. The results of recent burns in QD6 and QD19 indicate that they have had little, if any, effect on limiting the spread of she oak, and a return to the frequent burning regime in the 1995 fire management plan is now unlikely to be successful limiting she oak spread, though it will probably retard recruitment of canopy eucalypts. It is apparent that new methods will be needed to ensure cost effective control of she oak. This plan proposes trailing a technique of manual removal of she oak saplings coupled with burning. The manual removal will to some extent mimic the marsupial grazing of regrowth that would have limited the spread of she oak in the past. The proposed procedure is as follows:

1. Areas where it is considered desirable to limit the density of she oak in order to conserve biodiversity have a maximum desirable density of she oak specified in table 9.
2. Where this density has been exceeded, she oak saplings should be manually removed by cutting the stem and pasting the exposed stump with herbicide. This should be carried out at least 3 months before a scheduled burn. The cut upper part of the stem may be left on the ground as fuel for the subsequent fire.

## 6.4 Weed Control

Known responses to fire of introduced plants on the Queens Domain is detailed in table 7.

Prior to management burning any mature woody weeds in the VMUs to be burnt should be treated to ensure infestations are root dead at the time of burning. Chemical treatment of woody weeds may involve cutting and poisoning the stump (cut-stump), tree injection, or spraying with an appropriate herbicide. Herbaceous weeds should be treated using a foliar spray. Treatment of target weeds both pre- and post-fire has been detailed in table 10.

Table 10 – Recommended treatment for target weeds on the Queens Domain

| TARGET WEEDS | BEFORE BURNING | | | | | AFTER BURNING | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | |
| *Arctotheca calendula* (African daisy) | | | | | | X | | | | | |
| *Briza maxima* (quaking grass) | | | | | | X | | | | | |
| *Briza minor* (shivery grass) | | | | | | X | | | | | |
| *Bromus spp* | | | | | | X | | | | | |
| *Carduus spp. / Cirsium sp.* (thistles) | X | | | | | X | | | | | |
| *Centranthus ruber* (red valerian ) | | | | | | X | | | | | |
| *Chrysanthemoides monilifera ssp. Monilifera* (boneseed) | X | X | | | | X | | | X | | Preferable to have cut stems lying on ground for fuel and to avoid moving seed bearing material. |
| *Coprosma repens* (mirror bush) | | X | X | | | X | | | | | |
| *Cortaderia selloana* (pampas grass) | X | | | | X | X | | | X | X | Remove flower panicles opportunistically and mark for future spraying. |
| *Cotoneaster spp.* (cotoneaster) | | X | X | | | X | | | X | | Preferable to have cut stems lying on ground for fuel. |
| *Crataegus monogyna* (hawthorn) | | X | X | | | X | | | X | | Preferable to have cut stems lying on ground for fuel. |

| TARGET WEEDS | BEFORE BURNING | | | | | AFTER BURNING | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | |
| *Crocosmia x Xcrocosmiiflora* (montbretia*)* | X | | | | | X | | | | | |
| *Cytisus scoparius* (English broom) | X | | | | | X | | | X | | Preferable to have cut stems lying on ground for fuel and to avoid moving seed bearing material. |
| *Dactylis glomerata* (cocksfoot) | | | | | | X | | | | | |
| *Erica lusitanica* (Spanish heath) | X | | | | | X | | | X | | |
| *Euryops abrotanifolius* (winter euryops) | X | X | | X | | X | | | X | | |
| *Foeniculum vulgare* (fennel) | X | | | | | X | | | | | |
| *Genista monspessulana* (canary broom) | X | X | | | | X | | | X | | Preferable to have cut stems lying on ground for fuel and to avoid moving seed bearing material |
| *Holcus lanatus* (yorkshire fog grass) | | | | | | X | | | | | |
| *Hypochoeris radicata* (rough catsear) | | | | | | X | | | | | |
| *Leontodon taraxacoides* (hairy hawkbit) | | | | | | X | | | | | |
| *Lycium ferocissimum* (African boxthorn) | X | X | | | | X | | | | | Preferable to have cut stems lying on ground for fuel and to avoid |

| TARGET WEEDS | BEFORE BURNING | | | | | AFTER BURNING | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | |
| | | | | | | | | | | | moving seed bearing material. |
| *Nassella neesiana* (Chilean needle grass) | X | | | | | X | | | | | |
| *Pinus radiata* (Monterey pine) | | X | | | | X | | | X | | Preferable to have cut stems lying on ground for fuel and to avoid moving seed bearing material. |
| *Pittosporum undulatum* (sweet pittosporum) | | X | X | | | X | | | X | | |
| *Pyracantha crenulata* | | X | | | | | X | | | | |
| *Rapistrum rugosum* (giant mustard) | | | | | | X | | | | | |
| *Reseda alba* (white mignonette) | | | | | | X | | | | | |
| *Rhamnus alaternus* (Italian buckthorn) | | X | | | | | | | X | | |
| *Rosa rubiginosa* (briar rose) | X | X | | | | X | | | X | | |
| *Rubus fruticosus* (blackberry) | X | | | | | X | | | | | |
| *Salix alba* X *fragilis* (crack willow) | | X | X? | | | X | | | | | Drilling only suited to mature trees. |
| *Scabiosa atropurpurea* (garden pincushion) | | | | | | X | | | | | |

| TARGET WEEDS | BEFORE BURNING | | | | | AFTER BURNING | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | Spot Spray | Cut Stump & Poison | Drill & Poison | Hand Pull | Other | |
| *Sisymbrium officinale* (hedge mustard) | | | | | | X | | | | | |
| *Ulex europaeus* (gorse) | X | X | | | | X | | | X | | Preferable to leave cut stems lying on ground for fuel and to avoid moving seed bearing material. |
| *Urospermum dalechampii* (false dandelion) | X | | | | | X | | | | | |
| *Vinca major* (periwinkle) | X | X | | X | | X | | | X | | |

Herbicide treatment should be carried out at least 3 months prior to a burn to ensure that the chemical has penetrated into the root system, achieved a kill of all tissue, and the plant has had time to desiccate prior to burning. This will maximise removal of weed biomass during the burn. Disturbance of the treated infestations (by mechanical means, slashing or burning) within this period may reduce the herbicide's effectiveness, and regeneration from rootstock is likely to occur.

Following a management burn in heavily weed infested areas, a flush of weed seedlings can be expected. It is essential to treat weed seedlings (either manually or using a foliar spray) before indigenous plant seeds germinate. As a rule of thumb, herbaceous (and some woody) weeds germinate rapidly in high light situations, so that it may be possible to treat the flush of weeds before any native seeds germinate. However, once native seeds have germinated, control options are reduced to careful spot-spraying (using a protective cone nozzle sprayer) or hand weeding.

Woody weeds regenerating from rootstock must also be treated promptly. Re-cutting the stump and poisoning, drilling into the bole (junction of stem and root), or spraying new shoots when they reach approximately 0.5 m in height, is recommended.

Burning weed debris in situ is an economical way of disposing of large amounts of material, and may stimulate germination of indigenous plant seeds if present in the soil. Note that burning will also stimulate weed seeds to germinate and follow-up treatment will be required.

## 6.5 Post-Fire Safety and Rehabilitation

Immediately following a management burn or wildfire on the Queens Domain, all roads and foot tracks through the burnt area should be closed to the public until they are inspected and declared safe. This will involve checking the burnt area for damaged trees or branches and removing any that may fall on the trail. In addition, any other infrastructure in the burnt area should be inspected for damage and repaired as required.

Any control lines constructed to control fires should be fully rehabilitated, particularly if on steep slopes.

## 6.6 Equipment and Training

Successful implementation of the prescribed burns in this plan requires trained personnel and special equipment. Prescribed burns can be carried out by Hobart City Council, the Tasmania Fire Service, or by contractors. If the prescribed burning is contracted out, the contractor must be able to meet the required training, crew and equipment levels specified

in this section, as well as provide evidence of experience in carrying out ecosystem management burns.

The person in charge of the crew conducting any burns prescribed in this fire management plan must have completed training to Officer level in the Tasmania Fire Service (TFS) (or equivalent), and have currency in accredited courses/competencies for low intensity prescribed burning. If the burn is to be carried out near a public road, the person in charge must also have an accredited competency in managing smoke hazards over roads.

All crew members must have completed the TFS's Respond to Wildfire course (or equivalent). All personnel involved in the burn must be attired, and provided with personal protective equipment, as set out in the TFS Emergency Response Procedure. All personnel must comply with the relevant safety procedures in the TFS Standard Operating Procedures. Crews should also receive training in the recognition of Aboriginal heritage sites.

**Crew Strength**

Officer in charge plus 4 crew members for smaller burns; 6 crew members required if two tankers are used on larger burns. An additional 2 , suitably qualified, crew members may be required to control traffic if smoke is likely to blow across nearby roads, alternatively the police or other qualified traffic controllers will be required. Recommended minimum crew strengths can be varied at the discretion of the officer in charge of the burn.

**Minimum Resources**

Light, medium or heavy tanker as appropriate. More than one tanker may be required for larger burns (decision to be made by the officer in charge prior to the burn)

- hydrant standpipe on each tanker
- 3 McLeod Tools
- axe and brush hook
- 3 drip torches + fuel
- 2 knapsack sprays (4 for units where there is limited vehicle access)
- chainsaw and fuel
- fire hoses sufficient to mop up for a distance of at least 100 m from the boundary of the burn
- instruments to measure wind speed, relative humidity and temperature
- drinking water and first aid kit
- warning signs, traffic control signs, and road barriers as required.

These recommended minimum equipment requirements can be varied at the discretion of the officer in charge of the burn.

### Communications

The crew conducting a burn must have the means to communicate with the Tasmania Fire Service (mobile phone, radio) at all times while the burn is under way in case back-up is required.

Hand-held radios should be used if the area to be burnt is relatively large, and crew members will be out of sight of each other.

## 6.7 Coordination of Burns with other Activities

A meeting of the relevant stakeholders, should be held each autumn at the commencement of the burning season in order to coordinate and integrate the various on-ground fire management activities to be undertaken over winter.

A meeting should also be held in spring at the beginning of the bushfire danger period to review works undertaken during autumn and winter, and coordinate activities during the fire season.

The meeting should include representatives of any groups who will be carrying out fire management, weed control, recreation or construction activities on the Queens Domain. Hobart Water and Aurora Energy should be included if issues affecting their infrastructure will be discussed. TALSC should also be included if activities in areas with known Aboriginal heritage sites, or in the sensitive zone for Aboriginal sites (between the foreshore and the 50 m contour) will be discussed.

The meetings should be minuted, and an edited version of the minutes prepared that summarises management actions completed since the previous meeting, and future management actions agreed to at the meeting. The edited minutes should be circulated to all interested stakeholders.

### Autumn Meeting

The autumn meeting should at least consider and resolve the following issues:

- what is the best time to carry out scheduled prescribed burns so that they cause the least disruption to other activities?
- to what extent is pre- and post-fire weeding required, who will carry it out, and when?
- what other preparation work needs to be carried out, who will do it, and when?
- are there any areas within, or adjacent to, areas to be burnt (such as roadside barriers) that require special protection, and what protection measures will be taken?

- is everyone aware of the identified fire exclusion zones (eg. fire sensitive habitats)?
- have any threatened species been recently identified on the Domain? Are they likely to be affected by the burns proposed for the year? If so, what needs to be protected from fire (nest sites, food sources etc)? If individuals of threatened species are likely to be killed in the burns, check if a licence from the DPIW is required?
- which emergency vehicle access routes require maintenance, who will carry it out and when?

### Spring Meeting

The spring meeting should at least consider and resolve the following issues:

- what are the predictions for the coming fire season?
- have all the prescribed burns and other fire management activities for the previous winter been achieved, if not, can they still be achieved?
- has maintenance of all defendable spaces around assets at risk on the Domain been carried out? (see table 6)
- if a severe fire season is predicted can any precautions be taken to minimise the fire risk?.

## 6.8 Monitoring and Evaluation

Details of any management burning or wildfires on the Domain should be recorded as follows:

### Management Burns

The following details should be recorded for any management burns on the Domain:

- the area burnt (VMU, or portion of unit)
- date, and time of commencement and completion of the burn
- who carried out the burn
- crew strength
- fine fuel loads prior to the burn
- weather conditions during the burn (temperature, relative humidity, wind speed and direction)
- FDR and SDI on the day of the burn
- fire intensity estimated from flame height (low < 0.5 m; moderate 0.5 to 1.5 m; high> 1.5 m)
- percent of canopy scorch (forest and shrubland units only)
- any variations to the burning prescription

- any problems encountered, such as spotting over control lines
- dates and extent of any pre- and post-burn weed control
- weed species and general density of weeds in the area burnt at the time of pre-burn weed control.

**Wildfires**

The following details should be recorded for any wildfires on the Domain:

- the cause of the fire
- the area burnt (VMUs or portion of units)
- date and time the fire was reported
- weather conditions at the time of the fire (temperature, relative humidity, wind speed and direction)
- FDR and SDI on the day of the fire
- extent of any backburning carried out
- fire intensity estimated from flame height (low < 0.5 m; moderate 0.5 to 1.5 m; high> 1.5 m)
- average scorch height (survey one to two weeks after the fire)
- any assets lost or damaged within or adjacent to the Domain
- any problems encountered during fire fighting operations, such as poor condition of access, inadequate water supply
- dates and extent of any post-fire weed control.

### 6.8.1 Species of Conservation Value

It is important that the burning regimes in this Fire Management Plan do not negatively impact upon known populations of threatened species. The fire regimes prescribed in this plan are based on current knowledge of the fire management requirements of the threatened species known to occur on the Domain. However, given some of the uncertainties in our knowledge of the fire ecology of some of the threatened plants, changes in populations should be monitored.

Accurate mapping and determination of existing population sizes followed by periodic recounts is the best way to accomplish this. Appendix A contains the locations of all threatened flora that could be located on the Domain and an estimate of the population size. These locations are also shown on figure 5.

### 6.8.2 Plant Community Structure and Floristics

A photographic record of the vegetation in each VMU should be set up to monitor any major changes in plant community structure over time. Photos should be taken of a representative section of each VMU at the beginning of each 3-year period of the plan. Photos should be taken from the same location in each unit and show the same area of bushland. This will require a marked vantage point in each unit, and specifications as to the film type and camera settings to be used. Ideally the same focal length setting should be used throughout the monitoring period.

The 1995 fire management plan recommended setting up paired replicated permanent monitoring plots over the boundaries of compartments. This action was not implemented. The only vegetation monitoring carried out uses 68 random sampling areas spread over the area of the Domain covered by native vegetation. These plots have been set up by Professor Jamie Kirkpatrick and are monitored periodically. The last sampling occurred in 2000 and the results were published in the Australian Journal of Botany in 2004 (Kirkpatrick, 2004).

Although a system of paired replicate plots would provide better data on the effects of fire on the native vegetation on the Domain, the randomly selected sampling sites have the advantage of about 30 years of data. Sampling of the random sites should be continued at, at least, 10 yearly intervals. Some paired replicate sites should also be added to the monitoring program.

### 6.8.3 Performance Indicators

The management action summary in section 8 includes performance indicators for actions, or groups of actions, recommended to meet the objectives of the fire management plan. Desired outcomes for management burns are given in the prescriptions in section 6.3.1 and in table 9. The performance indicators should be used to determine if the specific objectives of this fire management plan have been achieved. They should be monitored every 5 years during the operation of the plan. Where performance targets are not being achieved, a review of the relevant portion of the plan should be undertaken.

### 6.8.4 Review of the Fire Management Plan

If a wildfire burns more than half of a VMU, the whole of the unit should be considered to have been burnt and the schedule adjusted accordingly.

Minor reviews should be undertaken approximately every 5 years, and when any of the triggers listed in table 11 are encountered. A full review of the fire management plan should be undertaken after all the burns prescribed for the fifth 3-year period of the plan have been completed.

The review should include:

- an audit to ascertain if procedures have been properly carried out and performance targets have been achieved
- a review of contemporary fire management and fire ecology literature to incorporate the latest information into the plan
- comparison of the condition of burnt and unburnt VMU
- assessment of any changes in plant community structure as a result of fire
- preparation of a revised fire management plan to cover the next 15 years.

**Table 11 - Fire management plan revision procedures**

| ASSESSMENT | REVIEW TRIGGER | RECOMMENDED ACTION |
|---|---|---|
| Monitoring of wildfires on the Queens Domain. | Wildfire burns more than half of any single VMU. | Consider the whole unit to have been burnt and reschedule the next prescribed burn according to the optimal fire frequency given in Table 5. |
| Monitoring of wildfires on the Queens Domain | Wildfire burns more than 50% of the VMUs in any single year. | Completely revise the burning schedule. |
| Flora and fauna surveys or incidental recordings. | Threatened species considered sensitive to fire recorded on the Domain. | Revise the burning prescription and/or burning schedule to ensure that the newly identified threatened species is/are not adversely affected. |
| At the end of each 3-year period check that each burn has produced the desired outcomes. | Burning prescription not producing the desired outcomes. | Revise burning prescription based on information recorded during the burn to ensure outcomes can be achieved. |
| Review of ecological literature. | Research shows that the optimal fire frequencies for particular plant communities or threatened species needs revision. | Revise burning schedules for the fire management units containing the particular species or plant community. |

## 6.9 Adaptive Management

It is recommended that an 'adaptive management' approach be adopted for the implementation of the part of this plan concerned with the conservation of biodiversity on the Domain. Although this plan incorporates current knowledge on the impacts of fire on specific flora and fauna species and different plant communities, none of this knowledge is

specific to the Domain. It is therefore difficult to predict the effect of the management actions recommended in this plan, particularly the prescribed burning program, on the ecosystems on the Domain, or on individual flora and fauna species.

Adaptive management utilises an experimental approach to land management where full scientific knowledge is lacking but where immediate management actions are required. For the adaptive management approach to work, the management plan will have to be run as an experiment with the following steps:

### Model (hypothesis)

This is the aim of the experiment and can be stated as:

- To apply a specific fire regime to the various plant communities on the Domain that will maintain their distribution, structure and floristics, as at 2007, in the long-term.
- To maintain the populations of indigenous fauna on the Domain.
- To reduce the distribution and abundance of introduced species in the native plant communities on the Domain.

### Test

The test is the implementation of the plan.

### Collect Relevant Data

The performance indicators in the summary table in section 8 of this plan are designed to monitor the effectiveness of the implementation of the plan, rather than its impacts. However, it should be noted that if the plan is not being implemented effectively it will be more difficult to analyse and draw useful conclusions from the monitoring program.

It order to run this 'experiment', baseline data of sufficient accuracy for resampling and statistical analysis must be collected. This should be available through the on-going study being carried out by Professor Kirkpatrick of University of Tasmania.

### Analyse

Data collected will need to analysed in such a way that it will indicate where changes in the plan are required.

### Feedback

Use of the monitoring results to improve the plan is the essential component of adaptive management. This will allow the plan to be progressively improved so that it is more closely linked to the actual conditions on the Domain.

# 7. Further Research

Apart from the adaptive management approach used in this plan there are also opportunities to use the fire management activities recommended in the plan as the basis for specific research projects. There has been a great deal of research into bushfires in Australia over the years. Initially the emphasis was on understanding fire behaviour, but recently more emphasis has been placed on fire ecology, and particularly the effects of fire on native flora and fauna, and native ecosystems. However, most of these studies have only been short-term, and Whelan (1995) states that: "There are very few long-term experimental studies of the effects of fire on any level of organisation - individual organism, population or community". Whelan goes on to state that: "The need for validation of models of long-term change based on short-term studies is becoming urgent". Valid models of long-term change will obviously contribute greatly to effective fire management in bushland reserves.

Luckily the Domain has been the site of a long-term study into vegetation changes in urban grassy woodlands by Professor J. B. Kirkpatrick of the University of Tasmania (Kirkpatrick, 2004). This study has monitored vegetation changes on the Domain since 1974 using 68 random sites, and has already yielded invaluable data. Professor Kirkpatrick should be encouraged to continue his long-term study.

# 8. Management Action Summary

The management actions recommended in this plan have been summarised and classified using the following criteria:

**U**RGENT - Actions required to reduce a very high risk to life or property.

**E**SSENTIAL - Actions required to improve safety, or inadequate fire protection measures in high risk areas.

- Actions that are essential for control & suppression of wildfires, and/or conservation of threatened species.

**REC**OMMENDED - Actions required to improve inadequate fire protection measures in moderate risk areas.

- Actions required to ensure on-going effective fire management, or conservation of biodiversity.

**ROU**TINE - Maintenance of fire control resources and protection measures.

Urgent actions need to be undertaken as soon as possible.

Where applicable the desirable timing of other actions has been coded as follows:

A - Inspect and maintain annually, or as specified in the relevant MP

A/S - Timing as specified in the fire management plan

1, 2, etc - Carry out action within the time period specified (years)

1A, 2A etc - Construct within the next 1, 2 etc years and then inspect and maintain annually, or as specified in the relevant MP.

# MANAGEMENT ACTION SUMMARY

| FIRE MANAGEMENT OBJECTIVE | RECOMMENDED ACTION | PRIORITY | PERFORMANCE INDICATORS |
|---|---|---|---|
| 1. Monitor the impact of fire management activities on the Queens Domain. Adjust practices to achieve relevant objectives, and periodically review the fire management plan. | a) Monitor the impacts of fires carried out as outlined in Section 6.10.<br>b) Review this fire management strategy at regular intervals using the procedures in Section 6.8.4. and table 11.<br>c) Regularly revise burning prescriptions to ensure they incorporate the most recent information on the fire ecology of flora, fauna and plant communities of conservation value on the Queens Domain.<br>d) Request Professor J. B. Kirkpatrick to continue his long running study of vegetation changes on the Domain.<br>e) Add any monitoring data on threatened species to the Natural Values Atlas maintained by DPIW. | a) REC - A/S<br>b) ROU - 5<br>c) REC - A/S<br>d) REC<br>e) REC | • Monitoring and review carried out as scheduled in the plan.<br>• New information on the fire management requirements of threatened flora and fauna incorporated into the fire management plan.<br>• New information on threatened species added to the Natural Values Atlas. |
| 2. Minimise the risk of wildfires starting and spreading on the Queens Domain. | a) Carry out the management burns shown on figure 7 and scheduled in table 9.<br>b) Maintain all power line easements on Domain.<br>c) Implement the community education program in Section 6.2. | a) E<br>b) E<br>c) REC | • Management burns carried out according to prescriptions.<br>• No wildfires started by accident on the Domain. |
| 3. Minimise the risk of fire to residents on, and surrounding, the Queens Domain. | a) Maintain existing defendable spaces on the Domain as shown on figure 8 and described in table 6.<br>b) Establish new defendable spaces as shown on figure 8 and described in table 6. | a) E<br>b) E - 1 | • No residents injured by wildfires or the effects of wildfires.<br>• Defendable spaces shown on figure 6 maintained. |
| 4. Minimise the risk of wildfire damaging built and cultural heritage assets on the Queens Domain. | a) Implement the fire protection measures listed in table 6 for protection of public infrastructure, and items of cultural heritage value.<br>b) Consult with the TALSC prior to undertaking any works that could disturb the soil surface in VMUs 14, 15, 17, 18, 19, 20, 21, 22, 24, 27, 28, 29 and 37. | a) E<br>b) REC | • Fire protection measures listed in table 6 implemented and maintained.<br>• No cultural heritage assets damaged during fire management or control operations on the Domain. |

| FIRE MANAGEMENT OBJECTIVE | RECOMMENDED ACTION | PRIORITY | PERFORMANCE INDICATORS |
|---|---|---|---|
| 5. Minimise the impact of smoke from management burns on sporting activities and nearby residents. | a) Coordinate management burns with users of the sporting facilities on the Domain.<br>b) Ensure that burns are carried out when the winds will blow the smoke away from nearby urban areas.<br>c) End burns early if there is a likelihood of an inversion forming at night.<br>d) Coordinate management burns on the Queens Domain with other burns in the region to minimise smoke pollution in the Derwent Valley. | a) REC<br>b) REC<br>c) REC<br>d) REC | • No complaints about smoke from burns on the Domain.<br>• No disruption of sporting activities by smoke from management burns. |
| 6. Maintain existing vehicle tracks shown in Figure 8 in a trafficable condition for 4WD vehicles. | Inspect tracks regularly and clear away fallen limbs, trees or regrowth, as required to keep the routes trafficable. | E –A | Access tracks inspected, and maintained in a trafficable condition for fire service vehicles.. |
| 7. Establish additional vehicle access routes shown in Figure 8 to facilitate management burns in VMUs 19, 22 and 23. | Clear new 4WD routes as required so that an approximately 20 m wide unburnt buffer can be left along the Brooker and Domain Highways when VMUs adjoining these roads are burnt. | E – A/S | Additional vehicle access routes cleared prior to burns. |
| 8. Minimise damage to the emergency vehicle access route system by preventing unauthorised vehicle access. | a) Supply the Tasmania Fire Service Hobart Brigade with a master key to the gates on the Domain.<br>d) Inspect gates and bollards regularly to ensure that locks are in place and functioning. | a) REC - 1<br>d) ROU - A | • No unauthorised use of emergency vehicle access routes on the Domain.<br>• Master key supplied to the Tasmania Fire Service Hobart Brigade. |
| 9. Ensure an adequate and accessible water supply for fire fighting. | Ensure fire hydrants on the Domain and in nearby urban areas are clearly marked and maintained to Australian Standard AS2419.1 - 2005. | E - A | Fire hydrants on the Domain and in nearby urban areas are clearly marked and meet current standards of flow rate and pressure. |
| 10. Ensure all personnel carrying out fire management activities on the Queens Domain are suitably trained, equipped and supervised. | Ensure all personnel engaged in prescribed burning activities on the Domain have the appropriate level of training and equipment as outlined in section 6.6. | E | All personnel are able to demonstrate the required level of training and minimum levels of equipment. |

| FIRE MANAGEMENT OBJECTIVE | RECOMMENDED ACTION | PRIORITY | PERFORMANCE INDICATORS |
|---|---|---|---|
| 11. Develop, assist development of, or utilise existing education programs and materials aimed at:<br>• reducing arson<br>• informing residents of fire safety issues, and measures to improve protection of themselves and their property. | Provide residents within and surrounding the Domain with a regular newsletter to keep them informed of the progress of the plan, fire risk reduction measures they should implement on their properties, and encourage them to report any suspicious activity. | REC - A | • Newsletter distributed at least annually.<br>• Reduction in the incidence of illegal fires in the Domain. |
| 12. Maintain up-to-date information on; emergency vehicle access routes and their condition, defendable spaces, and areas burnt in management burns and wildfires. | a) Record fire management activities and wildfires using the procedures in section 6.8.<br>b) Relay any updated information to the TFS. | a) REC - A/S<br>b) ROU | Records maintained of all fire management activities. |
| 13. Coordinate fire management activities on the Queens Domain amongst the various stakeholders. | Implement the procedures for coordinating fire management activities in section 6.7. | REC – A | Meetings held and minuted as outlined in section 6.7. |
| 14. Ensure that all roads, trails and other infrastructure are checked after a fire to ensure they are safe prior to allowing use by the public. | Implement the safety and rehabilitation procedures in section 6.5 following fires. | E | Post-fire safety and rehabilitation procedures carried out after wildfires and management burns. |
| 15. Minimise fire risk to fire sensitive vegetation and threatened flora and fauna. | a) Apply the appropriate fire regime to populations of threatened flora and fauna that require periodic fire for their long-term survival.<br>b) Consult with the DPIW Threatened Species Section when planning prescribed burns in units containing populations of threatened flora and fauna.<br>c) Avoid burning the whole of any population of a threatened or rare plant species in a single fire.<br>d) Monitor the recovery of any populations of threatened or rare flora and fauna burnt by wildfires or prescribed burns.<br>e) Fire fighting foams should not be used in the vicinity of known populations of threatened plants during management burns without prior consultation with the DPIW Threatened Species Section. | a) E<br>b) E<br>c) E<br>d) E<br>e) E | • All prescribed burns carried out according to the requirements of threatened flora and fauna.<br>• No decline in the populations of threatened or rare flora and fauna due to fire.<br>• No decline in the area or distribution of plant communities of conservation value. |

| FIRE MANAGEMENT OBJECTIVE | RECOMMENDED ACTION | PRIORITY | PERFORMANCE INDICATORS |
|---|---|---|---|
| 16. Implement a mosaic burning program in selected plant communities to maintain and enhance existing habitat diversity, and reduce overall fuel loads in bushland areas. | a) Carry out prescribed burning according to the schedule in Table 9 using the prescriptions in section 6.3.<br>b) Regularly revise burning prescriptions to ensure they incorporate the most recent information on the fire ecology of flora, fauna and plant communities of conservation value on the Domain. | a) E - A/S<br>b) REC - A/S | • Mosaic of burnt VMUs maintained.<br>• No decline in the populations or distribution of threatened species.<br>• No decline in the area or distribution of plant communities of conservation value. |
| 17. Control unwanted plant species through minimising the spread of weeds. | a) Ensure that all vehicles involved in fire management and suppression activities on the Domain are washed to remove any mud, soil or plant material prior to entering the area, particularly vehicle underbodies, in order to control the spread of weeds and plant diseases.<br>b) Coordinate weed control with management burning as outlined in section 6.4. | a) REC – A/S<br>b) REC | • Pre and post fire weed control carried out in any weed infested VMUs burnt under this plan. Minimal coppicing or regrowth of weeds from treated rootstock.<br>• All declared noxious weeds removed, reduction in extent of other weeds. |
| 18. Manage individual vegetation management units to achieve the objectives in table 8. | Carry out management activities listed in table 9 for each VMU on the Domain. | E | Management objectives in table 8 achieved. |

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# *Glossary*

The following descriptions of bushfire related terms used in this plan are taken or adapted from:

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**Backburning**

A fire started intentionally along the inner edge of a fire control line to consume the fuel in the path of a wildfire. This is usually the only method for controlling large wildfires, or fires of high intensity.

**Building Protection Zone**

An area between buildings and the fuel modified buffer zone, where fine fuels are maintained in a minimum fuel condition to ensure that the zone acts as a barrier between the building and a fire.

**Bushfire**

A fire burning in plantations, forests, mallee, grasslands and other vegetation types. Usually classified as either a 'wildfire' or a 'prescribed fire'.

**Bushfire Hazard**

Synonymous with static risk, a relative assessment of the likely difficulty of controlling and suppressing a bushfire in an area. Bushfire hazard is a function of slope, access and vegetation type.

**Bushfire Prone**

Refers to the potential for the vegetation in an area to carry a bushfire at reasonable frequencies.

**Bushfire Risk**

In general, bushfire risk is the probability of a wildfire starting and spreading.

**Defendable Space**

An area of managed fuel around a dwelling or asset at risk that reduces the risk of damage by fire. It consists of a Building Protection Zone and a Fuel Modified Buffer Zone.

**Fine Fuel**

Live and dead plant matter (including grasses, bracken, leaves, bark, and twigs and branches) less than 6 mm in diameter. Fine fuel is what burns at the fire front and contributes directly to fire behaviour. Increasing fine fuel loads increases the rate of spread and intensity of fire fronts.

**Fire Break**

Any natural or constructed discontinuity in a fuel bed used to segregate, stop, and control the spread of a wildfire, or to provide a fire control line from which to suppress a fire.

**Fire Control Line**

A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of a fire. Fire control lines can include constructed trails, roads, cleared areas and environmental features such as watercourses and rock outcrops.

**Fire Danger Rating (FDR)**

A relative number denoting an evaluation of rate of spread, or suppression difficulty for specific combinations of fuel, fuel moisture and wind speed. FDRs range from 1 (low danger) to 100 (extreme danger). The FDR is used for general fire danger forecasting and is based on the expected behaviour of fires burning in eucalypt forest carrying a fuel loading of 12.5 tonnes per hectare and travelling over level to undulating ground.

**Fire Intensity**

The rate of energy output per unit length of fire perimeter, usually measured in kilowatts per metre. It is a function of the heat yield of the fuel (H), the weight of the fuel consumed (W), and the rate of spread of the fire (R) i.e. I = HWR.

**Fire Regime**

The pattern of fire occurrence within an area described by the frequency, intensity, and season of fire occurrence.

**Fuel Load**

The quantity of fine fuel in an area, usually measured in tonnes per hectare of dried fine fuel.

**Fuel Modified Buffer Zone**

A zone between a building protection zone and a bushfire hazard that can include an area of minimum fine fuel, or an area of vegetation (forest, grassland etc) that is maintained in a fuel reduced condition, or both. Provision of an inner building protection zone and an outer fuel modified buffer zone will ensure that there is a progressive reduction of fine fuel between a bushfire hazard and any combustible structures.

**Fuel Reduced Condition**

A condition where fine fuel is maintained below a maximum height of 100 mm in grasslands, or below 8 tonnes per hectare in other fuel types.

**Hazard Reduction**

Reduction of the average fuel load over an area by burning (prescribed burn or wildfire), chemical, mechanical, or manual means.

**Indigenous Vegetation**

The plant species and/or plant communities which occur naturally in a locality. The term 'indigenous' excludes Australian species from another locality or region, as well as non-native species, that have been introduced to a locality.

**Introduced Species**

Species of plants or animals that have been deliberately, or accidentally, brought to an area in which they did not naturally occur.

**Minimum Fuel Conditions**

A condition where fine fuels are minimised to the extent that the passage of a fire will be prevented or severely restricted. This generally requires the removal of dead fine fuel and control of live fuel, breaks in the continuity of any fuel, maintenance of a high moisture content in vegetation, or replacement of vegetation with roads, paths, etc.

**Prescribed Burn**

(Synonymous with prescribed fire, controlled burn, prescription burn, scheduled fire or management burn) The controlled application of fire under specified environmental conditions to a predetermined area, and at the time, intensity, and rate of spread required to attain planned resource management objectives. It is undertaken in specified environmental conditions.

**Soil Dryness Index (SDI)**

A measure of the average dryness of an area in terms of the number of millimetres of rainfall required to thoroughly wet the soil.

**Spotting, Spot Fire**

Isolated fires started ahead of the main fire by sparks, embers, or other ignited material carried by the wind, sometimes to a distance of several kilometres.

**Wildfire**

A bushfire which is not burning according to management prescriptions or requirements.

# Appendix A

## Threatened Flora Locations Confirmed in 2007

**Threatened flora locations confirmed in 2007**

NOTE: although there are numerous other records of varying reliability and accuracy from previous surveys, these are not included in this table.

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 1 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 1000 | | 526048 | 5254486 | 14/03/2007 |
| 1 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | | | 526090 | 5254521 | 14/03/2007 |
| 1 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 525969 | 5254765 | 14/03/2007 |
| 2 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 20 | | 526234 | 5254534 | 11/01/2007 |
| 2 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | | | 526254 | 5254547 | 11/01/2007 |
| 2 | knotty speargrass | *Austrostipa nodosa* | r/- | | 10 | | 526062 | 5254717 | 14/03/2007 |
| 3 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | dead *Allocasuarina verticillata* | 2 | | 526502 | 5254531 | 6/03/2007 |
| 4 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 35 | | 526179 | 5254471 | 11/01/2007 |
| 4 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | bend in track | 2 | | 526141 | 5254485 | 14/03/2007 |
| 4 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 20 | | 526200 | 5254328 | 11/01/2007 |
| 6 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 10 | | 525915 | 5254724 | 14/03/2007 |
| 7 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | lower side of road - shoulder | 10 | | 525975 | 5254226 | 14/03/2007 |
| 8 | knotty speargrass | *Austrostipa nodosa* | r/- | opp Clearys Gates - just slashed | 10s? | | 525792 | 5254340 | 27/03/2007 |
| 8 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | opp Clearys Gates - just slashed | 100s? | | 525792 | 5254340 | 27/03/2007 |
| 8 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | opp Clearys Gates - just slashed | 100s? | | 525792 | 5254340 | 27/03/2007 |
| 8 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 12 | | 526131 | 5253871 | 15/03/2007 |
| 9 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 30 | | 526205 | 5253838 | 11/01/2007 |
| 10 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 100 | | 526381 | 5253812 | 11/01/2007 |
| 11 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 3 | | 526464 | 5253649 | 11/01/2007 |
| 11 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 50 | | 526490 | 5253559 | 11/01/2007 |
| 11 | knotty speargrass | *Austrostipa nodosa* | r/- | | 30 | | 526484 | 5253656 | 11/01/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 12 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 150 | | 526531 | 5253643 | 11/01/2007 |
| 12 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 20 | | 526677 | 5253674 | 6/03/2007 |
| 12 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 2 | | 526688 | 5253780 | 6/03/2007 |
| 12 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of old *E.viminalis* | 1 | | 526703 | 5253517 | 6/03/2007 |
| 13 | curly sedge | *Carex tasmanica* | -/V | in roadside drain below culvert | 50 | | 526620 | 5253989 | 6/03/2007 |
| 14 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 30 | | 527052 | 5253426 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 15 | | 527088 | 5253101 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 10 | | 527136 | 5253096 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 30 | | 527142 | 5253101 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 10 | | 527165 | 5253094 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 5 | | 527154 | 5253044 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 30 | | 527146 | 5253048 | 11/01/2007 |
| 15 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 527139 | 5253019 | 11/01/2007 |
| 15 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | poor condition beneath dead wattles near *E. maculata* | 50 | | 527105 | 5253256 | 6/03/2007 |
| 16 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 50 | | 527060 | 5253105 | 11/01/2007 |
| 16 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | under planted wattles in car park | 5 | | 526985 | 5253229 | 6/03/2007 |
| 16 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | | 10 | | 526998 | 5253188 | 6/03/2007 |
| 17 | woolly new holland daisy | *Vittadinia gracilis* | r/- | adj car park in mulch - planted | 3 | | 526832 | 5254085 | 27/03/2007 |
| 17 | spreading knawel | *Scleranthus fasciculatus* | v/- | adj car park in mulch - planted | 10 | | 526828 | 5254098 | 27/03/2007 |
| 17 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 2 | | 526813 | 5254048 | 11/01/2007 |
| 17 | knotty speargrass | *Austrostipa nodosa* | r/- | | 6 | | 526620 | 5254046 | 11/01/2007 |
| 19 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | 10 x 12 extending across track into QD22, amongst needles beneath mature *Allocasuarina verticillata* | 1 | 120 | 526387 | 5254822 | 11/01/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 19 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | 12 m diameter beneath she oak | 1 | 38 | 526550 | 5254758 | 19/05/2007 |
| 19 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | at base of large she oak | 2 | | 526606 | 5254716 | 19/05/2007 |
| 19 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 8 | | 526448 | 5254817 | 6/03/2007 |
| 20 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 50 | | 526471 | 5254938 | 9/01/2007 |
| 20 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 100s | | 526524 | 5254878 | 9/01/2007 |
| 20 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | | 50 | | 526195 | 5255084 | 9/01/2007 |
| 20 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 526261 | 5255059 | 9/01/2007 |
| 20 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 100 | | 526269 | 5255048 | 9/01/2007 |
| 20 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 100 | | 526352 | 5255007 | 9/01/2007 |
| 20 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 1 | | 526443 | 5254959 | 9/01/2007 |
| 20 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 4 | | 526487 | 5254923 | 9/01/2007 |
| 20 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 1 | | 526468 | 5254939 | 9/01/2007 |
| 20 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526474 | 5254926 | 9/01/2007 |
| 21 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | old road formation | 500 | | 526076 | 5255088 | 15/03/2007 |
| 21 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 10 | | 526101 | 5255117 | 15/03/2007 |
| 21 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526098 | 5255095 | 15/03/2007 |
| 21 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 2 | | 526069 | 5255109 | 15/03/2007 |
| 22 | leafy fireweed | *Senecio squarrosus* | r/- | | 1 | | 526371 | 5254726 | 11/01/2007 |
| 22 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | lwr side of road beneath *A.mearnsii* | 20 | | 526223 | 5254721 | 6/03/2007 |
| 22 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 525984 | 5254824 | 6/03/2007 |
| 22 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | 8 x 12 - beneath *A. verticillata* and *A. mearnsii* | 1 | 96 | 525994 | 5254919 | 6/03/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 22 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | dense in bare ground at base of dead euc, but closed out by grasses. Many trees have died - leading to loss of habitat suitability | 1 | | 526311 | 5254712 | 14/03/2007 |
| 22 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | base of *B. spinosa* on rocky bank | 1 | | 526271 | 5254717 | 14/03/2007 |
| 22 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 20 | | 526052 | 5254791 | 14/03/2007 |
| 23 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | 20m x 15 m on lower slopes of road to 63 under *Bursaria* and *Acacia mearnsii* | 1 | 300 | 525882 | 5254710 | 14/03/2007 |
| 23 | stinking pennywort | *Hydrocotyle laxiflora* | v/- | as above | | | 525877 | 5254692 | 14/03/2007 |
| 23 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of mature *A. verticillata* | 1 | | 525821 | 5254514 | 14/03/2007 |
| 24 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526232 | 5255106 | 9/01/2007 |
| 24 | rough speargrass | *Austrostipa scabra scabra* | r/- | | 20 | | 526347 | 5255051 | 9/01/2007 |
| 24 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526375 | 5255041 | 9/01/2007 |
| 24 | rough speargrass | *Austrostipa scabra scabra* | r/- | | 10 | | 526375 | 5255040 | 9/01/2007 |
| 24 | forest daisy | *Brachyscome sieberi var. gunnii* | r/- | | 3 | | 526429 | 5255060 | 9/01/2007 |
| 24 | forest daisy | *Brachyscome sieberi var. gunnii* | r/- | | 4 | | 526440 | 5255057 | 9/01/2007 |
| 24 | forest daisy | *Brachyscome sieberi var. gunnii* | r/- | | 1 | | 526439 | 5255043 | 9/01/2007 |
| 24 | forest daisy | *Brachyscome sieberi var. gunnii* | r/- | | 6 | | 526836 | 5254651 | 9/01/2007 |
| 24 | forest daisy | *Brachyscome sieberi var. gunnii* | r/- | | 1 | | 526818 | 5254679 | 9/01/2007 |
| 24 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 20 | | 526766 | 5254718 | 9/01/2007 |
| 24 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 1 | | 526484 | 5254987 | 9/01/2007 |
| 25 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 2 | | 526702 | 5253375 | 6/03/2007 |
| 25 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | | 200 | | 526735 | 5253330 | 6/03/2007 |
| 25 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of *E.viminalis* | 8 | | 526672 | 5253464 | 6/03/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 25 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of dead *Bursaria* | 4 | | 526611 | 5253503 | 6/03/2007 |
| 26 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | roadside | 8 | | 526433 | 5254126 | 6/03/2007 |
| 26 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | roadside | 5 | | 526489 | 5254121 | 6/03/2007 |
| 26 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 4 | | 526887 | 5253541 | 11/01/2007 |
| 26 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | near tree 63 - edge of track | 15 | | 527212 | 5253100 | 6/03/2007 |
| 26 | spreading knawel | *Scleranthus fasciculatus* | v/- | | 1 | | 526779 | 5253566 | 11/01/2007 |
| 26 | spreading knawel | *Scleranthus fasciculatus* | v/- | | 50 | | 526793 | 5253573 | 11/01/2007 |
| 26 | woolly new holland daisy | *Vittadinia gracilis* | r/- | tree 263 | 7 | | 526816 | 5253567 | 11/01/2007 |
| 26 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 5 | | 527180 | 5253014 | 6/03/2007 |
| 26 | leafy fireweed | *Senecio squarrosus* | r/- | | 1 | | 527200 | 5253039 | 6/03/2007 |
| 26 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | near Charles Meredith monument | 50 | | 527238 | 5252942 | 6/03/2007 |
| 26 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | | | 527211 | 5252939 | 6/03/2007 |
| 26 | woolly new holland daisy | *Vittadinia gracilis* | r/- | base of tree 264 | 3 | | 526815 | 5253565 | 6/03/2007 |
| 26 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | beneath *Melaleuca armillaris* | 3 | | 526388 | 5254106 | 14/03/2007 |
| 27 | knotty speargrass | *Austrostipa nodosa* | r/- | | 10 | | 526978 | 5253866 | 11/01/2007 |
| 27 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 526906 | 5253895 | 11/01/2007 |
| 27 | woolly new holland daisy | *Vittadinia gracilis* | r/- | car park bed | 4 | | 526840 | 5254040 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 60 | | 526978 | 5253866 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 60 | | 526903 | 5253916 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | base of redwood | 65 | | 526847 | 5254017 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | road bank | 80 | | 526860 | 5254025 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | car park bed | 50 | | 526840 | 5254040 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | start of Grassland Gully track | 40 | | 526840 | 5254030 | 11/01/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | track junction | 150 | | 526950 | 5253820 | 8/03/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | road edge | 300 | | 526910 | 5253800 | 8/03/2007 |
| 27 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | scattered under planted eucalypts | 20 | | 527020 | 5253730 | 8/03/2007 |
| 27 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 527050 | 5253720 | 8/03/2007 |
| 27 | spreading knawel | *Scleranthus fasciculatus* | v/- | first large white gum | 1 | | 526945 | 5253790 | 8/03/2007 |
| 27 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 3 | | 526945 | 5253790 | 8/03/2007 |
| 27 | spreading knawel | *Scleranthus fasciculatus* | v/- | track junction | 80 | | 526950 | 5253820 | 8/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | base of cypress | 80 | | 526920 | 5253780 | 8/03/2007 |
| 27 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | track junction | 1 | | 526950 | 5253820 | 8/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | topside of track between cypreess & redwood | 150 | | 526930 | 5253820 | 8/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | downslope of old golf green | 100 | | 526870 | 5253970 | 8/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 10 | | 526865 | 5253900 | 6/03/2007 |
| 27 | spreading knawel | *Scleranthus fasciculatus* | v/- | downslope of old golf green | 30 | | 526860 | 5253980 | 8/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 500 | | 526852 | 5253879 | 6/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | tree removed and so grasses threaten to swamp habitat | est 100 | | 527020 | 5253828 | 27/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | base of tree stump | est 10 | | 527015 | 5253838 | 27/03/2007 |
| 27 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | corner carpark on bank opposite Botanic Gardens drive access | 10 | | 526985 | 5253892 | 27/03/2007 |
| 27 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 10 | | 526865 | 5253928 | 6/03/2007 |
| 27 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 10 | | 526745 | 5253952 | 6/03/2007 |
| 27 | woolly new holland daisy | *Vittadinia gracilis* | r/- | tree removed and so grasses threaten to swamp habitat | 1 | | 527020 | 5253828 | 27/03/2007 |
| 27 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | under large macrocarpa | 10 | | 526998 | 5253871 | 27/03/2007 |
| 27 | knotty speargrass | *Austrostipa nodosa* | r/- | opp bus stop | 200 | | 527002 | 5253877 | 27/03/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 27 | knotty speargrass | *Austrostipa nodosa* | r/- | corner car park on bank opposite Botanic Gardens drive access | 5 | | 526985 | 5253892 | 27/03/2007 |
| 29 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 6 | | 527213 | 5253367 | 11/01/2007 |
| 29 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 40 | | 527221 | 5253428 | 11/01/2007 |
| 30 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | pool car park | 20 | | 527081 | 5252981 | 22/02/2007 |
| 30 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 5 | | 527133 | 5252976 | 22/02/2007 |
| 30 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | between 2nd and 3rd trees up from exit | 100 | | 527133 | 5252976 | 22/02/2007 |
| 30 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 1 | | 527160 | 5252981 | 22/02/2007 |
| 30 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 1 | | 527160 | 5252981 | 22/02/2007 |
| 30 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 200 | | 527160 | 5252981 | 22/02/2007 |
| 30 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 3 | | 527057 | 5253074 | 22/02/2007 |
| 30 | woolly new holland daisy | *Vittadinia gracilis* | r/- | | 2 | | 527057 | 5253074 | 22/02/2007 |
| 30 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 1 | | 526987 | 5253010 | 22/02/2007 |
| 30 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526987 | 5253010 | 22/02/2007 |
| 30 | woolly new holland daisy | *Vittadinia gracilis* | r/- | 5th tree up from pool exit, plus a couple under 6th tree | 50 | | 527128 | 5252994 | 6/03/2007 |
| 30 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | car park fence near *V .gracilis* tree | 100 | | 527110 | 5252989 | 22/02/2007 |
| 30 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 2 | | 527133 | 5252976 | 22/02/2007 |
| 30 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of *Eucalyptus viminalis* | 4 | | 527010 | 5252936 | 6/03/2007 |
| 30 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 50 | | 526974 | 5252921 | 6/03/2007 |
| 31 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 4 | | 526805 | 5253302 | 6/03/2007 |
| 31 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 2000 | 100 | 526801 | 5253288 | 6/03/2007 |
| 31 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | 2nd cedar | 20 | | 526755 | 5253297 | 6/03/2007 |
| 31 | knotty speargrass | *Austrostipa nodosa* | r/- | | 5 | | 526818 | 5253261 | 6/03/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 31 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | on slope below car park | 200 | | 526839 | 5253259 | 6/03/2007 |
| 31 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 2 | | 526780 | 5253235 | 6/03/2007 |
| 31 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | extending to blue gums | 200 | | 526780 | 5253235 | 6/03/2007 |
| 32 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of *A. mearnsii* | 9 | | 526512 | 5253489 | 6/03/2007 |
| 33 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 60 | | 526209 | 5253946 | 11/01/2007 |
| 33 | spreading knawel | *Scleranthus fasciculatus* | v/- | | 30 | | 526225 | 5253959 | 11/01/2007 |
| 33 | spreading knawel | *Scleranthus fasciculatus* | v/- | | 1 | | 526210 | 5254010 | 6/03/2007 |
| 33 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 7 | | 526213 | 5254031 | 11/01/2007 |
| 33 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 55 | | 526199 | 5254015 | 11/01/2007 |
| 33 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 5 | | 526190 | 5253996 | 6/03/2007 |
| 34 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 1 | | 526174 | 5254281 | 11/01/2007 |
| 34 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 60 | | 526100 | 5254471 | 6/03/2007 |
| 34 | knotty speargrass | *Austrostipa nodosa* | r/- | | 2 | | 526144 | 5254466 | 6/03/2007 |
| 34 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 2 | | 526078 | 5254402 | 11/01/2007 |
| 34 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 25 | | 526100 | 5254471 | 6/03/2007 |
| 35 | leafy fireweed | *Senecio squarrosus* | r/- | | 1 | | 526517 | 5254279 | 11/01/2007 |
| 35 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | senescent *A. verticillata* | 5 | | 526593 | 5254419 | 6/03/2007 |
| 35 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of *A. verticillata* | 10 | | 526592 | 5254418 | 6/03/2007 |
| 35 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | base of *A. verticillata* | 10 | | 526605 | 5254401 | 6/03/2007 |
| 36 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 50 | | 526460 | 5254223 | 6/03/2007 |
| 36 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 200 | | 526469 | 5254196 | 6/03/2007 |
| 36 | drooping sedge | *Carex longebrachiata* | r/- | Looks to be more similar to *Carex iynx* except for arrangement of male and female parts on terminal spike of some flowers | 200 | | 526362 | 5254172 | 11/01/2007 |

| VMU | Common name | Scientific name | Status[1] | NBES Comments | No. Plants | Sq. m | East GDA | North GDA | Date |
|---|---|---|---|---|---|---|---|---|---|
| 36 | curly sedge | *Carex tasmanica* | -/V | 2 m from blue gum | 3 | | 526372 | 5254150 | 27/03/2007 |
| 37 | curly sedge | *Carex tasmanica* | -/V | Grassland Gully | 10 | | 526617 | 5254040 | 27/03/2007 |
| 37 | mountain sedge | *Carex gunniana* | r/- | above boardwalk | 50 | | 526660 | 5253998 | 27/03/2007 |
| 37 | curly sedge | *Carex tasmanica* | -/V | above boardwalk | 2 | | 526654 | 5253995 | 27/03/2007 |
| 37 | mountain sedge | *Carex gunniana* | r/- | scattered down creek | 50 | | 526681 | 5254011 | 27/03/2007 |
| 37 | mountain sedge | *Carex gunniana* | r/- | lower basin | 100 | | 526746 | 5254040 | 27/03/2007 |
| 37 | curly sedge | *Carex tasmanica* | -/V | trackside- planted? | 3 | | 526673 | 5253996 | 27/03/2007 |
| 37 | curly sedge | *Carex tasmanica* | -/V | slope above gully | 25 | | 526648 | 5254002 | 27/03/2007 |
| 38 | double-jointed spear grass | *Austrostipa bigeniculata* | r/- | | 60 | | 526381 | 5253878 | 15/03/2007 |
| 38 | blue wallaby grass | *Austrodanthonia popinensis* | e/EN | | 20 | | 526428 | 5253812 | 15/03/2007 |
| 38 | shade peppercress | *Lepidium pseudotasmanicum* | r/- | | 3 | | 526388 | 5253899 | 15/03/2007 |
| 38 | narrow leaf new holland daisy | *Vittadinia muelleri* | r/- | | 100 | | 526388 | 5253899 | 15/03/2007 |

1 –- lower case - Tasmanian *Threatened Species Protection Act* 1995, UPPER CASE - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

# Appendix B

## Threatened Flora Locations

## on the Soldiers Memorial Avenue

**Threatened flora locations along the Soldiers Memorial Avenue in three earlier surveys**

| Tree no. | East GDA | North GDA | Asset Number | Species Present 2003 Survey (Jamie Kirkpatrick) | Species Present 2005 Survey (Luke Chiu) | Species Present 2006 Survey (Jamie Kirkpatrick) |
|---|---|---|---|---|---|---|
| 10 | 527197.677 | 5252834.78 | 160768 | *Lepidium hyssopifolium, Vittadinia muelleri* | *Lepidium hyssopifolium, Vittadinia muelleri* | Dead *Lepidium hyssopifolium* |
| 15 | 527230.509 | 5252870.67 | 160775 | *Lepidium hyssopifolium* | *Lepidium hyssopifolium* | NONE FOUND |
| 20 | 527234.213 | 5252927.3 | 160779 | *Lepidium hyssopifolium* | *Lepidium hyssopifolium* | NONE FOUND |
| 20 | 527234.213 | 5252927.3 | 160779 | *Lepidium hyssopifolium* | *Lepidium hyssopifolium* | NONE FOUND |
| 25 | 527216.627 | 5252948.615 | 160783 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | NONE FOUND |
| 29 | 527197.781 | 5252968.369 | 160788 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* |
| 32 | 527189.425 | 5252978.951 | 160791 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | NONE FOUND |
| 47 | 527199.314 | 5253039.677 | 160807 | NONE FOUND | *Lepidium pseudotasmanicum* | NONE FOUND |
| 59 | 527194.182 | 5253068.179 | 160814 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | NONE FOUND |
| 60 | 527209.181 | 5253064.689 | 160816 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | Dead *Lepidium pseudotasmanicum* |
| 63 | 527197.25 | 5253073.325 | 160815 | *Lepidium pseudotasmanicum* | NONE FOUND | NONE FOUND |
| 95 | 527216.569 | 5253174.404 | 160849 | *Vittadinia muelleri* | *Vittadinia muelleri* | NONE FOUND |
| 138 | 527137.319 | 5253309.933 | 100028 | NONE FOUND | NONE FOUND | *Lepidium pseudotasmanicum* |
| 199 | 527018.433 | 5253445.85 | 100097 | *Lepidium pseudotasmanicum* | NONE FOUND | NONE FOUND |
| 207 | 527008.66 | 5253462.725 | 100102 | NONE FOUND | *Lepidium pseudotasmanicum* | NONE FOUND |
| 211 | 526998.064 | 5253479.569 | 100107 | *Lepidium pseudotasmanicum* | NONE FOUND | NONE FOUND |
| 215 | 526994.384 | 5253485.049 | 100108 | NONE FOUND | *Lepidium pseudotasmanicum* | NONE FOUND |
| 231 | 526953.754 | 5253536.842 | 100131 | Lepidium pseudotasmanicum | NONE FOUND | NONE FOUND |
| 232 | 526969.433 | 5253541.544 | 100130 | *Lepidium pseudotasmanicum, Vittadinia muelleri* | NONE FOUND | NONE FOUND |

| Tree no. | East GDA | North GDA | Asset Number | Species Present 2003 Survey (Jamie Kirkpatrick) | Species Present 2005 Survey (Luke Chiu) | Species Present 2006 Survey (Jamie Kirkpatrick) |
|---|---|---|---|---|---|---|
| 237 | 526914.38 | 5253532.04 | 100147 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum, Vittadinia muelleri* |
| 240 | 526928.52 | 5253558.666 | 100138 | NONE FOUND | *Lepidium pseudotasmanicum* | NONE FOUND |
| 242 | 526912.451 | 5253581.812 | 100143 | NONE FOUND | *Lepidium pseudotasmanicum, Vittadinia muelleri* | Dead *Lepidium pseudotasmanicum* |
| 245 | 526883.702 | 5253566.397 | 90703 | *Scleranthus fasciculatus* | NONE FOUND | NONE FOUND |
| 247 | 526888.77 | 5253537.192 | 90411 | NONE FOUND | NONE FOUND | *Vittadinia muelleri* |
| 250 | 526877.44 | 5253566.005 | 90412 | NONE FOUND | *Scleranthus fasciculatus* | NONE FOUND |
| 255 | 526856.554 | 5253552.132 | 90417 | *Lepidium hyssopifolium, Lepidium pseudotasmanicum* | *Lepidium hyssopifolium* | NONE FOUND |
| 262 | 526803.827 | 5253552.348 | 90427 | NONE FOUND | NONE FOUND | *Vittadinia muelleri* |
| 263 | 526819.761 | 5253567.447 | 90423 | *Vittadinia gracilis* | *Vittadinia gracilis* | *Vittadinia gracilis* |
| 264 | 526804.629 | 5253583.715 | 90426 | *Vittadinia gracilis* | *Vittadinia gracilis* | *Vittadinia gracilis* |
| 268 | 526768.178 | 5253535.834 | 90433 | NONE FOUND | NONE FOUND | Dead *Lepidium pseudotasmanicum* |
| 270 | 526793.137 | 5253566.826 | 90429 | *Scleranthus fasciculatus* | *Lepidium pseudotasmanicum* | *Scleranthus fasciculatus* |
| 272 | 526758.001 | 5253539.706 | 90436 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | NONE FOUND |
| 274 | 526779.703 | 5253566.316 | 90431 | NONE FOUND | *Scleranthus fasciculatus* | NONE FOUND |
| 276 | 526745.523 | 5253545.774 | 90438 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* |
| 277 | 526742.722 | 5253570.262 | 90444 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | Dead *Lepidium pseudotasmanicum* |
| 281 | 526736.567 | 5253582.183 | 90449 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* |
| 301 | 526726.186 | 5253635.683 | 90463 | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* | *Lepidium pseudotasmanicum* |
| 349 | 526733.26 | 5253812.618 | 90520 | NONE FOUND | *Podolepis jaceoides* | NONE FOUND |
| 351 | 526758.183 | 5253840.031 | 90527 | NONE FOUND | NONE FOUND | *Podolepis jaceoides* |

| Tree no. | East GDA | North GDA | Asset Number | Species Present 2003 Survey (Jamie Kirkpatrick) | Species Present 2005 Survey (Luke Chiu) | Species Present 2006 Survey (Jamie Kirkpatrick) |
|---|---|---|---|---|---|---|
| 353 | 526723.88 | 5253837.537 | 90528 | *Podolepis jaceoides*[1] | NONE FOUND | NONE FOUND |
| 356 | 526705.638 | 5253835.11 | 90529 | NONE FOUND | NONE FOUND | Dead *Lepidium pseudotasmanicum* |
| 359 | 526747.008 | 5253856.861 | 90532 | NONE FOUND | NONE FOUND | *Podolepis jaceoides* |
| 370 | 526699.761 | 5253882.753 | 90549 | NONE FOUND | *Lepidium pseudotasmanicum* | *Lepidium hyssopifolium* |
| 374 | 526649.16 | 5253919.97 | 90566 | *Lepidium pseudotasmanicum* | NONE FOUND | NONE FOUND |
| 378 | 526643.822 | 5253923.728 | 90567 | NONE FOUND | NONE FOUND | *Lepidium hyssopifolium* |
| 423 | 526565.118 | 5253976.014 | 90601 | *Lepidium hyssopifolium* | *Lepidium hyssopifolium* | NONE FOUND |

1 – Not threatened but considered rare in Hobart (Kirkpatrick, 2003)

# Appendix C

## Fuel Load Assessment Procedure

# TAKING A CLOSER LOOK AT FUELS.

**Fuels are being constantly produced by trees and scrub. In the dry forests decomposition can't keep pace with production so fine fuels accumulate to more than 10 tonnes per hectare only 10 years after the last burn. Although these fine fuels may stabilise at about this amount, heavy fuels, such as branches, logs and dead roots continue to accumulate until the next fire.**

## Fuel Quantity

**Fuels up to pencil thickness (6mm) such as dead leaves, twigs and bark are called the 'fine' fuels and are the ones that have the greatest effect on fire spread. Doubling their quantity doubles flame height and rate of spread and quadruples fire intensity and damage on each hectare. It also quadruples the area burnt in a given time. Together this means that doubling the fine fuel quantity causes SIXTEEN TIMES the damage.**

**These fine fuels occur mostly as litter on the ground or as standing scrub and their quantity can be easily assessed without having to weigh anything. Just find a typical patch and estimate the % cover of litter and scrub in a circle about 2 m diameter.**