CARBUNUP RESERVE MANAGEMENT PLAN

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Prepared by

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For the Shire of Busselton

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Common Acronyms and Abbreviations

AgWA	Agriculture Western Australia
CALM	Department of Conservation and Land Management
CRMG	Carbunup Reserve Management Group
DRF	Declared Rare Flora
DEP	Department of Environmental Protection
DOLA	Department of Land Administration
EA	Environment Australia
FESA	Fire and Emergency Services Authority
LCDC	Land Conservation District Committee
MRWA	Main Roads Western Australia
TEC	Threatened Ecological Community

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Summary and Recommendations

The Carbunup Reserve 38582 is a completely vegetated bushland reserve familiar to many as the bushland that straddles the Bussell Highway just south of the Carbunup River bridge and store, between Busselton and Margaret River.

The Carbunup Reserve has very high regional conservation values. The Reserve's Marri woodland community contains more species than any other type of woodland on the Swan Coastal Plain, and is listed as a Threatened Ecological Community (TEC) which is currently afforded special, informal protection by the Department of Conservation and Land Management (CALM) pending changes to CALM legislation. Only six remnants of this community type remain on reserved lands, totalling an area of less than 60ha. The Carbunup Reserve, at half this area, represents the largest and highest quality remnant of this vegetation type remaining on public lands. The Reserve also contains two plants which are listed as Declared Rare Flora (DRF) and specially protected by the State Wildlife Conservation Act (1950), the Conservation and Land Management Act (1984) and the Federal Environment Protection and Biodiversity Conservation Act (1999). The Reserve contains another plant which is soon to be listed as DRF.

The objectives of this management plan are:

- To conserve, protect and enhance the biodiversity, ecology, and conservation values of the Carbunup Reserve for present and future generations to enjoy.
- To encourage community involvement in management of the Reserve.
- To raise community awareness of nature conservation and the protection of native flora and fauna.
- To encourage sustainable recreational and educational use of the Reserve consistent with Reserve's regional conservation significance.

The Reserve, which encompasses an area of about 31ha, is currently classified as a 'C' Class Reserve for the purpose of 'Parkland'. Several areas of bushland adjacent to the Reserve are either VCL, or vested for other purposes, including Road Reserves and R10 zoned residential land. Most of these areas are completely vegetated and have conservation values similar to the adjoining Reserve.

Four main vegetation communities are present in the Carbunup Reserve, containing a vascular flora of 337 species, of which 324 are native plants, and 13 are introduced weeds. The vegetation of the Carbunup Reserve is generally in very good to excellent condition, and weed invasion into the bushland is very low. Previous disturbance of the bushland is associated with the access tracks and firebreaks, the power transmission line, too frequent fire, dieback disease, litter dumping, and timber and firewood collection.

Little is known about the native fauna of the Reserve, although Western grey kangaroo and Brushtail possums are common. Quenda or Southern brown bandicoot are occasionally sighted in the Reserve. Feral cats, foxes and rabbits are vermin requiring control within the Reserve.

Carbunup Reserve is regularly used by local residents for bushwalking, many of who like to take their dog walking with them. Trailbike riding and camping have also occurred in the Reserve in the past. The Carbunup River pools in the south-east corner of the Reserve are regularly used by visitors to the Reserve, especially during the summer marron season.

Present and future management issues affecting the Carbunup Reserve were identified through consultation with relevant agencies, interested groups and the Carbunup River community. Important conservation issues facing the Reserve are:

- The degree of protection afforded to the Reserve by the current 'C' classification.
- The vesting and tenure of adjoining bushland.
- Protection of native flora and vegetation, particularly Declared Rare Flora and Threatened Ecological Communities.
- Uncertainty about the status and extent of dieback disease within the Reserve.
- Potential impacts from the invasion of weeds.
- A lack of knowledge about the Reserve's native fauna.
- Potential impacts from feral animals and domestic pets on the native flora and fauna.
- Appropriate management of fire within the Reserve to protect property and life from the threat of wildfire, whilst also maintaining and enhancing biodiversity.
- Uncontrolled and unmanaged access to the Reserve, particularly vehicles.
- Managing recreation impacts including dog walking.
- Litter.

Because of its high conservation values, aesthetic beauty and relative uniqueness, Carbunup Reserve is a valuable resource to the general public. The provision of interpretive signage and educative material aimed at raising community awareness and understanding of the Reserve's natural values to encourage sustainable use of the Reserve and its surrounds are an integral part of the management plan's conservation program.

In this management plan, specific management objectives and recommendations have been formulated to address the conservation issues facing the Reserve, and to guide implementation of the management plan. Many of the recommendations are very general to allow flexibility and choice in the way that they are implemented. Specific ideas and information for implementing the recommendations are detailed within the relevant sections of the management plan. Each recommendation has been assigned to at least one responsible authority. Any responsibility allocated to the Carbunup Reserve Management Group (CRMG) is not a statutory obligation, rather it is intended to be a guide to the activities that the community can undertake together as a group. Target dates are included as a guide to the timeframe for implementation, while priority is given to indicate the relative importance of each recommendation. Numerous recommendations require ongoing attention and should be continued for the life of the plan or until review deems them unnecessary.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.1a To assist in the inter-agency management of the Reserve, all agencies and groups involved in the management of the Reserve should use the agreed numbering for management zones within the Reserve (figure 5) when planning or documenting actions within the Reserve.	All agencies and groups involved in management of the Reserve	High
4.2a Investigate reclassifying the Reserve as an 'A' Class Reserve to provide the Reserve with greater protection.	Shire of Busselton.	High
4.2b Investigate changing the purpose of the Reserve from 'Parkland' to 'Conservation of Flora and Fauna and Passive Recreation' to ensure that the conservation significance of the Reserve is highlighted, while allowing for sustainable public use.	Shire of Busselton.	High
4.2c A formal request should be made to DOLA to pass vesting of adjoining VCL to the Shire of Busselton for inclusion into the existing Reserve. *Nb: The Department for Planning and Infrastructure will need to be consulted before any approach is made to have VCL at Carbunup amalgamated with Carbunup Reserve.*	Shire of Busselton.	High
4.2d A formal request should be made to DOLA to amalgamate all unmade Road Reserves (Weir Street, O'Donnell Road and Carbunup River Road) into the existing Reserve.	Shire of Busselton.	High
4.3a Contact should be established with the Abba Plain project co-ordinator at GeoCatch to investigate how the Carbunup Reserve can be included into the Abba Plain biodiversity enhancement project.	Shire of Busselton and the CRMG	Medium
4.3b All due care should be taken to minimise disturbance to both the soil and native vegetation during any management activities within the Reserve.	All agencies involved in the management of the Reserve	High
4.3c Surrounding landholders should be encouraged to use best management practices to limit fertiliser, pesticide or herbicide drift along the Reserve's boundaries.	CRMG and the Sussex LCDC	Medium
4.3d Contact should be established with Western Power, Telstra and MRWA to discuss suitable management strategies for maintenance activities within the Reserve to reduce unnecessary or accidental damage to the native vegetation.	Shire of Busselton	High
4.3e MRWA should be contacted to investigate possibilities for rehabilitation of any unnecessary tracks through the highway reserve opposite the Carbunup Store, and to devise a strategy to control the spread of weeds, particularly *Watsonia* sp., into the Reserve from this area.	Shire of Busselton	High

4.3f A suitably accredited *Phytopthora cinnamomi* interpreter should be contracted to formally assess the pattern and extent of dieback disease caused by the fungus within the Reserve.	Shire of Busselton	High
4.3g Following a formal *Phytopthora cinnamomi* assessment, the recommendations of this management plan should be reviewed to ensure that all management actions prevent or limit the further spread of dieback disease within the Reserve.	Shire of Busselton	High
4.3h All materials (including soils, brushing, mulch and plants) and machinery brought into the Reserve for any management activity must be free of the *Phytopthora cinnamomi* fungus.	CRMG and the Shire of Busselton	High
4.3i If any works are to be undertaken in any management zone that contains DRF, both CALM and EA should be advised during the planning phase of any activity.	Shire of Busselton and the CRMG	High
4.3j If any works are to be undertaken in the Marri woodland TEC, CALM should be advised during the planning phase for the activity.	Shire of Busselton and the CRMG	High
4.3k To identify the exact location of DRF for the purposes of management, and to obtain advice on how to protect the DRF from any adverse impacts, CALM should be contacted.	Shire of Busselton and the CRMG	High
4.3l Volunteer assistance to monitor the populations of DRF within the Reserve should be provided to CALM wherever possible.	CRMG	Low
4.3m The area cleared for drainage, to the west of the town site (management zone 1.1, currently R10 zoned land) should be rehabilitated using direct seeding or planting of tubestock (see recommendations 4.3q and 4.3r).	CRMG	Low
4.3n Two small access tracks leading into management zone 5 from the power line track should be assisted to regenerate naturally.	CRMG	Low
4.3o A small clearing in management zone 5 that has been excavated by children should be assisted to regenerate naturally. Trenches will need to be filled using sand sourced from within the clearing.	CRMG	Medium
4.3p The area of bush immediately south of the Carbunup Store and town site (management zone 1.2, currently VCL) should be assisted to regenerate naturally.	CRMG	Medium
4.3q Only local provenance seed stock should be used for any revegetation or rehabilitation within the Reserve to maintain the genetic integrity and diversity of the Reserve's flora.	CRMG and the Shire of Busselton	High
4.3r All plants used for any revegetation or rehabilitation activities should be grown at a nursery accredited for *Phytopthora cinnamomi* (dieback disease) control.	CRMG and the Shire of Busselton	High

4.3s Prior to the collection of any native seed or any plant specimens, a licence should be obtained from CALM.	CRMG and the Shire of Busselton	High
4.3t The herbarium of Ambergate Reserve flora prepared by the Busselton Naturalists Club, and the Cape Naturaliste Regional Herbarium prepared by the Toby Inlet Catchment Group could be used to identify the flora of the Carbunup Reserve.	CRMG	Medium
4.3u A vouchered herbarium of the flora of the Carbunup Reserve could be created as part of the Cape Naturaliste Regional Herbarium (see recommendation 4.3s).	CRMG	Low
4.3v Small, unobtrusive signs to identify common local plants species should be placed along the main walk track.	CRMG	Medium
4.4a A monitoring program focussing on disturbed areas and access tracks should be established to locate areas where weeds are invading and need attention, to identify new weeds, and to prioritise weed control efforts within the Reserve.	CRMG and the Shire of Busselton	High
4.4b Suitable weed control measures, including mechanical methods (mowing or slashing), hand removal, spot spraying, and herbicide wipe, should be used to eradicate weed species within the Reserve.	CRMG and the Shire of Busselton	High
4.4c Broadscale weed spraying and burning should not be used to control weed species within the Reserve.	CRMG and the Shire of Busselton	High
4.4d Priority for weed control should be given to areas where DRF are at risk from weed invasion, particularly management zone 1, to the south of the Carbunup Store and town site, and areas within the Marri woodland TEC.	CRMG and the Shire of Busselton	High
4.4e Priority weeds for removal are: *Ferraria crispa* (Black flag); *Oxalis purpurea* (Purple wood sorrell); *Monadenia bracteata* (a South African orchid); *Orobranche minor* (Lesser broom rape); *Watsonia* sp.; and *Ricinus communis* (Castor oil plant).	CRMG and the Shire of Busselton	High
4.4f Weed control programs should be undertaken several times per year, and should occur before the weeds set seed.	CRMG and the Shire of Busselton	High
4.4g Any weed control activity with the potential to impact any DRF or TEC should be referred to CALM and EA for approval as necessary (see recommendations 4.3i, 4.3j and 4.3k).	CRMG and the Shire of Busselton	High
4.4h Community awareness of weed prevention and control, and the effects of dumping garden waste within the Reserve should be raised through the provision of educative material.	CRMG	High
4.5a A suitably qualified fauna consultant should be contracted to assist the community to undertake a community based survey of the Reserve's native fauna.	CRMG	High

4.5b Ongoing monitoring of the Reserve's fauna and birdlife should be undertaken using simple, non-intrusive survey methods.	CRMG	Medium
4.5c Any new information gathered on the native fauna of the Reserve should be made available to the Shire of Busselton, CALM, and the general public at the Busselton Dunsborough Environment Centre.	CRMG	High
4.5d Following a detailed fauna survey, the recommendations of this management plan should be reviewed to ensure that all management actions serve to protect or conserve the known populations of native fauna.	Shire of Busselton	High
4.5e Information on the importance of fauna habitat within the Reserve should be provided to the local community.	CRMG	Low
4.5f Timber and firewood collection should be prohibited within the Reserve.	Shire of Busselton	High
4.6a Any active rabbit warrens or fox dens identified within the Reserve should be fumigated using aluminium phosphide tablets (Phos-toxin). *Nb: Agriculture WA no longer undertakes fumigation work. As Phos-toxin is listed as an S7 poison, any person undertaking fumigation of rabbit warrens must have completed a Chem-Cert course in chemical handling.*	CRMG	High
4.6b Non-jawed traps (non-lethal) may be used to trap feral foxes, rabbits or feral cats in areas around the town site.	CRMG and AgWA	High
4.6c A suitable contractor should be employed to conduct a 1080 baiting program twice yearly (January and April/May) within the Reserve to control foxes. The program should only use poisoned egg baits which are buried in areas well away from the town site and the dog-walking areas. *Nb: Agriculture WA must carry out an assessment of the Reserve to permit the use of 1080 poison. 1080 poison cannot be purchased without the issue of a voucher from Agriculture WA.*	Shire of Busselton	High
4.6d Surrounding residents should be encouraged to contain their pets through the provision of information on the impacts of domestic pets on native flora and fauna in the Reserve.	CRMG	Medium
4.6e The Reserve should be designated as a 'Cat Prohibited Area'.	Shire of Busselton	High
4.7a To protect the Carbunup River town site residents from the threat of wildfire, prescribed burns should be undertaken to reduce fuel levels in management zones 2, 5 and 6 as soon as possible.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7b Existing firebreaks within the Reserve should be maintained using equipment and techniques that minimise soil disturbance and do not widen or deepen the existing track.	Shire of Busselton	High

4.7c No new firebreaks should be installed within the Reserve.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7d To identify areas requiring fuel reduction burns, fuel levels within the Reserve should be monitored annually.	Shire of Busselton	High
4.7e Any prescribed burn plans for the Reserve must be referred to CALM for approval during the planning phase.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7f In the event of any wildfire, CALM should be immediately notified.	Carbunup Bush Fire Brigade	High
4.7g Approval needs to be sought from both CALM and EA to undertake any prescribed burn in the vicinity of DRF, or from CALM only to burn any part of the Reserve's threatened Marri woodland community (see recommendations 4.3i, 4.3j and 4.3k).	Shire of Busselton, the Carbunup Bush Fire Brigade and the CRMG	High
4.7h A comprehensive Fire Management Strategy endorsed by all agencies involved in the management of the Reserve and the local community should be prepared for the Reserve to reconcile conflicting fire management objectives within the Reserve.	Shire of Busselton	High
4.7i As part of the Fire Management Strategy, local fire crews should be provided with an information pack detailing the location of access points and water sources, and appropriate protocols for fire suppression within the Carbunup Reserve.	CALM	High
4.7j Until an agreed Fire Management Strategy is prepared, only prescribed burns that are necessary to protect life and property in Carbunup River should be carried out.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7k Carbunup River community members should be provided with FESA's 'Bushfire Survival Manual' to assist them to protect themselves from the threat of wildfires.	CRMG	High
4.7l A community fire awareness course could be organised to assist the Carbunup community members to protect themselves from the threat of wildfires.	CRMG and the Carbunup Bush Fire Brigade	Medium
4.8a All vehicles except Shire, management and emergency vehicles should be prohibited within the Reserve.	Shire of Busselton	High
4.8b To effectively control access to the Reserve, non-locked, treated pine pole gates should be erected at each access point to the Reserve (figure 6).	Shire of Busselton	High
4.8c An open gate on the southern boundary of the Reserve should be permanently closed by fencing.	Landholder and the Sussex LCDC	High
4.8d Around the town site, the Reserve should be fenced using treated pine poles.	CRMG and the Shire of Busselton	High
4.9a Dog-walking should be allowed to continue along a designated dog-walking circuit and the peripheral firebreaks to the west of Bussell Highway only.	Shire of Busselton and the CRMG	High

4.9b Dogs must remain on a leash and droppings should be removed from the Reserve using the 'poo pouches' provided.	Dog owners	High
4.9c Camping and trailbike riding should be prohibited within the Reserve.	Shire of Busselton	High
4.9d Regular patrols of the Reserve should be undertaken by the Shire Ranger to ensure that no camping occurs.	Shire of Busselton	High
4.9e Amenities such as picnic tables, barbecues or toilets should not be provided within the Reserve as they are incompatible with low-impact recreation objectives for the Reserve.	CRMG and the Shire of Busselton	High
4.9f No new amenities should be provided within the Reserve until a review of visitor use deems them necessary.	CRMG and the Shire of Busselton	High
4.9g A program should be established to monitor visitor use of the Reserve, to assess patterns of use and environmental impacts.	CRMG and the Shire of Busselton	Medium
4.9h Several clean-up days should be organised to remove old litter and rubbish from the Reserve.	CRMG	High
4.9i The Shire should provide rubbish bins and fortnightly rubbish collection at the start of the main walk track/dog walking circuit, adjacent to the town site.	Shire of Busselton	High
4.9j Dog 'poo pouches' should be regularly supplied to a suitable post next to the rubbish bins at the start of the dog-walking circuit.	CRMG and the Shire of Busselton	High
4.9k Regular, community 'clean up' days should be organised to remove litter from the highway verges and around the periphery of the town site.	CRMG	Medium
4.9l Interpretive signage should be used to inform visitors of the Reserve's regulations and conservation strategies.	CRMG and the Shire of Busselton	High
4.9m To avoid the proliferation of signs, all of the information that visitors require at each location should be posted on one eye-catching but simple, positively worded sign.	CRMG and the Shire of Busselton	High
4.9n Interpretive signage should be located at major access points to the Reserve, including the south-western corner of the town-site, on the MRWA Highway Reserve opposite the Carbunup Store, and at other entry points as appropriate.	CRMG and the Shire of Busselton	High
4.9o Signage encouraging visitors to remove litter from the Reserve should be placed at the rubbish collection point.	CRMG and the Shire of Busselton	High
4.9p Small pine-pole posts with arrows should be used to assist visitors with dogs to identify the dog-walking circuit.	CRMG and the Shire of Busselton	High

4.9q In order to maximise the effectiveness of interpretive signage, research should be conducted to determine the most suitable and effective way to present interpretive information about the Reserve.	Shire of Busselton	High
4.10a The local community should be informed and educated about various impacts and threats to the Reserve, and what they can do to mitigate these threats, via the provision of educative leaflets and newsletters.	CRMG	Medium
4.10b The local community should be informed about any potential threats to themselves or their pets from living in close proximity to the Reserve (including feral animal control programs and bushfire threats), and what they can do to protect themselves.	CRMG and the Shire of Busselton	High
4.10c The local community should be informed about the activities, achievements and success of the CRMG, and encouraged to participate in busy bees, social days and information days via the provision of a regular newsletter.	CRMG	Medium
4.10d The CRMG should actively encourage community participation in CRMG meetings and activities by placing notices in the local press.	CRMG	High
4.10e Schools, TAFE and universities should be encouraged to use the Reserve for projects that may improve awareness or understanding of the Reserve's natural features and conservation values, or research or monitoring projects that may assist to improve future management of the Reserve.	CRMG	Low
5.1a The CRMG should assist the Shire of Busselton to manage the Carbunup Reserve by undertaking community activities within the Reserve consistent with this management plan.	CRMG	High
5.1b The membership of the CRMG should include local residents, members of the Sussex LCDC and the Carbunup Bush Fire Brigade, and any other interested individuals or groups.	CRMG	High
5.1c The CRMG should meet regularly to plan the group's activities and work towards achieving the objectives outlined in this plan by addressing the listed recommendations according to priority.	CRMG	High
5.1d Minutes from the CRMG meetings detailing the group's plans and activities should be made available to the Sussex LCDC, the Shire of Busselton and CALM.	CRMG	High
5.1e One member of the CRMG should be designated to be responsible for informing the Shire and CALM of the group's activities, and be the point of contact within the group for these agencies.	CRMG	High
5.1f The Shire's Environmental Officer should be the first point of contact within the Shire for the CRMG, and should provide assistance and advice to the group as necessary.	Shire of Busselton	High

5.1g CALM should nominate representatives who will be available to provide advice and assistance to the CRMG as necessary.	CALM	High
5.1h The CRMG should prepare a brief annual report listing the group's activities and successes or otherwise over the past twelve months to measure progress against the recommendations of this management plan.	CRMG	High
5.2a The Busselton Shire should be regularly notified of future projects and requests for funding and assistance so that the Shire can plan its budget accordingly.	CRMG	High
5.3a External funding opportunities should be actively sought to implement the recommendations of this management plan.	CRMG and the Shire of Busselton	Medium
5.4a The recommendations of this management plan should be reviewed as new information about dieback disease, native fauna populations, and rare and priority flora becomes available. If necessary, the recommendations should be amended to ensure that the Reserve's conservation values are protected.	Shire of Busselton	High
5.4b This management plan should be comprehensively reviewed within five years of its adoption by the Busselton Shire Council.	Shire of Busselton	High

1. Introduction

1.1 Background

The Carbunup Reserve is a completely vegetated bushland Reserve, familiar to many as the bushland that straddles the Bussell Highway, just south of the Carbunup River Bridge, between Busselton and Margaret River.

A recent Action Plan prepared for the Carbunup River (Community Environmental Management, 2000) initially sparked interest in establishing a community group to assist in management of the Reserve. At several meetings in early 2001, interested community members met with the Sussex LCDC and various agency representatives to discuss the future management of the Reserve, particularly their concerns about fire management. In April 2001, a number of community members joined the Carbunup Bush Fire Brigade to assist with fire management in the Reserve. Some community members have expressed specific interest in managing the Reserve's conservation values through action as a community group. The Sussex LCDC expressed a desire to form a subgroup of the LCDC to manage the Reserve as an LCDC project.

To provide assistance with the formation of a community-based management group, and to provide guidance for the future management of the Reserve, the Busselton Shire funded the preparation of this management plan. The 'Carbunup Reserve Management Group' (CRMG) was formally established as a subgroup of the Sussex LCDC at a community meeting in May 2001.

1.2 Conservation Significance of the Reserve

The Carbunup Reserve is one of the largest remaining areas of Marri and *Banksia* woodlands that were formerly widespread on the southern Swan Coastal Plain, from Carbunup River to Capel. The Reserve is the only known remaining area where these woodlands are associated with intact, fringing riverine vegetation (Keighery *et al.*, 1996).

The Reserve's Marri woodland community contains more plant species than any other type of woodland on the Swan Coastal Plain (Keighery *et al.*, 1996). These Marri woodlands are listed by the Department of Conservation and Land Management (CALM) as a Threatened Ecological Community (TEC), 'Floristic Community Type 1b Southern *Eucalyptus calophylla* woodlands on heavy soils', which is currently afforded special, informal protection by CALM pending changes to CALM legislation. The status of the community is listed as 'Vulnerable', which means that it is likely to become endangered in the near future if factors leading to its loss continue to operate. Only six remnants of this community type remain on reserved lands, encompassing an area of less than 60ha. The Carbunup Reserve, at half this area, is the largest, and highest quality, remnant of this community type remaining on public land. As a result, the Carbunup Reserve bushland is of extremely high regional conservation value.

The Reserve contains two plant species gazetted as Declared Rare Flora (DRF) (one Critically Endangered orchid - *Caladenia busselliana*, and one Vulnerable understory plant - *Davesia elongata* subsp. *elongata*), which are specially protected by the State Wildlife Conservation Act (1950), the Conservation and Land Management Act (1984) and the Federal Environment Protection and Biodiversity Conservation Act (1999). The Reserve also contains another rare orchid species (*Caladenia procera*) which is soon to be listed as a Critically Endangered DRF.

Due to its conservation significance, in 1994, the Department of Environmental Protection (DEP) identified the Reserve's bushland as a 'Threatened and Poorly Reserved Community in need of Interim Protection' (Department of Environmental Protection, 1994). This means that any development proposal that may affect the Reserve must be referred to the Environmental Protection Authority.

1.3 Management Plan Aims

The aims of this management plan are to:

- To conserve, protect and enhance the biodiversity, ecology, and conservation values of the Carbunup Reserve for present and future generations to enjoy.
- To encourage community involvement in management of the Reserve.
- To raise community awareness of nature conservation and the protection of native flora and fauna.
- To encourage sustainable recreational and educational use of the Reserve, consistent with Reserve's regional conservation significance.

1.4 Focus and Scope of this Plan

The Shire of Busselton funded this management plan to guide and assist the community, as the CRMG, together with the Shire of Busselton to co-operatively manage the Carbunup Reserve. Ultimate responsibility for management of the Reserve remains with the vesting body, the Shire of Busselton. However, this management plan seeks to encourage the community to assist the Shire to manage the Reserve by undertaking activities consistent with the recommendations of this management plan.

The focus of this management plan is to assist the CRMG to co-ordinate community activities within the Reserve, and to provide a clear guide for the future management of the Reserve to both the Shire of Busselton and the community.

The Reserve contains several road reserves and parcels of land that adjoin the town site and are vested for other purposes and not currently included within the Reserve (see section 2.2 Vesting and Purpose). All of these areas are completely vegetated and there are no physical or visible boundaries that separate them from the Reserve. To adequately manage impacts to the Reserve, this management plan also includes recommendations for management of these parcels of land.

2. General Information

2.1 Location of Reserve

The Carbunup Reserve 38582 (Sussex Locations 16, 17 and 19) adjoins the Carbunup River town site, approximately 20 km south-west of Busselton (figure 1). The Bussell Highway divides the Reserve, which is approximately 31 hectares in area. The Carbunup River flows through the south-eastern corner of the Reserve. The Reserve is bounded to the north by Wildwood Road, to the west by an unmade road (Weir Street) and private property, to the south by private property, and to the east by an unmade road (Carbunup River Road) and private property.

2.2 Vesting and Purpose

The Carbunup Reserve 38582 is vested with the Shire of Busselton as a 'C' Class Reserve for the purpose of 'Parkland'.

Several areas of bushland adjacent to the Carbunup River town site and adjoining the Reserve are currently either Vacant Crown Land (VCL) or vested for other purposes and not included within the Reserve (figure 2). Immediately west of the Carbunup River town site, a portion of the bushland is VCL and zoned for future low-density residential development (R10 zoning). Another portion of the bushland adjacent to the town site is VCL zoned for the purpose of 'Recreation'. Between these areas, and along parts of the western and eastern boundaries of the Reserve are gazetted Road Reserves (Weir Street, Carbunup River Road and O'Donnell Road) vested with the Shire of Busselton. Part of the Weir Road Reserve bisects an undisturbed portion of the Reserve. A strip of vegetated land either side of the Bussell Highway is vested with Main Roads Western Australia (MRWA).

2.3 Catchment and Surrounding Land Uses

The Carbunup Reserve lies within the catchment of the Carbunup River, which flows northwards along the south-eastern corner of the Reserve, through the Carbunup River Road Reserve, to discharge into Geographe Bay, about 7 km downstream. Historically, dairy farming was widespread within the Carbunup River catchment, however the industry has contracted in recent years. Cattle and sheep grazing, and horticulture (particularly potato farming) are common local land uses. Since the 1970's, viticulture has steadily increased, and the region now has a reputation for producing high quality wines and table grapes. The area of land within the catchment that is planted to vines each year continues to increase.

Paddocks on the eastern and southern boundaries of the Reserve are varyingly used for sheep grazing or potato farming, with occasional use for low-density cattle grazing. Along the eastern boundary of the Reserve, a vineyard has recently been established. In 1994, a portion of the gazetted town site that was still bushland, on the northern side of the Reserve, was cleared for low density residential development (R10). Twelve private residences have been built on this land since.

3. Description of the Reserve

3.1 Landform, Soils and Topography

The Carbunup Reserve is located on the south-western edge of the Swan Coastal Plain, which extends eastward from Dunsborough, along the coast of Geographe Bay northwards to Moore River, near Geraldton. The Swan Coastal Plain is a flat and gently undulating plain formed on Quarternary marine, alluvial and aeolian sediments. The southern Swan Coastal Plain is narrow, and in the Geographe Bay catchment, it extends around 10 - 15 km inland. To the west of the southern Swan Coastal Plain lies the Margaret River Plateau, more commonly known as the Leeuwin-Naturaliste Ridge.

The Carbunup Reserve lies within the south-western corner of the Abba Plain land system, which is the major land system of the southern Swan Coastal Plain, lying inland of the narrower Quindalup Coast and Ludlow Plain land systems (Tille and Lantzke, 1990). A land system is defined as an area or groups of areas where the landform, geology, soils and vegetation types show similar, recurring patterns.

The Abba Plain lies about 10-40 m above sea level, is about 10 km wide, and extends from about 5 to 15 km inland in the Geographe Bay catchment (figure 3). Three Abba Plain land units (of 11) are represented in the Carbunup Reserve (Tille and Lantzke, 1990). They are:

- Abba Very Fertile Flats (AF):
  Well drained flats with deep red-brown sands, loams and light clays (i.e. Marybrook soils).
- Abba Fertile Flats (Af):
  Well drained flats with sandy gradational grey-brown (Busselton) soils, and some red-brown sands and loams (Marybrook soils)
- .Abba Deep Sandy Dunes (Ad2):
  Gently sloping low dunes and rises (0-5% gradients) with deep bleached sands.

The topography of the Reserve and the surrounding landscape is very gently undulating, with low rises and dunes interspersed with shallow depressions. Within the Reserve, *Banksia* and *Melaleuca* woodlands occur in the shallow depressions, while Marri woodland occurs on the higher rises which surround the depressions. The south-eastern corner of the Reserve slopes gently down to the Carbunup River.

3.2 Vegetation and Flora

The vegetation and flora of the Carbunup Reserve has been surveyed by both Gibson *et al.* (1994) and Keighery *et al.* (1996). The description of vegetation and flora provided here is derived from the Keighery *et al.* (1996) report.

3.2.1 VEGETATION COMMUNITIES

Four principal vegetation communities are represented within the Carbunup Reserve (figure 4):

- *Marri Woodlands*

Marri (*Eucalyptus calophylla*) Woodlands (mapped as mW) are characteristic of the sandy silts. Jarrah (*E. marginata*) occurs at varying densities throughout the woodland and at times is the dominant tree in the canopy. Snottygobble (*Persoonia longifolia*), *Xylomelum occidentale,* Peppermint tree (*Agonis flexuosa*) and Bull banksia (*Banksia grandis*) are found in some areas. These woodlands have a diverse and dense understory of shrubs, herbs and sedges. Characteristic understory species include: *Bossiaea ornata, Hakea amplexicaulis,* Blackboy (*Xanthorrhoea priessii*), *Hibbertia hypericoides, Acacia extensa* and *Mesomelaena tetragona*. In the wetter areas near the river *Dasypogon hookeri* and *Kingia australis* are significant. *Acacia myrtifolia, Opercularia spermcocea* and *Acacia mooreana* are largely restricted to these woodlands on the Swan Coastal Plain.

The flora of these woodlands indicates a close association with the Whicher Plateau and the South Coast because of the presence of a series of plant species that are commonly thought to be absent on the Swan Coastal Plain. Such species include: Tree hovea (*Hovea elliptica*), *Baxteria Australis, Dasypogon hookeri, Gonocarpus hexandrus* ssp. i*ntegrifolius, Johnsonia lupulina, Hypocalymma cordifolium, Persoonia graminea* and *Podocarpus drouynianus*.

This element of southern species characterises the nature of the Reserve's Marri Woodland community, which is listed as a 'Vulnerable' TEC - 'Floristic Community Type 1b - Southern *Eucalyptus calophylla* woodlands on heavy soils', which is currently afforded special, informal protection by CALM pending changes to CALM legislation. This vegetation community is restricted to the Swan Coastal Plain south of Capel (the Abba Plain).

- *Banksia Woodlands*

Candle banksia (*Banksia attenuata*) Woodlands (mapped as bLW), often with an overstory of scattered to denser Marri, occur on the sandy soils. Sheoak (*Allocasuarina fraseriana*) and Peppermint tree (*Agonis flexuosa*) are common in the *Banksia* layer. *Jacksonia sparsa, Acacia extensa, Stirlingia latifolia, Adenanthos meisneri, Melaleuca thymoides, Hibbertia hypericoides, Phlebocarya ciliata* and *Lepidosperma angustatum* are characteristic of the understory.

These *Banksia* woodlands are restricted to sand sheets at the base of the Whicher Scarp, and sand sheets on elevated ridges and sand plains south of Bunbury. Like the Marri woodland, these woodlands are identified by the presence of a series of southern taxa including *Acacia extensa* and *Jacksonia sparsa*.

- *Melaleca preissiana Low Open Woodland*

In all of the damp, sandy areas Modong (*Melaleuca preissiana*) is found, excepting one area where Swamp Banksia (*Banksia littoralis*) dominates (mapped as mpLW and blLW respectively). The understory varies from open heath of *Kunzea* aff. *Micrantha, Regelia ciliata* and *Pericalymma ellipticum*, to a low heath dominated by *Pericalymma ellipticum*. The shrub layers are underlain by sedges and herbs. In the two more northerly damplands, the shrub layer occurs in dense clumps with patches of herbland and sedgeland without a shrub layer.

These types of wetland woodlands are relatively widespread, and commonly found on sandy soils associated with underlying heavier soils.

- *Riverine Vegetation*

Along the river Marri Open Forest (mapped as mF) occurs with an extremely dense understorey of Swamp Peppermint (*Agonis linearifolia*), Wonnich (*Calostachys lanceolata*), Poison bush (*Gastrolobium lineare*), and the sedges *Taraxis glauca* and *Baumea vaginalis*.

This area of riverine vegetation is of particular regional significance as very little of the Swan Coastal Plain's riverine vegetation remains. As this riverine remnant is connected to a large remnant of upland (dryland) vegetation, it is of additional significance as there is no other comparable area currently known to remain on the Swan Coastal Plain.

3.2.2 FLORISTIC COMMUNITY TYPES

Three floristic community types, categorised by the Gibson *et al.* (1994) study of the floristic variation of the Swan Coastal Plain, occur within the Reserve:

- Floristic Community Type 1b *Southern Eucalyptus calophylla woodlands on heavy soils*

This floristic community type is listed by CALM as a Vulnerable Threatened Ecological Community (TEC), and may move into the endangered category if factors leading to the loss of this community type continue to occur.

Protection of TECs that are not critically endangered is presently informal pending changes to CALM legislation, however their conservation significance is recognised by other State Government agencies and is considered in evaluations and legal processes administered by those agencies. CALM is the primary agency responsible for administering the protection of non-critically endangered TECs on reserved lands.

- Floristic Community Type 21b *Southern Banksia attenuata woodlands*

Although this community type is present in more than two conservation reserves, its regional conservation status is considered to be 'Susceptible'.

- Floristic Community Type 4 *Melaleuca preissiana damplands*

This community type is considered to have a 'Low Risk' regional conservation status.

3.2.3 FLORA

The Carbunup Reserve contains a vascular flora of 337 taxa, of which 324 are native species, and 13 introduced weed species (Appendix 2). Four taxa are non-flowering vascular plants, 124 are monocotyledons (116 natives and 8 weeds), and 209 are dicotyledons (204 natives and 5 weeds). The families that are represented by the highest diversity of species are:

Papilionaceae (32 taxa)
Proteaceae (26 taxa)
Orchidaceae (23 native taxa, 1 weed)
Myrtaceae (18 taxa)
Cyperaceae (17 taxa)
Anthericaceae (16 taxa)
Dasypogonaceae (13 taxa)
Asteraceae (13 native taxa, 2 weeds)
Restionaceae (12 taxa)
Mimosaceae (12 taxa)
Haemodoraceae (12 taxa)
Stylidaceae (11 taxa)

3.2.4 SIGNIFICANT FLORA

Thirty five taxa recorded in the Reserve are characteristic of the heavier soils of the southern side of the Swan Coastal Plain (or eastern side of the Plain north of Busselton (Appendix 2). There are also at least twelve taxa that are recorded on the Swan Coastal Plain south of Capel only (Appendix 2).

A number of flora are of particular interest because they are either uncommon, have restricted distributions, are at the limits of their range, represent outstanding records for the species, have not been previously recorded or are uncommon on the Swan Coastal plain, or have unusual or unique growth habits or forms. They are:

Johnsonia lupulina
Xanthosia pusilla
Pentapeltis peltigera
Centipedia cunninghamii
Baumea vaginalis

Cyathochaeta sp.
Leproydia heleocharoides
Baxteria australia
Dasypogon hookeri
Anigozanthos flavidus
Gonocarpus hexandrus subsp. *integrifolius*
Acacia browniana
Acacia divergens
Acacia semitrullata
Hypocalymma cordifolium
Callistachys lanceolata
Hovea elliptica
Podocarpus drouynianus
Conospermum flexuosum subsp. *laevigatum*
Persoonia graminea
Taraxis grossa
Opercularia species

3.2.5 RARE AND PRIORITY FLORA

Carbunup Reserve contains two plant species that are gazetted as Declared Rare Flora (DRF), and another species soon to be listed, which are specially protected by the Western Australian Wildlife Conservation Act (1950), the Conservation and Land Management Act (1984) and the Federal Environment Protection and Biodiversity Conservation Act (1999):

Caladenia busselliana (listed as Critically Endangered)
Davesia elongata subsp. *elongata* (listed as Vulnerable)
Caladenia procera (soon to be listed as Critically Endangered)

Four species listed on CALM's Priority Flora List, which contains species requiring further survey or monitoring to determine their conservation status, occur within the Reserve:

Acacia semitrullata (Priority 3)
Conospermum paniculatum (Priority 3)
Lepyrodia heleocharoides (Priority 3)
Tyrbastes glaucescens (Priority 4)

3.2.6 VEGETATION CONDITION

The vegetation of the Carbunup Reserve is generally in excellent to very good condition. Weed invasion into the bushland is low, and only thirteen weed species have been recorded. Disturbance of the bushland is generally associated with access tracks and firebreaks, the power transmission line, frequent fire, dieback, and timber and firewood collection. Disturbance along the tracks, particularly areas where the soil has been disturbed and piled in mounds, creates an ideal situation for the establishment and invasion of weeds. Areas of dieback disease on the sandy soils has resulted in the selective loss of susceptible species (Jarrah, *Banksia* species, heath family, pea family, Blackboy and *Macrozamia* species). Timber and firewood collection is also selectively targeting tree species (mainly Jarrah and *Banksia*), while timber collection in the *Banksia* woodlands focusses on dieback effected areas where there are dead and dying *Banksia* trees. This activity is contributing the further spread of dieback.

3.2.7 ENVIRONMENTAL WEEDS

Thirteen introduced weed species have been recorded in the Reserve, however there has been no formal mapping of their distribution or extent. They are:

Conyza albida (Tall fleabane)
Hypochaeris glabra (Smooth cats ear)
Centaurium erythraea (Common centaury)
Ferraria crispa (Black flag)
Ixia maculata (Yellow ixia)
Juncus bufonius (Toad rush)
Juncus capitatus (Unnamed rush)
Orobranche minor (Lesser broomrape)
Oxalis purpurea (Purple wood sorrel)
Aira caryophylla (Silvery hairgrass)
Briza maxima (Quaking grass)
Briza minor (Lesser quaking grass)
Monadenia bracteata (South African orchid)

Two other weed species have been identified on land immediately adjoining the Reserve:

Watsonia sp.
Ricinus communis (Castor oil plant)

3.2.8 DIEBACK DISEASE CAUSED BY *PHYTOPTHORA CINNAMOMI*

To date, there has been no formal interpretation or mapping of the pattern or extent dieback disease caused by the introduced fungus *Phytophthora cinnamomi* within the Reserve (M.Soutar, CALM, pers. comm.). Keighery *et al.* (1996) noted that there were large areas affected by dieback disease within the *Banksia* woodlands in the central part of the Reserve. Dead *Banksia* and Jarrah trees are visible over a large area either side of the main track to the south of the town site, however there are many healthy *Banksia* and Jarrah trees at the northern end of this track, near the town site.

3.3 Fauna

3.3.1 NATIVE FAUNA

There has been no systematic research on, or trapping of, the fauna within the Carbunup Reserve to date. The Carbunup Reserve area is within the species distribution ranges of several fauna which, although not positively recorded within the Reserve, are highly likely to be present based on the existing habitat within the Reserve (G. Voigt, CALM, pers. comm.). They are:

Western ringtail possum (*Pseudocheirus occidentalis*)
Brushtail possum (*Trichosurus vulpecula*)
Brush-tailed phascogale (*Phascogale tapoatafa*)
Chuditch (*Dasyurus geoffroii*)
Echidna (*Tachyglossus aculeatus*)
Mardo (*Antechinus flavipes*)
Dunnarts (*Smithopsis* species)

Western grey pygmy-possum (*Cercartetus concinnus*)
Bush rat (*Rattus fucipes*)

It is possible (although less likely) that several uncommon fauna may also be present within the Reserve (G. Voigt, CALM, pers. comm.). They are:

Honey possum (*Tarsipes rostratus*)
Western brush wallaby (*Macropus irma*)
Quokka (*Setonix brachyurus*)
Water rat (*Hydromys chyrsogaster*)

Brushtail possums (*Trichosurus vulpecula*) are abundant in the Reserve and are regularly seen by local residents, and there have also been occasional sightings of Quenda or Southern brown bandicoot (*Isoodon obesulus*) in recent years. Western grey kangaroo (*Macropus fuliginosus*) are common in the Reserve, particularly in the area of bush to the east of the highway, near the Carbunup River, where the bush is criss-crossed by many, well-used kangaroo tracks.

3.2.2 INTRODUCED FAUNA

Introduced fauna known to occur in the Reserve include:

Rabbits
Foxes
European rats
House mice
Feral cats
Domestic pets

Fox control measures (1080 baiting programs together with shooting) have been undertaken on surrounding farmland during the lambing season (June/July) for many years, leading to a gradual decline in the fox population (W. Credaro, local landholder, pers. comm.). The reduction in fox numbers around the Reserve has led to a dramatic increase in the population of rabbits both within and around the Reserve, where they have become an increasing problem in recent years (W. Credaro, local landholder, pers. comm.). The majority of the rabbit population is confined to the perimeters of the Reserve, particularly the sandy areas along the southern and western boundaries, where they burrow, and move onto the adjacent farmland to graze in the evenings.

3.4 Fire History

Prior to 1994, when the Carbunup River town site was developed for housing, the Reserve was burnt regularly by surrounding landholders to reduce the risk of summer wildfires using low intensity, cool burns during autumn and early winter. Because of the limited number of people available to assist when burning, the timing of burns was carefully chosen, usually after rains, to ensure that only very controllable, cool, slow moving, patchy burns occurred. The objective of the burns was always to reduce the risk of hot, uncontrollable, summer fires by removing the built up fuel on the soil surface only, without burning the tree canopies. Generally, one whole block of bush bounded by tracks or firebreaks was burnt at a time, although the resulting burn was always very patchy because of the low intensity of the fires.

For many decades, each area of the Reserve was burnt on a rotation of around four years (F. Credaro, local landholder, pers. comm.). Summer wildfires have also occasionally occurred within the Reserve.

The Carbunup Reserve is traversed by a number of strategic firebreaks which now divide the Reserve into six zones for fire management (figure 5). All of the Reserve's firebreaks and tracks, except one, have been present for many decades, and represent the boundaries of areas used for previous fire management activities. The firebreak that separates zone 1 from zone 4 was installed in autumn 1997 to allow prescribed burning to protect the town site. Prior to 1997, that area of bush was divided by the central tracks only, and was burnt as whole blocks either side of the main track.

Since the development of the Carbunup River town site, fire management has become a contentious issue. Some landholders are concerned about the significant threat of wildfire and risk to life and property posed by the close proximity of the surrounding bushland. Other residents are concerned about the impacts of burning on the flora and fauna of the Reserve, and the aesthetics of the Reserve following fires. The presence of rare flora and threatened ecological communities (see section 4.3.4) has also complicated the issue. Disagreements over a suitable fire management strategy have seen no fires occur in the Reserve since 1997.

The last burns to occur in each management zone are (see figure 5):

- Management zone 1: Last prescribed burn was in autumn 1997.
- Management zone 2: The whole zone was burnt during a controlled spring burn in 1983. Smaller sections of this zone were burnt using controlled autumn burns in 1987, 1988, 1989 and 1990.
- Management zone 3: Last prescribed burn was during winter 1995.
- Management zone 4: Last prescribed burn was during winter 1995.
- Management zone 5: The southern portion of this bush was last burnt during 1995, but the northern end of this block has not been burnt since 1989/90.
- Management zone 6: Has been a no burn area.

3.5 Firebreaks, Access Tracks and Fencing

The Reserve has an established network of strategic firebreaks which are maintained by the Shire of Busselton (figure 5). All strategic firebreaks were graded early in 2001, except the western part of the firebreak separating management zone 1 from 4, which is becoming overgrown. There are no major areas of erosion, however the soil has been disturbed and piled in mounds along the edges of the firebreaks as result of the grading. Local residents have expressed concern that the firebreaks are being graded wider and successively deeper each year.

In addition to strategic firebreaks, there are a number of other tracks that are passable to 2WD vehicles, some of which are regularly used as walking trails by the local community (figure 6). There are no single-file walk trails through the Reserve.

There are eight major points where vehicles can gain access to the Reserve (figure 6):

- The southern end of the Carbunup River town site (the start of the main walking trail).
- The northern end of the power line track (to the west of the town site).

- The northwest corner of the Reserve, (where the western firebreak meets Wildwood Road).
- Through the MRWA land opposite the Carbunup Store (access through to the firebreak along the Reserve's eastern boundary).
- To the west of Bussell Highway (the strategic firebreak separating management zones 1 and 4).
- To the east of Bussell Highway (the strategic firebreak separating management zones 2 and 3).
- The firebreak along the southern boundary (both sides of the highway).

All of the Reserve's boundaries with farmland are adequately fenced to exclude stock. At one point on the southern boundary (see figure 6), the neighboring farmer has an open gate into the Reserve's firebreak which has been occasionally used for a short distance to access an adjacent paddock.

3.6 Current Recreational and Educational Uses

Bushwalking along the existing network of firebreaks and tracks is a popular activity within the Reserve, and many local residents enjoy taking their dogs on walks with them. The bushwalking track most commonly used by the Carbunup River residents is shown in figure 6. Other recreational pursuits that occur within the Reserve include trailbike riding, which occurs very infrequently along the Reserve's firebreaks, and catching marron in the pools on the Carbunup River in the south-east corner of the Reserve. Very occasionally, people camp in the Reserve, and there are a number of old campsites along tracks within the Reserve, particularly by the Carbunup River pools, which are well used during the marron season.

Currently, there are no recreational or educational facilities provided within the Reserve, and there are no school or university groups that use the Reserve as a study site.

3.7 Other Uses

Firewood and timber collection has occurred in the Reserve in the past. There are considerable stands of Jarrah, Banksia and Sheoak that may be targetted by timber cutters. There is also a large amount of dead timber in the Reserve which is desirable firewood. Both of these activities often target areas where dieback disease is prevalent.

3.8 History

3.8.1 ABORIGINAL HERITAGE

The name Carbunup is recorded by the Department of Land Administration (DOLA) to be an Aboriginal name meaning 'place of kindly stream' (Community Environmental Management, 2000).

The Aboriginal heritage of the Carbunup area has not been investigated to date. Traditionally, the Aboriginal people of the south-west were part of a cultural bloc distinguished by their initiation practices, which consisted of nasal septum piercing and scarring of the upper body rather than circumcision, which was practiced by their northern and inland neighbours (Bates, 1985). This cultural bloc has come to be known as Nyungar, however, prior to settlement these people recognised themselves and their culture as *Bibbulmun* (Bates, 1985).

The Bibbulmun people occupied all of the land to the west of a line drawn roughly from Jurien Bay on the west coast to Esperance on the south coast (Bates, 1985). Within the Bibbulmun, there were around 13 tribes that were distinguished by linguistic differences. The Bibbulmun people who occupied the coastal areas from Bunbury to Augusta called themselves, and were called by their inland neighbours *Waddarndi Bibbulmun* (Bates, 1985).

The Wardandi Bibbulmun migrated seasonally from the coastal plain to Nannup, Augusta and areas between, to exploit various food resources as they became abundant each year. Many of the tracks used by the Bibbulmun people were used by the early settlers to explore the land, and eventually to create roads. Many of these early roads still follow similar alignments, and often link areas of traditional importance, such as Busselton and Augusta (Collard, 1994). The Bussell brothers, when exploring north from the settlement at Augusta in 1830, were guided to the Vasse River by local Aboriginals along a traditional Bibbulmun walking path (Shann, 1926). The route of this path was possibly very close to the current route of the Bussell Highway. As a result, it is possible that the Wardandi Bibbulmun visited and used the Reserve and the nearby Carbunup River during their seasonal travels.

The Aboriginal Affairs Department's Sites Registry lists no Aboriginal heritage sites within the Reserve or its immediate surrounds. However, sites may exist that have not yet been recorded or entered onto the register. The Aboriginal Heritage Act (1972) protects all Aboriginal heritage sites in Western Australia, whether they are known to the department or not. If any future development of the Reserve is planned, particularly the addition of amenities such as car parks or toilet blocks (which are not recommended in this plan), consultation with relevant Aboriginal communities and archaeological surveys will be needed to determine the Aboriginal heritage of the Reserve.

3.8.2 EUROPEAN HISTORY

Captain John Molloy first named the river the Lennox River after Lennox Bussell in 1835. Later it became known as the Carbunup River, and the town site was named Carbunup after it in 1926 (Community Environmental Management, 2000). In 1958, the town's name was changed to Carbunup River to avoid confusion with the similarly named town Carbarup near Mount Barker.

The Reserve was first vested with DOLA as a 'C' Class Reserve for the purpose of 'Parkland' in 1983. Prior to then, the Reserve was part of the gazetted Carbunup River town site. In 1991, the Reserve was officially vested with the Shire of Busselton.

Apart from occasional dumping of large-scale metal rubbish, irregular camping by people passing through the district, and recreational use by surrounding community members, the Reserve has remained as an undisturbed, vegetated bushland. To the best knowledge of the surrounding farming families, the Reserve was never used for grazing or as a storm refuge for stock in the past.

Both the Carbunup Store and the Carbunup Hall, constructed during the 1920s and located on the Bussell Highway nearby the Reserve, are recognised as sites of cultural heritage significance under the Heritage of Western Australia Act (1990).

4. Management Issues and Strategies

Management issues affecting the Carbunup Reserve were identified through consultation with relevant agencies, interested groups, and the local community. In this section of the plan, objectives have been formulated to guide the management of specific issues, which are highlighted. A number of recommendations have been developed to address these issues, and to assist and guide the implementation of the management plan (section 5).

The recommendations are prioritised as either high, medium or low to indicate the relative importance of each recommendation. Target dates are included for each recommendation as a guide to the timeframe for implementation. Many of the recommendations require ongoing action which should be continued until review deems them unnecessary. Other recommendations address issues in an interim manner only, as current information is insufficient for adequate management, particularly knowledge of the extent of dieback and native fauna populations. Review of some of the recommendations will be necessary as further information becomes available. Many of the recommendations are very general to allow flexibility and choice in the way that they are implemented. Specific ideas and information to guide and assist implementation of the recommendations have been included in the text of the management plan.

Responsibility for the implementation of each recommendation has been assigned to al least one group or agency. Any responsibility allocated to the CRMG is not a statutory obligation, rather it is a guide to activities that the CRMG and local community can undertake. The Shire of Busselton may provide assistance with most of these activities.

4.1 Management Zones

4.1.1 OBJECTIVE

To identify suitable management zones within the Reserve to assist all of the agencies and groups involved in the Reserve's management to document and identify target areas for works in a consistent manner.

4.1.2 APPROPRIATE MANAGEMENT ZONES

For the purpose of management, it is easiest to divide a large block of bush into smaller parcels of land in which specific issues can be identified and activities can be targeted. It is most convenient to define boundaries for zones by readily observed features such as tracks or fences. The Carbunup Reserve is traversed by a number of strategic firebreaks which divide the Reserve into six zones for the purpose of fire management (see figure 5). Two of these zones (1 and 4) are further subdivided by vehicle tracks into two and three sub-zones respectively. These divisions and subdivisions are easily observed in the field, and therefore, are a good basis for management zones that can be consistently used by all agencies and groups involved in the management of the Reserve.

For the purposes of previous fire management, the Reserve has been divided and numbered into six zones. To maintain consistency, these numbers should be retained. To further define sub-zones within these fire management zones, the subdivisions of zones 1 and 4 should be numbered as 1.1, 1.2, 4.1, 4.2, etc. (figure 5).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.1a To assist in the inter-agency management of the Reserve, all agencies and groups involved in the management of the Reserve should use the agreed numbering for management zones within the Reserve (figure 5) when planning or documenting actions within the Reserve.	All agencies and groups involved in management of the Reserve	High

4.2 Vesting and Purpose

4.2.1 OBJECTIVE

To ensure that the vesting and purpose of the Reserve provides adequate protection for the Reserve, and reflects the regional conservation significance of the Reserve.

4.2.2 PROTECTION AFFORDED BY VESTING AND PURPOSE

Currently, the Carbunup Reserve 38582 is vested with the Shire of Busselton as a 'C' Class Reserve for the purpose of 'Parkland'. The level of protection afforded to the Reserve by its current 'C' classification is probably inadequate, given the Reserve's conservation values. Under the Land Act (1933), only Ministerial approval is necessary to alter the vesting and purpose of 'C' Class land. Reclassifying the Reserve to 'B' or 'A' Class will afford the Reserve greater protection. 'A' Class land requires the approval of both the Legislative Assembly and the Legislative Council to alter purpose or vesting, whilst 'B' Class land needs the approval of the Legislative Assembly only. To reclassify the Reserve to 'A' Class, which would reflect the Reserve's regional conservation significance, the approval of both houses of Parliament will be necessary.

At present, the purpose of the Reserve is 'Parkland', which also does not adequately reflect the conservation significance of the Reserve. Because of the high regional conservation significance of the Reserve's vegetation communities and flora, and the community's desire to continue using the Reserve for passive recreation, the most appropriate purpose for the Reserve would be 'Conservation of Flora and Fauna and Passive Recreation'.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.2a Investigate reclassifying the Reserve as an 'A' Class Reserve to provide the Reserve with greater protection.	Shire of Busselton.	High
4.2b Investigate changing the purpose of the Reserve from 'Parkland' to 'Conservation of Flora and Fauna and Passive Recreation' to ensure that the conservation significance of the Reserve is highlighted, while allowing for sustainable public use.	Shire of Busselton.	High

4.2.3 VESTING AND PURPOSE OF ADJACENT LAND

There are several areas of bushland adjacent to the Carbunup River town site and adjoining the Reserve which currently are either Vacant Crown Land (VCL) or vested for other purposes and not included within the Reserve (see section 2.2 and figure 2).

Currently, all of these areas are completely vegetated and appear to have conservation values similar to the adjacent Reserve areas. Both areas of VCL and all of the Road Reserves contain the Reserve's Marri woodland community which is listed as a TEC (see sections 1.2 and 3.2.5). The rare orchid *C. Procera* (soon to be listed as Critically Endangered DRF) has been previously recorded in the VCL block to the south of the Carbunup Store (G. Bussell, pers. comm.), while both blocks of VCL adjacent to the town site are considered to be potential habitat for the critically endangered orchid *C. busselliana*.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.2c A formal request should be made to DOLA to pass vesting of adjoining VCL to the Shire of Busselton for inclusion into the existing Reserve. *Nb: The Department for Planning and Infrastructure will need to be consulted before any approach is made to have VCL at Carbunup amalgamated with Carbunup Reserve.*	Shire of Busselton.	High
4.2d A formal request should be made to DOLA to amalgamate all unmade Road Reserves (Weir Street, O'Donnell Road and Carbunup River Road) into the existing Reserve.	Shire of Busselton.	High

4.3 Protection and Rehabilitation of Native Vegetation

4.3.1 OBJECTIVES

- To conserve and protect the native flora and vegetation communities within the Reserve.
- To protect rare and priority flora and vegetation communities.
- To enhance community awareness of the Reserve's flora and vegetation communities.

4.3.2 CONSERVATION AND PROTECTION OF NATIVE FLORA AND VEGETATION COMMUNITIES

Prior to settlement, Banksia, Marri, and Marri/Jarrah (*Banksia* sp., *Eucalyptus calophylla* and *E. marginata*) dominated woodlands and forests were widespread on the eastern side of the southern Swan Coastal Plain (the Abba Plain, figure 3). However, the extent of remnant vegetation has declined significantly due to clearing for grazing and agriculture, and within the Geographe Bay catchment, it has been estimated that less than 12% of the original area of Abba Plain vegetation communities remains, mostly located on private land. The Carbunup Reserve bushland represents one of the largest remnants of original Abba Plain vegetation communities, and the largest, and best quality, remnant of southern Marri woodlands remaining on public land (see section 1.2). As a result, the vegetation of the Reserve is recognised to have very high regional conservation value.

In February 2001, the Geocatch Network Centre commenced a project that aims to conserve and enhance the biodiversity of remnant Abba Plain vegetation communities. The Carbunup Reserve may be useful to this project as an example of high quality remnant Abba Plain vegetation communities, and as a potential seed source for revegetation of these communities in areas on private land.

Maintaining healthy, undisturbed vegetation and soils is the best way to prevent weed invasion and vegetation stress, which in turn increases the susceptibility of the vegetation to infection by insect parasites such as borers and leaf miners, and diseases such as the honey fungus *Armillaria* sp., and canker fungi. As the vegetation of the Carbunup Reserve is in very good condition, protection of the vegetation will be best achieved by minimising any disturbance to the soil or native vegetation during any management activities.

Many native plants, particularly *Banksia* sp., are very sensitive to, and may be killed by, high levels of phosphate, whilst increased nutrient levels also encourage the establishment of weeds. Excess nutrients may enter the Reserve from the surrounding farmland or town site gardens. To minimise nutrient addition to the vegetation at the Reserve's boundaries, farmers should be encouraged to spread super-phosphate and other fertilisers when the wind is blowing away from the Reserve, or simply not apply fertiliser for the first run next to the Reserve, particularly where *Banksia* trees are present. Nutrients are also added to the Reserve as garden waste, which is occasionally dumped around the boundaries near the town site. This practice also introduces new exotic species to the Reserve and should be actively discouraged (see section 4.4.4).

As essential service providers, Western Power and Telstra both have statutory access and maintenance rights over specific areas of the Reserve. Western Power regularly undertake maintenance activities along the power line through the Reserve, and this has the potential to impact on the native vegetation. In particular, at the northern end of the power line track, there is a significant stand of regenerating Bull Banksia (*Banksia grandis*) which appear to be very healthy and unaffected by dieback. Broadscale weed spraying or pruning of this track by Western Power, or along the highway verges by MRWA may also impact native flora.

Dense stands of the common Chapman's spider orchid (*Caladenia chapmanii*) are regularly killed during spring herbicide spraying of highway verges by MRWA (G. Bussell, pers. comm.). Establishing contact with these agencies to discuss suitable management strategies for maintenance of the power line and highway verges may help to reduce unnecessary or accidental damage to the native vegetation.

The area of highway reserve vested with MRWA, opposite the Carbunup Store (figure 2), is divided by a number of tracks and MRWA store areas which have encouraged the establishment of a number of problem weeds in the area. In particular, a severe infestation of *Watsonia* sp. is currently threatening the Reserve's Marri woodland TEC at the northern end of management zone 2. Contact should be established with MRWA to discuss possibilities for rehabilitation of any unecessary tracks and storage areas within the highway reserve, and also to devise a strategy to control the spread of weeds, particularly *Watsonia* sp., into the Reserve from this area.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3a Contact should be established with the Abba Plain project co-ordinator at GeoCatch to investigate how the Carbunup Reserve can be included into the Abba Plain biodiversity enhancement project.	Shire of Busselton and the CRMG	Medium
4.3b All due care should be taken to minimise disturbance to both the soil and native vegetation during any management activities within the Reserve.	All agencies involved in the management of the Reserve	High

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3c Surrounding landholders should be encouraged to use best management practices to limit fertiliser, pesticide or herbicide drift along the Reserve's boundaries.	CRMG and the Sussex LCDC	Medium
4.3d Contact should be established with Western Power, Telstra and MRWA to discuss suitable management strategies for maintenance activities within the Reserve to reduce unnecessary or accidental damage to the native vegetation.	Shire of Busselton	High
4.3e MRWA should be contacted to investigate possibilities for rehabilitation of any unnecessary tracks through the highway reserve opposite the Carbunup Store, and to devise a strategy to control the spread of weeds, particularly *Watsonia* sp., into the Reserve from this area.	Shire of Busselton	High

4.3.3 MANAGEMENT OF DIEBACK DISEASE CAUSED BY *PHYTOPTHORA CINNAMOMI*

As there has been no formal mapping of the extent of dieback disease caused by the fungus *Phytophthora cinnamomi* within the Reserve, a formal assessment should be undertaken by an accredited *Phtyopthora cinnamomi* interpreter as soon as possible. It will be necessary to review some of the recommendations of this management plan following the assessment, particularly those relating to access. To prevent the further spread of *Phtyopthora cinnamomi* within the Reserve, it may be necessary to rationalise the number or location of access tracks.

In the interim, to minimise the further spread of the fungus within the Reserve, vehicles should be excluded from the Reserve (see section 4.8.2). Care must be taken to ensure that any materials (soils, brushing, mulch and plants) or machinery brought into the Reserve for any management activities are free of *Phytphthora cinnamomi*. CALM can provide advice on appropriate hygiene and procedures to control the spread of *Phytopthora cinnamomi* (contact details in Appendix 1).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3f A suitably accredited *Phytopthora cinnamomi* interpreter should be contracted to formally assess the pattern and extent of dieback disease caused by the fungus within the Reserve.	Shire of Busselton	High
4.3g Following a formal *Phytopthora cinnamomi* assessment, the recommendations of this management plan should be reviewed to ensure that all management actions prevent or limit the further spread of dieback disease within the Reserve.	Shire of Busselton	High
4.3h All materials (including soils, brushing, mulch and plants) and machinery brought into the Reserve for any management activity must be free of the *Phytopthora cinnamomi* fungus.	CRMG and the Shire of Busselton	High

4.3.4 MANAGEMENT OF RARE FLORA AND THREATENED ECOLOGICAL COMMUNITIES

The Carbunup Reserve contains two plants (one orchid and one understory plant) that are listed as DRF, which are specially protected by the State Wildlife Conservation Act (1950), the Conservation and Land Management Act (1984) and the Federal Environment Protection and Biodiversity Conservation Act (1999). Another orchid is soon to be listed as DRF and is currently afforded the same protection. Any actions that have the potential to impact in any way on these flora require the approval of both CALM and Environment Australia (EA) prior to the commencement of any activity. These agencies will need to be notified during the planning phase for any activity so that each agency can provide advice on how to appropriately mitigate potential threats to the DRF during the specified activity.

Ideally, CALM should be notified of any planned actions that may impact DRF at least one spring/summer growing season (Sept – February) prior to the activity to allow for thorough flora surveys to be undertaken (M. Soutar, CALM, pers. comm.)

The Marri woodland vegetation of the Reserve is listed by CALM as a TEC which is currently afforded special, informal protection by CALM pending changes to CALM legislation. Any actions that are likely to impact on the TEC will also require the approval of CALM. As this community is present over most of the Reserve (figure 4), agencies and the CRMG will need to liase closely with CALM when organising any workplans for the Reserve. CALM will then provide advice on how to best protect the TEC from any adverse impacts when undertaking the proposed activity.

Currently, it is the policy of CALM to not publicise the location of DRF in order to assist in their conservation, unless disclosure will directly assist in preserving the population, such as when contractors are working nearby. In addition, the location of orchids can be very cryptic, with some plants remaining dormant while others are actively flowering, leading to a gradual change in the exact location and boundaries of the visible population from year to year. Where agencies or groups require specific locations for DRF, this information can be obtained from CALM. For the purposes of this management plan, the location of DRF are identified by management zones only. DRF are known to occur in management zones 1, 3 and 4, although the entire Reserve is considered to be potential habitat for these plants.

CALM intensively monitor the locations of populations of DRF within the Reserve during September – November each year, which is the flowering time for native orchids. Any volunteer assistance with this activity can greatly increase the capacity of the monitoring program.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3i If any works are to be undertaken in any management zone that contains DRF, both CALM and EA should be advised during the planning phase of any activity.	Shire of Busselton and the CRMG	High
4.3j If any works are to be undertaken in the Marri woodland TEC, CALM should be advised during the planning phase for the activity.	Shire of Busselton and the CRMG	High
4.3k To identify the exact location of DRF for the purposes of management, and to obtain advice on how to protect the DRF from any adverse impacts, CALM should be contacted.	Shire of Busselton and the CRMG	High

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3l Volunteer assistance to monitor the populations of DRF within the Reserve should be provided to CALM wherever possible.	CRMG	Low

4.3.5 REHABILITATION OF NATIVE VEGETATION

Although the vegetation of the Reserve is in very good condition, there are a few areas within the Reserve and on adjacent land that have been disturbed and could benefit from rehabilitation of the natural plant communities.

The area recently cleared for drainage, to the west of the town site, at the northern end of the power line track (management zone 1.1, currently R10 zoned land), is unlikely to regenerate naturally. This area may be rehabilitated by the use of direct seeding, or planting of tube stock, however the vesting and tenure of the land should be resolved first.

Two small access tracks that lead into management zone 5 from the power line track may also benefit from assistance to regenerate naturally. In a small clearing at the end of one of these tracks, 1m deep trenches have been dug by children to play 'war games' in the past, however the area has not been used recently. Native vegetation should be encouraged to regenerate naturally in this clearing, however it will be necessary to refill the trenches with soil sourced from within the clearing first.

The area of bush immediately south of the Carbunup Store and town site (management zone 1.2, which is currently VCL) has been burnt frequently in the past and weed invasion is worsening. This area could also benefit from assistance to regenerate naturally.

Natural regeneration of the Reserve's vegetation should be acheived using the Bradley method of rehabilitation (Bradley 1988). The Bradley method of bush regeneration uses minimal disturbance techniques to remove weeds, allowing the native vegetation to re-establish itself where sufficient propagules, such as seeds, tubers or root-stock, are present. Where there are insufficient propagules of the local plants present at a site, native plants may be re-established by the use of direct seeding or planting of tubestock. Three basic principles guide the Bradley method of bush regeneration:

- Principle 1: Work from areas in good condition towards degraded areas.
- Principle 2: Disturb the soil as little as possible.
- Principle 3: Let the regeneration of native plants govern the rate of weed removal.

Large areas of the Reserve are affected by dieback disease caused by the fungus *Phytopthora cinnamomi*, although the extent of the disease within the Reserve has not been formally mapped. Following an assessment of the pattern and extent of disease caused by *Phytopthora cinnamomi* within the Reserve (see section 4.3.3), it may be useful to rehabilitate affected areas of vegetation with strains of Jarrah that are resistant to the fungus. Some access tracks may need to be closed and may require rehabilitation or assistance to regenerate naturally. To ensure that dieback disease is not spread further within the Reserve, care must be taken to ensure that all materials (soils, brushing, mulch or plants) used for rehabilitation activities, either brought into the Reserve or sourced from within the Reserve itself, are free from the *Phytopthora cinnamomi* fungus (see section 4.3.3).

Irrespective of the rehabilitation method used, it is important that any seed or plant stock used within the Reserve is collected from local provenance stock, or plants that grow at, or as close as possible to, the site to be replanted.

This is to ensure that the genetic integrity and diversity of the Reserve's flora is retained. In addition, it is vital that plants are grown at a dieback accredited nursery to ensure that dieback is not spread by any revegetation activities.

General advice on bush regeneration and the rehabilitation of native vegetation is provided in Scheltema and Harris (1995) and Buchanan (1989), whilst assistance and advice on planning may be obtained from CALM's Bushcare Program, Greening Western Australia or the Australian Association of Bush Regenerators (contact details are provided in Appendix 1).

At least one member of the CRMG will need appropriate training or qualifications for the group to undertake any seed collection or bush regeneration activities. This training can be provided by the training agency APACE Aid, located in Fremantle (contact details are provided in Appendix 1).

In Western Australia, all native flora growing on public land are protected under the Wildlife Conservation Act (1950), which is administered by CALM. Under the provisions of the Act, a license is required to take any flora, flowers, seeds, or any other parts of plants from any Crown land.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3m The area cleared for drainage, to the west of the town site (management zone 1.1, currently R10 zoned land) should be rehabilitated using direct seeding or planting of tubestock (see recommendations 4.3q and 4.3r).	CRMG	Low
4.3n Two small access tracks leading into management zone 5 from the power line track should be assisted to regenerate naturally.	CRMG	Low
4.3o A small clearing in management zone 5 that has been excavated by children should be assisted to regenerate naturally. Trenches will need to be filled using sand sourced from within the clearing.	CRMG	Medium
4.3p The area of bush immediately south of the Carbunup Store and town site (management zone 1.2, currently VCL) should be assisted to regenerate naturally.	CRMG	Medium
4.3q Only local provenance seed stock should be used for any revegetation or rehabilitation within the Reserve to maintain the genetic integrity and diversity of the Reserve's flora.	CRMG and the Shire of Busselton	High
4.3r All plants used for any revegetation or rehabilitation activities should be grown at a nursery accredited for *Phytopthora cinnamomi* (dieback disease) control.	CRMG and the Shire of Busselton	High
4.3s Prior to the collection of any native seed or any plant specimens, a licence should be obtained from CALM.	CRMG and the Shire of Busselton	High

4.3.6 COMMUNITY AWARENESS OF THE FLORA

To assist the community and the 'Friends' group to identify and recognise the flora within the Reserve, a herbarium of the local species is very useful. Herbaria contain mounted, dried specimens of the flora, together with information on where the plant grows, soil types, growth habit, habitat description, associated species and its conservation status. A herbarium can be used to identify suitable species for revegetation activities, and can provide a baseline of the flora against which any long-term changes can be assessed.

The Busselton Naturalists Club has created a herbarium of species growing within the Ambergate Reserve which can be accessed by the public at the Busselton-Dunsborough Environment Centre (contact details are included in Appendix 1). This herbarium is a vouchered collection, meaning that it has been verified by and registered with the Western Australian Herbarium in Perth, which is a costly process. Many of the plants which are included in the Ambergate Reserve herbarium are found within the Carbunup Reserve, so the CRMG may wish to use the herbarium to identify local species.

A herbarium of the flora of the Carbunup Reserve could also be created as part of the Toby Inlet Catchment Group's Cape Naturaliste Regional Herbarium, which is also a vouchered collection. This will help to significantly reduce the cost of building a herbarium for the Reserve, as many specimens will not require re-verifying by the WA Herbarium. The Cape Naturaliste Regional Herbarium, which currently contains over 550 specimens and is still being added to, will eventually be housed at the Busselton Shire Offices to make the collection of regional plants available to the public for education purposes. Presently, the herbarium is managed and maintained by Mr. Don Carter from the Toby Inlet Catchment Group (contact details in Appendix 1). The CRMG should contact Mr. Carter for assistance with establishing the Reserve's herbarium. Two specimens should be collected for each plant in the Reserve so that one may be added to the Cape Naturaliste Regional Herbarium, and one may be retained for the CRMG's collection. Information on the collection of plant specimens for a community herbarium is provided by Patrick (1997).

To assist the local community to identify the flora within the Reserve, small, unobtrusive signs identifying plants could be added along the main walk track, as has occured at Ambergate Reserve. Both the Ambergate Reserve Herbarium and the Cape Naturaliste Regional Herbarium, and local botanists from the Busselton Naturalists Club may be able to assist the CRMG to identify the plants.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.3t The herbarium of Ambergate Reserve flora prepared by the Busselton Naturalists Club, and the Cape Naturaliste Regional Herbarium prepared by the Toby Inlet Catchment Group could be used to identify the flora of the Carbunup Reserve.	CRMG	Medium
4.3u A vouchered herbarium of the flora of the Carbunup Reserve could be created as part of the Cape Naturaliste Regional Herbarium (see recommendation 4.3s).	CRMG	Low
4.3v Small, unobtrusive signs to identify common local plants species should be placed along the main walk track.	CRMG	Medium

4.4 Weed Management

4.4.1 OBJECTIVES

- To identify, monitor, and control exotic weed species in Carbunup Reserve.
- To protect rare flora and threatened vegetation communities from the impacts of weeds and weed control measures.
- To raise community awareness of weed control through the prevention of further weed invasion.

4.4.2 IDENTIFICATION, MONITORING AND CONTROL OF WEEDS

Environmental weeds are problematic exotic species that directly compete with native flora for nutrients and light, inhibit growth and discourage natural regeneration, create habitat for other introduced plants and animals, and represent a significant fire hazard in summer when the weeds die off. Carbunup Reserve, like many bush remnants, is a small area of bush surrounded by farmland and residential housing, and fragmented by the highway, power line, firebreaks and access tracks. This fragmentation increases the risk of weed invasion.

Thirteen weed species have been previously identified within the Reserve, and another two species have been identified on land immediately adjoining the Reserve. There has been no formal mapping of the distribution or extent of weeds within the Reserve. Areas where weeds are prevalent (figure 7) include: the area of bush immediately south of the Carbunup Store and the town site (VCL) that has been frequently burnt; bush verges between the farmland and the Reserve's firebreaks; along the highway verges; around the Carbunup River pool at the south east corner of the Reserve; on the MRWA highway reserve opposite the Carbunup Store; and around the cleared area at the north of the power line track, to the west of the town site. Areas susceptible to weed invasion include the edges of the tracks, although the tracks within the Reserve (not those on the perimeter), appear to have very few weeds present as the bush is mostly undisturbed.

Ongoing monitoring of all disturbed areas within the Reserve will be necessary to identify areas where weeds are invading, and to prioritise weed control efforts within the Reserve.

Priority should be given to management zones where DRF may be at risk from weed invasion (particularly management zone 1, to the south of the town site), and areas within the Marri woodland TEC. Ongoing monitoring is also important to gauge the success of the weed control program. Taking photographs regularly at the same places within the Reserve can be a useful record to monitor the success of weed control and rehabilitation programs, and highlight areas where problems are worsening.

Agriculture Western Australia (AgWA) suggest that nine of the weed species occuring in the Reserve are prevalent throughout the south-west, meaning that control of these species will be difficult, as re-invasion from surrounding farmland is likely to occur (T. Pocock, AgWA, pers. comm.). Despite this, it is important to use minimal disturbance techniques to attempt to control the spread of and ultimately eradicate these species by assisting the Reserve's vegetation to regenerate to a self-sustaining state where the growth of weeds is naturally supressed.

Four weed species found within the Reserve are not locally endemic, and control efforts should be prioritised on these species (T. Pocock, AgWA, pers. comm.). They are: *Ferraria crispa* (Black flag); *Oxalis purpurea* (Purple wood sorrell); *Monadenia bracteata* (a South African orchid); and *Orobranche minor* (Lesser broom rape). *Watsonia* sp. and *Ricinus communis* (Castor oil plant) occur on land adjacent to the Reserve and should be controlled as they threaten native vegetation within the Reserve. The *Watsonia* sp. infestation on the MRWA highway reserve opposite the Carbunup Store, near the Carbunup River, is particularly severe and is currently threatening the Reserve's Marri woodland TEC. Contact should be established with MRWA to devise strategies to control the spread of weeds into the Reserve from this area (see recommendation 4.3e).

Suitable weed control strategies for use in the Reserve are mowing, slashing, herbicide wipe or spot spraying (not broad-scale spraying). Burning should not be used for weed control as it generally exacerbates the problem, favouring further weed invasion, whilst accidental escapes of fire may be dangerous to the community or detrimental to the ecology of the Reserve.

Black flag, purple wood sorrell, and the South African orchid are best controlled by spot spraying with 5 grams of Chlorsulfuron to 100 litres of water, plus 200 mls of a recommended penetrant. Alternately, Glyphosate may be used to control these weeds, however they would require treatment more frequently.

Lesser broomrape appears each winter. It is a leafless root parasite whose hosts include clovers and many other plants. Identification and eradication of the host plants will control this parasite.

Watsonia sp. are highly invasive, particularly in disturbed areas. *Watsonia* sp. are spread by both seeds, corms and small cormlets formed on the leaf axil each year. Watsonia sp. are generally controlled by hand wiping of herbicide onto the leaf surface using sponge attached rubber gloves or a small sprayer to create a wick. Glyphosate should be used at 1 part to 10 parts water during September to November when in flower. Slashing to remove the flower heads before they mature is also useful.

Castor oil plants are most effectively eradicated by hand removal, and stumps with a diameter of more than 5cm should be painted with a 1:60 Triclopyr/diesel mix. As Castor oil plants are vigorous re-sprouters, several follow-ups may be necessary. The number of Castor oil plants in the Reserve is very small, so complete eradication is likely to be easy to achieve if attended to soon. Care should be taken with the Castor oil plant as its dark seeds are extremely poisonous.

The remainder of the weeds that have been identified within the Reserve are mostly pasture weeds. The most effective methods to control the spread of these weeds are mechanical (slashing to remove immature flower heads), or hand pulling before the flowers mature, with the primary aim of preventing these species from setting seed (T. Pocock, AgWA, pers. comm.).

Weed control programs should be undertaken several times per year, during winter and spring to reduce vegetative growth, and should occur before the weeds have set seed. Weeding and herbicide application should be repeated within two months to reduce regrowth. Some weed species have large seed banks stored within the soil.

To ensure that the long-term spread of weeds is controlled within the Reserve, weed control efforts will need to be continued from year to year.

Weeding, like all bush regeneration activities, should follow the Bradley method (Bradley, 1988; see section 4.3.5), which attacks weed infestations by working from the least infested areas to the worst, so that existing vegetation can regenerate naturally into the areas that weeds are removed from. Only small areas are tackled at any time, so that natural regeneration can occur at the same pace. All due care should be taken to minimise disturbance to the soil surface when undertaking weed control activities, as disturbance will favour the re-establishment of weeds rather than native species.

Practical and useful advice on weed control techniques is provided by Scheltema and Harris (1995), whilst Hussey *et al.* (1997) is a useful key to identify the weed species of Western Australia. AgWA can provide further advice and assistance with weed control programs (contact details provided in Appendix 1).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.4a A monitoring program focussing on disturbed areas and access tracks should be established to locate areas where weeds are invading and need attention, to identify new weeds, and to prioritise weed control efforts within the Reserve.	CRMG and the Shire of Busselton	High
4.4b Suitable weed control measures, including mechanical methods (mowing or slashing), hand removal, spot spraying, and herbicide wipe, should be used to eradicate weed species within the Reserve.	CRMG and the Shire of Busselton	High
4.4c Broadscale weed spraying and burning should not be used to control weed species within the Reserve.	CRMG and the Shire of Busselton	High
4.4d Priority for weed control should be given to areas where DRF are at risk from weed invasion, particularly management zone 1, to the south of the Carbunup Store and town site, and areas within the Marri woodland TEC.	CRMG and the Shire of Busselton	High
4.4e Priority weeds for removal are: *Ferraria crispa* (Black flag); *Oxalis purpurea* (Purple wood sorrell); *Monadenia bracteata* (a South African orchid); *Orobranche minor* (Lesser broom rape); *Watsonia* sp.; and *Ricinus communis* (Castor oil plant).	CRMG and the Shire of Busselton	High
4.4f Weed control programs should be undertaken several times per year, and should occur before the weeds set seed.	CRMG and the Shire of Busselton	High

4.4.3 PROTECTION OF RARE FLORA AND THREATENED ECOLOGICAL COMMUNITIES

The reserve contains two plants that are listed as DRF, one plant soon to be listed as DRF, and a TEC present over a large area of the Reserve (see section 3.2.5). These flora and vegetation communities are specially protected by State and Federal statutes and agreements that require either CALM or EA to grant approval for any activity with the potential to impact the DRF or the TEC.

As a result, any weed control activity that occurs in the vicinity of any DRF or TEC will need to be documented and referred to both CALM and EA in the case of DRF, or CALM only in the case of the TEC. Ideally, this should occur during the planning phase for each years weed control activities (see section 4.3.4).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.4g Any weed control activity with the potential to impact any DRF or TEC should be referred to CALM and EA for approval as necessary (see recommendations 4.3i, 4.3j and 4.3k).	CRMG and the Shire of Busselton	High

4.4.4 COMMUNITY AWARENESS AND WEED PREVENTION

Ultimately, the best method of controlling weeds is to prevent their introduction in the first place, which is considerably cheaper and easier than eradication at a later date. Dumping of garden refuse within the Reserve can introduce new exotic species to the Reserve, whilst also increasing nutrient levels in the soil, encouraging the establishment of weeds. Dumping of garden refuse within the Reserve should be actively discouraged.

Education of the local community is important to discourage further weed invasion from the surrounding town site. A leaflet explaining the impacts of garden refuse on the Reserve's vegetation, and the importance of controlling exotic plants in nearby gardens could be distributed to all of the local landholders via the Carbunup Store Post Office. The leaflet should also stress the importance of minimising disturbance to both the soil and vegetation, and preventing fertiliser drift from residential gardens, to discourage further weed invasion (see section 4.3.2).

CALM's Bushcare Program or Greening Australia may be able to provide information and assist with educative material (contact details in Appendix 1).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.4h Community awareness of weed prevention and control, and the effects of dumping garden waste within the Reserve should be raised through the provision of educative material.	CRMG	High

4.5 Management of Native Fauna

4.5.1 OBJECTIVES

- To identify, protect and conserve native fauna populations and their habitats within the Carbunup Reserve.
- To raise community awareness of the native fauna of the Carbunup Reserve.

4.5.2 COMMUNITY BASED FAUNA SURVEYS

To date, there has been no study of native fauna within the Carbunup Reserve. Given the regional conservation value of the Reserve's bushland because of both its size and condition, it is highly likely that a number of native fauna are resident within the Reserve. To effectively manage native fauna and their habitats within the Reserve, information on the Reserve's fauna populations is needed.

A community-based fauna survey, undertaken with the assistance of a suitably qualified fauna consultant, could help to identify some of the mammals and reptiles present in the Reserve. Information and options for community based fauna surveys are described by Sanders (1999). Practical assistance and advice for planning may be sought from CALM's Land for Wildlife Program (contact details in Appendix 1).

All native fauna in Western Australia are protected by the Wildlife Conservation Act (1950). A license must be obtained from CALM to trap, catch or handle any native fauna.

In addition to detailed cage and pit-trap surveys, there are a number of simple surveys the community could regularly undertake to identify and monitor a range of native fauna within the Reserve. These activities are non-intrusive and do not involve catching or handling the animals. Rather, they involve observation and do not require licensing with CALM. These include simple birdwatching activities, spotlighting at night to see nocturnal mammals, sound recording, and the use of hair cones to collect hair specimens which can be used to identify fauna. Detailed information on these survey techniques is provided in Sanders (1999).

Undertaking fauna surveys as part of a community group can be a very rewarding and stimulating experience. Not only will the surveys encourage appreciation of the fauna and their habitats, they will also be very enjoyable tasks which can assist to generate community interest and participation in managing the Reserve, and help to develop a sense of community ownership of the Reserve.

Information about the Reserve's fauna or ecology is most useful when it is widely available to all individuals, groups and agencies involved in environmental management. It is important to disseminate any new information gathered on the native fauna of the Reserve to the Shire of Busselton and CALM, and also to the general public via the Busselton Dunsborough Environment Centre.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.5a A suitably qualified fauna consultant should be contracted to assist the community to undertake a community based survey of the Reserve's native fauna.	CRMG	High
4.5b Ongoing monitoring of the Reserve's fauna and birdlife should be undertaken using simple, non-intrusive survey methods.	CRMG	Medium
4.5c Any new information gathered on the native fauna of the Reserve should be made available to the Shire of Busselton, CALM, and the general public at the Busselton Dunsborough Environment Centre.	CRMG	High
4.5d Following a detailed fauna survey, the recommendations of this management plan should be reviewed to ensure that all management actions serve to protect or conserve the known populations of native fauna.	Shire of Busselton	High

4.5.3 PROTECTION OF NATIVE FAUNA HABITAT

Firewood and timber collectors often target dead and decaying trees and hollow logs that are important nest and den sites for native birds and fauna. It is important to educate the community on the importance of these habitats for the native fauna. The DEP has produced a leaflet explaining the importance of hollow logs as fauna habitat. These could be distributed to the local community via the Carbunup River Post Office. Further information may be obtained from CALM's Land for Wildlife Program (see contact details in Appendix 1).

As timber and firewood collection removes important native fauna habitat from within the Reserve, and also contributes to the spread of dieback within the Reserve, these activities should be prohibited within the Reserve.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.5e Information on the importance of fauna habitat within the Reserve should be provided to the local community.	CRMG	Low
4.5f Timber and firewood collection should be prohibited within the Reserve.	Shire of Busselton	High

4.6 Protection from Feral and Domestic Animals

4.6.1 OBJECTIVES

- To control and minimise the impact of feral and domestic animals on the native flora and fauna of the Carbunup Reserve.
- To raise community awareness of the impacts of domestic pets on the Reserve.

4.6.2 IMPACTS OF FERAL AND DOMESTIC ANIMALS ON THE NATIVE FLORA AND FAUNA

Non-native feral animals such as cats, foxes, and rabbits are pests in native bushland as they have a detrimental effect on the native flora and fauna. They prey on and interfere with native fauna, compete with native fauna for food and shelter, and damage the native vegetation and alter habitats by digging, burrowing, grazing and trampling.

Domestic dogs and cats can also adversely impact on the Reserve's flora and fauna in a number of ways:

- Domestic dogs and cats can physically disturb and scare native fauna.
- Domestic cats are opportunistic hunters that will feed on a wide variety of native fauna, including invertebrates, reptiles, birds and mammals.
- Dog droppings, while also being aesthetically unappealing, can infect native fauna with potentially harmful, introduced parasites and diseases.
- Dogs that dig can physically disturb the native flora, while also increasing the potential for weed invasion.
- There is some evidence that dog scents along tracks may form significant physical barriers to the movement of small mammals such as Mardo, Honey possums and native mice (B. Masters, pers. comm.).

4.6.3 CONTROL OF FERAL ANIMALS

Rabbits, foxes and feral cats are animals requiring control within the Reserve. These feral animals should be controlled using a combination of three methods:

- Fumigation

Aluminium phosphide tablets (Phos-toxin) should be used opportunistically to fumigate any active rabbit warrens or fox dens identified within the Reserve. Phos-toxin is a very dangerous poison that requires careful handling and storage. To use Phos-toxin in the Reserve, advice and assistance should be sought from AgWA's Agriculture Protection Officer (contact details are provided in Appendix 1). There is one active fox den located alongside a kangaroo track in the *Banksia littoralis* low woodland in the middle of management zone 5. This should be fumigated as soon as possible.

- Trapping

Non-jawed traps (which are not lethal to the animals they trap) may be used to trap rabbits, foxes and feral cats when they have been identified in close proximity to the town site. Traps should not be used within the Reserve as they can also trap native fauna such as bandicoots. Assistance to trap feral animals will be provided by AgWA's Agriculture Protection Officer (contact details in Appendix 1).

- Poisons

Generally, 1080 is the preferred method to control feral animals in Nature Reserves. However, the Carbunup Reserve is very small, and the close proximity of the Carbunup River town site makes the safe use of the poison difficult. Domestic pets would be at high risk. As a result, 1080 baiting should be undertaken very cautiously within the Reserve, and only occur in areas well away from the town site and the main dog walking tracks.

Surrounding landholders undertake 1080 poisoning on their lands each April/May to control foxes prior to the winter lambing season. To compliment this, a 1080 baiting program specifically targeting foxes should be undertaken in the Reserve at the same time. Only poisoned egg baits should be used, and they should be buried to protect non-target animals. Poisoned meat or 'crackle' baits should not be used within the Reserve as they will attract not-target animals as well. 1080 baiting for foxes should also be undertaken during January when young cubs disperse from the den and seek new territory.

As a substantial portion of the rabbit population move onto neighboring farmland in the evenings to graze, they may be effectively controlled using a product called 'Rabbait', which contains the poison Pindone. Native fauna are poisoned by the product, so it cannot be used within the Reserve itself. Surrounding landholders should be encouraged to undertake a 'Rabbait' program around the periphery of the Reserve on annual basis, during February – April each year or more frequently if necessary. As the activity will be undertaken for the purpose of protecting the Reserve, the landholders should be financially assisted to undertake the program. Spotlightling in the evenings along the edge of the Reserve is a useful method to identify problem areas which should be targetted by the program. Pindone does not cause secondary poisoning of animals that eat affected rabbits.

As feral animal control programs have the potential to impact on domestic pets and farm dogs, local residents and surrounding farmers should be kept well informed about all programs occurring in the Reserve, any potential impacts to their pets and how to minimise them.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.6a Any active rabbit warrens or fox dens identified within the Reserve should be fumigated using aluminium phosphide tablets (Phos-toxin). *Nb: Agriculture WA no longer undertakes fumigation work. As Phos-toxin is listed as an S7 poison, any person undertaking fumigation of rabbit warrens must have completed a Chem-Cert course in chemical handling.*	CRMG	High
4.6b Non-jawed traps (non-lethal) may be used to trap feral foxes, rabbits or feral cats in areas around the town site.	CRMG and AgWA	High
4.6c A suitable contractor should be employed to conduct a 1080 baiting program twice yearly (January and April/May) within the Reserve to control foxes. The program should only use poisoned egg baits which are buried in areas well away from the town site and the dog-walking areas. *Nb: Agriculture WA must carry out an assessment of the Reserve to permit the use of 1080 poison. 1080 poison cannot be purchased without the issue of a voucher from Agriculture WA.*	Shire of Busselton	High
4.6d Local residents and surrounding farmers should be kept informed about any feral animal control program occurring within the Reserve, any potential impacts to their pets and how to minimise them.	CRMG	High

4.6.4 REDUCING THE IMPACTS OF DOMESTIC ANIMALS

To ensure that the Reserve remains in good condition, the impacts of domestic pets on the native flora and fauna must be controlled. Surrounding residents should be encouraged to contain their dogs and not allow them stray into the Reserve unaccompanied. Information about the impacts of domestic pets on the Reserve's flora and fauna should be provided to surrounding residents to assist them to understand the importance of containing their pets when living in close proximity to a reserve that is being managed for the conservation of native flora and flora.

As dog walking has been a regular community activity in the Reserve, it will continue to be permitted, however, to minimise impacts to the Reserve, the activity will need to be restricted to an agreed dog-walking circuit and the peripheral firebreaks to the west of Bussell Highway only (see section 4.9.2), and dogs must remain on a leash. To reduce the impacts of dog droppings on native animals, visitors should be encouraged to collect 'poo pouches' at the start of the main walking track, adjacent to the town site, where a rubbish bin will be provided for their disposal (see section 4.9.4).

In April 2001, the Shire of Busselton introduced the new Local Law for the Keeping and Welfare of Cats to promote responsible cat ownership within the Shire. Key components of the local law encourage cat owners to register, identify and contain their cats. The local law allows the Shire to designate certain areas as proposed 'Cat Prohibited Areas', allowing the Shire to undertake intensive trapping in these areas.

This approach will assist the Shire to control feral cats on conservation lands whilst encouraging surrounding landholders to ensure that their pets do not stray into the reserves.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.6e Surrounding residents should be encouraged to contain their pets through the provision of information on the impacts of domestic pets on native flora and fauna in the Reserve.	CRMG	Medium
4.6f The Reserve should be designated as a 'Cat Prohibited Area'.	Shire of Busselton	High

4.7 Fire Management

4.7.1 OBJECTIVE

- To manage fire within the Reserve to provide protection from wildfire to human life and property, while also protecting, maintaining and enhancing biodiversity.

4.7.2 FIRE AS A MANAGEMENT TOOL[1]

Fire has been a natural element of the Australian landscape for thousands of years which, along with other natural disturbances such as drought, has shaped the Australian environment and its native plants and animals. Many of the Australian native species have developed specific mechanisms that allow them to survive and tolerate periodic fires, while some species even require fire for regeneration or other critical life stages. For example, some species resprout readily after fire, while others rely on fire to crack their hard seed pods so that seeds are scattered in the resulting ashbeds in a nutrient-rich and competition-free environment for rapid regeneration after rain.

The effect of fire on native vegetation and fauna is extremely variable and depends on the frequency, intensity and season of fires. Too frequent fire can reduce the number of native species present in an area by depleting the seed bank contained within the soil, especially when fires occur before species become reproductively mature and are able to replenish the soil seed store over a number of flowering years. Based on current research, a period of 10 – 15 years without fire is considered necessary to allow all of the plant species within southwest woodland communities to reach reproductive maturity following a fire. Burning too frequently will favour native species that are able to grow and reach maturity rapidly. Too frequent fire also increases the amount of nutrients and light available to plants and reduces competition, which also encourages weed invasion. Long periods without fires can reduce species diversity by not allowing regeneration of the fire dependant flora.

Low intensity fires favour the regeneration of some types of native plants, and burns the litter on the forest floor in a patchy manner, leaving a mosaic of unburnt vegetation which are refuges for native fauna and also provide a source of plant seed for colonisation of the burnt area. In contrast, high intensity fires consume most of the above-ground plant material, and may kill some native plants and animals, while also favouring the regeneration of other native species.

[1] Most of this information has been drawn from a special edition of *Landscope* magazine, published by the Department of Conservation and Land Management in 2000, which is a compendium of articles on the role, impacts and use of fire as a management tool in Western Australia.

The time of year in which the fire occurs will also have a considerable effect on the impact of the fire. The season of burn affects the intensity and scale of the fire, which will always be hotter and more intense during the summer and early autumn when the bush and soils are very dry. Late autumn, winter and early spring fires that occur when the vegetation and soils are moist will usually burn much cooler and patchier than hotter burns. Critical life stages of plants and animals are also affected differently depending on the time of the burn. Spring burns will tend to occur when a large proportion of the vegetation is flowering and may prevent plants from setting seed, whilst autumn burns allow seeds to sprout when rain will be readily available, but may also encourage winter weed establishment. Winter burns disrupt flowering and seed set for some species, and do not cause soil-stored seed to germinate. Winter burns also encourage the growth of pasture weeds.

Each year in Western Australia, around 500 unplanned wildfires occur. While most of these fires are lit by humans, either as an act of arson or by accident, lightning is also a major cause, particularly in the southwest forests. While every effort is made to contain them when they occur, the best method to prevent wildfires is planned burning to reduce fuel levels, particularly in areas where life and property are at significant risk. In Western Australia, CALM use fire in a number of different ways to reduce the threat of wildfire to life and property, whilst also maintaining and enhancing biodiversity. Ultimately, the type of fire regime that is used in any particular area will be decided by the particular management objectives that need to be achieved. Within Carbunup Reserve, areas around the town site will need to be managed for the protection of life and property, whilst areas away from the town site should be managed to maintain and enhance the Marri woodland TEC and populations of DRF.

4.7.3 PROTECTION OF LIFE AND PROPERTY FROM WILDFIRE

The close proximity of the Carbunup River town site to the Reserve poses a significant threat to the town's residents and their property in the event of an unplanned, summer wildfire. For the safety of the town's residents, prescribed burns are due to be carried out in three areas where fuel loads are high and currently represent a significant risk to nearby residents.

The south-east corner of the Reserve, nearby the Carbunup River (management zone 2) has a considerable build up of fuel, particularly in the northern end, as this zone has remained unburnt for more than ten years. This area is regularly used by visitors to the Reserve, so there is a significant risk of an accidental fire being lit in this corner.

The north-west corner of the Reserve (management zone 5), particularly along Wildwood Road, has remained unburnt for more than eight years and is currently carrying heavy fuel loads. As this block of bush adjoins western side of the town site, this area poses significant risk to the Carbunup River residents.

The area of riverine vegetation adjoining the Carbunup River in management zone 6 is very dense and has remained unburnt for many years. This area is regularly used by visitors to the Reserve, particularly in summer, so the risk of an accidental fire escaping from this area is high. DRF are present in an adjacent management zone (3) and may also be threatened by any accidental fires in this area. As a result, fuel levels in management zone 6 should be reduced through a low intensity prescribed burn.

Local community members have expressed concern that strategic firebreaks in the Reserve are becoming wider and are being graded successively deeper each year, causing disturbance to the Reserve's vegetation and encouraging the establishment of weeds. Any firebreak maintenance activities within the Reserve should use equipment and techniques that minimise soil disturbance and do not widen or deepen the existing firebreak. Care should be taken to ensure that soil is not mounded on the edge of the firebreaks, and that the Reserve's native vegetation, particularly DRF and the TEC, are not disturbed by the maintenance activities (see section 4.3.4). The western end of the strategic firebreak that separates management zone 1 from 4 may require maintenance prior to any prescribed burns. This firebreak is in the vicinity of known DRF populations which means that statutory approvals may be needed for any maintenance activities (see section 4.3.4).

As the Shire of Busselton and the local Bush Fire Brigades are satisfied with the degree of protection afforded by the current network of strategic firebreaks, no new firebreaks should be cleared within the Reserve. The Reserve's fire management strategy should detail strategies to ensure that no new firebreaks are inadvertently installed, particularly during wildfire suppression (see section 4.7.6).

To adequately assess the risk of wildfire in the Carbunup Reserve, and to identify areas requiring fuel reduction burns, fuel levels in each management zone will need to be monitored annually.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.7a To protect the Carbunup River town site residents from the threat of wildfire, prescribed burns should be undertaken to reduce fuel levels in management zones 2, 5 and 6 as soon as possible.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7b Existing firebreaks within the Reserve should be maintained using equipment and techniques that minimise soil disturbance and do not widen or deepen the existing track.	Shire of Busselton	High
4.7c No new firebreaks should be installed within the Reserve.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7d To identify areas requiring fuel reduction burns, fuel levels within the Reserve should be monitored annually.	Shire of Busselton	High

4.7.4 PROTECTION OF RARE FLORA AND THREATENED ECOLOGICAL COMMUNITIES

Within the Reserve, there are two rare plants that are listed as DRF, and another soon to be listed as DRF, which are specially protected by the Western Australian Wildlife Conservation Act (1950), the Conservation and Land Management Act (1984) and the Federal Environment Protection and Biodiversity Conservation Act (1999) (see sections 3.2.5 and 4.3.4). Under the provisions of these Acts, approval must be sought from CALM, the State Minister for the Environment, EA and the Commonwealth Minister for the Environment and Heritage, before any prescribed burn can occur in the vicinity of any DRF. Management zones where DRF have been located are 1, 3 and 4. However, CALM considers that the entire Reserve is potential habitat for the rare orchids, and intensively survey the Reserve each year to locate the active populations.

As a result, CALM should be contacted to check the location of DRF populations in the Reserve prior to any prescribed burns. In the event of a wildfire, CALM should also be notified so that steps can be taken to protect any DRF at risk.

The Reserve's Marri woodland vegetation community, which is present over most of the Reserve, is listed by CALM as a TEC which is currently afforded special, informal protection by CALM pending changes to CALM legislation. CALM must provide approval for any prescribed burns that occur within this community. As this community is present in all management zones of the Reserve, any prescribed burning plans for any part of the Reserve will need to be referred to CALM for approval.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.7e Any prescribed burn plans for the Reserve must be referred to CALM for approval during the planning phase.	Shire of Busselton and the Carbunup Bush Fire Brigade	High
4.7f In the event of any wildfire, CALM should be immediately notified.	Carbunup Bush Fire Brigade	High
4.7g Approval needs to be sought from both CALM and EA to undertake any prescribed burn in the vicinity of DRF, or from CALM only to burn any part of the Reserve's threatened Marri woodland community (see recommendations 4.3i, 4.3j and 4.3k).	Shire of Busselton, the Carbunup Bush Fire Brigade and the CRMG	High

4.7.5 USE OF FIRE TO MAINTAIN AND ENHANCE BIODIVERSITY

Fire management for nature conservation objectives aims to ensure that fires do not occur more frequently than the time needed for all plants to reach adequate reproductive capacity following a fire (either by seeding or resprouting), and that a variety of habitats for fauna are provided.

CALM do not support a continual regime of cool, autumn fires only as has occurred in the Carbunup Reserve for many decades. Rather, to maintain and enhance biodiversity, a variety of disturbance types (i.e different intensity or season of fires) is necessary to produce a diversity of ecological responses and habitats. To manage the flora and vegetation of southwest Jarrah forest ecosystems for the highest biodiversity, CALM generally recommends a controlled burning regime of several late spring/autumn burns, followed by a spring burn, and then a no burn period, with a minimum rotation of 7 – 8 years between each burn. Longer intervals between burns, such as every 10 – 15 years are more preferable.

To identify the appropriate burning regime to conserve and maintain biodiversity in any native bushland, information about the fire response of each plant species present, particularly the method of regeneration and the length of time after fire to first flowering, is required. Information on native fauna is also required. CALM scientists are constantly researching the fire responses of Western Australia's native flora and fauna and can provide advice on species responses in the Carbunup Reserve. This information should be used to determine appropriate minimum burn frequencies for the Reserve. Current knowledge suggests that a minimum period of 10 – 15 years between fires is required to maintain the Reserve's Marri woodland community, however future research may suggest changes.

4.7.6 A FIRE MANAGEMENT STRATEGY

To reconcile the conflicting objectives of fire management within the Carbunup Reserve, a comprehensive Fire Management Strategy which is endorsed by CALM, the Busselton Shire, the Carbunup Bush Fire Brigade, the Bush Fires Board, and all surrounding landholders should be prepared as soon as possible. The fire management strategy should include measures to adequately reduce the threat of wildfire to life and property in Carbunup River town site, while ensuring that the biodiversity of the remaining bushland is maintained and enhanced, and that DRF and TEC are adequately protected.

The strategy should detail contingencies for a wildfire, including suppression strategies, such as protocols for the use of fire retardants, and the location of water sources and access points. The strategy should examine the potential use of water bores on private land surrounding the town site to protect the town in the event of a wildfire.

The strategy should include appropriate protocols for the maintenance of strategic firebreaks, and ensure that no new firebreaks are installed in the Reserve.

The strategy should identify the potential fire threats to the Reserve and its TEC and DRF posed by the proximity of the surrounding town site and the Bussell Highway. The strategy should detail measures to manage and control fire within the town site, and manage the threat of fire incursion into the Reserve from these areas.

To ensure that the Carbunup Bush Fire Brigade acts in accordance with the strategy, an information pack briefly listing appropriate protocols for the Reserve should be developed for use in the field by the brigade's fire crews. CALM have been trialling information packs for their fire crews and can provide this information to the local brigade.

Until an agreed fire management strategy is prepared, prescribed burns should only be carried out within the Carbunup Reserve to protect the life and property of the Carbunup River residents. The remainder of the Reserve should remain unburnt until an appropriate regime to maintain and enhance biodiversity is developed.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.7h A comprehensive Fire Management Strategy endorsed by all agencies involved in the management of the Reserve and the local community should be prepared for the Reserve to reconcile conflicting fire management objectives within the Reserve.	Shire of Busselton	High
4.7i As part of the Fire Management Strategy, local fire crews should be provided with an information pack detailing the location of access points and water sources, and appropriate protocols for fire suppression within the Carbunup Reserve.	CALM	High
4.7j Until an agreed Fire Management Strategy is prepared, only prescribed burns that are necessary to protect life and property in Carbunup River should be carried out.	Shire of Busselton and the Carbunup Bush Fire Brigade	High

4.7.7 COMMUNITY FIRE AWARENESS

Carbunup River residents recognise that they are at risk of experiencing a summer wildfire by living in such close proximity to native bushland, however they feel that they do not know what they can do to assist to reduce this threat. The Western Australian Fire and Emergency Services Authority (FESA) provides advice to the general public to help them protect themselves from the threat of bushfires. FESA can provide the Carbunup River community members with the 'Bushfire Survival Manual' (Anon, 1998), which details a number of actions that local residents could take to reduce the wildfire threat to their properties, and increase their chances of surviving a bushfire. If required by the community, FESA can also organise a community fire awareness course. Contact details for FESA are given in Appendix 1.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.7k Carbunup River community members should be provided with FESA's 'Bushfire Survival Manual' to assist them to protect themselves from the threat of wildfires.	CRMG	High
4.7l A community fire awareness course could be organised to assist the Carbunup community members to protect themselves from the threat of wildfires.	CRMG and the Carbunup Bush Fire Brigade	Medium

4.8 Access and Fencing

4.8.1 OBJECTIVE

- To reduce unnecessary impacts to the Reserve by controlling access.

4.8.2 CONTROLLING ACCESS

As a result of uncontrolled access to Carbunup Reserve in the past, a number of adverse impacts have occurred. A considerable amount of litter and garden waste has been dumped alongside tracks in the Reserve, and dieback disease has probably been spread by vehicle movements. Timber and firewood collection has also contributed to the spread of dieback, while also removing valuable habitat for native fauna. Unrestricted camping in the Reserve has contributed to the litter build-up, while campfires have been known to cause wildfires in the Reserve.

To effectively control all of these impacts, all vehicles except Shire, management and emergency service vehicles should be prohibited in the Reserve. To prevent access of public vehicles, non-locked treated pine pole management gates should be erected at each access point to the Reserve (figure 6). Some land vesting and tenure issues may need to resolved first.

At each management gate, signage should clearly state that all vehicle access, excepting Shire, management and emergency vehicles, is prohibited (see section 4.9.5).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.8a All vehicles except Shire, management and emergency vehicles should be prohibited within the Reserve.	Shire of Busselton	High
4.8b To effectively control access to the Reserve, non-locked, treated pine pole gates should be erected at each access point to the Reserve (figure 6).	Shire of Busselton	High

4.8.3 FENCING

Current fencing around the Reserve is adequate to restrict stock from straying into the Reserve. Along the southern boundary of the Reserve, to the west of Bussell Highway, the neighbouring farmer should be encouraged to fence an open gate into the Reserve which has been occasionally used to access an adjoining paddock.

The area around the town site should be fenced using treated pine poles, particularly on the western side where there is a wide, open area where vehicles can easily access the Reserve. Land tenure issues may need to be resolved first.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.8c An open gate on the southern boundary of the Reserve should be permanently closed by fencing.	Landholder and the Sussex LCDC	High
4.8d Around the town site, the Reserve should be fenced using treated pine poles.	CRMG and the Shire of Busselton	High

4.9 Public Use and Requirements

4.9.1 OBJECTIVES

- To allow for passive recreational use of the Reserve consistent with the conservation of flora and fauna.
- To remove existing litter and ensure that the Reserve remains clean and free from litter.
- To promote appropriate use of the Reserve through easily accessible interpretive signage.
- To coordinate signage in the Reserve to limit the proliferation of signs.

4.9.2 EXISTING RECREATION AND IMPACTS

The Carbunup Reserve does not attract a large number of visitors. Local residents regularly use the Reserve for bushwalking along the existing network of access tracks, which are all 2-3m wide vehicle access tracks. There are no single-file walk tracks through the bush, and visitors appear to stay on the existing paths. Bushwalking is a very low impact activity that is not of concern unless the public begin to wander from the established paths. Appropriately worded signage should encourage visitors to stay on the established paths only (see section 4.9.5).

Some bushwalkers like to take their dogs walking with them. The high conservation value of the Carbunup Reserve generally means that dogs should not be permitted within the Reserve. However, as dog-walking is an established activity that the community wish to be able to continue, it should be allowed providing that appropriate restrictions are adhered to. To minimise impacts to the Reserve, dog walking should be restricted to one agreed dog-walking circuit and the peripheral firebreaks to the west of Bussell Highway only, and dogs should be excluded from all other areas of the Reserve. Initially, the dog-walking circuit should be the tracks which have been commonly used for this purpose, which is the main walking track to the south of the town site (figure 6). The location of the dog-walking curcuit should be reviewed when further information about the native fauna and dieback disease is available. Dog-walking should be restricted to the area where native fauna populations are lowest, and should avoid areas where specially protected, rare or endangered fauna or flora occur. To minimise impacts to native flora and fauna, dogs must remain on leashes, and any dog droppings should be removed from the Reserve using the 'poo pouches' provided (see section 4.9.4).

Camping has occurred in various areas of the Reserve in the past, and regularly occurs at the pools on the Carbunup River in the south-eastern corner of the Reserve, and in the MRWA land opposite the Carbunup Store. Camping is a major cause of litter, and accidental campfire escapes represent a significant fire risk to the Reserve, particularly as there are populations of DRF at risk. As a result, camping should be prohibited within the Reserve. Prohibiting vehicular access into the Reserve should assist to prevent camping (see section 4.8.2). To ensure that no camping occurs in the Reserve, regular patrols should be undertaken by the Shire Ranger, particularly during the marron season each summer.

Trailbike riding is an unacceptable pursuit within the Reserve as it damages the landscape and is a danger to other visitors. As a result, it should be prohibited within the Reserve.

Wildflower picking occasionally occurs within the Reserve. As all native flora growing on public lands is protected by the Wildlife Conservation Act (1950), wildflower picking without a license is illegal within the Reserve. Signage should be used to inform visitors of this fact (see section 4.9.5).

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.9a Dog-walking should be allowed to continue along a designated dog-walking circuit and the peripheral firebreaks to the west of Bussell Highway only.	Shire of Busselton and the CRMG	High
4.9b Dogs must remain on a leash and droppings should be removed from the Reserve using the 'poo pouches' provided.	Dog owners	High
4.9c Camping and trailbike riding should be prohibited within the Reserve.	Shire of Busselton	High
4.9d Regular patrols of the Reserve should be undertaken by the Shire Ranger to ensure that no camping occurs.	Shire of Busselton	High

4.9.3 RECREATIONAL AMENITIES

As the primary objective of the Reserve's management is conservation of flora and fauna, only necessary amenities should be provided. Carbunup community members are happy with the current lack of amenities within the Reserve, and have requested that the Reserve be maintained in as natural a state as possible. In particular, the community requested that no new walk trails, park or picnic benches, barbecue facilities or toilets be provided within the Reserve.

Public toilets and a picnic bench are available at the Carbunup Hall which is immediately adjacent to the Reserve. Car parking is currently available to Reserve visitors at both the Carbunup Hall, and the MRWA rest stop on Bussell Highway, just to the south of the Reserve. This is adequate to serve the current level of visitation to the Reserve, therefore, no car parking facilities should be provided within the Reserve.

As there is no immediate pressure of increased visitation to the Reserve, no new amenities are required within the Reserve. However, as the population of the surrounding area slowly increases, visitor numbers to the Reserve should be monitored. When recreational use of the Reserve appears likely to increase, the provision of public amenities should be reviewed. Issues relating to the tenure of land surrounding the Reserve will need to be resolved first.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.9e Amenities such as picnic tables, barbecues or toilets should not be provided within the Reserve as they are incompatible with low-impact recreation objectives for the Reserve.	CRMG and the Shire of Busselton	High
4.9f No new amenities should be provided within the Reserve until a review of visitor use deems them necessary.	CRMG and the Shire of Busselton	High
4.9g A program should be established to monitor visitor use of the Reserve, to assess patterns of use and environmental impacts.	CRMG and the Shire of Busselton	Medium

4.9.4 LITTER

Over previous decades, Carbunup Reserve was used as an unofficial tip-site for dumping of car bodies and other scrap metal, which is now lying in rusted heaps alongside access tracks within the Reserve. No large-scale dumping of rubbish has occurred within the Reserve for many years. Areas where there is a large amount of old rubbish are: along the power line track; the periphery of the town site; the south-east corner of the Reserve; and around the Carbunup River pools. There is a small amount of litter along the peripheral firebreaks of the Reserve, and along the highway verges as well (figure 7).

The Carbunup River pools, in the south eastern corner of the Reserve, are frequently used by overnight campers, particularly during the marron season each summer. As no rubbish bins are provided within the Reserve, a considerable amount of rubbish, including many alcohol bottles and cans, has accumulated in the bush at this corner of the Reserve.

Several 'clean up' days could be organised by the local community to tackle the litter build-up at each of these areas. The Shire of Busselton will provide assistance to remove rubbish and large items of litter within Reserve.

Rubbish bins should be provided at the start of the main walking track and dog walking circuit, adjacent to the town site, to assist to reduce litter build up in this area. Dog 'poo pouches' should be provided at this point, where visitors to the Reserve should be encouraged to bring their litter and 'poo pouches' back to with appropriate signage (see section 4.9.5).

Small amounts of litter are regularly dumped from cars along the highway, and drifts into the bush from the adjacent town site. Regular 'clean up' days (once or twice a year) will be needed to maintain these areas.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.9h Several clean-up days should be organised to remove old litter and rubbish from the Reserve.	CRMG	High
4.9i The Shire should provide rubbish bins and fortnightly rubbish collection at the start of the main walk track/dog walking circuit, adjacent to the town site.	Shire of Busselton	High
4.9j Dog 'poo pouches' should be regularly supplied to a suitable post next to the rubbish bins at the start of the dog-walking circuit.	CRMG and the Shire of Busselton	High
4.9k Regular, community 'clean up' days should be organised to remove litter from the highway verges and around the periphery of the town site.	CRMG	Medium

4.9.5 INTERPRETIVE SIGNAGE

Signage is an effective way to explain regulations to visitors and to inform them about the Reserve's conservation strategies. In Carbunup Reserve, interpretive signage should be used to inform visitors that:

- Camping, fires and trailbike riding are prohibited.
- Vehicle use is prohibited.
- Timber and firewood collection is prohibited.
- Dumping of rubbish, particularly green waste, is prohibited.
- Wildflower picking is illegal.
- Dogs are prohibited except on a leash.
- Dogs are restricted to the dog-walking circuit only.
- Visitors with dogs should use the 'poo pouches' provided.
- To discourage weeds and protect the native flora and fauna, it is very important for visitors and their dogs to stay on the existing walk tracks, and take care to not disturb the fauna, flora or soils within the Reserve.

To ensure that entry points do not end up with a proliferation of signs simply prohibiting specific activities, signage should be carefully coordinated in Carbunup Reserve. In order to maximise the effectivenessof interpretive signage, research should be conducted to determine the most suitable and effective way to present interpretive information about the Reserve.

One Reserve-specific sign should be designed for posting at major entry points to the Reserve. Ideally, the sign should be eye-catching but simple, incorporate all of the information identified above, and be maintenance free.

Wording should be positive and explain why certain activites are not allowed which is generally more effective than a simple list of prohibited activites. Clear icons could also identify what activities are not allowed or discouraged. A simple, colourful map of the Reserve showing the location of walk trails, dog-walking circuit, distances, and other features could be an eye-catching centrepiece to the sign. The location of rubbish bins, suitable car-parking and toilet facilities should also be highlighted.

To be effective, signs need to be located in areas where visitors will easily see and use them. In the Carbunup Reserve, major visitor access points are located at the south-western corner of the town-site, and the MRWA Highway Reserve opposite the store, both on land vested for other purposes and not currently part of the Reserve (figure 6). To make either of these a major entry point to the Reserve will require land vesting tenure issues to be resolved first. However, as these are regularly used access points to the Reserve, simple signage that is not permanently erected (i.e. cemented etc.) should be located at these sites in the interim. Other access points include the firebreaks that lead to the highway (two to the west and two to the east), and the firebreak along Wildwood Road. Visitor use needs to be monitored to determine which other entry points require signage (see recommendation 4.9g).

A number of other small signs will be needed to assist visitors to use the Reserve appropriately. At the rubbish collection point at the start of the main walking track/dog-walking circuit, simple signage should encourage visitors to bring their rubbish back to that point. The sign should also encourage visitors to use the 'poo pouches' provided to remove their pet's droppings from the Reserve. Signs prohibiting all vehicles except Shire, management and emergency vehicles should also be placed on each management gate. To assist visitors with dogs to keep to the dog-walking circuit, small pine-pole posts with arrows should be installed along the designated circuit, particularly at the junctions with other tracks.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.9l Interpretive signage should be used to inform visitors of the Reserve's regulations and conservation strategies.	CRMG and the Shire of Busselton	High
4.9m To avoid the proliferation of signs, all of the information that visitors require at each location should be posted on one eye-catching but simple, positively worded sign.	CRMG and the Shire of Busselton	High
4.9n Interpretive signage should be located at major access points to the Reserve, including the south-western corner of the town-site, on the MRWA Highway Reserve opposite the Carbunup Store, and at other entry points as appropriate.	CRMG and the Shire of Busselton	High
4.9o Signage encouraging visitors to remove litter from the Reserve should be placed at each rubbish collection point.	CRMG and the Shire of Busselton	High
4.9p Small pine-pole posts with arrows should be used to assist visitors with dogs to identify the dog-walking circuit.	CRMG and the Shire of Busselton	High
4.9q In order to maximise the effectiveness of interpretive signage, research should be conducted to determine the most suitable and effective way to present interpretive information about the Reserve.	Shire of Busselton	High

4.10 Community Involvement and Education

4.10.1 OBJECTIVES

- To increase community awareness, understanding, and enjoyment of the Reserve's natural values.
- To educate the community about potential impacts to the Reserve, and actions that they can take to mitigate these threats.
- To inform and educate the local community about conservation and management strategies being implemented in the Reserve.
- To encourage the local community to participate in managing the Reserve by joining the CRMG.
- To encourage use of the Reserve for educational purposes.

4.10.2 INFORMING, EDUCATING AND INVOLVING THE LOCAL COMMUNITY

nforming and educating the local community can raise awareness and appreciation of the Reserve's natural features and conservation values, and can encourage appropriate behaviour both within and around the Reserve to help minimise impacts to the Reserve's flora and fauna. Within this management plan, a number of recommendations have been made to inform and educate the local community about various impacts on the Reserve, potential threats from living in close proximity to the Reserve, and what they can do to reduce these impacts and threats. Particular information that the local community should be provided includes:

- Information about the Reserve's conservation values.
- Information about weed control, how to prevent weed invasion in the Reserve, the impacts of garden waste on the Reserve, and how to reduce the impacts of residential gardens on the Reserve (recommendation 4.4h).
- Information on the importance of fauna habitat, particularly hollow logs, within the Reserve (recommendation 4.5e).
- Information about the impacts of domestic pets on the Reserve's flora and fauna (recommendation 4.6f).
- Information about any feral animal control programs being carried out within or around the Reserve, including any potential impacts to domestic pets and how to minimise them (recommendation 4.6e).
- Fire awareness information, particularly about things the community can do to help protect themselves and their property from the threat of wildfire (recommendations 4.7k & l).

Some of the information listed above is detailed within specific leaflets published by various government agencies including the DEP, AgWA and FESA. The CRMG should contact these agencies to obtain leaflets which can then be distributed to the local community.

Other information could be conveyed via a regular 'Carbunup Reserve' newsletter (prepared quarterly perhaps, or following CRMG meetings). The newsletter could also be used to inform the local community about specific conservation and management strategies being implemented in the Reserve.

To ensure that responsibility for management of the Reserve is shared equally amongst a number of committed individuals, so that nobody has too large a task to handle, the CRMG should continually strive to increase participation in the group's activities. Local residents should be kept informed about the progress and achievements of the group, and any upcoming activities via a newsletter, and regularly encouraged to lend a hand.

To encourage community involvement in the CRMG activities, social days could also be organised, which can help to bring the community together to appreciate the values that the Reserve provides to the local community, and increase future participation in CRMG activities. Social days should also be advertised in a regular newsletter.

To assist the community to learn about the Reserve's flora and fauna, and various conservation and management measures, including weed and feral animal control, bush regeneration, and non-intrusive fauna surveys, information days could be organised. Assistance with planning and provision of technical advice should be sought from various agencies, including AgWA, Greening Australia WA, and CALM. Contact details for relevant agencies are given in Appendix 1.

The Carbunup Store and Post Office is a perfect point of contact for the local community members. Any newsletters or leaflets could be distributed to the local community via their postboxes, and also posted on the community notice board provided at the front of the store. This is likely to be an easy and very effective method to reach most members of the local community because there is no roadside mail delivery in the area so most landholders regularly visit the store and post office.

New members for the CRMG should be actively sought by regularly advertising in the local press. Placing a notice in the Busselton Shire's community information page in the Mail newspaper (via the Shire Environment Officer) is a particularly useful way to reach interested local community members. Notices inviting the public to attend CRMG meetings should also be placed in the local press to ensure that all interested individuals and groups are given the opportunity to participate in the management of the Reserve.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.10a The local community should be informed and educated about various impacts and threats to the Reserve, and what they can do to mitigate these threats, via the provision of educative leaflets and newsletters.	CRMG	Medium
4.10b The local community should be informed about any potential threats to themselves or their pets from living in close proximity to the Reserve (including feral animal control programs and bushfire threats), and what they can do to protect themselves.	CRMG and the Shire of Busselton	High
4.10c The local community should be informed about the activities, achievements and success of the CRMG, and encouraged to participate in busy bees, social days and information days via the provision of a regular newsletter.	CRMG	Medium
4.10d The CRMG should actively encourage community participation in CRMG meetings and activities by placing notices in the local press.	CRMG	High

4.10.3 ENCOURAGING EDUCATIONAL USE OF THE RESERVE

Because of its high biodiversity and important conservation values, the Carbunup Reserve is a valuable educational resource and research site. It may be a useful site for environmental studies by schools, TAFE and university groups, local environmental groups and government agencies.

Local high schools, TAFE and universities should be encouraged to undertake any projects which will assist to improve their understanding or appreciation of the Reserve's natural features and conservation values, or research or monitoring programs which may help to better inform and guide future management of the Reserve. In early 2001, Murdoch University's Environmental Science faculty approached the Sussex LCDC looking for projects for Environmental Management students. There are a number of projects monitoring various environmental impacts and change within the Reserve that these students could undertake.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
4.10e Schools, TAFE and universities should be encouraged to use the Reserve for projects that may improve awareness or understanding of the Reserve's natural features and conservation values, or research or monitoring projects that may assist to improve future management of the Reserve.	CRMG	Low

5. Implementation

5.1 Carbunup Reserve Management Group

In May 2001, the CRMG formally established to assist the Shire of Busselton to manage the Carbunup Reserve by undertaking community activities within the Reserve. In recognition of the significant community interest in future management of the Reserve, the Shire of Busselton funded the preparation of this management plan to ensure that both the group and the Shire are working consistently to manage the Reserve for agreed objectives and outcomes (see section 1.3).

As the Sussex LCDC deals primarily with environmental management issues in the Carbunup River catchment, the membership of the CRMG was likely to overlap with both the LCDC and the Carbunup Bush Fire Brigade. To integrate community environmental management in the Carbunup River catchment, and to reduce the number of meetings that interested community members need to attend, the community decided that the Friends of the Carbunup Reserve should be formed as a subgroup of the Sussex LCDC. This has additional benefits for the group as their activities are covered by the LCDC insurance policy, which is more comprehensive than the Shire's policy for 'Friends' groups, and they have some access to the LCDC's financial resources to commence implementing the recommendations of this management plan.

The membership of the CRMG should be drawn from the local community, and include members of the Sussex LCDC and the Carbunup Bush Fire Brigade.

The CRMG would be expected to meet regularly (at least 4 times per year) to coordinate and plan the group's activities consistent with this management plan. To inform all groups and agencies involved in managing the Reserve about the CRMG's plans for activities, brief minutes should be recorded for each meeting and made available to the Sussex LCDC, the Busselton Shire and CALM.

As management of the Reserve will involve regular, ongoing liason with both the Shire of Busselton and CALM, one member of the CRMG should be designated to be the group's agency liason. This person will have the role of contacting and informing the Shire and CALM of the group's activities, and will also be the point of contact within the group for each of these agencies. Agencies have found through experience that working with community groups works best when there are delegated contacts within the group.

Representatives of the Busselton Shire and CALM may be regularly asked for advice and assistance, and occasionally may be requested to attend CRMG meetings. The Busselton Shire's Environmental Officer is able to assist and advise the CRMG when planning the group's activities, and should be the group's first point of contact within the Shire (contact details in Appendix 1). CALM should nominate representatives who can provide assistance and advice to the group as necessary.

To monitor the progress of the CRMG towards achieving the objectives of this management plan, a brief progress report should be prepared by the group each year. The annual report should list all the activities undertaken by the CRMG in the past twelve months including notes on their success or otherwise, and specify which of this plan's recommendations each activity addresses. The annual report should be provided to CRMG members, the Shire of Busselton, CALM, the Sussex LCDC and interested community members.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
5.1a The CRMG should assist the Shire of Busselton to manage the Carbunup Reserve by undertaking community activities within the Reserve consistent with this management plan.	CRMG	High
5.1b The membership of the CRMG should include local residents, members of the Sussex LCDC and the Carbunup Bush Fire Brigade, and any other interested individuals or groups.	CRMG	High
5.1c The CRMG should meet regularly to plan the group's activities and work towards achieving the objectives outlined in this plan by addressing the listed recommendations according to priority.	CRMG	High
5.1d Minutes from the CRMG meetings detailing the group's plans and activities should be made available to the Sussex LCDC, the Shire of Busselton and CALM.	CRMG	High
5.1e One member of the CRMG should be designated to be responsible for informing the Shire and CALM of the group's activities, and be the point of contact within the group for these agencies.	CRMG	High
5.1f The Shire's Environmental Officer should be the first point of contact within the Shire for the CRMG, and should provide assistance and advice to the group as necessary.	Shire of Busselton	High

RECOMMENDATION	RESPONSIBILITY	PRIORITY
5.1g CALM should nominate representatives who will be available to provide advice and assistance to the CRMG as necessary.	CALM	High
5.1h The CRMG should prepare a brief annual report listing the group's activities and successes or otherwise over the past twelve months to measure progress against the recommendations of this management plan.	CRMG	High

5.2 Shire of Busselton Assistance

Management of the Carbunup Reserve has used very few Shire resources to date. Adoption and implementation of this management plan will require greater involvement from the Shire in management of the Reserve. The CRMG will expect the Shire to provide technical assistance (such as equipment, herbicides, and other materials) where it is needed and when it is available.

Formation of the CRMG may involve the Shire Council to oversee the management and administration of the Reserve, and provide the CRMG with grant-matched funding when it is available to manage the Reserve. To ensure that the CRMG receives assistance from the Shire, the group will need to keep the Shire informed of their proposed activities. It will be the responsibility of the CRMG to forward their future funding requests and work plans to the Shire to meet deadlines for the Busselton Shire Council's annual budgets and four year projection plans. The Shire's Environmental Officer can provide some advice and assistance to the CRMG to help with work planning and funding requests (contact details in Appendix 1). Information that the Shire requires for its planning processes includes details of any proposed projects and activities, any equipment or technical assistance required, and any costs.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
5.2a The Busselton Shire should be regularly notified of future projects and requests for funding and assistance so that the Shire can plan its budget accordingly.	CRMG	High

5.3 External Funding Opportunities

There are many sources of funding from both State and Federal Governments and various non-government organisations which are available to volunteer community groups to undertake conservation and management activities on public lands.
The CRMG and the Shire of Busselton should actively seek funding from these sources to assist with the implementation of this plan. Generally, when a recognised community group is seeking to implement the recommendations of a formally adopted management plan, such as this, external funding can be relatively easy to obtain.

A comprehensive Federal Government website that details information about government grants available to community groups can be accessed online at www.grantslink.gov.au. This is a useful starting point to find external funding to assist the group in managing the Reserve.

A selection of funding sources and grants that may be available to the CRMG are:

- Natural Heritage Trust Bushcare Program (Environment Australia) – provides assistance with a variety of conservation related projects.
- Save the Bush Program Grant (Environment Australia) – provides assistance for bushland conservation and rehabilitation projects.
- National Conservation Trust (Environment Australia) – provides assistance for conservation related projects including weed and vermin control, and fencing.
- World Wide Fund Threatened Species Network Community Grants – provides assistance for projects to conserve threatened species and communities. This may be useful for projects affecting the Marri Woodland TEC in the Reserve.
- Gordon Reid Foundation for Conservation (W.A. Lotteries Commission) – provides assistance for flora and fauna surveys, weed and vermin control programs and other conservation related projects.
- Greening Australia WA – provides assistance with bush regeneration and rehabilitation projects.
- Tourism Development Fund (South West Development Commission) – provides assistance with projects to develop interpretive signage.
- Australian Family Foundation – provides assistance with educational projects.

This list is by no means comprehensive, and funding sources are continually changing. To ensure that the CRMG keeps abreast of funding opportunities, the group should register its interest with various agencies, so that it can be placed on mailing lists to receive notification of applications and deadlines for submissions. Agencies to start at include the Busselton Shire, the Lotteries Commission, Environment Australia, Greening Australia WA and the South West Development Commission.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
5.3a External funding opportunities should be actively sought to implement the recommendations of this management plan.	CRMG and the Shire of Busselton	Medium

5.4 Tenure, Monitoring and Review of the Management Plan

Once adopted by the Busselton Shire Council, this management plan should remain active until another plan is adopted.

Throughout the term of this plan, new information about the Reserve's flora and fauna and use by the community will be generated through research and monitoring. The recommendations of this plan will need to be reviewed when important new information becomes available, particularly about dieback disease, native fauna populations, and rare and priority flora, to ensure that the plan's recommendations continue to adequately manage potential impacts to the Reserve's conservation values.

This Management Plan should be comprehensively reviewed within five years of its adoption to enable the Shire and the CRMG to measure progress against each recommendation, and determine whether the plan continues to protect the Reserve's conservation values and reflect current community attitudes and expectations. Provision should be made to amend the plan as necessary.

RECOMMENDATION	RESPONSIBILITY	PRIORITY
5.4a The recommendations of this management plan should be reviewed as new information about dieback disease, native fauna populations, and rare and priority flora becomes available. If necessary, the recommendations should be amended to ensure that the Reserve's conservation values are protected.	Shire of Busselton	High
5.4b This management plan should be comprehensively reviewed within five years of its adoption by the Busselton Shire Council.	Shire of Busselton	High

6. References and Further Reading

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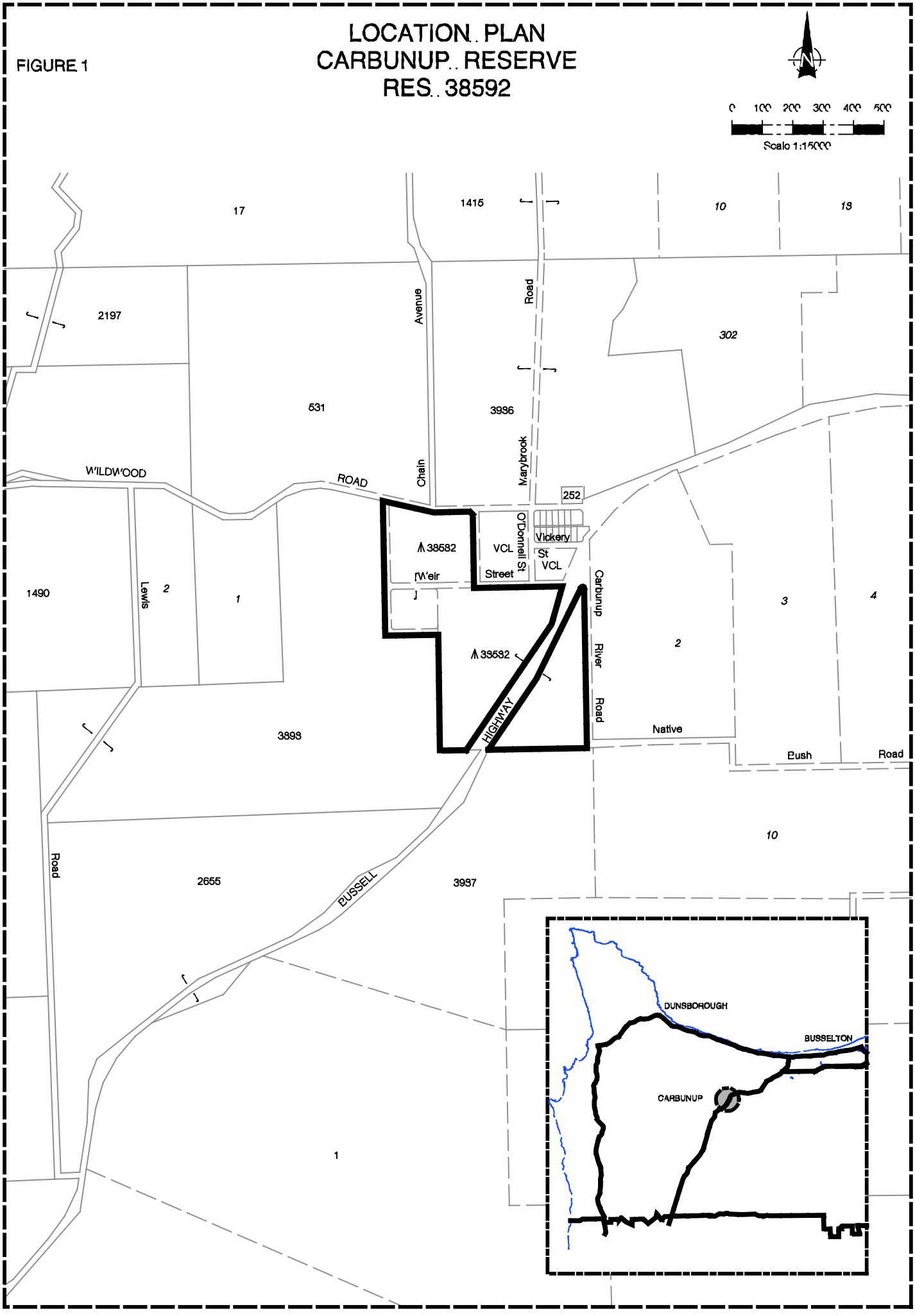
FIGURE 1

LOCATION PLAN
CARBUNUP RESERVE
RES 38592



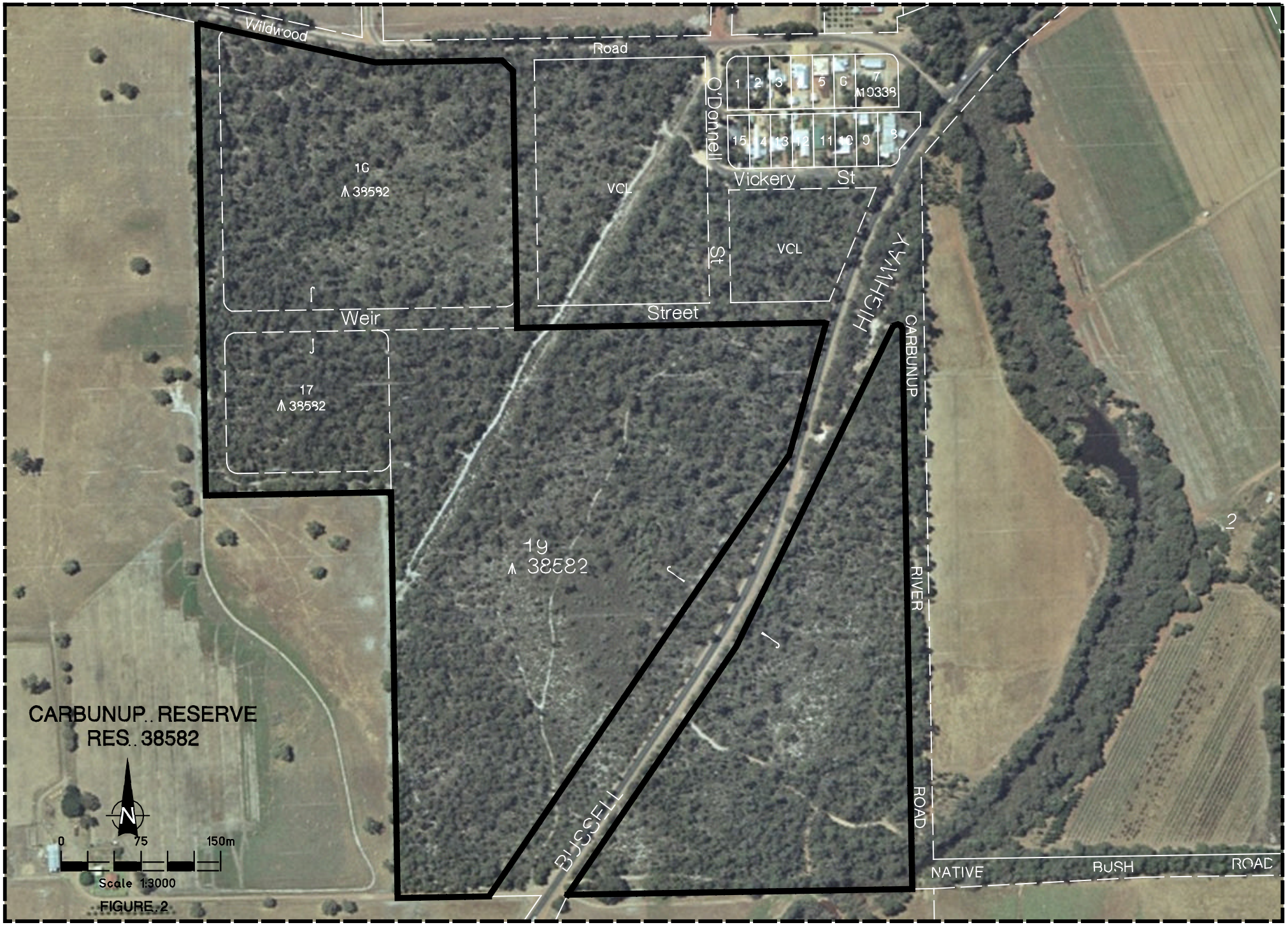

Wildwood
Road
O'Donnell
St
Vickery
St
VCL
VCL
1G
38582
17
38582
19
38582
Weir
Street
HIGHWAY
CARBUNUP
RIVER
ROAD
BUSSELL
NATIVE
BUSH
ROAD
CARBUNUP. RESERVE
RES. 38582
N
0
75
150m
Scale 1:3000

FIGURE. 2

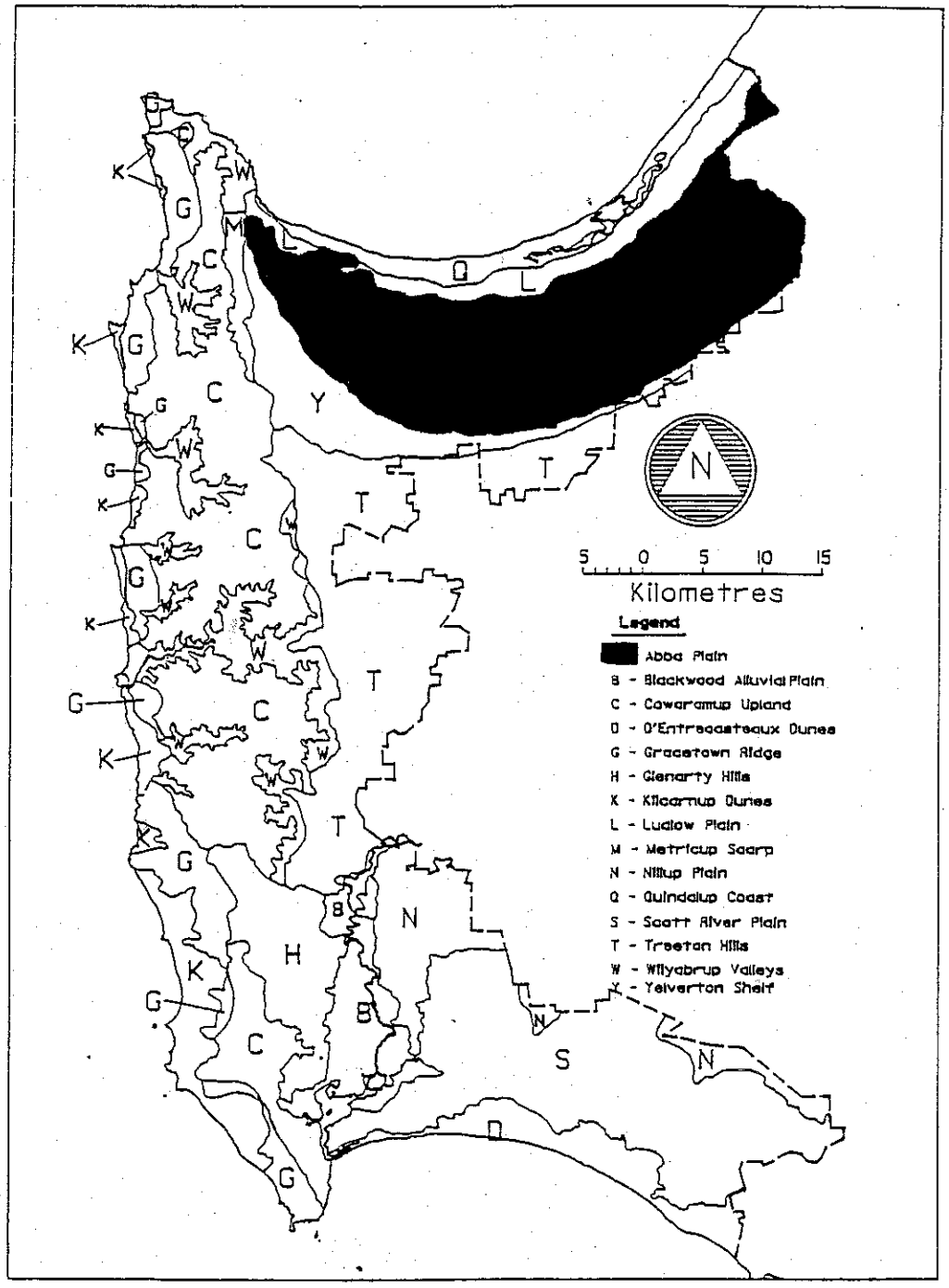


Figure 3. Extent of the Abba Plain land system in the Geographe Bay catchment (Tille and Lantzke, 1990).

VEGETATION COMMUNITIES OF THE CARBUNUP RESERVE

(Keighery et.all., 1996)

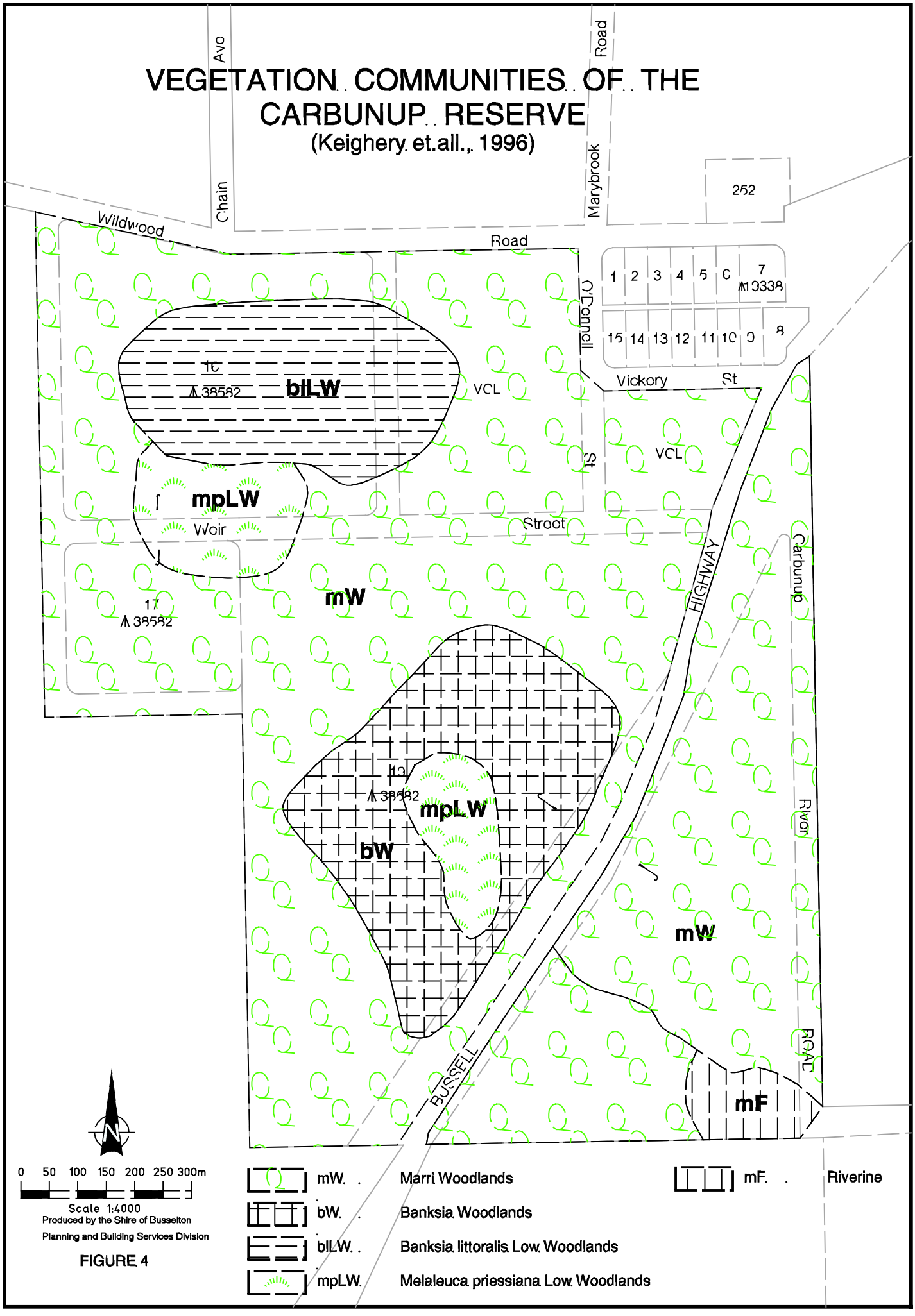
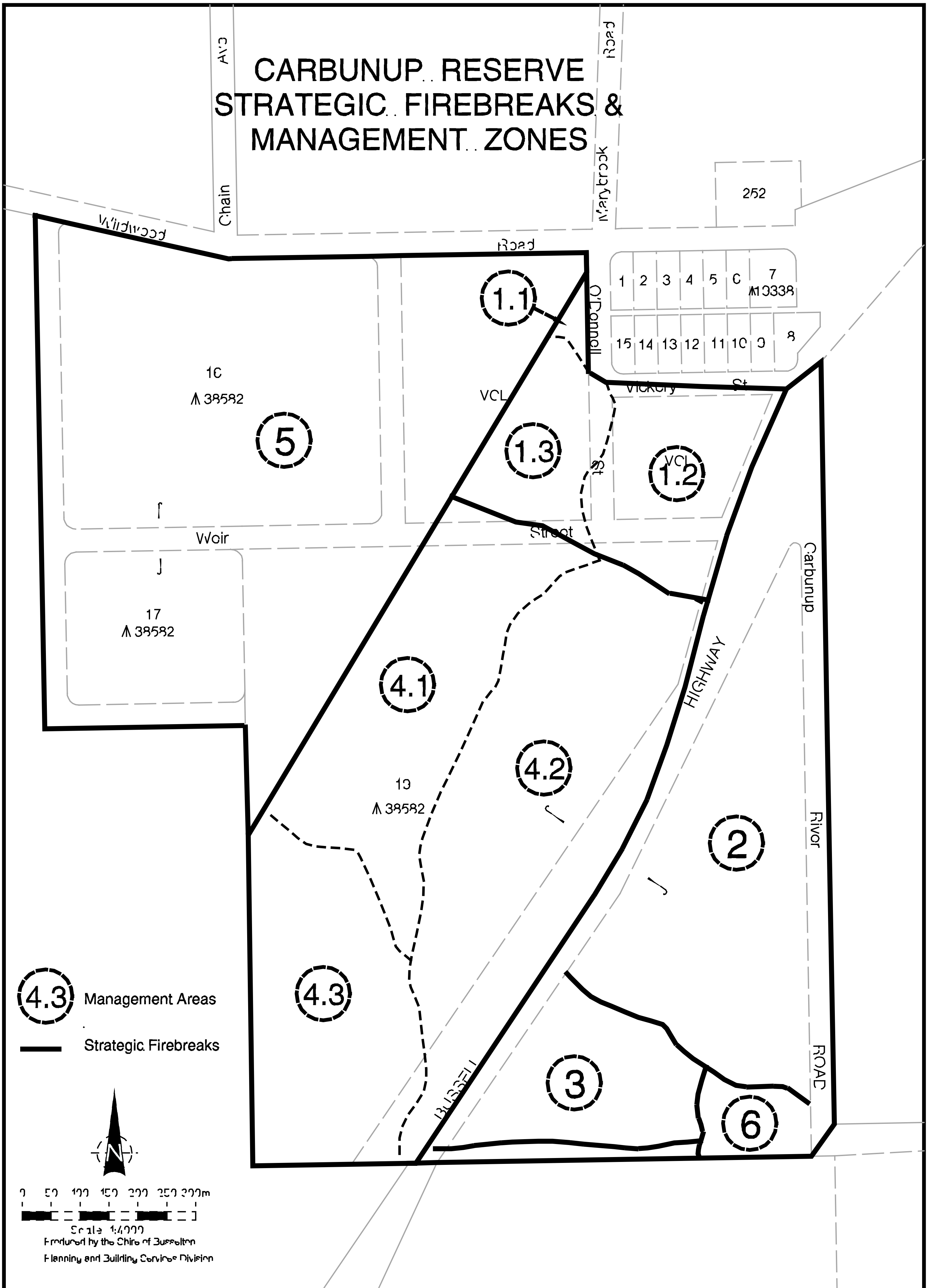


FIGURE 4



CARBUNUP RESERVE
STRATEGIC FIREBREAKS &
MANAGEMENT ZONES
Wildwood
Road
Chain
Marybrook
O'Donnell
Vickery
St
252
1 2 3 4 5 6 7
10338
15 14 13 12 11 10 9 8
16
38582
5
VCL
1.1
1.3
1.2
Weir
Street
17
38582
4.1
4.2
19
38582
HIGHWAY
Carbunup
River
ROAD
2
3
6
4.3
BUSSELL
Management Areas
Strategic Firebreaks
N
Scale 1:4000
Produced by the Shire of Busselton
Planning and Building Services Division

FIGURE 5

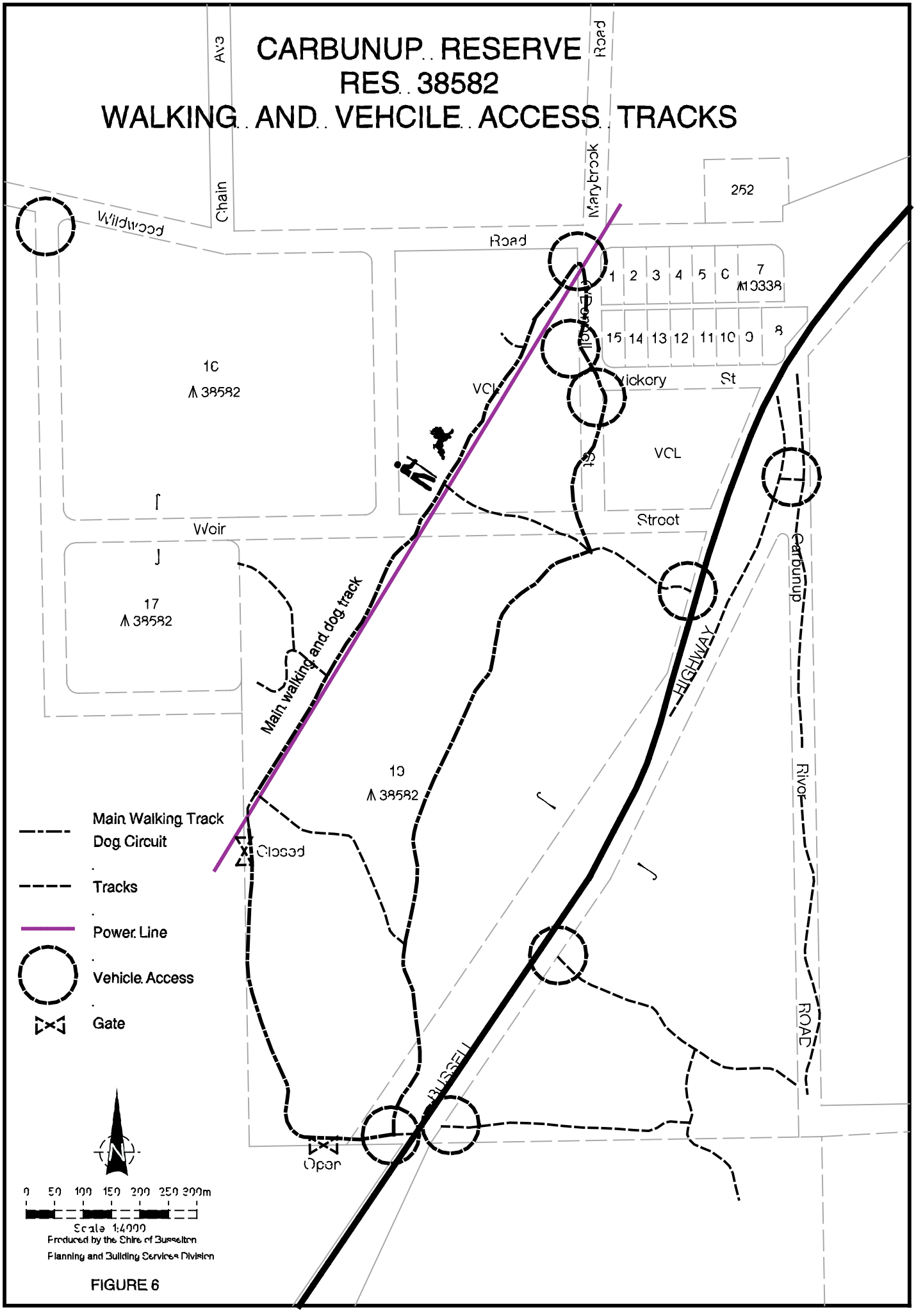
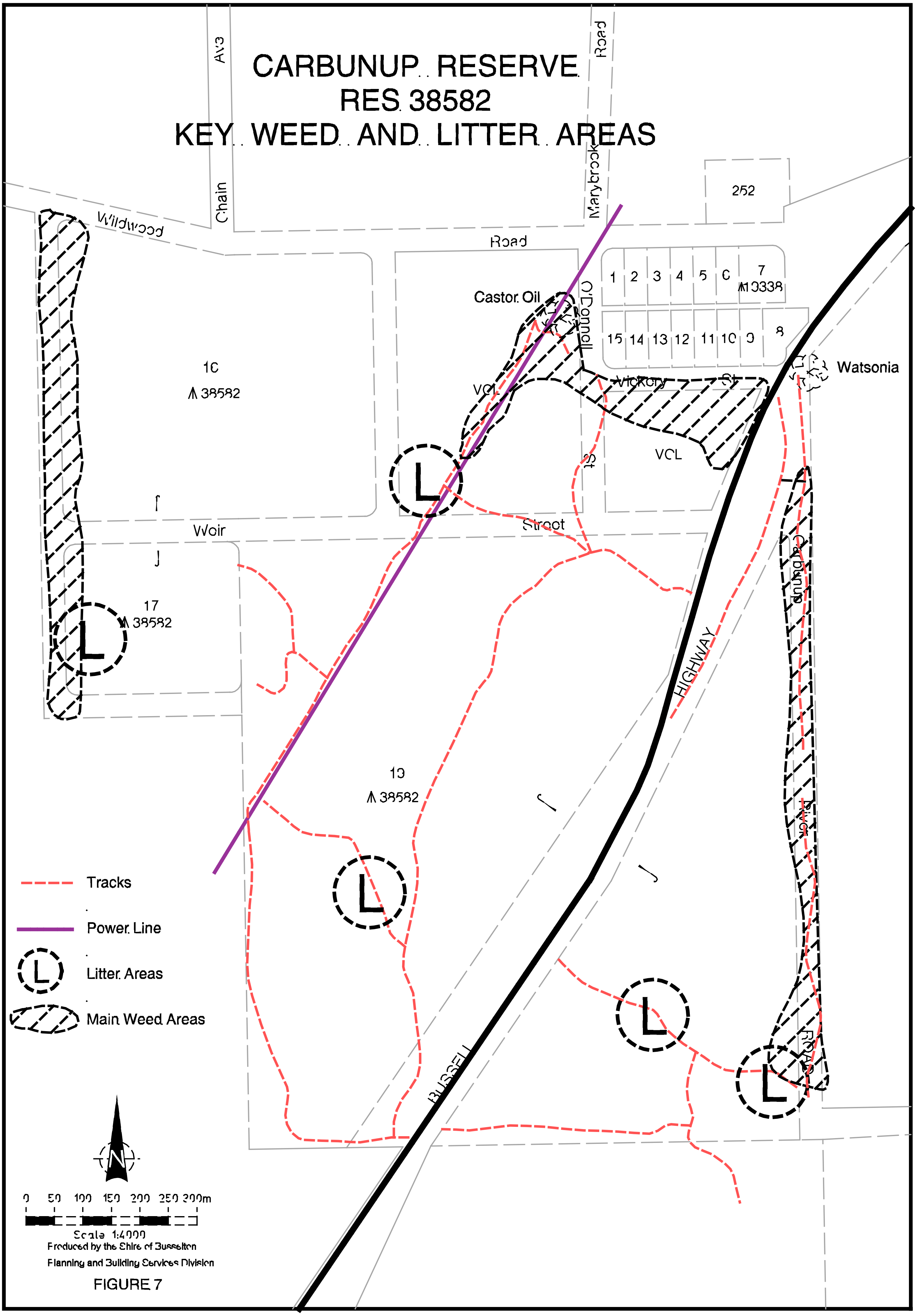

CARBUNUP RESERVE
RES 38582
WALKING AND VEHCILE ACCESS TRACKS
Ave
Chain
Road
Marybrook
252
Wildwood
Road
1 2 3 4 5 6 7
M10338
15 14 13 12 11 10 9 8
Hickory St
1C
M 38582
VCL
VCL
Street
Weir
J
17
M 38582
Main walking and dog track
19
M 38582
Carbunup
HIGHWAY
River
ROAD
RUSSELL
Closed
Open
Main Walking Track
Dog Circuit
Tracks
Power Line
Vehicle Access
Gate
N
0 50 100 150 200 250 300m
Scale 1:4000
Produced by the Shire of Busselton
Planning and Building Services Division

FIGURE 6



CARBUNUP RESERVE
RES 38582
KEY WEED AND LITTER AREAS
Wildwood
Road
Chain
Av3
Marybrook
Road
252
1 2 3 4 5 6 7
10338
15 14 13 12 11 10 9 8
Castor Oil
O'Connell
St
Vickery
St
Watsonia
VCL
VCL
VCL
16
38582
Weir
Street
17
38582
19
38582
HIGHWAY
BUSSELL
Carbunup
River
ROAD
Tracks
Power Line
Litter Areas
Main Weed Areas
0 50 100 150 200 250 300m
Scale 1:4000
Produced by the Shire of Busselton
Planning and Building Services Division
FIGURE 7

APPENDIX 1: USEFUL CONTACTS

Busselton Shire
Environment Officer
Shire of Busselton
Southern Drive
BUSSELTON WA 6280
Ph: (08) 9781 0444
Fax: (08) 9752 4958

CALM – South West Capes District
14 Queen Street
BUSSELTON WA 6280
Ph: (08) 9752 1677
Fax: (08) 9752 1432

Sussex LCDC
John Partridge
President
P.O. Box 62
VASSE WA 6280
Ph: (08) 9755 1268

CALM – Land for Wildlife
Cherie Kemp
CALM South West Capes District
14 Queen Street
BUSSELTON WA 6280
Ph: (08) 9752 1677
Fax: (08) 9752 1432

CALM – Bushcare
Gary McMahon
CALM Bunbury Regional Office
North Boyanup Road
BUNBURY WA 6230
Ph: (08) 9725 4300
Fax: (08) 9725 4351

Greening Australia WA
APACE Aid
Australian Association of Bush Regenerators (Inc.)
Winter House
1 Johanna Street
NORTH FREMANTLE WA 6159
Ph: (08) 9336 1262
Fax: (08) 9430 5729

Greening Australia WA Bushcare Support
Joel Geoghegan
C/- Busselton Dunsborough Environment Centre
25 Prince Street
BUSSELTON WA 6280
Ph: (08) 9754 2049

Busselton Dunsborough Environment Centre
25 Prince Street
BUSSELTON WA 6280
Ph: (08) 9754 2049

Agriculture Western Australia
Phil Williams
Agriculture Protection Officer
Queen Street
BUSSELTON WA 6280
Ph: (08) 9752 1688
Fax: (08) 9752 3877

Geocatch Network Centre
Unit 2 Palm Court
62 Kent Street
BUSSELTON WA 6280
Ph: (08) 9754 4331
Fax: (08) 9754 4335

Fire and Emergency Services Authority
Tony Moran
Operations Manager
P.O. Box 1288
BUNBURY WA 6230
Ph: (08) 9780 1900

Toby Inlet Catchment Group (Inc.)
Cape Naturaliste Regional Herbarium
Don Carter
EAGLE BAY WA
Ph: (08) 9756 80

APPENDIX 2: CARBUNUP RESERVE FLORA LIST

KEY

Column 1 Family, Conservation Status (as at 1996) and Regional Distributions
R = Declared Rare Flora
1 = Priority 1: Poorly Known Taxa
2 = Priority 2: Poorly Known Taxa
3 = Priority 3: Poorly Known Taxa
4 = Priority 4: Rare Taxa

Regional ecological preferences
H = Taxa characteristic of clays and sandy clay soils on the southern side (or eastern side north of Busselton) of the Swan Coastal Plain.
S = Taxa characteristic of sandy soils on the southern side (or eastern side north of Busselton) of the Swan Coastal Plain.
E = Taxa found on both soils types on the southern side of the Plain.
E = Endemic to the eastern side of the Plain.

Geographical Location (range ends)
S = Taxa found on the Plain south of Capel.
N = Population at the northern limit of their known geographic range.
S = Population at the southern limit of their known geographic range.
D = Populations disjunct from their known geographic range.

Column 2 Taxon
Names follow Gibson *et al*. (1994) unless indicated otherwise. Taxa yet to be named have an attached reference collection number from the relevant collector. An "ms" after the name indicates that this is a manuscript name which is yet to be published. A * preceding the name indicates a weed.

Columns 3-8 (Mapping units for Figure 4, same symbols except Column 5)

Column 3 **mW** = Marri Woodland
J = Found in areas also dominated by Jarrah
(J) = Jarrah is also present

Column 4 **bLW** = *Banksia* Woodland

Column 5 **R** = Riverine (mapping unit for figure 4: mF)

Column 6 **blLW** = *Banksia littoralis* Low Woodland

Column 7 **mpLW** = *Melaleuca preissiana* Low Woodland

Column 3 **D** = Degraded areas (road sides, track edges, transmission line)

		mW	bW	R	blLW	mpLW	D
Amaranthaceae							
	Alternanthera nodiflora			●			
H	Ptilotus manglesii	●					
Anthericaceae							
H	Agrostocrinum scabrum	●					
	Caesia micrantha	●					
	Caesia occidentalis	●					
	Chamaescilla corymbosa	●	●				
	Johnsonia acaulis		●		●		
H	Johnsonia lupulina	●	●				
	Laxmannia sessiliflora subsp. australis		●				
	Sowerbaea laxiflora	● (J)				●	
S	Thysanotus formosus		●				
	Thysanotus manglesianus	●					
	Thysanotus multiflorus	●					
	Thysanotus patersonii	●					
	Thysanotus sparteus	● (J)					
	Thysanotus thyrsoideus	●					
	Tricoryne elatior	●					
	Tricoryne tenella	●					
Apiaceae							
	Actinotus glomeratus		●				
	Homalosciadium homalocarpum	● (J)					
	Hydrocotyle alata				●		
	Hydrocotyle pilifera	●	●				
H	Pentapeltis peltigera	●					
	Platysace compressa	●	●				
	Platysace tenuissima	●					
	Trachymene pilosa	●	●		●		
	Xanthosia candida	●			●		
	Xanthosia huegelii		●				
S	Xanthosia pusilla	●					
Asteraceae							
	Centipeda cunninghamii			●			
*	Conyza albida	●					
	Craspedia variabilis	●					
	Gnaphalium gymnocephalum	●J					
*	Hypochaeris glabra	●	●		●	●	●
	Lagenifera huegelii	●			●		
	Millotia myosotidifolia	●			●		
	Olearia heliophila	●			●		
	Quinetia urvillei		●		●		
	Petrchaeta paniculata		●				
	Senecio minimus				●		
H	Trichocline spathulata	●					

		mW	bW	R	blLW	mpLW	D
	Waitzia citrina	●	●				
Caesalpiniaceae							
H	Labichea punctata	●					
Campanulaceae							
	Wahlenbergia preissii		●				
Casuarinaceae							
	Allocasuarina fraseriana	●	●				
	Allocasuarina humilis		●				
Centrolepidaceae							
	Aphelia cyperoides	●					
	Centrolepis aristata	● (J)			●		
	Centrolepis drummondii		●				
	Centrolepis glabra				●		
Colchicaceae							
	Burchardia multiflora	●	●		●		
	Burchardia congesta	●					
Crassulaceae							
	Crassula colorata	●J	●				
	Crassula pedicellosa				●		
Cyperaceae							
	Baumea juncea				●		
	Baumea vaginalis				●		
H	Cyathochaeta avenacea	●			●		
	Cyathochaeta clandestina	●			●		
H	Cyathochaeta sp. (GJK 13 628)					●	
	Isolepis marginata		●				
	Lepidosperma angustatum		●	●		●	
	Lepidosperma tenue	●	●				
	Mesomelaena graciliceps	● (J)					
H	Mesomelaena tetragona	●			●		
	Schoenus bifidus				●		
	Schoenus curvifolius	● J					
	Schoenus subbulbosus				●		
	Schoenus subflavus		●				
	Schoenus unispiculatus						●
	Tetraria capillaris	●					
	Tetraria octandra	●			●		
Dasypogonaceae							
H	Baxteria australis	● J	●		●		
	Dasypogon bromeliifolius		●		●		
H	Dasypogon hookeri	●					
H	Kingia australis	●			●		

		mW	bW	R	blLW	mpLW	D
	Lomandra caespitosa		●				
	Lomandra hermaphrodita	●	●		●		
	Lomandra integra	●					
	Lomandra nigricans	●	●				
	Lomandra pauciflora	●					
	Lomandra preissii		●				
	Lomandra purpurea				●		
	Lomandra sericea	●	●		●		
	Lomandra suaveolens				●		
Dennstaedtiaceae							
	Pteridium esculentum	● J				●	
Dilleniaceae							
	Hibbertia cunninghamii	●					
	Hibbertia hypericoides	●	●		●		
S	Hibbertia quadricolor	● J					
	Hibbertia racemosa	●	●		●		
	Hibbertia rhadinopoda		●				
	Hibbertia serrata	●					
	Hibbertia subvaginata	●					
Droseraceae							
	Drosera erythrorhiza	● (J)					
	Drosera gigantea				●		
	Drosera glanduligera		●				
	Drosera menziesii subsp. penicillaris	●	●				
	Drosera nitidula				●		
	Drosera pallida	●					
	Drosera rosulata	● J			●		
Epacridaceae							
	Astroloma baxteri	●					
	Astroloma ciliatum	●			●		
	Astroloma pallidum	●			●		
	Conostephium pendulum		●				
	Leucopogon australis	●					
	Leucopogon conostephioides			●			
	Leucopogon parviflorus	●					
	Leucopogon propinquus	●					
	Leucopogon revolutus		●				
Euphorbiaceae							
	Ampera ericoides	●					
	Monotaxis occidentalis		●				
	Phyllanthus calycinus	● (J)					
	Poranthera microphylla	●					
Gentianaceae							

		mW	bW	R	blLW	mpLW	D
*	Centaurium erythraea				●		
Goodeniaceae							
	Dampiera linearis	●					
	Goodenia micrantha				●		
	Goodenia pulchella				●		
	Lechenaultia expansa				●		
	Scaevola calliptera	●					
	Scaevola glandulifera	●			●		
	Scaevola phlebopetala	●			●		
	Velleia trinervis				●		
Haemodoraceae							
H/S	Anigozanthos flavidus	●					
	Anigozanthos manglesii	● (J)	●		●		
	Conostylis aculeata	●					
	Conostylis laxiflora				●		
	Conostylis serrulata	●			●		
	Conostylis setigera	●					
	Haemodorum laxum	●					
H	Haemodorum simplex				●		
	Haemodorum sparsiflorum					●	
	Haemodorum spicatum	● (J)					
	Phlebocarya ciliata		●		●		
	Tribonanthes australis				●		
Haloragaceae							
H	Gonocarpus hexandrus subsp. integrifolius			●			
Hypoxidaceae							
	Hypoxis occidentalis	●			●		
Iridaceae							
*	Ferraria crispa						●
	*Ixia aff. maculata						●
	Patersonia juncea	●			●		
	Patersonia occidentalis	●					
	Patersonia xanthina	●	●		●		
Juncaceae							
*	Juncus bufonius				●		
*	Juncus capitatus				●		
Lamiaceae							
	Hemiandra pungens				●		
	Hemigenia ramosissima	● J					
Lauraceae							
	Cassytha racemosa		●		●		

		mW	bW	R	blLW	mpLW	D
Lindsaeaceae							
H	Lindsaea linearis	●	●		●		
Lobeliaceae							
	Isotoma hypocrateriformis	●					
	Lobelia alata				●		
	Lobelia tenuior		●				
Loganiaceae							
S	Logania campanulata	●			●		
	Logania serpyllifolia	●					
	Mitrasacme paradoxa		●				
Loranthaceae							
	Nuytsia floribunda		●		●		
Menyanthaceae							
	Villarsia albiflora				●		
	Villarsia parnassifolia				●		
	Mimosaceae						
	Acacia applanata	●					
S	Acacia browniana	●					
S	Acacia divergens	●					
	Acacia extensa	●	●		●		
S	Acacia mooreana	●					
S	Acacia myrtifolia	●					
	Acacia nervosa	●					
	Acacia pulchella	●					
3	Acacia semitrullata	●	●		●		
	Acacia stenoptera	●			●		
S	Acacia tetragonocarpa				●		
	Acacia willdenowiana		●				
Myrtaceae							
	Agonis flexuosa	● (J)	●		●		
	Agonis linearifolia			●			
	Agonis parviceps					●	
	Calytrix flavescens		●				
	Eucalyptus calophylla	●	●		●		
	Eucalyptus marginata	● (J)	●				
	Eucalyptus patens			●			
	Hypocalymma angustifolium	●					
H	Hypocalymma cordifolium			●			
	Hypocalymma robustum	●	●		●		
	Kunzea ericifolia		●				
	Kunzea aff. micrantha (BJK & NG 040)			●			●
	Kunzea recurva	●					
	Leptospermum spinescens					●	●
	Melaleuca preissiana				●	●	

		mW	bW	R	blLW	mpLW	D
	Melaleuca thymoides		●				
	Pericalymma ellipticum	●	●		●	●	
	Regelia ciliata					●	
Orchidaceae							
	Caladenia chapmanii	●					
	Caladenia ferruginea	●					
	Caladenia flava		●				
	Caladenia rhomboidformis					●	
	Caladenia marginata	●					
	Caladenia reptans		●				
	Caladenia sericea	● J					
	Caladenia pectinata	● J					
	Calochilus robertsonii	●					
	Elythranthera brunonis		●			●	
	Eriochilus dilatatus	●					
	Leporella fimbriata		●			●	
	Lyperanthus nigricans	● J	●				
	Lyperanthus serratus	●					
*	Monadenia bracteata	●					
	Prasophyllum parvifolium	●	●				
	Pterostylis nana		●				
	Pterostylis recurva					●	
	Pterostylis vittata	●	●				
	Thelymitra crinita				●		
	Thelymitra macrophylla	●					
	Thelymitra pauciflora				●		
	Thelymitra spiralis						●
Orobanchaceae							
*	Orobanche minor	●					
Oxalidaceae							
*	Oxalis purpurea	●					
Papilionaceae							
	Bossiaea eriocarpa	● (J)					
S	Bossiaea linophylla	●					
H	Bossiaea ornata	●	●				
	Bossiaea rufa	●	●				
H	Brachysema praemorsa	●					
S	Chorizema minor	●					
	Callistachys lanceolata			●			
H	Daviesia cordata	●					
	Daviesia decurrens		●			●	
1	Daviesia elongata subsp. elongata	● J					
	Daviesia incrassata	●					
	Daviesia inflata	●					
	Daviesia physodes	● (J)					

		mW	bW	R	blLW	mpLW	D
	Daviesia preissii	●					
	Gompholobium knightianum			●			
	Gompholobium marginatum	●					
H	Gompholobium polymorphum	● (J)					
	Gompholobium tomentosum			●			
	Hardenbergia comptoniana	●		●			
	Hovea chorizemifolia	● (J)	●				
	Hovea elliptica	●					
	Hovea pungens		●				
	Hovea trisperma var. trisperma	● J	●				
H	Hovea trisperma var. grandiflora	● J			●		
	Jacksonia sparsa ms (J. sp. Busselton in Gibson *et al*. 1994)	●	●				
H	Kennedia carinata	●					
	Kennedia coccinea	●					
	Mirbelia dilatata	●					
	Oxylobium lineare			●			
	Pultenaea reticulata		●		●		
	Sphaerolobium medium	●			●		
	Viminaria juncea	●					
Philydraceae							
	Philydrella pygmaea				●		
Pittosporaceae							
	Billardiera variifolia	●					
	Pronaya fraseri	●					
Poaceae							
	Agrostis avenacea	●					
*	Aira caryophyllea	●			●		
	Amphipogon debilis	●					
	Amphipogon turbinatus		●				
	Brachyachne prostrata	●					
*	Briza maxima	●					
*	Briza minor	●					
	Danthonia setacea	●					
	Microlaena stipoides	●					
	Neurachne alopecuroidea	●					
	Stipa compressa		●				
	Stipa semibarbata	●					
	Tetrarrhena laevis	●					
Podocarpaceae							
S	Podocarpus drouynianus	●	●				
Polygalaceae							
	Comesperma calymega	● (J)		●			
	Comesperma virgatum	● (J)		●			
	Comesperma volubile			●			

		mW	bW	R	blLW	mpLW	D
Proteaceae							
	Adenanthos barbigerus subsp.intermedius ms	●		●			
	Adenanthos meisneri		●				
	Adenanthos obovatus				●		
	Banksia attenuata		●				
	Banksia grandis	●					
	Banksia ilicifolia		●				
	Banksia littoralis	●			●		
	Conospermum capitatum	● (J)			●		
	Conospermum flexuosum subsp. laevigatum				●		
	Dryandra lindleyana (George 1996, D. nivea Gibson *et al.* 1996)	● (J)	●		●		
H	Grevillea manglesioides				●		
	Grevillea quercifolia	●					
H	Grevillea trifida	●					
	Hakea amplexicauli	●					
H	Hakea ceratophylla					●	
H	Hakea lissocarpha	●					
	Hakea ruscifolia	●			●		
	Hakea varia				●		
	Persoonia elliptica	● (J)					
H/N	Persoonia graminea	●					
	Persoonia longifolia	● (J)					
	Persoonia saccata		●				
	Petrophile linearis		●				
	Stirlingia latifolia		●		●		
	Synaphea gracillima	●					
	Synaphea petiolaris	●			●		
	Xylomelum occidentale	●					
Restionaceae							
	Hypolaena exsulca		●		●		
	Hypolaena fastigiata	●	●		●		
3	Lepyrodia heleocharoides				●		
	Lepyrodia glauca					●	
	Lepyrodia macra				●		
	Lepyrodia muirii			●			
H	Loxocarya cinerea	●			●		
	Loxocarya fasciculata	●			●		
	Loxocarya flexuosa	●					
	Loxocarya pubescens				●		
	Lyginia barbata		●		●		
H	Taraxis grossams			●			
4	Taraxis glaucescensms			●			
Rhamnaceae							
H	Trymalium ledifolium	●			●		

		mW	bW	R	blLW	mpLW	D
Rubiaceae							
H	Opercularia apiciflora	●					
H	Opercularia echinocephala	●				●	
	Opercularia hispidula	●					
H	Opercularia spermacocea	●					
	Opercularia vaginata	●					
Rutaceae							
	Eriostemon spicatus	●			●		
Santalaceae							
	Leptomeria scrobiculata	●					
	Leptomeria squarrulosa	●					
Stackhousiaceae							
	Stackhousia pubescens	●					
	Tripterococcus brunonis	●					
Stylidiaceae							
	Levenhookia pusilla	●			●		
	Levenhookia stipitata	●					
	Stylidium amoenum	●					
	Stylidium brunonianum	●					
	Stylidium calcaratum	●					
	Stylidium carnosum		●		●		
	Stylidium crassifolium				●		
	Stylidium piliferum		●				
	Stylidium repens		●				
H	Stylidium scandens	● J					
	Stylidium schoenoides					●	
Thymelaeaceae							
	Pimelea hispida		●				
	Pimelea imbricata	●			●		
	Pimelea preissii	●			●		
	Pimelea rosea	●					
	Pimelea sulphurea	● J					
	Pimelea sylvestris	●					
Tremandraceae							
	Platytheca galioides		●				
	Tetratheca hirsuta	● (J)					
Violaceae							
	Hybanthus floribundus	●					
Xanthorrhoeaceae							
H	Xanthorrhoea gracilis	●					

	mW	bW	R	blLW	mpLW	D
Xanthorrhoea preissii	● (J)			●		
Zamiaceae						
Macrozamia riedlei	●	●				