City of Joondalup

City of Joondalup
Lilburne Park Management Plan

Contents

Acknowledgements

The City of Joondalup wish to acknowledge and thank the following people for assistance and input into the plan during its development:

- Renata Zelinova from Western Australian Local Government Association (WALGA);
- Tamara Kabat from BirdLife Australia;
- Les Holden and Ann Valenti from Fire and Emergency Services Authority of Western Australia (WA) (FESA);
- Syrinx Environmental PL; and
- 360 Environmental.

Acronyms

Acronym / Abbreviation	Definition
AHD	Australian Height Datum
BoM	Bureau of Meteorology
the City	City of Joondalup
CoJ	City of Joondalup
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection
DoE	Department of Environment
DoW	Department of Water
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EDOWA	Environmental Defender's Office Western Australia (Inc)
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
EWSWA	Environmental Weed Strategy for Western Australia
FCT	Floristic Community Type
FESA	Fire and Emergency Services Authority
GIS	Geographic Information System
ha	Hectare
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
JSCWSC	Joint Steering Committee for Water Sensitive Cities
NWCPAG	National Wildlife Corridors Plan Advisory Group
Syrinx	Syrinx Environmental PL
WA	Western Australia
WALGA	Western Australian Local Government Association

Executive Summary

The Lilburne Park Management Plan outlines a framework for the management of Lilburne Park for the next five years.

Lilburne Park is located 17 kilometres north-west from the Perth Central Business District in the suburb of Duncraig. The reserve covers approximately five hectares (ha) of bushland and is predominantly used for walking.

Lilburne Park is classified as a major conservation area and is ranked in the City of Joondalup's top five natural areas due to the high biodiversity values of the area. Lilburne Park is also listed as a place having significance for the purpose of protection of the landscape or environment in Schedule 5 of the City of Joondalup District Planning Scheme No. 2.

The majority of the native vegetation at Lilburne Park is in very good condition and surveys indicate that the area is likely to support 77 native flora species, 2 native mammals, 19 native birds, 8 native reptile species and 37 native invertebrates.

Environmental threats have the potential to degrade natural areas and reduce biodiversity values. Environmental threats include weeds, plant diseases, fire, non-native fauna species, human impacts and access and infrastructure. A total of 40 weed species, 6 non-native mammals, 5 non-native birds and 2 non-native invertebrates were recorded at Lilburne Park. A number of fires have occurred in the reserve over the past few years, resulting in some degradation of vegetation.

In order to address the key environmental threats at Lilburne a number of management actions are outlined within the Plan. Management actions have been proposed for the next five years and include implementation of the City's Pathogen Management Plan, regular weed control, annual fire fuel load assessments and engaging consultants to undertake flora, weeds, fungi, fauna, bat, the Graceful Sun Moth, invertebrates and fauna crossings studies. The management actions will be implemented in partnership with key stakeholders and community groups, where relevant.

1.0 Introduction

1.1 Background

The City of Joondalup ('the City') is situated along the Swan Coastal Plain, 30 kilometres from the Perth Central Business District. The City covers an area of 96.5 kilometres which encompasses a diverse range of natural areas including 17 kilometres of coastal foreshore, a chain of wetlands and a variety of bushland ecosystems (as shown in Figure 1).

The City's southern boundary is located approximately 16 kilometres from the Perth Central Business District, and is bounded by the City of Wanneroo to the east and north, the City of Stirling to the south, and the Indian Ocean to the west.

There are a number of regionally, nationally and internationally significant natural areas located within the City including the Yellagonga Regional Park, the Marmion Marine Park, the Neerabup National Park and a number of Bush Forever sites which contain species of high conservation value.

The City of Joondalup is committed to conserving and enhancing the City's natural assets to ensure the long term protection of the environment for future generations.

1.2 Natural Areas Management Plans

The City is developing Natural Areas Management Plans to provide strategic ongoing management of the City's natural areas and protect native vegetation and ecosystems.

Environmental threats have the potential to degrade natural areas and reduce biodiversity values. Environmental threats include weeds, plant diseases, fire, non-native fauna species, human impacts and access and infrastructure.

Natural Areas Management Plans describe the potential environmental impacts and risks of activities and environmental threats in natural areas and the associated management strategies that are implemented to minimise potential impacts.

1.3 Study Area

The Study Area for the Lilburne Park Management Plan is Lilburne Park, Duncraig.

Lilburne Park is located within the City of Joondalup, 17 kilometres north-west from the Perth Central Business District. Lilburne Park covers an area of approximately 5 hectares and is bounded by Hepburn Avenue, Lilburne Road and Hilarion Road (as shown in Figure 2). The Park is adjacent to Duncraig Fire Station and is surrounded by residential properties. Lilburne Park is located close to Hepburn Conservation Area, with the two areas being separated by Hepburn Avenue. Lilburne Park is also located close to Duncraig Senior High School.

Lilburne Park is vested with and managed by the City of Joondalup. The main uses of Lilburne Park are for passive recreational purposes such as walking or dog walking. Lilburne Park is zoned as 'Parks and Recreation', whilst the surrounding residential area is zoned as Residential R20.

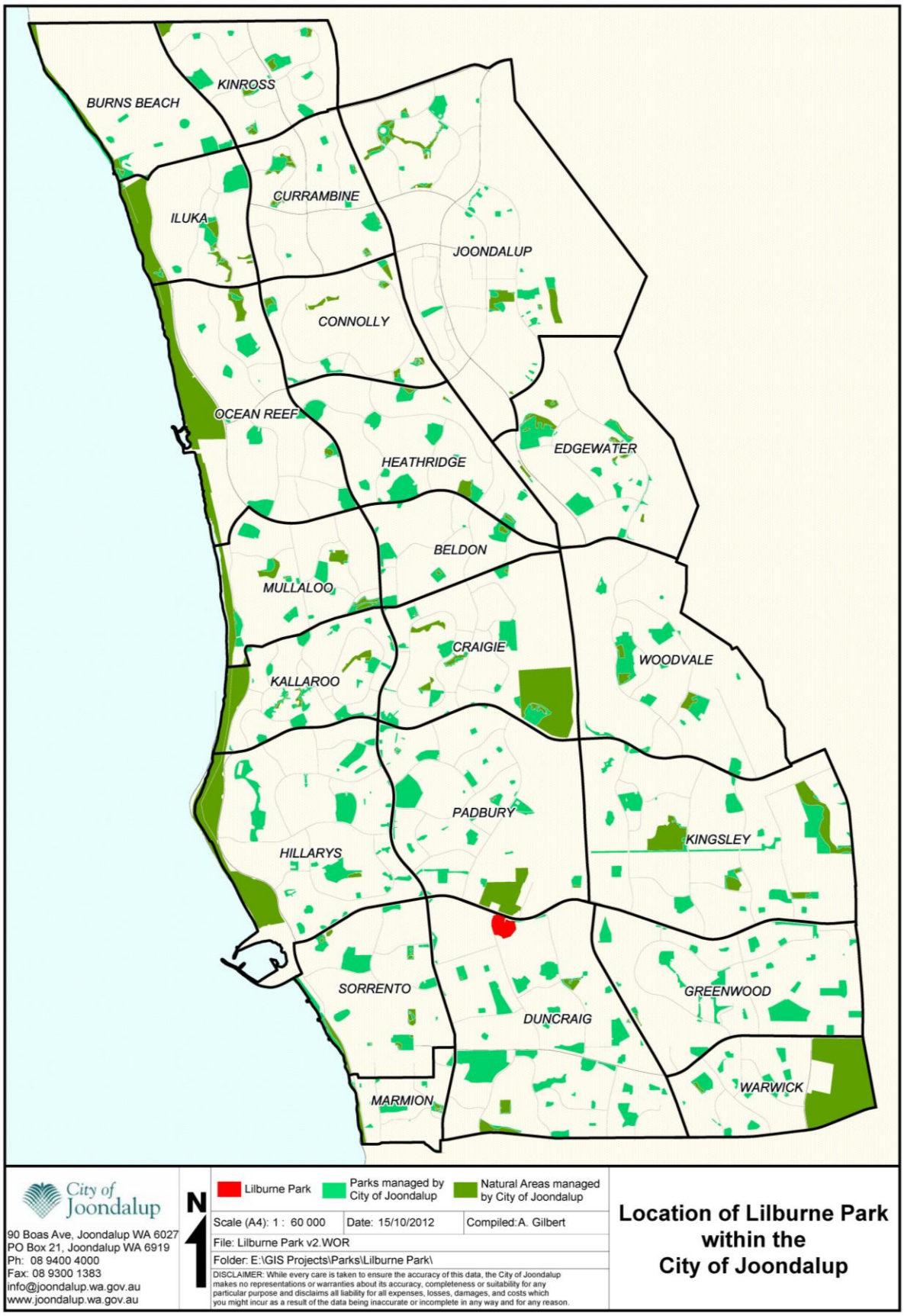


Figure 1: Location of Lilburne Park in City of Joondalup

Figure 2: Map of Study Area

1.4 Purpose

The purpose of the Lilburne Park Management Plan is to:

- Provide information to assist the City of Joondalup in prioritising maintenance schedules;
- Guide the future development of the City's Conservation Capital Works Program;
- Increase opportunities for grant funding by having a detailed schedule of projects; and
- Provide guidance to City employees and contractors and Friends Groups operating within Lilburne Park.

1.5 Aims and Objectives

The aims of the Lilburne Park Management Plan are to:

- Establish a baseline description of the environment to guide future environmental planning and recommended management actions.
- Outline key environmental threats and management strategies to minimise impact and protect conservation and recreation values.
- Outline an implementation plan to address key threats including monitoring and reporting.

The objective of the Lilburne Park Management Plan is to provide mechanisms to protect and enhance biodiversity values of the Park whilst maintaining appropriate community access and awareness of the Park.

1.6 Strategic Context

To ensure the Lilburne Park Management Plan complements other management initiatives, relevant legislation, policies, guidelines and documents were reviewed and are briefly detailed below.

1.6.1 Local Government

Strategic Plan

The City of Joondalup *Strategic Community Plan 2012-2022* highlights the focus on preservation, conservation, and accessibility of the City's natural assets and the importance of engaging with the community and regional stakeholders.

Environment Plan

The *City of Joondalup Environment Plan 2007-2011* identifies the key environmental pressures and threats and provides the strategic response to the major issues affecting the City of Joondalup.

Biodiversity Action Plan

The *City of Joondalup Biodiversity Action Plan 2009 – 2019* provides direction for the City's biodiversity management activities and details the development of individual Natural Areas Management Plans as an action.

The City of Joondalup Strategic Environmental Framework is outlined in Figure 3.

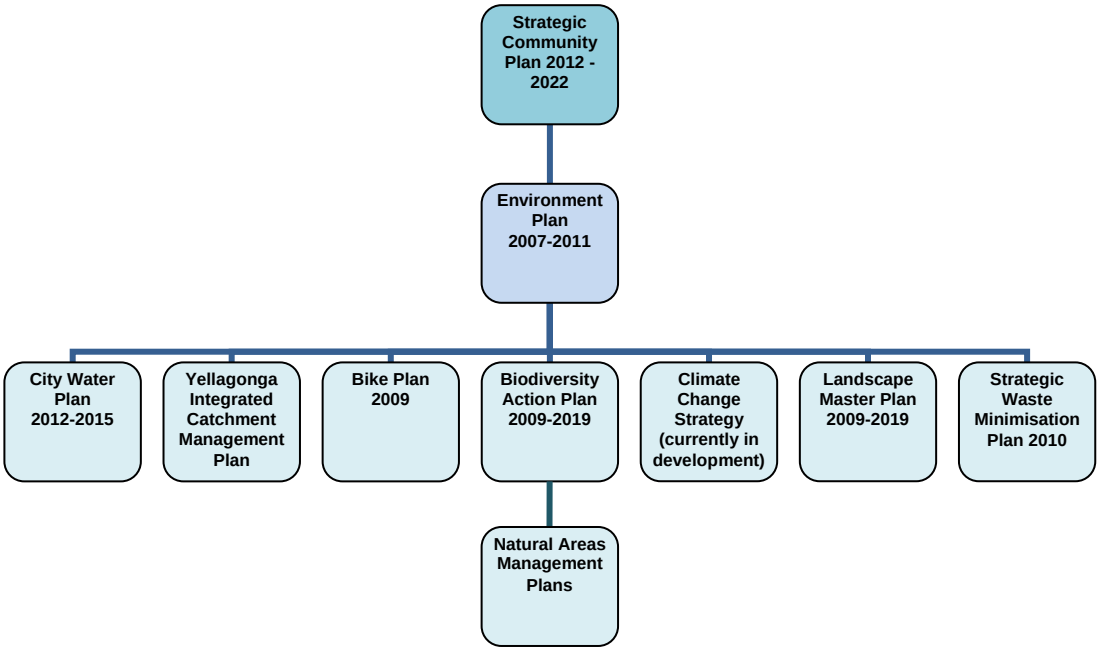


Figure 3: City of Joondalup Strategic Environmental Framework

Perth Biodiversity Project

The City of Joondalup is one of 32 local governments subscribed to the Perth Biodiversity Project. The aim of the Perth Biodiversity Project is to support local governments to effectively integrate biodiversity conservation into land use planning to protect and manage local natural areas.

As part of the Perth Biodiversity Project, the City of Joondalup assessed all natural areas from 2004 onwards using the ecological criteria of the Natural Area Initial Assessment, resulting in a priority ranking of natural areas. The City of Joondalup assess major conservation, high priority and medium priority natural areas approximately every 5-7 years using this assessment tool. Lilburne Park is one of the City's five Major Conservation Areas due to the high biodiversity values of the area.

City of Joondalup District Planning Scheme No. 2

Planning for land use occurs under the District Planning Scheme No 2. Lilburne Park is listed as a place having significance for the purpose of protection of the landscape or environment in Schedule 5 (Clause 5.3.1).

1.6.2 State Government

Relevant Legislation, Policies and Documents

Aboriginal Heritage Act 1972

The Act makes provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants.

Lilburne Park is not listed on any State or Federal Indigenous or non-Indigenous heritage inventory or register.

Agriculture and Related Resources Protection Act 1976

The Act gives provision to declare plants and animals that are known to be a significant environmental threat and provides for the management, control and prevention of these declared plants and animals for the protection of agriculture and related resources.

One declared plant, One-leaf Cape Tulip (*Moraea flaccida*), is likely to exist in Lilburne Park.[1]

Bushfires Act 1954

The Act makes provision for diminishing the dangers resulting from bush fires and for the prevention, control and extinguishment of bush fires.

Environmental Protection Act 1986

The Act provides authority to the Environmental Protection Authority (EPA) for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment in Western Australia.

Wildlife Conservation Act 1950

The Act provides the statute relating to conservation and legal protection of flora and fauna.

Only one threatened flora species, Grand Spider Orchid (*Caladenia huegelii*), potentially exists in Lilburne Park. Three threatened fauna species are likely to utilise Lilburne Park: Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris)* and Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii* naso) for foraging habitat and the migratory species Rainbow Bee-eater (*Merops ornatus*).[1]

WA Planning Commission "Bush Forever" Strategy 2000

The Strategy identifies regionally significant bushland in the Perth Metropolitan Region to be retained, managed and protected forever.

Two species were listed as significant flora of the Perth Metropolitan Region, *Conostylis aculeata* subsp *cygnorum* and Yellow Leschenaultia *(Lechenaultia linarioides*).[1]

State Planning Policy 2.8

The State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region was prepared under the *Planning and Development Act 2005*. The aim of the Policy is to provide direction and an implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision-making.

[1] Syrinx (2012)

1.6.3 Federal Government

Environment Protection and Biodiversity Conservation Act 1999

The Act provides for the protection of the environment and the conservation of biodiversity, and for related purposes.

Two *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* listed species are likely to utilise Lilburne Park, Carnaby's Black-Cockatoo for foraging habitat (*Calyptorhynchus latirostris*) and the migratory species Rainbow Bee-eater (*Merops ornatus*). The endangered Grand Spider Orchid (*Caladenia huegelii*) could potentially exist within Lilburne Park.[1]

Australia's Biodiversity Conservation Strategy 2010-2030

The Strategy aims to protect biological diversity and maintain ecological processes and systems.

1.6.4 International Conventions or Listings

International Union for Conservation of Nature (IUCN) Red List of Threatened Species

The IUCN Red List of Threatened Species™ provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria.

One endangered IUCN Red List species is likely to utilise Lilburne Park as foraging habitat, the Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*).[1]

1.6.5 Stakeholder Consultation

Stakeholder engagement will occur through a community consultation process with the Council endorsed draft version of the Lilburne Park Management Plan.

1.6.6 Land Tenure and Vesting

Lilburne Park is vested with and managed by the City of Joondalup.

2.0 Description of the Environment

2.1 Physical Environment

2.1.1 Geology, Soils and Landforms

Soils of the Swan Coastal Plain

Lilburne Park is situated with the City of Joondalup which is located within the Swan Coastal Plain. The majority of the soils of the Swan Coastal Plain are formed by material deposited by rivers and wind. A series of dune systems has been formed with the youngest dunes being the Quindalup Dunes nearest the coast, followed by the Spearwood Dunes and the oldest Bassendean Dunes are farthest from the coast, as shown in Figure 4.[2]

[2] Bolland (1998)

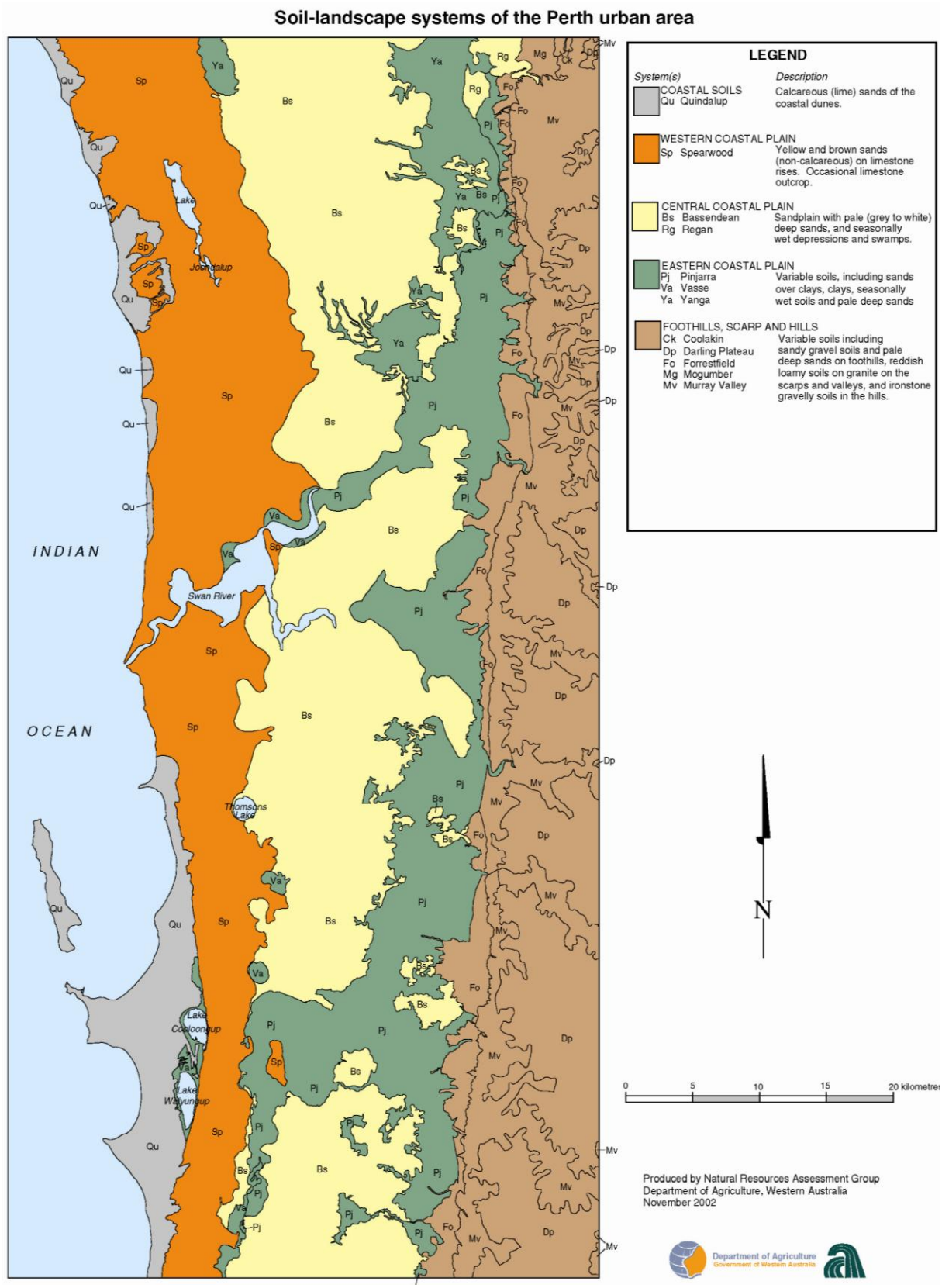


Figure 4: Soils of the Swan Coastal Plain (Department of Agriculture 2002)

Lilburne Park is located within the Spearwood Dunes which have a core of sandy aeolianite with a capping of secondary limestone (Tamala Limestone, predominantly calcarenite) overlain by yellow brown siliceous sands with weak podzol development.[3,4]

The Spearwood Dunes are believed to have formed around 40,000 years ago and comprise of red/brown, yellow and pale yellow/grey sands. The majority of the sands to the west are the yellow/grey sands known as the Karrakatta sands[5] representative of the following:

- Karrakatta sand (yellow phase). Grey—brown sandy surface passing into bright yellow siliceous sand and often with limestone within two metres.
- Karrakatta sand (grey phase). Grey sandy surface, a very light grey sub-surface, and pale yellow sand within one metre; limestone occurs at depth.

This system has an undulating surface, with some higher ridges and hills, and hollows representing dune swales.[6] The land contours range from 20-34 metres Australian Height Datum (AHD).[4] Lilburne Park gently slopes from north to west.

Acid Sulphate Soils

Acid Sulphate Soils are naturally occurring soils and sediments that contain iron sulphides. Acid Sulphate Soils are predominantly found in low-lying coastal wetlands and tidal flats and are harmless when left undisturbed. Exposure to air causes the iron sulphides in Acid Sulphate Soils to react with oxygen and water producing iron compounds and sulphuric acid, which can lead to heavy metals being released into the surrounding environment.[7]

Acid Sulphate Soils are categorised as Potential Acid Sulphate Soils or Actual Acid Sulphate Soils. Potential Acid Sulphate Soils have not been oxidised by exposure to air whilst Actual Acid Sulphate Soils have been disturbed or exposed to oxygen and become acidic.[7]

There is no known risk of Acid Sulphate Soils in Lilburne Park.[4] The risk of Acid Sulphate Soils is based on the likelihood of Acid Sulphate Soils occurring within soil profiles and has been mapped by the Department of Environment and Conservation (DEC) using available desk-top information and limited ground-truthing within areas where intensive on-ground mapping and soil analysis work has been undertaken. The mapping undertaken has found that Acid Sulphate Soils are not known or expected to occur in the environment of Lilburne Park on the basis of origin of the geological units present, depth to groundwater and partial "ground truthing" or onsite investigation.[7,8]

2.1.2 Hydrology

Groundwater

The City of Joondalup is located on Perth's largest source of groundwater, the Gnangara Groundwater System, comprising four main aquifers: superficial (shallow, unconfined), Mirrabooka (deeper, semi-confined), Leederville (deep, mostly confined) and the Yarragadee (deep, mostly confined). The Gnangara Mound extends across most of the superficial aquifer and refers to the water table creating a mound shape, as shown in Figure 5.

[3] McArthur and Bettenay cited in Syrinx (2012)
[4] Department of Water (2004)
[5] DAFWA cited in Syrinx (2012)
[6] Shire of Wanneroo cited in Syrinx (2012)
[7] DEC n.d.(a)
[8] Landgate (2006)

Groundwater levels in the superficial aquifer have been declining over recent years due to pressure from extraction and the impacts of climate change.[9]

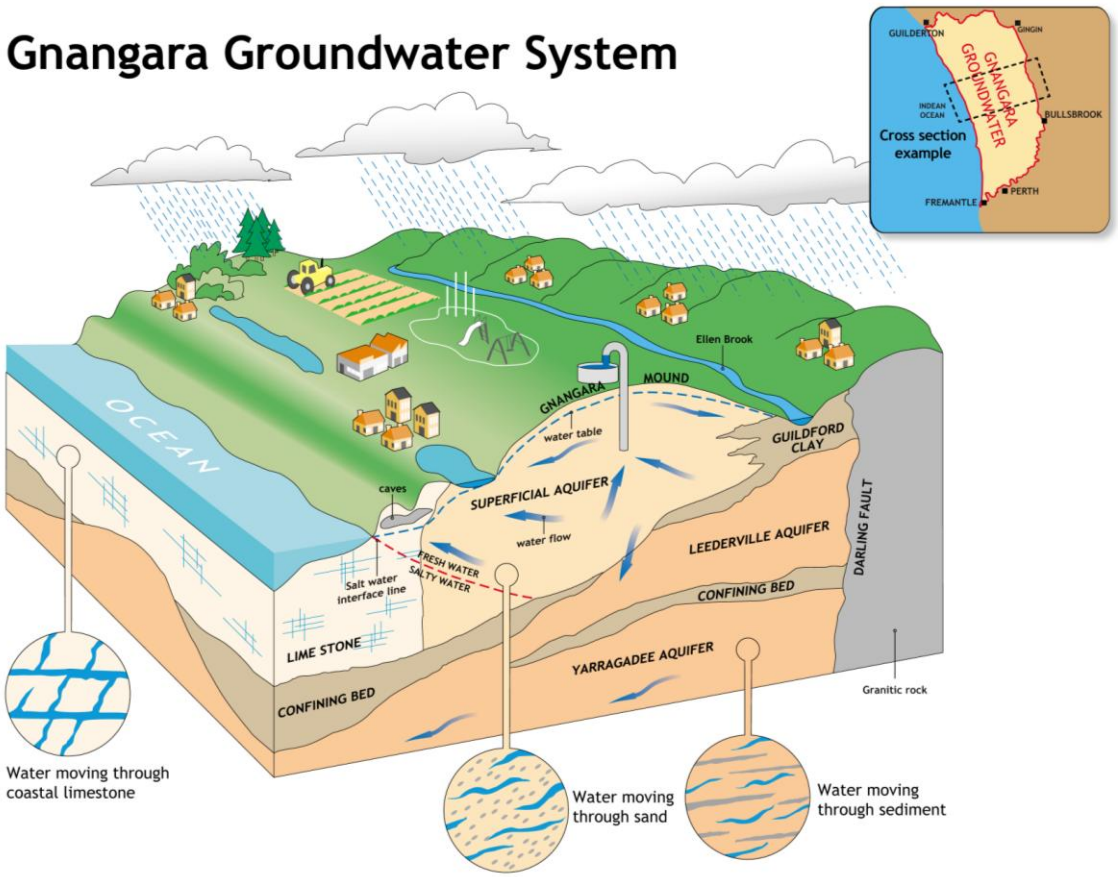


Figure 5: Gnangara Groundwater System (DoW n.d.)

Vegetation at Lilburne Park is unlikely to be dependent on groundwater for survival as the depth to water is 17-29 metres and the depth of water is 32 metres. Depth to water is the depth from the natural surface contours to the water table, whilst depth of water is depth from the water table contours to the base of the superficial aquifer (see Figure 6). Groundwater salinity at Lilburne Park is fresh (0 – 500 TDS in mg/L).

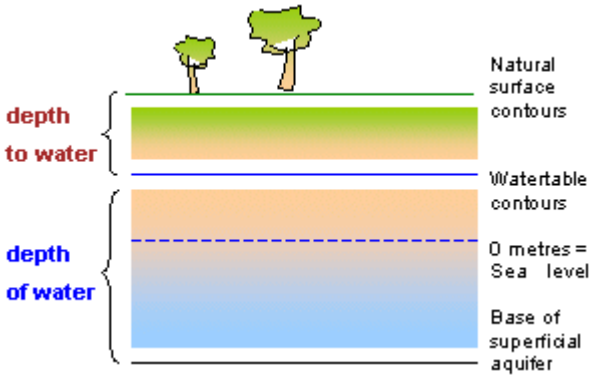


Figure 6: Groundwater Depth Explanation (DoW 2004)

[9] CoJ (2012a)

The use of groundwater for domestic irrigation through bores is deemed suitable in the area and is supported in preference to scheme water. The area is low in iron concentration, resulting in a low iron staining risk.[4]

Stormwater Drainage

Stormwater consists of runoff from rainfall and any material collected in its path of flow. Stormwater has the potential to recharge the superficial aquifer.[10]

Sumps allow stormwater to infiltrate retention basins (sumps), detain the water and over time the water is absorbed back into groundwater. Most sumps are steeply graded rectangular excavations with an inflow at the bottom. Sumps are fenced off in the interest of community safety due to the potential for rapid stormwater inflow.[11]

The main stormwater drainage line in Lilburne Park is from west to east along the limestone path and into the sump, as shown in Figure 7.

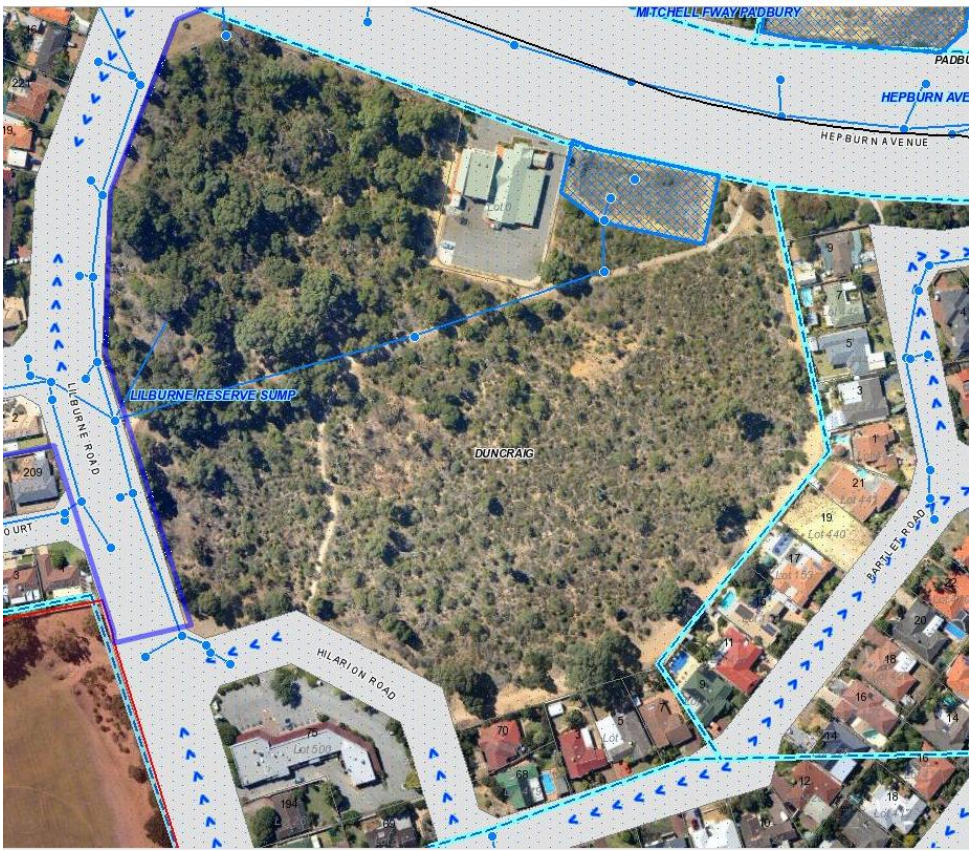


Figure 7: Lilburne Park Drainage Lines and Sump

2.1.3 Climate

The City of Joondalup experiences a Mediterranean climate with hot dry summers with an average temperature of 31 degrees during the day and cold wet winter with an average day time temperature of 19 degrees. Approximately 80 percent of the annual rain falls between the months of May and September, as shown in Figure 8.[12]

[10] DoE (2004)
[11] Grose and Hedgcock (n.d.)
[12] BoM (2012)

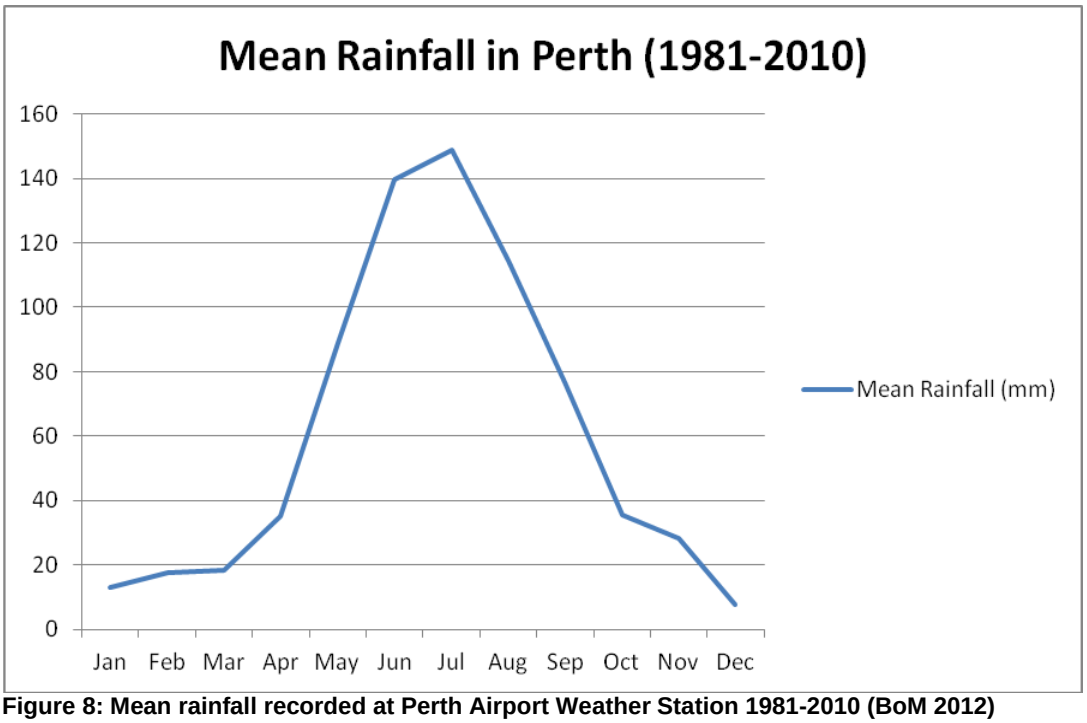


Figure 8: Mean rainfall recorded at Perth Airport Weather Station 1981-2010 (BoM 2012)

2.1.4 Vegetation

Vegetation Complexes

Vegetation complexes are based on soils and landforms in medium to large areas on the Swan Coastal Plain. Regional scale mapping shows the project area is classified as having Cottesloe Complex - Central and South (see Figure 9). This complex consists of predominantly open forest of *Eucalyptus gomphocephala – Eucalyptus Marginata – Corymbia calophylla* and woodland of *Eucalyptus Marginata* – Banksia species.[13]

The City of Joondalup portion of the pre-European extent of Cottesloe Complex – Central and South in Perth and Peel was 9% (3,966 ha). Approximately 35% (15,251 ha) of this vegetation complex currently remains in Perth and Peel. The City of Joondalup proportion of the current extent of Cottesloe complex – Central and South in Perth and Peel is 2% (345 ha), while the City of Joondalup level of retention of pre-European Cottesloe complex Central and South is just under 9%.

The State Government has established targets under Bush Forever which aim to protect at least 10% of each vegetation complex in the Perth Metropolitan Region to achieve a comprehensive representation of all the ecological communities originally occurring in the region.[14,15]

The project area's vegetation was described as Eucalyptus Woodland: Low Woodland Other.[16]

[13] Heddle et. al. cited in Syrinx (2012)
[14] WALGA (2010)
[15] Department of Planning (2000)
[16] Beard cited in Syrinx (2012)

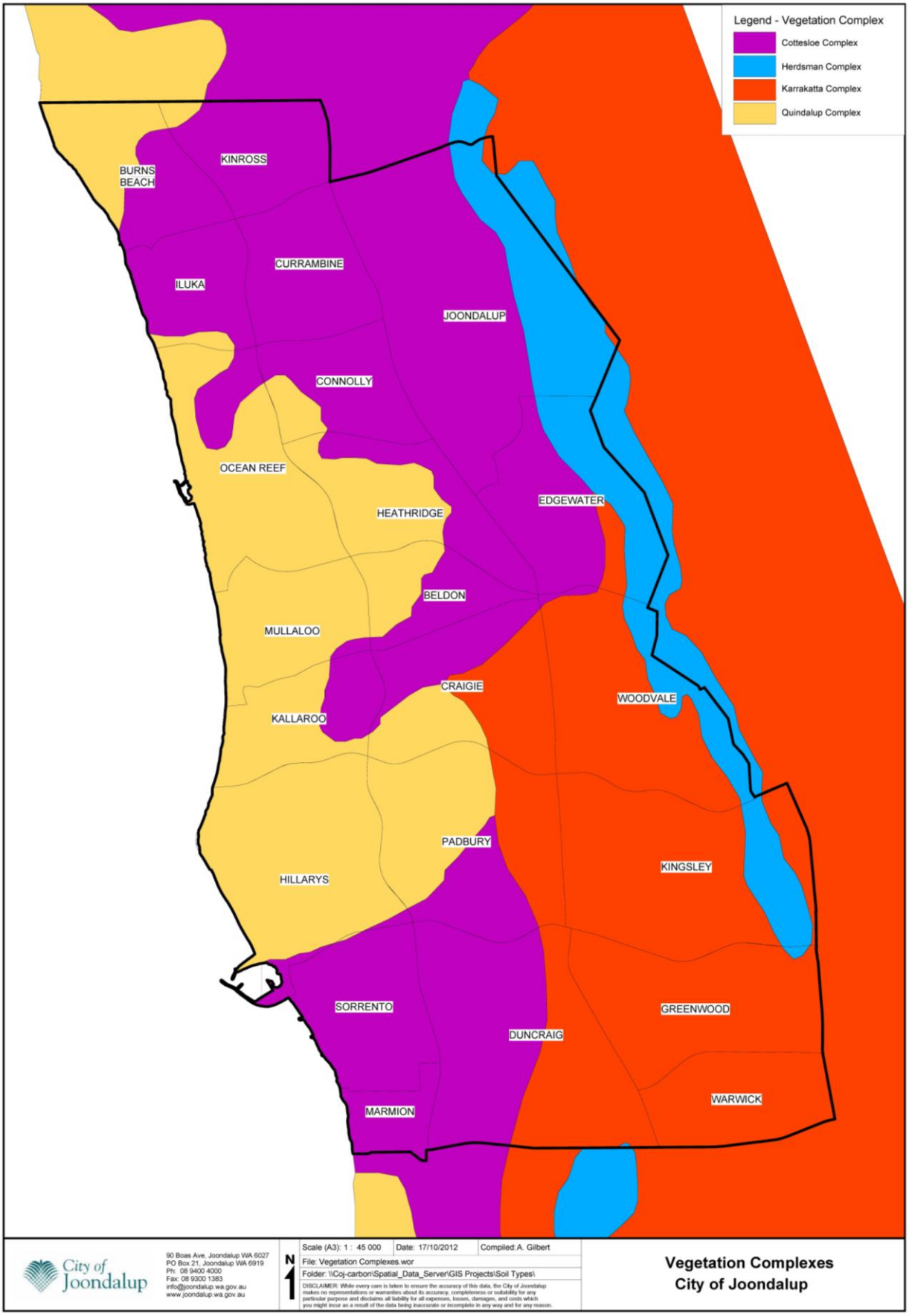


Figure 9: City of Joondalup Vegetation Complexes

Floristic Community Types

Floristic Community Types (FCTs) classify vegetation on the Swan Coastal Plain into groups of plant species that tend to co-occur in small to medium areas.

The following FCTs are possible within Lilburne Park:

- 24 - Northern Spearwood shrublands and woodlands;
- 26b - Woodlands and Mallees on limestone;
- 28 - Spearwood *Banksia attenuata* or *Banksia attenuata*- Eucalyptus woodlands; and
- 29a - Coastal shrublands on shallow sands.

Vegetation Communities

Two vegetation communities were identified at Lilburne Park, as described in Table 1 (shown in Figures 10, 11 and 12):

Vegetation Community No.	Description	Vegetation Condition
1	*Banksia attenuata* Low Woodland over Mixed Open Heath over Open Sedgeland of *Mesomelaena pseudostygia* and *Desmocladus flexuosus*	Very Good
2	*Eucalyptus gomphocephala* Open Woodland over *Eucalyptus marginata* Low Open Woodland over Mixed Open Heath over Mixed Low Shrubland over Very Open Mixed Sedgeland	Very Good

Table 1: Vegetation Communities at Lilburne Park

No Threatened or Priority Ecological Communities were identified within Lilburne Park or in nearby bushland.[1]

Vegetation Condition

The vegetation condition at Lilburne Park ranges from very good to degraded. The majority of the remnant vegetation is in very good condition, with patches of very good vegetation with the edges being degraded from past disturbance and encroachment of weeds. There is a degraded area in the centre of Lilburne Park that was burnt in 2011. Vegetation condition is shown in Figure 13 and 14.

Natural Areas Initial Assessments conducted in 2004 and 2011 by the City of Joondalup rated the vegetation condition using the Keighery Scale. Syrinx and 360 Environmental conducted a vegetation condition assessment in February 2012 and September 2012 respectively. The Keighery Scale rates the condition of vegetation from pristine to completely degraded, as detailed in Appendix 3. The majority of the vegetation condition in 2012 was rated as very good, followed by degraded, as shown in Table 2. The vegetation assessment in September 2012 was derived by 360 Environmental due to observations regarding the species richness of the community, numbers of native species, the impact to the structure of the community, physical disturbance, the health condition of most species' populations and the numbers of aggressive and competitive weeds. There has been a reduction in the amount of vegetation rated as excellent and good over the past decade, which can be largely attributed to the amount of bush fires that have taken place.

Year	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded
April 2004	0	20%	55%	20%	5%	0
Nov 2011	0	0	75%	20%	5%	0
Sept 2012	0	0	72%	2%	26%	0

Table 2: Lilburne Vegetation Condition Assessment using Keighery Scale (2004, 2011 and 2012)

Figure 10: Vegetation Community 1 (Syrinx 2012)

Figure 11: Vegetation Community 2 (Syrinx 2012)

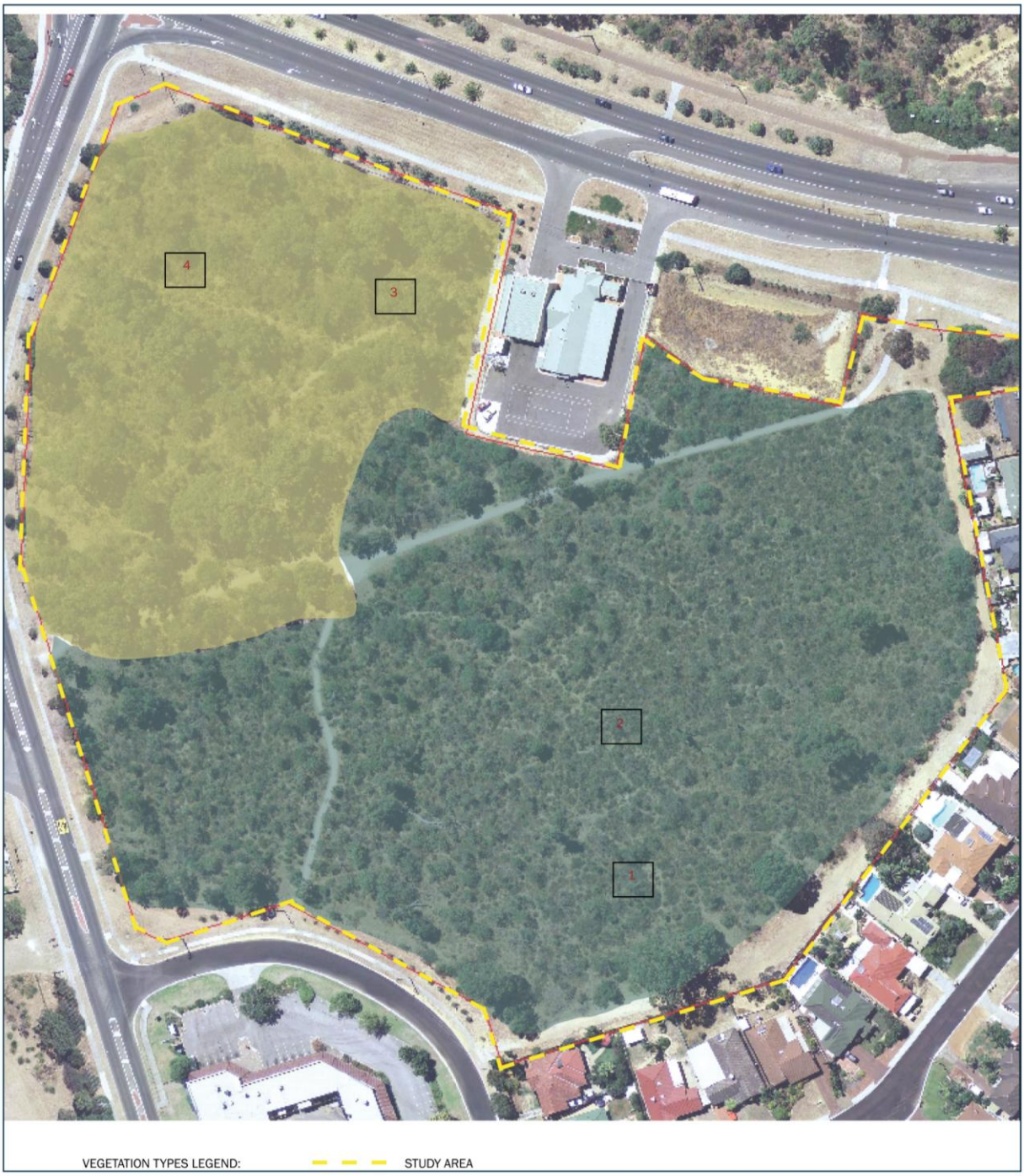


Figure 12: Lilburne Park Vegetation Communities (Syrinx 2012)

Figure 13: Lilburne Park Vegetation Condition - February 2012 (Syrinx 2012)

Figure 14: Lilburne Park Vegetation Condition - September 2012 (360 Environmental 2012)

3.0 Biodiversity Conservation

The natural area of Lilburne Park supports an abundance of plant and animals species. The long term protection of biodiversity values within Lilburne Park is critical to ensure the conservation of this unique habitat. The protection and enhancement of biodiversity within Lilburne Park also benefits the community through the provision of ecological services such as the capture of carbon dioxide, cooling of urban environments and a number of recreational and cultural experiences.[17]

There are a number of environmental threats that pose a risk to the biodiversity of Lilburne Park. The key environmental threats at Lilburne Park include:

- Weeds;
- Fire;
- Pathogens and disease; and
- Non-native fauna species.

Management strategies to address the key environmental threats have been established and are discussed in detail in the following section.

3.1 Flora

Southwest Australia, from Shark Bay in the north to Israelite Bay in the south, is one of 34 biodiversity hotspots in the world. There are over 2,900 endemic plant species in this region. Approximately 30% of the original vegetation extent of this area remains, with habitat loss being primarily due to agricultural expansion.[18] Lilburne Park is located within the Southwest Australia biodiversity hotspot.

The City engaged consultants, Syrinx Environmental PL, to undertake a flora survey of Lilburne Park in February 2012. Flora surveys document components of biodiversity and make recommendations to minimise ecological impacts. The findings and recommendations from scientifically-based flora surveys can be reflected in management planning decisions.[19] Subsequent to the flora survey, a vegetation condition assessment was conducted by consultants, 360 Environmental, in September 2012. In addition to a vegetation condition assessment, observations of some native and non-native flora species were recorded.

Flora Survey Methodology

Desktop study
A review was undertaken of all the available information provided by the City of Joondalup and any additional relevant information to provide a detailed background for Lilburne Park.[1] Natural Area Initial Assessments were undertaken by the City of Joondalup in 2004 and 2011 and were reviewed as part of the desktop study. Natural Area Initial Assessments include documenting information such as:

- vegetation complexes;
- threatened or significant flora or ecological communities;
- structured plant communities;
- weed species;

[17] CoJ (2012b)
[18] Conservation International (2012)
[19] Murray, Bell and Hoye (2002)

- rating vegetation condition;
- ecological criteria rankings; and
- a viability estimate.

Field survey
The floristic survey method included the set-up of two quadrats (10m x 10m) within each vegetation type delineated on aerial photography during the desktop assessment. Within each quadrat all species present were recorded (native and non-native) along with estimated abundance and percent cover per species. Vegetation and potential threatened species habitat was also traversed on foot in a series of parallel transects with vegetation condition being assessed. Weed populations were surveyed and recorded.[1]

Due to time limitations, the flora survey was conducted in summer. The optimum time to survey flowering annual flora species is spring, whilst weeds are most detectable in winter.

Native Flora

Native flora is an important part of the Lilburne Park ecosystem. The loss of native plant species can lead to a loss of fauna that depend on flora for food and shelter. A total of 77 native species were recorded at Lilburne Park (see Appendix 2).

Only one threatened species, Grand Spider Orchid (*Caladenia huegelii*), potentially exists in Lilburne Park.[1]

Two species in Lilburne Park were listed as significant flora of the Perth Metropolitan Region, *Conostylis aculeata* subsp *cygnorum* and Yellow Leschenaultia *(Lechenaultia linarioides*).[1]

Several populations of *Lomandra maritima* were observed in Lilburne Park, the food source for the threatened fauna species the Graceful Sun Moth (*Synemon gratiosa*). Some of the key native flora species existing or potentially existing at Lilburne Park are shown in Table 3.

Name	Common Name	Conservation Code	Likelihood	Image
Caladenia huegelii	Grand Spider Orchid	Schedule 1 (*Wildlife Conservation Act*), Critically Endangered (DEC) and Endangered (EPBC)	Potential	 Photo: I. And M. Greeve (WA Herbarium n.d.)

Name	Common Name	Conservation Code	Likelihood	Image
Conostylis aculeata subsp *cygnorum*		Taxa endemic to the Swan Coastal Plain, Significant Flora of the Perth Metropolitan Region	Confirmed	 Photo: K.C. Richardson (WA Herbarium n.d.)
Lechenaultia linarioides	Yellow Leschenaultia	Considered to be poorly reserved, Significant Flora of the Perth Metropolitan Region	Confirmed	
Lomandra maritima		Food source for threatened fauna species the Graceful Sun Moth (*Synemon gratiosa*)	Confirmed	

Table 3: Potential or Confirmed Threatened and Significant Flora at Lilburne Park (Syrinx 2012)

Note: For further explanations on Conservation Codes, refer to Appendix 2.

Weeds

Non-native flora or weeds can be exotic species or native species in ecosystems in which they previously did not exist. Weeds are commonly introduced and distributed within bushland areas through the dispersal of seed by wind and animals and birds, through dumping of garden refuse and through the use of machinery in natural areas.

Weeds have major economic, environmental and social impacts in Australia and can:

- displace native plant species;
- harbour pests and diseases;
- create fuel loads for fires;
- impact negatively on fauna and flora and their habitats; and
- compete with native species for space, water and nutrients.[17]

Over 27,000 known alien plant species have been introduced to Australia with approximately 10% now being established in the environment. Garden plants are the main source of Australia's weeds, accounting for 66% of recognised weed species.[17,20,21]

A total of 40 weed species were recorded at Lilburne Park (see Appendix 2). The majority of the weed species were grasses from the Poaceae family and daisies from the Asteraceae family. The majority of weeds were located in previously cleared degraded areas and along the edges of the remnant vegetation. The Annual Veldt grass was scattered throughout the bushland. The weed species with the most populations in summer were False Onion Weed (*Trachyandra divaricata*), Flaxleaf Fleabane (*Conyza bonariensis*) and Rose Pelargonium (*Pelargonium capitatum*).[1]

One declared plant, One-leaf Cape Tulip (*Moraea flaccida*), is likely to exist in Lilburne Park.[1] Key weed species existing at Lilburne Park are shown in Table 4 and the location of invasive weed species at Lilburne Park is shown in Figure 16.

Revegetation

The City of Joondalup follows the 'Bradley Method' of bush regeneration, i.e. "remove weeds competing with native plants in the good condition sections of bush and work out at the pace of natural regeneration, disturbing the soil as little as possible".[22] These principles encourage the vegetation to re-establish by itself and maintain high conservation values of natural areas.

Current Management Approach

Management of weeds at Lilburne Park is undertaken through weed monitoring, on ground weed management and community education initiatives.

Weed monitoring is conducted monthly at Lilburne Park to establish the extent of weeds and to identify priority weed species. The outcomes from weed monitoring inform the on ground weed management program.

The City monitors the density of priority environmental weeds in Lilburne Park on an annual basis, measured on three transects in the reserve. There has been an increase in weed density in 2011/12 due to prolonged rainfall in spring 2011, which increased the longevity of winter weeds and enabled new growth later in the season (see Figure 15).

[20] DSEWPC (2012)
[21] Groves, Boden and Lonsdale (2005)
[22] Bradley (2002)

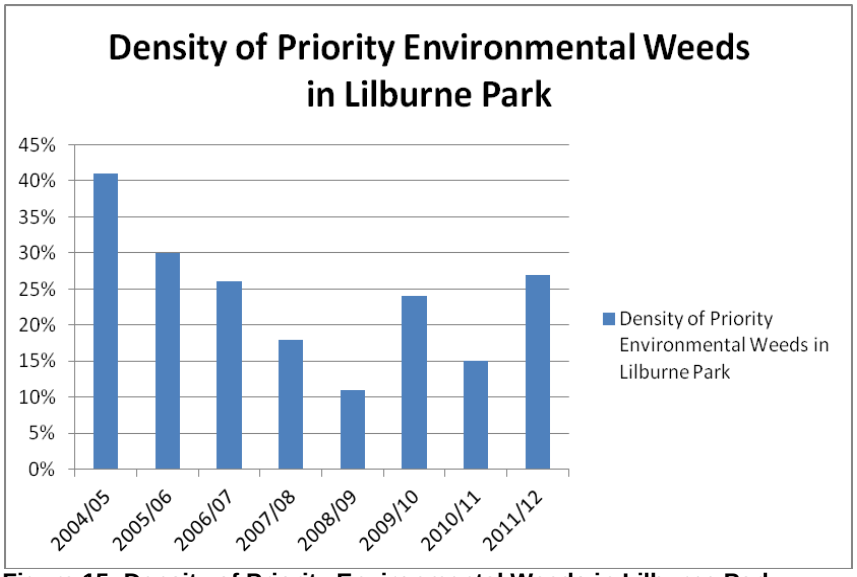


Figure 15: Density of Priority Environmental Weeds in Lilburne Park

In accordance with the City's Annual Bushland and Weekly Bushland Schedules on ground weed management occurs through weed spraying and hand weeding methods with approximately 16 hours a fortnight being allocated to weed management at Lilburne Park. In addition to this, contractors are engaged to spray weeds for approximately 70 hours per year and hand weed for approximately 150 hours annually. City of Joondalup staff use a weed spraying procedure and conduct weed trials periodically to evaluate the most effective weed management methods. There is currently no specific City of Joondalup hand weeding procedure due to the need for different hand weeding procedures for different weed species.

A City of Joondalup Weed Management Plan is to be developed in 2012/13 to provide guidance on weed surveying, priority weed species control and seasonal weed control measures.[17]

The recommended weed treatment methodology is detailed in Table 5 and Table 6.

A number of education initiatives have been undertaken to raise the awareness of weeds with the community, these include:

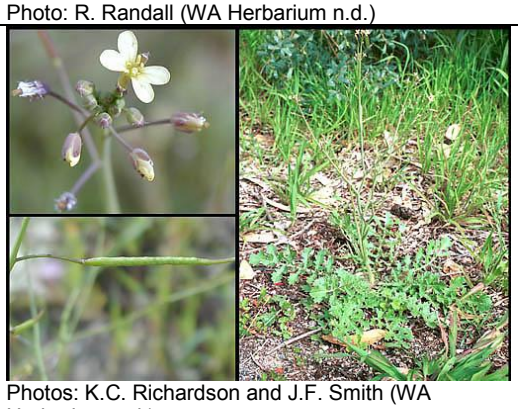
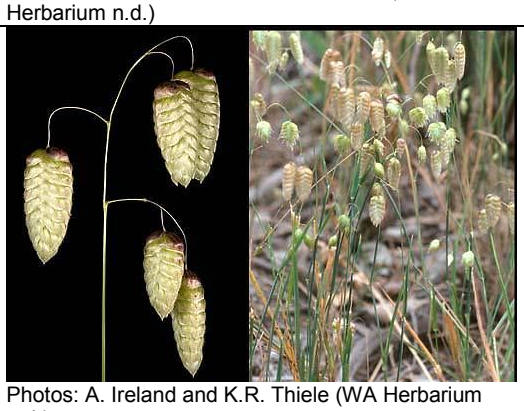
- Delivery of Great Gardens Workshops;
- Development and distribution of two weed brochures – *Environmental Weeds* and *Garden Escapees*; and
- Weed Education Workshops for Local Friends Groups.

Recommended Management Actions

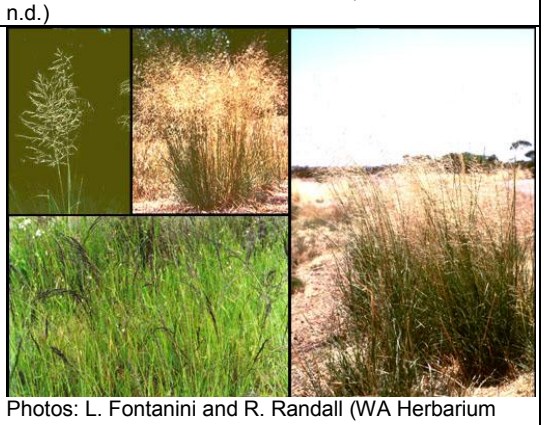
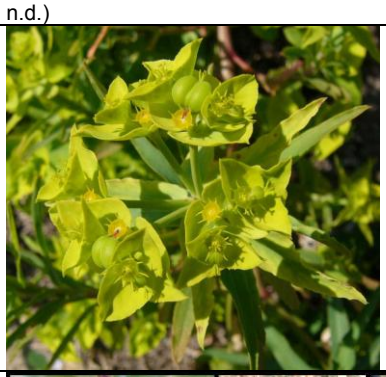
To monitor, conserve and protect native flora in Lilburne Park, the following management actions are proposed:

- Engage consultants to undertake a follow up flora survey in spring to supplement previous flora survey undertaken in summer.
- Conduct five yearly follow up of Natural Areas Initial Assessment in spring to monitor ecological health of site.
- Engage consultants to undertake a follow up weed survey in winter to supplement previous weed survey undertaken in summer.
- Undertake coordinated approach to regular weed control by implementing Annual Bushland Schedule and Weekly Bushland Schedule.

- Develop and implement hand weeding procedure to ensure a consistent hand weeding approach is undertaken by the City of Joondalup, contractors and Friends groups.
- Update the City's weed spraying procedure to reflect current weed spraying methodology which has improved over time through weed trials.
- Develop and implement a City of Joondalup Weed Management Plan to provide guidance on weed surveying, priority weed species control and seasonal weed control measures.

Name	Common Name	Conservation Code	Image
Avena barbata	Bearded Oat	Alien to Western Australia	 Photo: R. Randall (WA Herbarium n.d.)
Brassica tournefortii	Mediterranean Turnip	Alien to Western Australia	 Photos: K.C. Richardson and J.F. Smith (WA Herbarium n.d.)
Briza maxima	Blowfly Grass	Alien to Western Australia	 Photos: A. Ireland and K.R. Thiele (WA Herbarium n.d.)

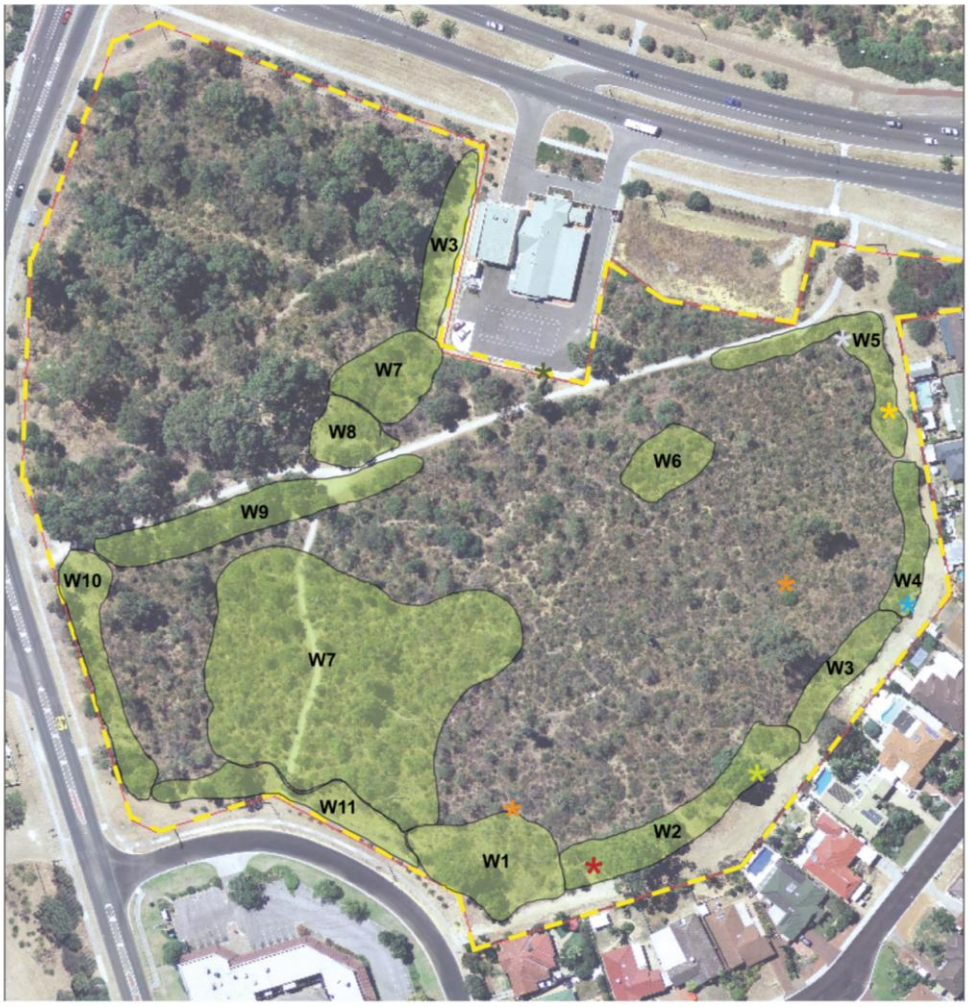
Name	Common Name	Conservation Code	Image
Bromus sp	Brome Grass	Alien to Western Australia	 Photo: Una Bell (WA Herbarium n.d.)
Carpobrotus edulis	Hottentot Fig	Alien to Western Australia	 Photos: I.R. Dixon, K. Richardson and R. Robson (WA Herbarium n.d.)
Conyza bonariensis	Flaxleaf Fleabane	Alien to Western Australia	
Ehrharta calycina	Perennial Veldt Grass	Alien to Western Australia	 Photos: S.M. Armstrong (WA Herbarium n.d.)

Name	Common Name	Conservation Code	Image
Ehrharta longiflora	Annual Veldt Grass	Alien to Western Australia	 Photos: L. Fontanini and R. Randall (WA Herbarium n.d.)
Eragrostis curvula	African Lovegrass	Alien to Western Australia	 Photos: L. Fontanini and R. Randall (WA Herbarium n.d.)
Euphorbia terracina	Geraldton Carnation Weed	Alien to Western Australia	
Ferraria crispa	Black Flag	Alien to Western Australia	 Photos: K.C. Richardson and D.P. Robinson (WA Herbarium n.d.)

Name	Common Name	Conservation Code	Image
Freesia alba x leichtlinii	Freesia	Alien to Western Australia	 Photos: J. Dodd and K.R. Thiele (WA Herbarium n.d.)
Fumaria capreolata	Whiteflower Fumitory	Alien to Western Australia	 Photos: J. Dodd, K.C. Richardson and K.R. Thiele (WA Herbarium n.d.)
Gladiolus caryophyllaceus	Wild Gladiolus	Alien to Western Australia	 Photos: J. Dodd and K.C. Richardson (WA Herbarium n.d.)
Lupinus consentinii	Blue Lupin	Alien to Western Australia	 Photos: J. Dodd and J.F. Smith (WA Herbarium n.d.)

Name	Common Name	Conservation Code	Image
Moraea flaccida	One-leaf Cape Tulip	Declared Weed, Department of Agriculture and Food WA (DAFWA)	 Photos: R. Knox and K.C. Richardson (WA Herbarium n.d.)
Pelargonium capitatum	Rose Pelargonium	Alien to Western Australia	
Trachyandra divaricata	False Onion Weed	Alien to Western Australia	 Photos: K. Eddington, K.C. Richardson and J.F. Smith (WA Herbarium n.d.)
Watsonia meriana var. *bulbillifera*	Watsonia	Alien to Western Australia	 Photo: R. Randall (WA Herbarium n.d.)

Table 4: Key Weed Species at Lilburne Park (Syrinx 2012, 360 Environmental 2012)



WEED POLYGONS: — — — STUDY AREA

Area	Species name	Common name
W1	Trachyandra divaricata	False Onion Weed
	Solanum nigrum Blackberry	Nightshade
	Conyza bonariensis	Fleabane
	Euphorbia terracina	Geraldton Carnation Weed
W2	Euphorbia terracina	Geraldton Carnation Weed
	Trachyandra divaricata	False Onion Weed
	Conyza bonariensis	Fleabane
	Pelargonium capitatum	Rose Pelargonium
	Sonchus oleraceus	Common Sowthistle
	Solanum nigrum	Blackberry Nightshade
W3	Conyza bonariensis	Fleabane
W4	Conyza bonariensis	Fleabane
	Chamelaucium uncinatum	Geraldton Wax
	Solanum nigrum	Blackberry Nightshade
W5	Pelargonium capitatum	Rose Pelargonium
	Conyza bonariensis	Fleabane
	Trachyandra divaricata	False Onion Weed
W6	Pelargonium capitatum	Rose Pelargonium
	Lupinus sp	Lupin
	Trachyandra divaricata	False Onion Weed
W7	Banksia prionotes	Acorn Banksia
W8	Trachyandra divaricata	False Onion Weed
W9	Hakea trifurcata	Two-leafed Hakea
	Grevillea crithmifolia	
	Jacksonia furcellata	Grey Stinkwood
	Kunzea ericifolia	Spearwood
	Hakea prostrata	Harsh Hakea
W10	Trachyandra divaricata	False Onion Weed
	Pelargonium capitatum	Rose Pelargonium
	Euphorbia terracina	Geraldton Carnation Weed
	Sonchus oleraceus	Common Sowthistle
W11	Trachyandra divaricata	False Onion Weed
	Conyza bonariensis	Fleabane
	Pelargonium capitatum	Rose Pelargonium
	Euphorbia terracina	Geraldton Carnation Weed

Weed points

Species name	Common name
Grevillea crithmifolia	
Acacia iteaphylla	Flinders range Wattle
Eremaea pauciflora var pauciflora	
Schinus terebinthifolius	Japanese Pepper
Watsonia meriana var. bulbillifera	Watsonia
Agave americana	Century Plant

CLIENT :	CITY OF JOOUNDALUP	DRAWING :	WEEDS	DATE :	25.05.2012
PROJECT :	LILBURNE PARK FLORA SURVEY	DRAWING NUMBER :	1204-04	SCALE :	NTS
PROJECT NUMBER :	1204	DRAWING REFERENCE :		DRAWN BY :	MS

SYRINX environmental pl

Figure 16: Location of Invasive Weed Species in Lilburne Park (Syrinx 2012)

Note: Subsequent to weed mapping conducted by Syrinx in February 2012, 360 Environmental conducted a vegetation condition assessment and noted prevalent weeds in September 2012. Additional weeds on site that were observed but not mapped were:

- Mediterranean Turnip (*Brassica tournefortii*);
- Freesia (*Freesia alba x leichtlinii*);
- Wild Radish (*Raphanus raphanistrum*); and
- Cape Bluebell (*Wahlenbergia capensis*).

Species	Common Name	Treatment Number	Timing
Highest Priority			
Avena barbata	Bearded Oat	2	Mid-June to mid-Aug
Brassica tournefortii	Mediterranean Turnip	4	Aug-Sept
Briza maxima	Blowfly Grass	2	Mid-June to mid-Aug
Bromus sp	Brome Grass	1,2	Mid-June to mid-Aug
Carpobrotus edulis	Hottentot Fig (Pigface)	1,4	Anytime
Ehrharta calycina	Perennial Veldt Grass	2	Mid-June to mid-Aug
Ehrharta longiflora	Annual Veldt Grass	2	Mid-June to mid-Aug
Eragrostis curvula	African Lovegrass	1	Anytime
Euphorbia terracina	Geraldton Carnation Weed	1,4,5	June-Oct spraying, anytime for hand weeding
Ferraria crispa	Black Flag	6	Aug-Oct - spraying
Freesia alba x leichtlinii	Freesia	6	Aug-Sept
Fumaria capreolata	Whiteflower Fumitory	4, 5 or 6	June/July spray, July-Oct hand weed
Gladiolus caryophyllaceus	Wild Gladiolus	4	Aug-Sept
Lupinus consentinii	Blue Lupin	1,4,5,6	July-Sept spraying, Sept/Oct hand weed
Moraea flaccida	One-leaf Cape Tulip	6	Aug/Sept for spraying. Can also hand wipe with Glyphosate in areas of limestone outcrops.
Pelargonium capitatum	Rose Pelargonium	1,4	Summer/Autumn – hand weed, Winter - spray
Watsonia meriana var. *bulbillifera*	Watsonia	1,4	Spring spraying, anytime for hand weeding
Other			
Acacia iteaphylla	Flinders Range Wattle	4	Anytime
Agave americana	Century Plant	3	Anytime, preferably in Autumn
Chamelaucium uncinatum	Geraldton Wax	4	Anytime
Conyza bonariensis	Flaxleaf Fleabane	1,4	Nov-Apr spray, anytime for hand weeding
Cynodon dactylon	Couch	1,2	Spring
Diplotaxis tenuifolia	Sand Rocket	Not targeted	-
Erodium sp	Storkbill	1,5,6	Incidental spraying, winter hand weeding
Gazania linearis	Gazania	1,4	Summer/Winter/Spring – spray, anytime for hand weeding
Hypochaeris glabra	Smooth Catsear	1,4	Jun-Aug spray, anytime for hand weeding
Hypochaeris radicata	Flatweed	1,4	Jun-Aug spray, anytime for hand weeding
Lysimachia arvensis	Pimpernel	Not targeted	-
Monoculus monstrosus	Stinking Roger	5 or 6	Incidental spraying
Oenothera stricta	Evening Primrose	1,4	Winter to spring spraying, anytime for hand weeding
Petrorhagia dubia	Hairy Pink	Not targeted	-
Romulea rosea	Guildford Grass	Not targeted	-
Schinus terebinthifolius	Japanese Pepper	3,4	Feb/Mar – basal bark, Spring – cut and paint
Silene gallica	French Catchfly	Not targeted	-

Species	Common Name	Treatment Number	Timing
Solanum nigrum	Black Berry Nightshade	1,4	Autumn spraying, anytime for hand weeding
Sonchus oleraceus	Common Sowthistle	5 or 6	June-Sept spraying
Trachyandra divaricata	False Onion Weed	1,4,6	Aug-Sept spraying, anytime for hand weeding
Tribulus terrestris	Caltrop	1,4	Nov-Dec spraying, Nov-April for hand weeding

Note: Grasses are the highest priority due to contributing to the high fuel load.

Table 5: Weed Control Methodology

Treatment Number	Treatment Type
1	Glyphosate
2	Quizalofop
3	Triclopyr / Picloram
4	Hand weeding (includes use of hoe, chainsaw or brush cutter)
5	Triasulfuron
6	Metsulfuron

Table 6: Weed Treatment Types

3.2 Fungi

It is estimated that there are 10 times more species of fungi than plants in the world, equating to approximately 140,000 fungi and 14,000 plant species in Western Australia. The amount of species of fungi present in bushland can be an indicator of ecosystem health. Fungi are strongly interconnected with plants and animals as fungi are recyclers that break down litter and debris to provide nutrients for plants. Native plants such as eucalypts, wattles and orchids have beneficial partnerships with fungi. Fungi also provide food and/or habitat for fauna such as bandicoots and beetles.[23,24,25]

Fungi surveys are important in providing baseline information and to highlight changes in fungi occurrence over time. Undertaking surveys also enables comparison of ecological data with other City of Joondalup natural areas.

Fungi survey methodology

The City engaged consultants, Syrinx Environmental PL, to undertake a fungi survey of Lilburne Park in February 2012 and record all incidental sightings of fungi.

Due to time limitations, the fungi survey was conducted in summer. The optimum time for fungi surveys is in winter after substantial rainfall.

Fungi

One fungi species was observed in the field survey, which was identified as the Scarlet Bracket Fungus (*Pycnoporus coccineus*), as shown in Table 7.

During previous field assessments photographs were taken of several types of fungi such as Mushrooms with Gills, Bracket and Shelf Fungi and Jelly and Ear Fungi.

[23] Bougher (2009)
[24] Robinson (n.d.)
[25] DEC (n.d.)b

Current Management Approach

The City of Joondalup currently monitor fungi in Lilburne Park through surveying for incidental sightings of fungi species every 5 years.

Recommended Management Actions:

To monitor fungi health in Lilburne Park, the following management action is proposed:

- Engage consultants to undertake a comprehensive fungi survey in winter after substantial rain, such as mid-June to end of July, to supplement previous incidental fungi survey.

Name	Common Name	Image
Pycnoporus coccineus	Scarlet Bracket Fungus	 Photo: N.L. Bougher (Bougher 2009)

Table 7: Key Fungi Species at Lilburne Park (Syrinx 2012)

3.3 Plant Diseases

Organisms such as fungi, bacteria and viruses that cause plant diseases are known as pathogens. Whilst some pathogens are naturally occurring within soil populations, others have been introduced to the environment through the movement of plant materials and soils.[26]

The symptoms produced by plants that are affected by pathogens vary depending upon the species of pathogen, host species, environment and climatic conditions. Some pathogens can cause rapid death of plants whilst others result in a slow, perennial decline in health.[26]

Phytophthora dieback refers to the disease caused by the introduced plant pathogen *Phytophthora*. While there are numerous species of *Phytophthora*, the most aggressive species affecting native plants throughout South-western Western Australia is *Phytophthora cinnamomi*.

Whilst *Phytophthora cinnamomi* is the most common species of *Phytophthora* dieback within Western Australia a second species of *Phytophthora*, *Phytophthora multivora* is common in urban areas of the Perth, particularly along the inland dune systems, and has been identified

[26] CoJ (2012c)

within the City's parks areas. *Phytophthora multivora* is named due to its wide host range, including *Banksia* and Eucalypt species. *Phytophthora multivora* can cause rapid death of plants, or a slow, perennial decline in health of the crown and is commonly associated with individual spot deaths and areas of tree decline.[26]

Armillaria luteobubalina has also been identified within a number of parks within the City of Joondalup. *Armillaria* is a soil-borne fungus that causes root rot of a wide variety of plants including many species of native flora. The fungus is native to Australia and can cause major damage to natural ecosystems. *Armillaria luteobubalina* is commonly known as the "Honey Fungus" due to the colour of the fruiting body seen above the ground during certain times of the year, as shown in Figure 17. Fruiting bodies (mushrooms) are not evident at all infected sites and their presence is usually a sign that the fungus is well established in that area.[26]

Figure 17: Fruiting Bodies of *Armillaria luteobubalina* (CoJ 2012c)

At present there is no reliable mechanism for the complete eradication of *Phytophthora* species and the control of *Armillaria luteobubalina* is both expensive and labour intensive.[26]

There are currently no suspected plant diseases in Lilburne Park, however no soil or other sampling activities have been undertaken to confirm this. The closest site to Lilburne Park with a confirmed pathogen, *Phytophthora multivora,* is Granadilla Park in Duncraig, approximately 2km south of Lilburne Park. A desktop study was undertaken by Arbor Carbon[27] that identified Lilburne Park as a high risk priority area for further investigation. The criteria used in a pathogen risk analysis of natural areas included confirmed or suspected disease, connectivity to natural areas and Bush Forever sites and presence/absence of irrigation within the site or in connected sites.

Current Management Approach

In 2012/13 the City of Joondalup will develop a Pathogen Management Plan intended to establish the level of risk for areas to be infected by pathogens and detail preventative and management actions to be implemented within the City, including guidelines for dieback-free purchasing and a hygiene procedure.

In order to reduce the risk of spreading pathogens between vegetated areas, City of Joondalup staff currently spray vehicles, shoes and tools with methylated spirits before they enter any bushland reserves.

[27] Arbor Carbon (2012)

Recommended Management Actions:

To prevent pathogen spread and protect biodiversity values at Lilburne Park, the following management action is proposed:

- Implement recommendations from the Pathogen Management Plan that are applicable to the management of Lilburne Park.

3.4 Fauna

Fauna surveys document components of biodiversity and make recommendations to minimise ecological impacts. The findings and recommendations from scientifically-based fauna surveys can be reflected in management planning decisions.[19]

Fauna Survey Methodology

The City engaged consultants, Syrinx Environmental PL, to undertake a fauna survey of Lilburne Park in February 2012.

Desktop study
A desktop study was undertaken by reviewing data provided by City of Joondalup and any additional relevant information.[1] Natural Area Initial Assessments were undertaken by the City of Joondalup in 2004 and 2011 and were reviewed as part of the desktop study. Natural Area Initial Assessments include documenting information such as threatened or significant fauna.

Field survey
Fauna trapping was undertaken over two nights, in conjunction with a bird census and one night of spotlighting for nocturnal species (including use of an Anabat bat call detector). This included a combination of pitfall, Elliot, funnel and cages with a total of four trap lines in the bushland, two in each vegetation community. Direct observations of fauna during daylight were carried out over four days in February 2012. Opportunistic observations of invertebrate fauna were recorded and a basic fauna habitat assessment was also undertaken.[1]

Due to time limitations, the fauna survey was conducted in summer. The optimum season for fauna detectability in the south west bioregions is spring. Trapping periods of 5 to 7 nights are recommended to show species diversity, richness trends and provide reliable indications of species composition and abundance data.

Native Fauna

Fauna and flora are interconnected in complex relationships with each other and with factors such as soil, water, climate and landscape. The decline of native fauna can cause loss of plant species and changes to ecological communities.[20]

<u>Mammals</u>
Two native mammals were recorded at Lilburne Park. Quenda diggings were recorded at several locations and the Grey Kangaroo was observed.

No bats have been identified in Lilburne Park. There are approximately 75 species of bat in Australia and these native mammals fall into two main groups: the megabats and the microbats. Two groups of bat occur in Western Australia: Flying-foxes (megabats) and insectivorous bats (microbats). Bats can be useful for pest control, feeding on moths,

beetles, mosquitoes, invertebrate larvae, flying ants and other invertebrates.[28] A comprehensive bat survey would require a one week remote monitoring bat survey during summer.[29] Bats can be encouraged to roost in the area by installing bat boxes.

Reptiles

Eight reptile species (lizards) were recorded at Lilburne Park, with the most common being the Striped Skink (*Ctenotus fallens*).

Birds

A total of 19 native birds have been recorded as occurring in Lilburne Park, including the migratory Rainbow Bee-eater (*Merops ornatus*) and evidence of feeding by the endangered Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), as shown in Table 8 and Appendix 2. Lilburne Park is also an unconfirmed roost site for Carnaby's Black-Cockatoos.[30] The most common native birds observed in Lilburne Park were Red Wattlebird (*Anthochaera carunculata*), Western Wattlebird (*Anthochaera superciliosus*), Australian Raven (*Corvus coronoides*), Singing Honeyeater (*Lichenostomus virescens*) and Brown Honeyeater (*Lichmera indistincta*).

Invertebrates

Invertebrates are animals without backbones such as insects, worms and molluscs. Invertebrates constitute more than 95% of all living animal species, with Australia having documented 100,000 species and an estimated 200,000 undescribed invertebrate species.[25] Some invertebrates are important indicators of ecosystem health, such as ants (seed dispersers), bees (pollinators) or spiders (top invertebrate predators).[31]

A total of 37 native invertebrate species were recorded in Lilburne Park, as shown in Appendix 2. The majority of the invertebrates were spiders (such as wolf spider, golden orb weaver spider, white-tailed spider, jumping spider and huntsman spider) and ants (such as bull ant, meat ant and peaceful night ant).

As *Lomandra maritima* exists in Lilburne Park, it is possible that the threatened Graceful Sun Moth (*Synemon gratiosa*) also occurs on site. The Graceful Sun Moth is a small day-flying moth endemic to south-west Western Australia (between Quinns Rocks and Mandurah). The species is declared specially protected fauna being fauna that is rare or likely to become extinct under the *Wildlife Conservation Act 1950* and listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. The Graceful Sun Moth appears for a limited period each year (late February though early April) and utilises *Lomandra maritima* or *Lomandra hermaphrodita* as a larval host plant.[32]

Threatened and Priority Fauna

Threatened and Priority fauna that are likely or have the potential to occur in Lilburne Park are shown in Table 8 and include:

- Carnaby's Black-Cockatoo;
- Forest Red-tailed Black-Cockatoo;
- Rainbow Bee-eater;
- Peregrine Falcon;
- Quenda; and
- the Graceful Sun Moth.

[28] DEC (2007)
[29] J Tonga 2012, pers. comm., 6 July
[30] T Kabat 2012, email, 20 June
[31] V Framenau 2012, email, 9 July
[32] Bishop et al. 2010

Name	Common Name	Conservation Code	Likelihood	Image
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	Schedule 1 (*Wildlife Conservation Act*), Endangered (DEC and EPBC)	Likely	 Photo: Raana Scott
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	Schedule 1 (*Wildlife Conservation Act*), Vulnerable (DEC and EPBC)	Likely	 Photo: Rick Dawson (DEC 2009)
Merops ornatus	Rainbow Bee-eater	Schedule 3 (*Wildlife Conservation Act*), Migratory (Japan-Australia Migratory Bird Agreement (JAMBA))	Likely	

Name	Common Name	Conservation Code	Likelihood	Image
Falco peregrinus	Peregrine Falcon	Schedule 3 (*Wildlife Conservation Act*)	Potential	 Photo: Birds Australia n.d.
Isoodon obesulus fusciventer	Southern Brown Bandicoot, Quenda	Priority 5 (DEC)	Likely	
Synemon gratiosa	Graceful Sun Moth	Schedule 1 (*Wildlife Conservation Act*), Endangered (DEC and EPBC)	Potential	

Table 8: Likely or Potential Threatened and Priority Fauna at Lilburne Park (Syrinx 2012)

Note: For further explanations on Conservation Codes, refer to Appendix 2.

Non-native Fauna

Non-native fauna impact native fauna and flora through predation, competition for food and shelter, spreading diseases and destroying habitat. These impacts can result in the diminishing or extinction of native species.[17,20]

Non-native animals such as cats, foxes, rabbits, birds and bees inhabit the City's bushland, wetland and coastal areas.

The European Rabbit is common within the City's coastal and bushland areas and has the potential to damage large areas of native vegetation. Rabbits also reduce the effectiveness of bushland rehabilitation activities by feeding on newly planted seedlings.

The European Honey Bee is also common within the City's natural areas and may impact upon native flora and fauna through competing with native fauna (including native bees) for floral resources, disrupting natural pollination processes and displacing endemic wildlife from tree hollows.

Domestic animals such as dogs can also cause damage to the City's natural environment, particularly when exercised unleashed within natural areas. Dogs can chase and harass native fauna often resulting in stress and harm to the animals. Dogs can also inadvertently spread pathogens if they disturb the soil, particularly around trees.

Domestic cats have the potential to cause significant environmental harm when enabled to roam within natural areas. Predation of wildlife by domestic cats is known to have serious impacts on the population of native mammals, reptiles and birds within bushland areas along the Swan Coastal Plain.[17]

Mammals

Non-native mammals that were recorded during field surveys, or evidence indicated their presence include dog (*Canis lupus*), cat (*Felus cattus*), European rabbit (*Oryctolagus cuniculus*), house mouse (*Mus Musculus*), black rat (*Rattus rattus*) and red fox (*Vulpes vulpes*).

Birds

A total of 5 non-native species of birds have been recorded as occurring in Lilburne Park including Little Corella (*Cacatua sanguinea*), Kookaburra (*Dacelo novaeguineae*), Spotted Turtledove (*Streptopelia chinensis*), Laughing Dove (*Streptopelia senegalensis*) and Rainbow Lorikeet (*Trichoglossus haematodus*), as shown in Appendix 2.

Invertebrates

Two non-native invertebrate species were recorded in Lilburne Park, the European Honey Bee (*Apis mellifera*) and Portuguese millipede (*Ommatoiulus moreletii*).

Fauna Habitat

Vegetation condition at Lilburne Park, in terms of fauna habitat, is considered moderate to very good. Whilst the site provides habitat for several small mammals and birds the inner metropolitan location of Lilburne Park and its small size limits the reserves use by fauna. The area is however in close proximity to Hepburn Conservation Area, Pinnaroo Valley Memorial Park and Craigie Open Space which provide habitat connectivity value.

Ecological Corridor

Naturally connected landscapes and ecosystems are generally healthier, protect a diversity of species, provide pathways for species movement and can store carbon more effectively than degraded landscapes.[33] In urban areas where there is engineered infrastructure dividing the landscape, it may be necessary to provide wildlife crossings such as underpasses, tunnels, viaducts or overpasses to enable wildlife movement.

The location of Lilburne Park in relation to Hepburn Conservation Area, Pinnaroo Valley Memorial Park and Craigie Open Space creates an ecological corridor with two main roads

[33] NWCPAG (2012)

dividing the landscape, as shown in Figure 18. Fauna crossings from Lilburne Park to Hepburn Conservation Area are via Hepburn Ave, an arterial road. Fauna crossings from Pinnaroo Valley Memorial Park to Craigie Open Space are also via an arterial road, Whitfords Ave.

The ecological corridor of Lilburne Park, Hepburn Conservation Area, Pinnaroo Valley Memorial Park and Craigie Open Space also extends to Woodvale Nature Reserve and is in close proximity to the north to south ecological corridor of Yellagonga Regional Park and Neerabup National Park.

Current Management Approach

The City of Joondalup is implementing a number of management actions to address the environmental impacts of domestic and pest animals within the City's natural areas, including surveying and monitoring of native animal populations within reserves. Control of non-native fauna is undertaken annually within bushland, wetland and coastal areas. Control methods employed include biological and chemical control, trapping, baiting and exclusion methods such as fencing.

The City's current management practices have greatly reduced the incidence of pest animal populations within the City, however continued and coordinated action is required to ensure that populations remain at controllable numbers and that the impacts on natural areas remain at a minimum.

The City also promotes responsible pet ownership and encourages the community to ensure that domestic pets do not have a negative impact of the natural environment.

Recommended Management Actions:

To monitor and protect native fauna in Lilburne Park, the following management actions are proposed:

- Engage consultants to undertake a follow up fauna survey in mid-late spring, with 5 to 7 nights trapping, to supplement previous fauna survey undertaken in summer.
- Engage consultants to undertake the Graceful Sun Moth surveys in accordance with the Survey Guidelines for the Graceful Sun Moth and Site Habitat Assessments.
- Engage consultants to undertake targeted survey for invertebrates in spring to supplement previous opportunistic invertebrate survey undertaken in summer.
- Engage consultants to undertake a one week remote monitoring bat survey in summer to supplement previous one night bat survey undertaken in summer.
- If bat survey indicates presence of bats, install five bat boxes to encourage bats to roost.
- Remove feral bee hive (if accessible) and implement fox control to reduce pressures on native fauna.
- In partnership with the DEC, undertake research to ascertain the benefits and costs associated with the installation of fauna crossings between Lilburne Park and Hepburn Conservation Area and from Pinnaroo Valley Memorial Park to Craigie Open Space to provide ecological linkages.

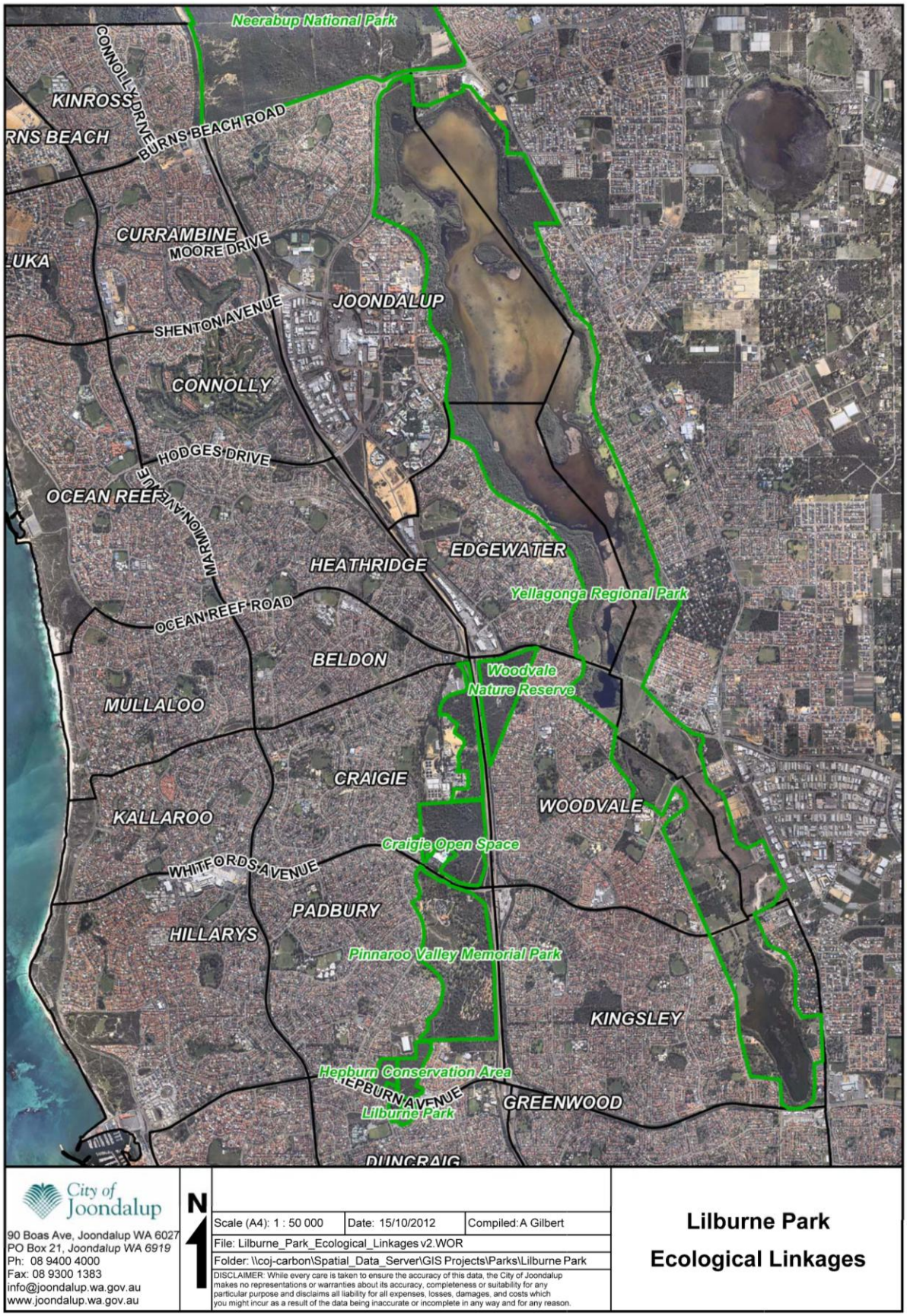


Figure 18: Ecological Linkages to Lilburne Park

3.5 Social and Built Environment

History and Heritage

Lilburne Park is not listed on any State or Federal Indigenous or non-Indigenous heritage inventory or register.

Social Value

The main uses of Lilburne Park are for purposes such as walking or dog walking. Lilburne Park is a thoroughfare for people walking from Duncraig to Hepburn Conservation Area.

There was previously a Friends of Lilburne Park group of community members actively involved in conservation of the Park, however the Friends of Lilburne Park group no longer exist. The closest Friends group is Friends of Hepburn Heights who focus on conservation actions within the Hepburn Conservation Area.

Key external stakeholders for the management of Lilburne Park include:

- DEC;
- FESA;
- Duncraig Senior High School; and
- City of Joondalup community.

Access and Infrastructure

Parking

There is no specific designated parking for Lilburne Park, although the parking facilities located close to Lilburne Park are sufficient for the current usage of the site. Parking is available nearby at Lilburne Shopping Centre on the corner of Hilarion Road and Lilburne Road (see Figure 18).

Fencing

Fencing is used to restrict access and protect areas of bushland. Timber post and chain mesh fencing surrounds two sides of the outer perimeter of Lilburne Park (see Figure 19) with the other two sides being residential fencing. Fencing also surrounds the sump located on site.

Fencing is inspected on a monthly basis and repairs are conducted as required. Minimal amounts of fence repairs are required.

Signage

Signage is important to encourage community appreciation and inform the community of the ecological values of the site. There is a wooden sign on the west side of Lilburne Park (on Lilburne Road) near the pedestrian access gate and one on the north side of Lilburne Park (on Hepburn Ave), indicating the name of the Park, that it is a natural bush area and is owned by City of Joondalup (see Figure 19).

There are no interpretive or educational signs with Lilburne Park.

Figure 19: Lilburne Park Signage, Fencing and Gate

Rubbish

Litter bins are generally installed in locations where people gather to socialise. There are no litter bins located in Lilburne Park as the site doesn't have infrastructure such as seating and tables which encourage people to socialise. There is a small amount of rubbish on site, mainly on the edges of the vegetation. Installation of a rubbish bin may reduce the amount of rubbish disposed of in the Lilburne Park bushland.

Rubbish is collected by the City of Joondalup on an as needed basis, sometimes in conjunction with hand weeding activities.

The City monitors the amount of waste present in Lilburne Park on an annual basis. There has been a decrease in the amount of waste present within Lilburne Park in 2011/12 due to targeted collections being conducted by the City of Joondalup while completing other works in the reserve (see Figure 20).

Figure 20: Amount of Waste Present within Lilburne Park

Fire Station

Duncraig Fire Station is located on the north side of Lilburne Park adjoining Hepburn Avenue, as shown in Figure 21 and Figure 23.

Figure 21: Duncraig Fire Station

Access Points

Access points allow people to enter natural areas that are fenced off. There are five pedestrian access points (gates) into Lilburne Park, as shown in Figure 23.

Paths

Paths in Lilburne Park are used for pedestrian access and bushland management and maintenance purposes. The paths in Lilburne Park are mostly used by pedestrians, dog walkers and a few cyclists. Lilburne Park can be used as a thoroughfare to Hepburn Conservation Area. There are two main limestone pedestrian paths at Lilburne Park, as shown in Figure 23. There is also an informal track. The existing paths in Lilburne Park are sufficient for the amount of usage the area receives.

Access for People with Disabilities

Four million Australians (20%) reported having a disability in the Survey of Disability, Ageing and Carers conducted in 2009. The study considers disability to include any impairments, activity limitations and participation restrictions which impede everyday activities for a period of at least 6 months. In 15 years time the number of West Australians with a disability is expected to increase from 1 in 5 people (20%) to 1 in 4 people (25%).

The City of Joondalup has an *Access and Inclusion Plan 2012-2014*, outlining that 'the City is committed to ensuring that its activities and services are inclusive of all members, including people with disabilities and their families or carers, and people from culturally and linguistically diverse backgrounds'.

It is difficult for people with a disability to access Lilburne Park through the current gates or to use the limestone paths due to the uneven limestone surface. The Draft Joondalup Walkability Plan proposes that path replacement will occur in 2014/15.[34]

Antisocial Behaviour

There is a history of cubby houses being built in Lilburne Park with resulting rubbish surrounding it. Monthly inspections are conducted and cubbies are dismantled by City of Joondalup as required.

Water Sensitive Urban Design

Retrofitting the sump at Lilburne Park could improve the water quality of stormwater being discharged and enhance the visual appeal of the current sump area, incorporating it into public open space.[10] The fenced off sump at Lilburne Park is on Hepburn Ave, next to Duncraig Fire Station (see Figure 22).

The City of Joondalup undertakes a City Sump Improvement Program as part of the capital works Stormwater Drainage Program utilising Water Sensitive Urban Design and water quality improvement principles. Water Sensitive Urban Design incorporates water supply, wastewater, stormwater and groundwater management, urban design and environmental protection into an integrated design of the urban water cycle.[35] The sump in Lilburne Park could be included in the City Sump Improvement Program.

Figure 22: Fenced Off Sump at Lilburne Park

[34] Grant and Bradshaw (2012)
[35] JSCWSC (2009)

Recommended Management Actions:

To enhance the social and built environment in Lilburne Park, the following management actions are proposed:

- Maintain fencing on an as needed basis (informed by monthly inspections) to protect the native vegetation, flora and fauna from informal access.
- Upgrade signage in accordance with the City of Joondalup Signage Strategy (to be developed in 2013/14).
- Create interpretative signage on conservation significant and ecologically important features of the site such as Quenda, Carnaby's Cockatoos, Rainbow bee-eater and *Lomandra maritima* being the home for the Graceful Sun Moth. Locate signage at main entrances and/or the intersection of main paths.
- Install a rubbish bin at the main entrance to Lilburne Park on Lilburne Road and incorporate the bin into the City weekly bin emptying schedule.
- Future upgrades to Lilburne Park are to address access issues by providing gates and paths that can be used by people with a disability, as well as benefit other path users such as people with prams.
- Dismantle cubby houses as required to discourage the disposal of rubbish in this area.
- Consider including Lilburne Park sump in the City Sump Improvement Program to improve the water quality of the stormwater being discharged and enhance the visual appeal and community usability of the area.

Figure 23: Infrastructure at Lilburne Park

3.6 Fire Management

Fire is an important natural feature of the Western Australian landscape. Fire helps to shape the diversity of plant communities with many native plants having developed fire-related adaptations over time, for example fire expedites many species to flower or germinate. Human activity such as accidents and arson have resulted in increased incidences of fire within many urban bushland reserves, which can have a negative effect on biodiversity and encourage growth of highly flammable and invasive weeds.[17]

Bushfires are unplanned fires that can be caused by events such as lightning, planned burning operations, escape from industrial activities, damaged power transmission lines, discarded cigarette butts or deliberate arson. Bushfires can cause significant damage to people, property and the environment.[36]

Management of Lilburne Park is the responsibility of the City of Joondalup. The City of Joondalup has a "duty of care" to take all reasonable precautions to prevent any bushfire from spreading onto neighbouring property. The City of Joondalup does not currently have a prescribed burn management regime for the area.

Objectives

The objectives of fire management within Lilburne Park are to:

- Protect life, property and environment in adjacent residential areas and Duncraig Fire Station.
- Fulfil obligations under the fire related legislation.
- Protect the ecological and amenity values of Lilburne Park.
- Protect landscape values (including flora and fauna) from uncontrolled fire and inappropriate suppression techniques.
- Reduce the frequency, impact and area of unplanned fires.
- Minimise the spread of disease and weeds during fire fighting operations and when establishing firebreaks.
- Minimise impacts on air quality.

Fire Risk

A fire fuel load assessment was conducted at Lilburne Park in April 2012 which indicated that the site has an average fuel load of 19 tonnes / ha, as shown in Figure 1A (Appendix 1). The fuel load assessment was undertaken according to the methodology from the *FESA Visual Fuel Load Guide for the Scrub Vegetation of the Swan Coastal Plain*.[37]

Fire Prevention

The City of Joondalup undertakes a number of on ground measures to reduce the risk of fire, including:

- Controlled access;
- Non-native species management (weeds and fauna);
- Fuel load management;
- Emergency vehicle access;

[36] EDOWA (2011)
[37] FESA (2007)

- Fire access tracks (fire access ways and strategic firebreaks);
- Water supply (hydrants located close to Lilburne Park); and
- Evacuation of residents and visitors.[17]

The City of Joondalup will develop a Fire Management Plan in 2013/14, outlining the City's strategy for assessing fire risk, prevention, response and recovery.

FESA have developed a *Fire Pre-Plan for the Urban Bushland Area of Lilburne Bushland*[38] that is updated annually in conjunction with key stakeholders including City of Joondalup.

Fire Occurrences

There are periodic fires at Lilburne Park, the majority of which are believed to be deliberately lit. The frequency of fires has lessened since the construction of the Fire Station adjoining the Park in 2005. Fire occurrences at Lilburne Park are detailed in Table 9. Figure 24 shows the result of a fire at Lilburne Park.

Dates	1 Jan 2012 - 23 May 2012	1 Jan 2011 – 31 Dec 2011	1 Jan 2010 – 31 Dec 2010	1 Jan 2009 – 31 Dec 2009	1 Jan 2008 – 31 Dec 2008
Fire Occurrences	2	3	0	0	1

Table 9: Fire Occurrences at Lilburne Park (FESA 2012)

Figure 24: Result of fire at Lilburne Park (photo taken May 2012)

Fire Response

FESA are located on site at the Duncraig Fire Station and are responsible for suppressing fires within Lilburne Park.

[38] FESA (n.d.)

Fire Recovery

Weed control is revised after fire incidents to aid regrowth by selecting appropriate chemicals, targeting weeds if safe to do so for new seedlings, and spraying grasses using backpacks.

Recommended Management Actions:

To prevent fire occurrences and minimise the environmental impact of fire occurrences in Lilburne Park, the following management actions are proposed:

- Maintain fire access tracks and footpaths, including weed control and pruning of vegetation, by implementing Annual Bushland Schedule and Weekly Bushland Schedule.
- Annually assess fire fuel load to inform fire prevention actions required.
- Revise weed control after fire incidents to aid regrowth by selecting appropriate chemicals, targeting weeds if safe to do so for new seedlings, and spraying grasses using backpacks.
- Monitor fire occurrences through mapping and updating GIS layers detailing fire incidents and frequency.

3.7 Education and Training

Community Involvement

Environmental objectives cannot be achieved through the actions of the City alone; the community can also affect the local environment in both positive and negative ways. Environmental outcomes require the support of an engaged community that is aware and participating in environmental activities.

The community provides significant input into the protection and enhancement of the City's natural areas through the participation in environmental volunteer groups known as Friends Groups. The City of Joondalup also actively encourages participation within its community to raise awareness of key environmental issues within the City.[17]

Training and Education

The City of Joondalup Natural Areas Team currently conduct weekly plant identification training, including weed management. New members in the Natural Areas Team undertake training for the identification and management of pathogens.

Recommended Management Actions:

To increase community awareness and training opportunities regarding natural areas management, the following actions are proposed:

- Implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as:
    - pathogens;
    - weeds;
    - fire;
    - flora and fauna awareness;

    - prevention of hand feeding wildlife; and
    - responsible pet ownership.

- Conduct guided nature tours for Duncraig Senior High School students to highlight the ecological value of the bushland.
- Conduct training with the Natural Areas Team regarding identifying and managing pathogens to prevent pathogen spread.
- Conduct Natural Areas Team weekly plant identification training, including weed management, to increase the effectiveness of weed control activities.
- Create Natural Areas Induction Manual to document on ground practices including information such as health and safety, personal protective equipment, responsibilities and procedures (e.g. weed management, pathogen management and pruning procedures).
- Seek interest in the establishment of a 'Friends of Lilburne Park' group to encourage community participation in the management of this natural area.

4.0 Implementation Plan

4.1 Roles and Responsibilities

Roles and responsibilities for management actions are detailed in Section 4.7.

4.2 Auditing and Inspections

Inspections of Lilburne Park are conducted by the City of Joondalup once every 4 weeks.

4.3 Key Performance Indicators

The City annually reports against the following key performance indicators relating to natural areas:

- Percentage density of priority environmental weeds.
- Incidence of foreign material within natural area / ha.

4.4 Routine Reporting

Assessing the management of Lilburne Park will be undertaken through annually reporting progress against management of the completion of actions and Key Performance Indicators in this Plan.

4.5 Scientific Research and Monitoring

A Natural Areas Initial Assessment is to be conducted on Lilburne Park every 5 years. The most recent assessment was conducted in 2011/12. The next assessment is to be conducted in 2016/17, prior to the review of the Lilburne Park Management Plan.

Surveys in Lilburne Park of flora, weeds, fungi, fauna, invertebrates, bats and the Graceful Sun Moth are to be conducted by consultants in 2015/16 and 2016/17.

Research is to be undertaken to ascertain the benefits and costs associated with the installation of fauna crossings between Lilburne Park and Hepburn Conservation Area and from Pinnaroo Valley Memorial Park to Craigie Open Space to provide ecological linkages, by 2016/17.

Fire fuel load assessments of Lilburne Park are to be undertaken annually.

4.6 Management Plan Review

The Lilburne Park Management Plan is to be reviewed every 5 years. The next review is due in 2017/18.

4.7 Implementation of Management Actions

Recommended Management Action	Biodiversity Conservation Area	Responsible Business Unit	Timeframe	Proposed Budget / Person Hours
Undertake regular weed control by implementing Annual Bushland Schedule and Weekly Bushland Schedule.	Flora	Operation Services	2012/13-2016/17	Natural Areas Team 416 hrs/year; Contractor 220 hrs/year
Maintain fire access tracks and footpaths, including weed control and pruning of vegetation by implementing Annual Bushland Schedule and Weekly Bushland Schedule.	Fire Management	Operation Services	2012/13-2016/17	60 hrs / year
Conduct Natural Areas Team weekly plant identification training, including weed management.	Education and Training	Operation Services	2012/13-2016/17	500 hrs / year allocated to the City's 108 natural areas
Annually assess and report on fire fuel load	Fire Management	Rangers Parking and Community Safety / Operation Services	2012/13-2016/17	3 hrs / year
Map fire incidents and update GIS layer detailing fire incidents and frequency.	Fire Management	Operation Services	2012/13-2016/17	3 hrs / year
Revise weed control after fire incidents to aid regrowth by selecting appropriate chemicals, targeting weeds if safe to do so for new seedlings and spraying grasses using backpacks.	Fire Management	Operation Services	2012/13-2016/17	
Install a rubbish bin at the main entrance to Lilburne Park and incorporate the bin into the City weekly bin emptying schedule.	Social and Built Environment	Asset Management	2012/13	$450 for bin installation and $500 / year for weekly bin emptying
Dismantle cubby houses as required.	Social and Built Environment	Operation Services	2012/13-2016/17	3 hrs / year
Maintain fencing on an as needed basis (informed by monthly inspections).	Social and Built Environment	Operation Services	2012/13-2016/17	2 hrs / year
Conduct training with new Natural Areas staff regarding identifying and managing pathogens.	Education and Training	Operation Services	2012/13-2016/17	16 hrs / year
Development of City of Joondalup Weed Management Plan.	Flora	Strategic and Organisational Development	2012/13-2016/17	450 hours
Implementation of City of Joondalup Weed Management Plan.	Flora	Operation Services	2012/13-2016/17	

Recommended Management Action	Biodiversity Conservation Area	Responsible Business Unit	Timeframe	Proposed Budget / Person Hours
Remove feral bee hive (if accessible) and implement fox control.	Fauna	Health and Environmental Services / Operation Services	2012/13-2016/17	$850
Development and implementation of the Pathogen Management Plan.	Plant Diseases	Strategic and Organisational Development	2012/13 2016/17	
Implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.	Education and Training	Strategic and Organisational Development	2012/13-2016/17	
Development of hand weeding procedure.	Flora	Strategic and Organisational Development	2013/14	
Implementation of hand weeding procedure.	Flora	Operation Services	2013/14-2016/17	
Update the City's weed spraying procedure.	Flora	Operation Services	2013/14	
Seek interest in the establishment of a 'Friends of Lilburne Park' group.	Education and Training	Operation Services	2013/14	
Upgrade signage in accordance with the City of Joondalup Signage Strategy (to be developed in 2013/14)	Social and Built Environment	Operation Services	2014/15	
Future upgrades to Lilburne Park are to address access issues by providing gates and paths that can be used by people with a disability, as well as benefit other path users such as people with prams.	Social and Built Environment	Operation Services	2014/15	$98,000
Consider including Lilburne Park sump in the City Sump Improvement Program.	Social and Built Environment	Asset Management	2015/16	$100,000
Engage consultants to undertake the Graceful Sun Moth surveys in accordance with the Survey Guidelines for the Graceful Sun Moth and Site Habitat Assessments.	Fauna	Operation Services	2015/16 and 2016/17	$5,000

Recommended Management Action	Biodiversity Conservation Area	Responsible Business Unit	Timeframe	Proposed Budget / Person Hours
Engage consultants to undertake a flora survey in spring.	Flora	Operation Services	2016/17	$7,000
Conduct Natural Areas Initial Assessment in spring.	Flora	Operation Services	2016/17	10 hrs
Engage consultants to undertake weeds survey in winter.	Flora	Operation Services	2016/17	$7,000
Engage consultants to undertake a fungi survey in winter after substantial rain.	Fungi	Operation Services	2016/17	$5,000
Engage consultants to undertake a fauna survey in mid-late spring with 5 to 7 nights trapping.	Fauna	Operation	2016/17	$20,000
Engage consultants to undertake a targeted survey for invertebrates in spring.	Fauna	Operation Services	2016/17	$8,000
Engage consultants to undertake a one week remote monitoring bat survey in summer.	Fauna	Operation Services	2016/17	$1,000
If bat survey indicates presence of bats, install five bat boxes to encourage bats to roost.	Fauna	Operation Services	2016/17	$1,000
In partnership with the DEC, undertake research to ascertain the benefits and costs associated with the installation of fauna crossings between Lilburne Park and Hepburn Conservation Area and from Pinnaroo Valley Memorial Park to Craigie Open Space to provide ecological linkages.	Fauna	Operation Services	2016/17	
Create interpretative signage on conservation significant and ecologically important features of the site such as Quenda, Carnaby's Cockatoos foraging, Rainbow bee-eater and *Lomandra maritima* being the home for the Graceful Sun Moth. Locate signage at main entrances and/or the intersection of main paths.	Social and Built Environment	Strategic and Organisational Development	2016/17	$7,000
Conduct guided nature tours for Duncraig Senior High School students to highlight the ecological value of the bushland.	Education and Training	Strategic and Organisational Development	2016/17	

Recommended Management Action	Biodiversity Conservation Area	Responsible Business Unit	Timeframe	Proposed Budget / Person Hours
Create Natural Areas Induction Manual including information such as health and safety, personal protective equipment, responsibilities and procedures (e.g. weed management, pathogen management and pruning procedures).	Education and Training	Operation Services	2016/17	

Note: Budget and person hour amounts are estimates only and will require review prior to the year of implementation.

5.0 References

360 Environmental, 2012, *Lilburne Park Vegetation Condition Assessment*, Perth, Western Australia.

Arbor Carbon, 2012*, Desktop Risk Analysis of Phytophthora and Armillaria to Parks and Natural Areas within the City of Joondalup*, Perth, Western Australia.

Birds Australia, n.d., *Birds in Backyards*, viewed on 28 June 2012, http://www.birdsinbackyards.net/.

Bishop, C., Williams, M., Mitchell, D. and Gamblin, T., 2012, *Survey guidelines for the Graceful sun-moth (Synemon gratiosa) and site habitat assessments*, DEC, Perth, Western Australia.

Bolland, 1998, *Soils of the Swan Coastal Plain*, Bunbury, Western Australia.

Bougher, 2009, *Fungi of the Perth Region and Beyond: A Self-Managed Field Book*, Perth, Western Australia.

Bradley, J 2002, *Bringing Back the Bush: The Bradley Method of Bush Regeneration*, Lansdowne Press, Sydney, New South Wales.

Bureau of Meteorology (BoM), 2012, *Perth Airport: Monthly Climate Statistics*, viewed on 23 May 2012, http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=009021&p_prim_element_index=0&p_comp_element_index=0&redraw=null&p_display_type=statistics_summary&normals_years=1981-2010&tablesizebutt=normal.

Cessnock City Council, 2002, *Flora and Fauna Survey Guidelines*, Hunter Region, NSW.

City of Joondalup (CoJ), 2012a, *City Water Plan 2012-2015*, Perth, Western Australia.

City of Joondalup (CoJ), 2012b, *City of Joondalup Environment Plan 2007-2011*, Perth, Western Australia.

City of Joondalup (CoJ), 2012c, *Draft Pathogen Management Plan*, Perth, Western Australia.

Conservation International, 2012, *Southwest Australia*, viewed on 23 July 2012, http://www.conservation.org/where/priority_areas/hotspots/asia-pacific/Southwest-Australia/Pages/default.aspx.

Department of Agriculture and Food WA (DAFWA), 2010, *Declared Plants in Western Australia*, Perth, Western Australia.

Department of Environment (DoE), 2004, *Introduction, Stormwater Management Manual for Western Australia*, Perth, Western Australia.

Department of Environment and Conservation (DEC). n.d.(a), *Acid Sulfate Soils: Fact Sheet*, Perth, Western Australia.

Department of Environment and Conservation (DEC), n.d.(b), *Department of Environment and Conservation*, viewed on 3 July 2012, http://www.dec.wa.gov.au/index.php.

Department of Environment and Conservation (DEC), 1999, *Environmental Weed Strategy for Western Australia* (EWSWA), Perth, Western Australia.

Department of Environment and Conservation (DEC), 2007, *Prevention and Control of Damage by Animals in WA: Bats*, Perth, Western Australia.

Department of Environment and Conservation (DEC), 2009, *Fauna Notes: No. 6 Red-tailed black cockatoo*, Perth, Western Australia.

Department of Environmental Protection (DEP), 2000, *Bush Forever Volume 2: Directory of Bush Forever Sites*, Government of Western Australia, Perth, Western Australia.

Department of Planning, 2000, *Bush Forever Volume 1: Policies, Principles and Processes*, Government of Western Australia, Perth, Western Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012, viewed on 3 July 2012, http://www.environment.gov.au/biodiversity/index.html.

Department of Water, (DoW), n.d., *Gnangara Groundwater System*, viewed on 26 June 2012, http://www.water.wa.gov.au/Understanding+water/Groundwater/Gnangara+Mound/default.aspx.

Department of Water (DoW), 2004, *Perth Groundwater Atlas, Second Edition*, Perth, Western Australia.

Department of Water (DoW), 2009, *Water Quality Protection Note: Swimming Pools*, Perth, Western Australia.

Environmental Defender's Office WA (Inc) (EDOWA), 2011, *Bush Fires Fact Sheet No. 35*, Perth, Western Australia.

Fire and Emergency Services Authority of Western Australia (FESA), 2007, *Visual Fuel Load Guide for the scrub vegetation of the Swan Coastal Plain*, Perth, Western Australia.

Fire and Emergency Services Authority of Western Australia (FESA), 2007, *Lilburne Reserve Suspicious or Deliberate Bush/Vehicle/Rubbish Fires: 23 May 2002 - 23rd May 2012*, Perth, Western Australia.

Fire and Emergency Services Authority of Western Australia (FESA), n.d., *Fire Pre-plan for the Urban Bushland Area of Lilburne Bushland*, Perth, Western Australia.

Grant, J. and Bradshaw, G., 2012, *The Draft Joondalup Walkability Plan*, Perth, Western Australia.

Grose and Hedgcock, n.d., *Designs for Stormwater Disposal in Public Open Space: An ecological assessment of current practices in Western Australia*, Perth, Western Australia.

Groves, R.H., Boden, R. & Lonsdale, W.M., 2005, *Jumping the Garden Fence: Invasive Garden Plants in Australia and their Environmental and Agricultural Impacts*, CSIRO report prepared for WWF-Australia, WWF-Australia, Sydney, New South Wales.

Joint Steering Committee for Water Sensitive Cities (JSCWSC), 2009, *Evaluating Options for Water Sensitive Urban Design – A National Guide*, Canberra, Australia.

Landgate, 2006, *Shared Land Information Platform: Interragator*, viewed on 26 June 2012, https://www2.landgate.wa.gov.au/interragatorplus/DiscoveryServlet?command=viewdetails&uuid=%7b1830F4A4-7776-8A28-B7B2-03B207FB635F%7d.

Murray, M., Bell, S. and Hoye, G., 2002, *Flora and fauna survey Guidelines: Lower Hunter Central Coast Region 2002*, Lower Hunter & Central Coast Regional Environmental Management Strategy, NSW.

National Wildlife Corridors Plan Advisory Group (NWCPAG), 2012, *Draft National Wildlife Corridors Plan*, Canberra, Australia.

Robinson, R., n.d., *Forest Fungi: Lifestyles of the little-known*, Department of Conservation and Land Management, Manjimup, Western Australia.

Syrinx Environmental PL (Syrinx), 2012, *Lilburne Park Flora, Fauna and Fungi Survey*, Perth, Western Australia.

Western Australian Herbarium, n.d., Florabase, viewed on 27 June 2012, http://florabase.dec.wa.gov.au/.

Western Australian Local Government Association (WALGA), 2010, *Perth Biodiversity Project: 2010 Remnant Vegetation by Vegetation Complex Dataset for Perth and Peel*, Perth, Western Australia.

6.0 Appendices

Appendix 1 - Figures

Appendix 2 - Lilburne Park Flora and Fauna Species Lists

Appendix 3 – Keighery Scale Definitions

Appendix 1 - Figures

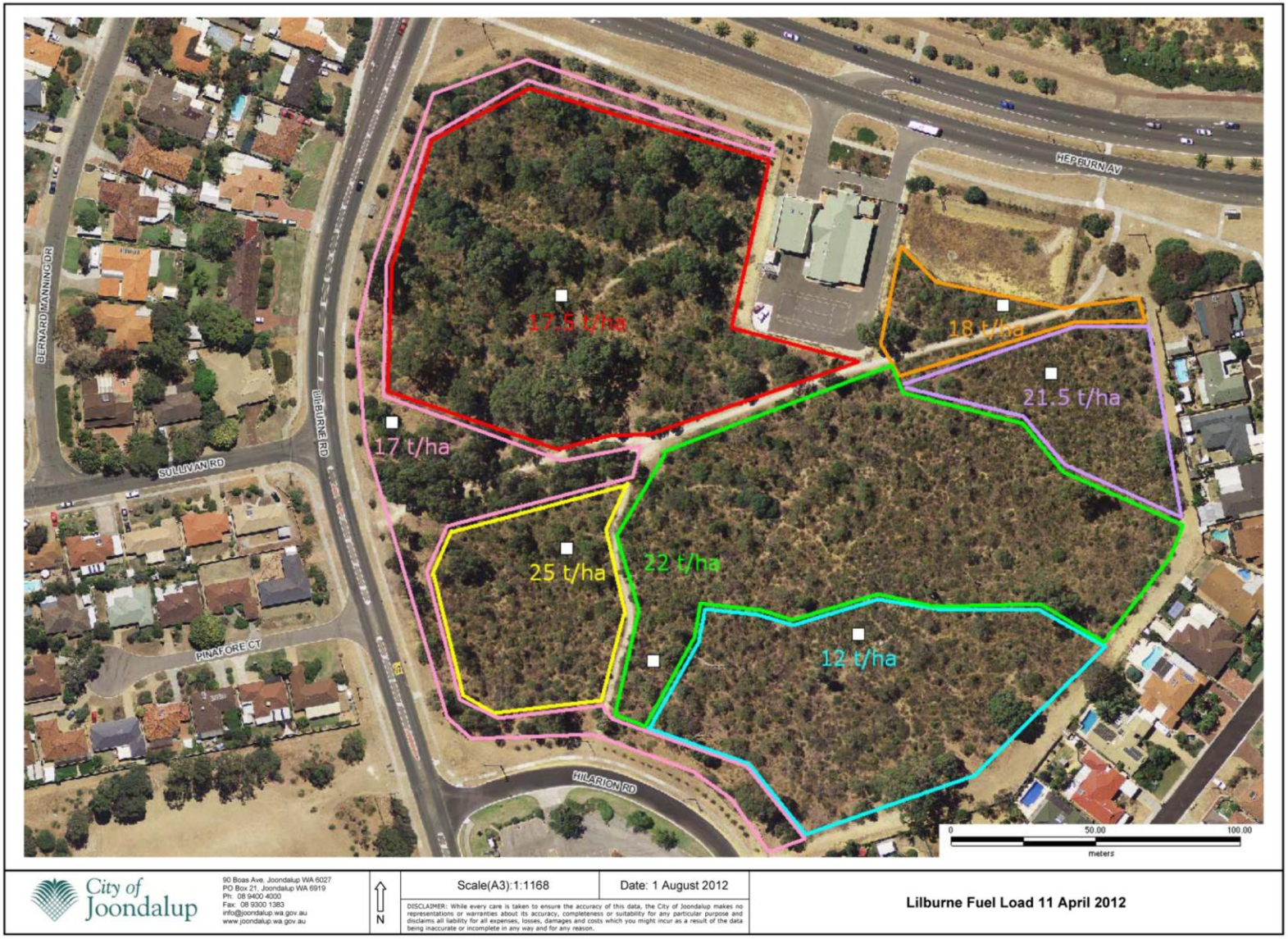


Figure 1A: Lilburne Park Fuel Load Assessment – 11 April 2012

Appendix 2 – Lilburne Park Flora and Fauna Species Lists

Flora Species Represented in Quadrats

				Sept 2012 Survey	Feb 2012 Survey		2004/2011		
Family	**Species**	**% Coverage**	**Estimated Abundance Per 100m^2**		**V1**	**V2**	**Previous Surveys**	**Significance**	**Comments**
Aizoaceae	**Carpobrotus edulis*	<1	2-10	Opp	√				
Amaranthaceae	*Ptilotus drummondii*	<1	2-10			√	√		
Amaranthaceae	*Ptilotus polystachyus*				Opp		√		
Amaranthaceae	*Ptilotus stirlingii*	<1	2-10			√	√		
Apiaceae	*Daucus glochidiatus*					Opp			
Asparagaceae	*Acanthocarpus preissii*	2-10	2-10		√	Opp			
Asparagaceae	*Lomandra maritima*	2-10	2-10		√	Opp	√		
Asparagaceae	*Thysanotus sparteus*	<1	2-10		√	√			
Asteraceae	**Conyza bonariensis*	<1	2-10		√				
Asteraceae	**Hypochaeris glabra*	<1	2-10		√				
Asteraceae	**Hypochaeris radicata*	<1	2-10		√				
Asteraceae	**Sonchus oleraceus*	<1	2-10		√	√			
Asteraceae	*Podotheca sp.*						√		
Caryophyllaceae	**Silene gallica*	<1	2-10		√				
Casuarinaceae	*Allocasuarina fraseriana*	1	2-10		√	Opp	√		
Casuarinaceae	*Allocasuarina humilis*	10-30	10-50		√		√		
Chenopodiaceae	*Rhagodia baccata*	1	2-10			√	√		
Colchicaceae	*Burchardia congesta*	<1	2-10		√	√	√		Previously *Burchardia umbellata*
Cyperaceae	*Lepidosperma ? squamatum*	2-10	2-10		Opp	√			
Cyperaceae	*Mesomelaena pseudostygia*	2-10	10-50		√	√	√		
Cyperaceae	*Schoenus cladestinus*	<1	2-10		√				
Cyperaceae	*Schoenus grandiflorus*						√		May be confused with *Tetraria octandra*
Cyperaceae	*Tetraria octandra*	2-10	2-10		√		√		
Dilleniaceae	*Hibbertia hypericoides*	10-30	2-10		√	√	√		
Dilleniaceae	*Hibbertia racemosa*	<1	2-10		Opp	Opp	√		

				Sept 2012 Survey	Feb 2012 Survey		2004/2011		
Family	**Species**	**% Coverage**	**Estimated Abundance Per 100m^2**		**V1**	**V2**	**Previous Surveys**	**Significance**	**Comments**
Ericaceae	*Conostephium pendulum*						√		
Ericaceae	*Leucopogon propinquus*	10-30	2-10			√	√		
Euphorbiaceae	**Euphorbia terracina*	<1	2-10		Opp				
Euphorbiaceae	*Ricinocarpos glaucus*	2-10	2-10			√	√		
Fabaceae	*Acacia pulchella*	<1	2-10		√				
Fabaceae	*Acacia rostellifera*			Opp					
Fabaceae	*Acacia saligna*	<1	2-10		Opp	√	√		
Fabaceae	*Daviesia divaricata*	2-10	2-10			√	√		
Fabaceae	*Daviesia nudiflora subsp. Nudiflora*	<1	2-10		√		√		
Fabaceae	*Daviesia triflora*	2-10	2-10		√	√	√		
Fabaceae	*Gastrolobium capitatum*	<1	2-10		√	Opp			
Fabaceae	*Gompholobium tomentosum*	2-10	2-10		√	√	√		
Fabaceae	*Hardenbergia comptoniana*	2-10	2-10		√	√			
Fabaceae	*Hovea trisperma*	2-10	2-10		√	√	√		
Fabaceae	*Jacksonia calcicola*	2-10	2-10		√				Previously recorded as *Jacksonia sericea*
Fabaceae	*Jacksonia furcellata*					Opp	√		
Fabaceae	*Kennedia prostrata*			Opp					
Geraniaceae	**Pelargonium capitatum*	<1	2-10		√	√			
Goodeniaceae	*Lechenaultia linarioides*	2-10	2-10		√		√	p	
Goodeniaceae	*Scaevola canescens*	2-10	2-10		√		√		
Goodeniaceae	*Scaevola repens*				Opp		√		
Haemodoraceae	*Anigozanthos humilis*			Opp					
Haemodoraceae	*Conostylis aculeata*	2-10	2-10		√	√	√		
Haemodoraceae	*Conostylis aculeata* subsp *cygnorum*	2-10	2-10		√	√		e	
Haemodoraceae	*Haemodorum paniculatum*	<1	2-10		√	Opp	√		Previously recorded as *Haemodorum Laxum*

				Sept 2012 Survey	Feb 2012 Survey		2004/2011		
Family	**Species**	**% Coverage**	**Estimated Abundance Per 100m^2**		**V1**	**V2**	**Previous Surveys**	**Significance**	**Comments**
Hemerocallidaceae	*Corynotheca micrantha var micrantha*	2-10	10-50		√		√		
Hemerocallidaceae	*Dianella revoluta*	2-10	2-10		√	√	√		
Hemerocallidaceae	*Tricoryne elatior*	<1	2-10		√		√		
Iridaceae	**Romulea rosea*	<1	2-10		√	√			
Iridaceae	**Gladiolus caryophyllaceus*	<1	2-10	Opp	√	√			
Iridaceae	*Orthrosanthus laxus* var *laxus*	<1	2-10		√	√	√		
Myrtaceae	*Calothamnus quadrifidus*	2-10	2-10		√		√		
Myrtaceae	*Corymbia calophylla*						√		
Myrtaceae	**Eremaea pauciflora var pauciflora*					Opp			Most likely planted
Myrtaceae	*Eucalyptus gomphocephala*	<1	2-10		Opp	Opp	√		
Myrtaceae	*Eucalyptus marginata*	2-10	2-10			√	√		
Myrtaceae	*Kunzea ericifolia*					Opp			
Myrtaceae	*Melaleuca systena*	2-10	2-10		√				
Orchidaceae	*Diuris magnifica*			Opp					
Orchidaceae	*Microtis media* subsp *media*	<1	2-10			√			
Phyllanthaceae	*Phyllanthus calycinus*	2-10	2-10		√	√	√		
Poaceae	**Avena barbata*	<1	2-10		√				
Poaceae	**Ehrharta calycina*	<1	10-50		√	√			
Poaceae	**Ehrharta longiflora*	<1	2-10		√				
Poaceae	*Austrostipa flavescens*	<1	2-10			√	√		
Primulaceae	**Lysimachia arvensis*	<1	2-10		√				
Proteaceae	**Bansksia prionotes*	10-30	10-50		Opp		√		
Proteaceae	*Banksia attenuata*	2-10	2-10		√	Opp	√		
Proteaceae	*Banksia dallanneyi* var *dallanneyi*	10-30	10-50		√	√	√		Previously *Dryandra lindleyana*
Proteaceae	*Banksia grandis*				Opp				

				Sept 2012 Survey	Feb 2012 Survey		2004/2011		
Family	**Species**	**% Coverage**	**Estimated Abundance Per 100m^2**		**V1**	**V2**	**Previous Surveys**	**Significance**	**Comments**
Proteaceae	*Banksia sessilis*						√		Previously *Dryandra sessilis*
Proteaceae	*Banksia menziesii*	1	2-10		Opp		√		
Proteaceae	**Grevillea crithmifolia*					Opp			Most likely planted
Proteaceae	*Grevillea vestita*	10-30	2-10		√		√		
Proteaceae	*Hakea lissocarpha*	10-30	2-10		√	√	√		
Proteaceae	*Hakea prostrata*	1	2-10		√		√		
Proteaceae	*Hakea trifurcata*					Opp			
Proteaceae	*Persoonia saccata*						√		
Proteaceae	*Petrophile linearis*					Opp	√		
Proteaceae	*Petrophile macrostachya*	2-10	2-10		√	Opp	√		
Proteaceae	*Stirlingia latifolia*	1	2-10			√	√		
Proteaceae	*Synaphea spinulosa*						√		
Restionaceae	*Alexgeorgea nitens*	2-10	2-10		√				
Restionaceae	*Desmocladus flexuosus*	2-10	10-50		√	√	√		
Rubiaceae	*Opercularia vaginata*						√		
Violaceae	*Hybanthus calycinus*			Opp					
Xanthorrhoeaceae	*Xanthorrhoea brunonis*	2-10	2-10		√	√			
Xanthorrhoeaceae	*Xanthorrhoea preissii*	10-30	10-50		√	√	√		
Zamiaceae	*Macrozamia riedlei*	2-10	2-10		Opp	Opp	√		

* denotes non-native species to the local area
'e' taxa endemic to the Swan Coastal Plain (DEP 2000)

Opp – Opportunistic collection – no abundance recorded
'p' considered to be poorly reserved (DEP 2000)

Weed Species List

Family	Species	Common Name	EWSWA* Rating	Declared Weed DAFWA^	Recorded 2004	Recorded 2011	Recorded Feb 2012	Recorded Sept 2012
Aizoaceae	*Carpobrotus edulis*	Hottentot Fig	Moderate			√	√	√
Anacardiaceae	*Schinus terebinthifolius*	Japanese Pepper	Moderate				√	
Asphodelaceae	*Trachyandra divaricata*	False Onion Weed	Mild		√	√	√	√
Asparagaceae	*Agave americana*	Century Plant	Low				√	
Asteraceae	*Gazania linearis*	Gazania	Low				√	
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	Low				√	
Asteraceae	*Hypochaeris glabra*	Smooth Catsear	Moderate				√	
Asteraceae	*Hypochaeris radicata*	Flatweed	Not Listed			√	√	
Asteraceae	*Monoculus monstrosus*	Stinking Roger	Not Listed			√	√	
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	Moderate			√	√	
Brassicaceae	*Brassica tournefortii*	Mediterranean Turnip	High					√
Brassicaceae	*Diplotaxis tenuifolia*	Sand Rocket	Low				√	
Brassicaceae	*Raphanus raphanistrum*	Wild Radish	Mild					√
Campanulaceae	*Wahlenbergia capensis*	Cape Bluebell	Moderate					√
Caryophyllaceae	*Silene gallica*	French Catchfly	Low		√		√	
Caryophyllaceae	*Petrorhagia dubia*	Hairy Pink	Not Listed		√			
Euphorbiaceae	*Euphorbia terracina*	Geraldton Carnation Weed	High		√	√		
Fabaceae	*Lupinus consentinii*	Blue Lupin	High		√	√	√	√
Iridaceae	*Freesia alba x leichtlinii*	Freesia	Listed					√
Geraniaceae	*Erodium sp*	Storkbill	Listed			√		
Geraniaceae	*Pelargonium capitatum*	Rose Pelargonium	High		√	√	√	
Iridaceae	*Ferraria crispa*	Black Flag**	Listed				√	
Iridaceae	*Gladiolus caryophyllaceus*	Wild Gladiolus	Moderate			√	√	√

Family	Species	Common Name	EWSWA* Rating	Declared Weed DAFWA^	Recorded 2004	Recorded 2011	Recorded Feb 2012	Recorded Sept 2012
Iridaceae	*Moraea flaccida*	One-leaf Cape Tulip	High	Yes	√	√		√
Iridaceae	*Romulea rosea*	Guildford Grass	High		√		√	
Iridaceae	*Watsonia meriana* var. *bulbillifera*	Watsonia	High				√	√
Mimosaceae	*Acacia iteaphylla*	Flinders Range Wattle	Low				√	
Myrtaceae	*Chamelaucium uncinatum*	Geraldton Wax	Not Listed				√	
Onagraceae	*Oenothera stricta*	Evening Primrose	Low				√	
Papaveraceae	*Fumaria capreolata*	Whiteflower Fumitory	Mild			√		√
Poaceae	*Avena barbata*	Bearded Oat	Moderate		√	√	√	
Poaceae	*Briza maxima*	Blowfly Grass	Moderate				√	
Poaceae	*Bromus sp*	Brome Grass	Listed			√		
Poaceae	*Cynodon dactylon*	Couch	Moderate				√	
Poaceae	*Ehrharta calycina*	Perennial Veldt Grass	High		√	√	√	
Poaceae	*Ehrharta longiflora*	Annual Veldt Grass	Moderate			√	√	
Poaceae	*Eragrostis curvula*	African Lovegrass	High		√		√	
Primulaceae	*Lysimachia arvensis*	Pimpernel	Not Listed			√	√	
Solanaceae	*Solanum nigrum*	Black Berry Nightshade	Moderate			√	√	√
Zygophyllaceae	*Tribulus terrestris*	Caltrop	Not Listed			√	√	

*EWSWA - Ratings from the Environmental Weed Strategy for WA (DEC 1999)

^DAFWA - Declared Weeds Database (2010)

** Identified during Natural Areas Site Inspection (August 2012)

Conservation Codes for Western Australian Fauna

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and WA *Wildlife Conservation Act 1950*.

Threatened Species Codes

Category	Code	Description
Extinct	EX	Taxa not definitely located in the wild during the past 50 years.
Extinct in the wild	EW	Taxa known to survive only in captivity.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	EN	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable	VU	Taxa facing a very high risk of extinction in the wild in the medium-term future.
Conservation Dependent	CO	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

WA Department of Environment and Conservation
WA Threatened Fauna Categories

Category	Code	Description
Schedule 1	T	Fauna which is rare or likely to become extinct.
Schedule 2	X	Fauna which is presumed extinct.
Schedule 3	IA	Birds which are subject to an agreement between the governments of Australia and Japan (JAMBA) relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S	Fauna that is otherwise in need of special protection

WA Department of Environment and Conservation and Land Management Priority Species Priority Codes

Category	Code
Priority 1	Taxa with few, poorly known populations on threatened lands.
Priority 2	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	Taxa in need of monitoring.
Priority 5	Conservation dependent species.

Note: species not listed under the WA *Wildlife Conservation Act 1950*, but for which there is some concern.

Vertebrate Fauna Species List

Scientific Name	Common name	Comments	Recorded 2011	Conservation Status
Reptiles				
Christinus marmoratus	Marbled Gecko	1 head-torched at night		Native
Cryptoblepharus buchananii	Fence skink	observed active on trees and pit-trapped		Native
Ctenotus fallens	Striped Skink	common throughout, trapped and observed active		Native
Hemiergis quadrilineata	Two-toed Garden Skink	one found in soil under leaf litter		Native
Lerista praepedita	Burrowing Skink	one found in soil under leaf litter		Native
Lialis burtonis	Burton's Legless Lizard	1 juvenile observed active		Native
Menetia greyii	Common Dwarf Skink	1 pit trapped, 1 observed active		Native
Tiliqua rugosa	Bobtail	sloughed skin		Native
Mammals				
Canis lupus	Dog	scats and tracks		Non-native
Felus cattus	Cat	1 head-torched at night		Non-native
Isoodon obesulus	Quenda	foraging signs identified in several locations in southern portion		Priority 5
Macropus fuliginosus	Grey kangaroo	1 adult observed active, and extensive scats identified		Native
Mus musculus	House mouse	several Elliot and Pit-fall trapped		Non-native
Rattus rattus	Black Rat	footprints in sand identified		Non-native
Vulpes vulpes	Red fox	an active warren		Non-native
Birds				
Anthochaera carunculata	Red Wattlebird	common throughout	√	Native
Anthochaera superciliosus	Western Wattlebird	common throughout		Native
Barnardius zonarius	Australian Ringneck	several observed and heard calling		Native
Cacatua roseicapilla	Galah	several heard calling	√	Native
Cacatua sanguinea	Little Corella	several heard calling		Native to WA but not to Perth
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	evidence of feeding - chewed *Banksia prionotes* cones		EN, T
Coracina novaehollandiae	Black-faced Cuckoo Shrike	several heard calling		Native

Scientific Name	Common name	Comments	Recorded 2011	Conservation Status
Corvus coronoides	Australia Raven	common throughout		Native
Cracticus tibicen	Magpie	1 family group observed		Native
Cracticus torquatus	Grey Butcherbird	1 heard calling		Native
Dacelo novaeguineae	Kookaburra	several heard calling		Non-native
Gerygone fusca	Western Gerygone	heard calling		Native
Grallina cyanoleuca	Magpie-lark	several heard calling		Native
Lichenostomus virescens	Singing Honeyeater	common throughout	√	Native
Lichmera indistincta	Brown Honeyeater	common throughout	√	Native
Merops ornatus	Rainbow Bee-eater	one heard calling	√	IA, Migratory
Ninox novaeseelandiae	Boobook Owl	1 observed in Tuart woodland area in northern portion		Native
Phylidonyris novaehollandiae	New Holland Honeyeater	several in southern portion	√	Native
Rhipidura leucophrys	Willie Wagtail	several observed		Native
Smicrornis brevirostris	Weebill	several groups observed and heard calling		Native
Streptopelia chinensis	Spotted Turtledove	several observed		Non-native
Streptopelia senegalensis	Laughing Dove	common throughout	√	Non-native
Trichoglossus haematodus	Rainbow Lorikeet	several heard calling		Non-native
Zosterops lateralis	Silvereye	several heard calling		Native

Invertebrate Fauna Species List

Common name	**Order: Family**	**Family/*Genus***
Woodlice (Slater)	Isopoda	
Scorpion - species 1	Buthiones	Buthidae
Scorpion - species 2	Aracnida: Scorpionidae	*Urodachus*
Millipede - species 1	Polydesmida	*Ommatoiulus*
Millipede - species 2	Polydesmida	
Tick	Arachnida	Acarina
Wolf Spider species 1	Arachnida	Lycosidae
Wolf Spider species 2	Arachnida	Lycosidae
Spider 1	Arachnida	
Spider 2	Arachnida	
Spider 3	Arachnida	
Golden Orb Weaver	Arachnida	
White-tailed spider	Arachnida	*Lampona*
Huntsman Spider	Arachnida	
Jumping Spider species 1	Arachnida	
Jumping Spider species 2	Arachnida	
Katidid - species 1 green	Orthoptera	Tettigoniidae
Katidid - species 2 fawn	Orthoptera	Tettigoniidae
Grass hopper	Orthoptera	
Cricket	Orthoptera	
Centipede	Chilopoda	
Moth species 1	Lepidoptera	
Moth species 2	Lepidoptera	
Butterfly - Monarch	Lepidoptera	Nymphalidae
Weevil species 1	Colepotera	Curculionoidae
Weevil species 2	Colepotera	Curculionoidae
Earwig species 1	Dermaptera	
Earwig species 2	Dermaptera	
Fly	Diptera	
Ant – bull ant	Hymenoptera	formicidae
Ant - meat ant	Hymenoptera	formicidae
Ant - small black sp 1	Hymenoptera	formicidae
Ant - small black sp 1	Hymenoptera	formicidae
Ant - peaceful night ant	Hymenoptera	formicidae
Native Bee sp 1	Hymenoptera	
Native Bee sp 2	Hymenoptera	
European Bee	Hymenoptera	
Assassin Bug	Hemiptera	Reduviidae
Stink Bug	Hemiptera	

Appendix 3 – Keighery Scale Definitions

Vegetation Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non- aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

(Sourced from Department of Planning 2000)

Draft Lilburne Park Management Plan Community Consultation Summary Oct 2012

Feedback Form Question/ Section	ID	Comment	City Response
What do you like about the Draft Lilburne Park Management Plan?	Aeron Stephenson	Quite thorough. Insightful information about the area re: geology etc. Appears to concisely cover flora, fauna and fire aspects of conservation.	Comments noted.
	Kathy Sheridan	1. upgrading paths for improved access 2. educational signs 3. regular dismantling of "cubbies" 4. guided nature tours	Comments noted.
	Mike Norman	The Management Plan is a good summary of Lilburne Park in terms of its natural components, the threats to its integrity and the actions to be taken managing the park over the next five years.	Comment noted.
	Sue Eccles	The structured approach, where everyone is aware of their responsibilities in ensuring the park is maintained, not only for the benefit of the community but the fauna & flora. The sump area will be incorporated into the plan.	Comments noted.
	John Hosgood	Basically, the interest detailed in the Plan and the surprising number of fauna to be found	Comment noted.
	Wendy Crawford	I found it very thorough. I particularly like the idea of better weed management, interpretative signage to better engage the community, improving the sump area and constructing an ecological corridor to Hepburn Conservation area considering how small the Lilburne area is and the need to prevent inbreeding.	Comments noted.
	Ron Cann	Eradication of introduced weed species. Involvement of Duncraig High School students.	Comments noted.
	Rosaleen Appelhans	That it exists! The detail regarding all aspects of the park.	Comments noted.
	Sue Shean	Targeted main issues. Foresight to see the benefit of protecting this little pocket of WA.	Comments noted.
	Tony Moore	It seems very thorough and considers all aspects	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
	Pam Algar	I like that respect is being given to the natural environment. I like the coloured pictures as they clarify which species to look for. The report is readable.	Comments noted.
	Marilyn Zakrevsky	1. Targeted management of weeds in Lilburne will also assist in the management of Hepburn Heights Bushland by reducing the opportunity for weed seeds being carried by wind and birds 2. The format (maps and tables showing weed control programme etc) is clear and concise and will assist in annual planning and implementation. 3. Management actions are clearly set out 4. The significance of visits by Carnaby's cockatoos to Lilburne Reserve. I have observed them feeding in Hepburn Heights and then moving on in a southerly direction to Lilburne Reserve.	Comments noted.
	Brian Buzzard	It keeps the area as a park. It recognises the value of City 'lungs'. It recognises the diversity of flora and fauna. It protects the amenity for years to come.	Comments noted.
		NO POWER SUB-STATIONS PLEASE.	Lilburne Park is classified as a major conservation area and is ranked in the City of Joondalup's top five natural areas due to the high biodiversity values of the area. Lilburne Park is also listed as a place having significance for the purpose of protection of the landscape or environment in Schedule 5 of the City of Joondalup District Planning Scheme No. 2. Lilburne Park is classified as a 'Reserve' and is Crown land, managed by City of Joondalup. Comment noted.
	Dr Marjorie Apthorpe	Very little. There is not a lot of management to actually comment on, being confined to a couple of boxes on one table. The management details are not given. There are 14 pages of introductory comments relating to the Swan Coastal Plain, the legislative framework, and speculative comments on what species are "likely" or "could potentially exist" in Lilburne Park.	Comment noted.
		The Draft Management Plan diagrams and text show a substantial number of errors of fact, and internal inconsistencies, suggesting sloppy compilation and "cut and paste" from previous City of Joondalup reports (for example, the Biodiversity Report).	Comment noted. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		Such errors include the statement on page 15 that "Lilburne Park is classified as having Karrakatta Complex - Central and South soil complex type, as shown in Figure 5", whereas Figure 5 shows quite clearly that Lilburne Park is within the purple area shown as Cottesloe Complex, not Karrakatta. Figure 5 presents other interesting internal contradictions: in the top right corner, the Legend is labelled "Vegetation Complex", whilst the Title of the diagram (at the bottom) says, twice "Soil Complex Types City of Joondalup	Delete text in Section 2.1.1 (Soils of the Swan Coastal Plain) of the Draft Lilburne Park Management Plan that states 'The City of Joondalup has three soil complex types; Cottesloe, Karrakatta and Quindalup. Regional scale mapping shows Lilburne Park is classified as having Karrakatta Complex - Central and South soil complex type, as shown in Figure 5'. In Section 2.1.4 (Vegetation Complexes) of the Draft Lilburne Park Management Plan it states 'Regional scale mapping shows the project area is classified as having Karrakatta Complex - Central and South (see Figure 5)'. This sentence should be amended to 'Regional scale mapping shows the project area is classified as having Cottesloe Complex - Central and South (see Figure 5)'. Also amend paragraph regarding pre-European extent of Karrakatta Complex – Central and South so that it refers to Cottesloe Complex – Central and South. Amend title of Figure 5 from 'Soil Complex Types City of Joondalup; to 'City of Joondalup Vegetation Complex Types'.
		The timing of the flora survey (summer) was inappropriate, as many species are not in flower or are not emergent, making a comprehensive flora listing impossible. More importantly, the cover and density of weed species cannot be assessed in summer, as many weeds are annuals, most prolific in winter, and dormant and poorly visible in summer.	The Draft Lilburne Park Management Plan states that 'due to time limitations, the flora survey was conducted in summer. The optimum time to survey flowering annual flora species is spring, whilst weeds are most detectable in winter.' Section 4.7 outlines recommended management actions of 'engage consultants to undertake weeds survey in winter' and 'engage consultants to undertake a flora survey in spring' in 2016/17. No amendments to Draft Lilburne Park Management Plan required.
		The flora survey uses terminology indicating that some of the records of species are speculative ("potentially exists"). This is unsatisfactory.	The desktop flora survey identified species that potentially exist in Lilburne Park but were not able to be confirmed during the survey. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		The weed map (Figure 15) is highly inaccurate. In winter 2012, a quick informal examination showed that much of the southern part of the reserve contains One-leaf Cape Tulip (Moraea flaccida), in places in high concentrations. Patches of this serious Declared Weed also occur in the northern part of the reserve, and abundantly along tracks. This weed has been present for several years from the size of the plants, and its dead stems should have been identified during the summer flora survey. Also present is Gladiolus caryophyllaceus (or possibly Watsonia merino - not yet in flower), which is scattered throughout, including in very good areas of vegetation condition. Gladiolus is not mentioned on the Weed Species location map (Figure 15), and on the list of weeds it is given as "not targeted" (Table 5). Perennial veldt grass was also observed along many tracks. Of considerable concern is the abundance and wide distribution along all tracks of Fumaria capreolata, an aggressive smothering weed. No management of Fumaria or of Gladiolus was observed. It should be self-evident that effective weed management cannot be carried out unless the presence of weeds is accurately mapped, at appropriate times of year.	Section 4.7 outlines the recommended management action of 'engage consultants to undertake weeds survey in winter' in 2016/17. Amend Table 5 in Draft Lilburne Park Management Plan to state that Gladiolus is treated by hand weeding in August/September. Change 'Pink Gladiola' to 'Wild Gladiolus'.
		Fauna: A February or March survey should have been able to establish the presence or absence of the Graceful Sun Moth. The status of this moth as given in the report is believed to be incorrect, as I understand that the status was changed to "vulnerable" in late 2011.	Section 4.7 outlines the recommended management action of engage consultants to undertake the Graceful Sun Moth surveys in accordance with the Survey Guidelines for the Graceful Sun Moth and Site Habitat Assessments' in 2015/16 and 2016/17. The Graceful Sun Moth is referred to in the Draft Lilburne Park Management Plan as 'threatened'. The species is listed in the EPBC Act List of Threatened Fauna as endangered and in Schedule 1 (Fauna that is rare or is likely to become extinct) under the *Wildlife Conservation Act 1950*, 17 Feb 2012. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		Scientific Research and Monitoring. Surveys of flora, weeds, fungi, fauna etc and the Graceful Sun Moth are to be conducted by consultants in 2015-16 and 2016-17. This is a long time off and very disturbing, as it is clear that the present status of most of the above categories is unknown. Effective management cannot be carried out with so little knowledge of the reserve and its flora and fauna. These base-line facts need to be established now, not in 3 to 5 years time.	The flora, fauna and fungi survey that was conducted in February 2012 provides baseline information for the Draft Lilburne Park Management Plan. No amendments to Draft Lilburne Park Management Plan required.
		Implementation of Management Actions. The development of a Weed Management Plan by Strategic and Organisational Development, requiring 1500 hours of time, and totally separated from Operation Services or other on-ground contact with the Lilburne Reserve, is totally inappropriate and a poor use of ratepayers funds. It is highly disturbing that more time will be spent on developing this document than actually carrying out weed management.	Section 4.7 outlines the recommended management action to develop a Weed Management Plan in 2012/13-2016/17 requiring 1,500 hours. This refers to a City of Joondalup Weed Management Plan. Amend text in Section 4.7 to state 'City of Joondalup Weed Management Plan'. Amend person hours amount to 450 hours. Amend note in Section 4.7 from 'Note: Budget amounts are estimates only and will require review prior to the year of implementation' to 'Note: Budget and person hour amounts are estimates only and will require review prior to the year of implementation'.
		I also note that less time will be spent on weed control (442 hours/year) than on training staff in plant identification (500 hours / year). While the latter is clearly necessary to carry out bushland weed control, it is difficult to understand why this weekly training has been allocated only to the Lilburne Management Plan, and not to other Natural Areas.	Section 4.7 outlines the recommended management action to 'conduct Natural Areas Team weekly plant identification training, including weed management' for 500 hrs/year. The training is for approximately 10 people in the Natural Areas team to conduct plant identification training for 1 hr/week and applies to the whole of City of Joondalup. No amendments to Draft Lilburne Park Management Plan required.
		Weed control of only 8.5 hours per week (ie. two staff for 4 hours maximum, minus travel time and setting up spraying signs etc) is unlikely to be effective in controlling weeds in Lilburne Reserve, given the present state of extensive weed infestation in the reserve.	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
Are there any changes / improvements that you think should be made to the Draft Lilburne Park Management Plan?	Aeron Stephenson	I would be interested to read a little more on the mineral/pollution composition of the local groundwater and whether this would have an effect on the reserve. (Iron content is listed however nothing else). There is a lot of run-off into local sumps, both the one in the reserve and the one on Hilarion rd. Would this have any impact on ground water quality?	The City of Joondalup does not conduct groundwater quality monitoring. The City installs gross pollutant traps in stormwater pipes to filter the water prior to the water entering sumps. Sand in sumps also filters the water prior to it entering the groundwater. No amendments to Draft Lilburne Park Management Plan required.
		There did not appear to be any reference to snakes in the park. Is it the case that there is in fact to evidence of snake activity in the entire reserve?	The fauna survey that was conducted consisted of two days of fauna trapping and four days of direct observation in summer, which only gives a sample of fauna in Lilburne Park. Snakes may exist in Lilburne Park however they haven't been identified on site as yet. No amendments to Draft Lilburne Park Management Plan required.
		Recommended actions to reduce activity of introduced fauna (p 43) had no actions to reduce cat activity - whether related to education of local community about night curfew rules, increasing awareness of issues domestic cats can cause in such areas, or reducing activity of feral cats.	In section 3.7 and 4.7, there is a recommended management action from 2012/13 to 2016/17 to 'implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.' Through targeting the issue of 'responsible pet ownership', the City will raise awareness of the effect of cats and dogs on local flora and fauna, and suggestions of actions people can take to reduce impacts. The *Cat Act 2011* was introduced to provide for the control and management of cats; and promotes and encourages the responsible ownership of cats, and for related matters. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		I also noted that in Appendix 2 – Flora and Fauna Species, under mammals, cat was listed as “1 head-torched at night”. Does this mean you found a cat head that had been set alight at night?	The reference to head-torching at night refers to the use of a head-torch to spot fauna. No amendments to Draft Lilburne Park Management Plan required.
		I was surprised that local school were not on board for weed or rubbish removal, especially given they are engaged for educational tours. Could 30 minutes of conservation activity be attached to the end of the tours? This could reinforce to the students that every little bit helps and that it is not difficult to care for local environments. Plus, free labour is always a good thing ;)	The City is currently investigating the establishment of a school based program to raise awareness of biodiversity values and develop bushland management skills. No amendments to Draft Lilburne Park Management Plan required.
	Kathy Sheridan	Path improvements should not only cater for people with disabilities but also prams, bikes. Gates will need to be changed for this and paths wide enough.	In Section 3.5 and 4.7 the Draft Lilburne Park Management Plan states the recommended management action that ‘future upgrades to Lilburne Park are to address access issues by providing gates and paths that can be used by people with a disability.’ Amend Management Plan to add ‘as well as benefit other path users such as people pushing prams’ at the end of the sentence.

Feedback Form Question/ Section	ID	Comment	City Response
	Mike Norman	I walked the reserve in August and make the following comments: 1. I do not believe the bushland condition map shown in Figure 13 (page 24) is entirely correct and needs to be resurveyed now. The aggressive bulbous weed "one leaf cape tulip" is present in quite high densities in many parts classified on the map as "very good". To get a good baseline (in order to see in future if the proposed investment in weeding manpower and methods is effective), both summer and winter growing weed densities need to be surveyed.	A vegetation condition assessment was conducted by consultants on 16 September 2012 using the Keighery Scale and mapping the results. Any prevalent weed species were also noted. A follow up vegetation condition assessment was undertaken by 360 Environmental in September 2012. The vegetation condition map created by Syrinx from the vegetation assessment undertaken in February 2012 is similar to the vegetation condition map created by 360 Environmental from the vegetation condition assessment in September 2012. The area of vegetation found to be very good by 360 Environmental was due to the species richness of the community, little impact to the structure of the community, the healthy condition of most species' populations and the low numbers of aggressive and very competitive weed species. *Moraea flaccida* (One-leaf Cape Tulip) was recorded as being found throughout the area in moderate densities with little impact on surrounding plants and low control priority. *Moraea flaccida* is also described as being of 'low competitive impact'. The vegetation condition assessment map from September 2012 is to be included in the Draft Lilburne Park Management Plan and Table 2 of the Draft Lilburne Park Management Plan is to be updated with the Keighery Scale percentage assessment from September 2012. Some text will be added to Draft Management Plan explaining why certain vegetation condition classifications (i.e. very good, good or degraded) were used. The weed species listed in Section 3.1 and Appendix 2 are to be updated with the prevalent weeds recorded in September 2012 by 360 Environmental.

Feedback Form Question/ Section	ID	Comment	City Response
		2. On page 28, the "Bradley Method" is stated as the method the City follows for weed management. In my experience, this method alone alone does not work for coastal or bushland reserves in urban areas. I have seen many reserves, including this one, where aggressive weed species have invaded from the degraded edges, especially after fire, but not only due to fire. So I believe that aggressive weed species need to be managed over the entire reserve. It is interesting that the Plan gives the impression herbicide use is the main way that the City will manage weeds. As most herbicides are not selective, weeding from bushland in good condition (using the Bradley Method) would therefore require mostly manual removal of weeds, due to the density of native plants.	The Draft Lilburne Park Management Plan (pg. 28) states 'the City of Joondalup follows the 'Bradley Method' of bush regeneration, i.e. "remove weeds competing with native plants in the good condition sections of bush and work out at the pace of natural regeneration, disturbing the soil as little as possible". These principles encourage the vegetation to re-establish by itself and maintain high conservation values of natural areas.' The City of Joondalup conducts weed management across entire reserves, using the priority order of working in good condition sections of bush to more degraded sections. The Draft Lilburne Park Management Plan (pg. 28) also states that 'management of weeds at Lilburne Park is undertaken through weed monitoring, on ground weed management and community education initiatives.' No amendments to Draft Lilburne Park Management Plan required.
		3. The weed "fumitory" is listed in the Weed Species List as "mild". This weed is spreading considerably in many coastal and bushland reserves in the City of Joondalup, smothering many species of low growing native plants. So from my experience it is not "mild" and I would like to see it actively managed at Lilburne Park.	*Fumaria capreolata* (Whiteflower Fumitory) is rated as mild in the Environmental Weed Strategy for WA (DEC 1999), however 360 Environmental describe it as a high control priority. Additional weeds are to be included in the highest priority section of Table 5 in the Draft Lilburne Park Management Plan (weeds identified on site that are referred to as high control priority in the 360 Environmental Lilburne Park Vegetation Condition Assessment (2012), rated as high in the Environmental Weed Strategy for WA (DEC 1999), are declared plants or weeds of national significance). Specifically the weeds to be added to the Highest Priority section in Table 5 are *Freesia alba x leichtlinii* (Freesia), *Carpobrotus edulis* (Hottentot Fig), *Lupinus consentinii* (Sandplain Lupin), *Moraea flaccida* (One-leaf Cape Tulip), *Watsonia meriana var. bulbillifera* (Watsonia), *Fumaria capreolata* (Whiteflower Fumitory) and *Eragrostis curvula* (African Lovegrass).

Feedback Form Question/ Section	ID	Comment	City Response
		4. I assume that the proposed Fire Management Plan mentioned on page 52 will include a map of all the existing fire access tracks (given they are not shown in any other map in the Management Plan). New fire access tracks should not be put through the reserve as they are very damaging to the bush and open it up for even more weed invasion.	Figure 23 indicates the current fire access track in Lilburne Park. There are currently no proposed fire access tracks for Lilburne Park. No amendments to Draft Lilburne Park Management Plan required.
		5. In August, there was a lot of rubbish, cubbies and large holes in the park. I assume that under the Management Plan these occurrences will be more closely managed.	The current management approach for City of Joondalup is that monthly inspections are conducted and cubbies are dismantled by City of Joondalup as required. Rubbish is collected by the City of Joondalup on an as needed basis, sometimes in conjunction with hand weeding activities. A recommended management action will be added to Section 3.5 and 4.7 to 'install a rubbish bin at the main entrance to Lilburne Park on Lilburne Road and incorporate the bin into the City weekly bin emptying schedule'.
	John Hosgood	The Plan covers everything that I could think of.	Comment noted.
	Wendy Crawford	I think more emphasis on community education is needed to create greater awareness about garden escapees and what native species can be found there. I'm sure most people just think its just empty scrub.	In section 3.7 and 4.7, there is a recommended management action from 2012/13 to 2016/17 to 'implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.' No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
	Rosaleen Appelhans	The Pink Gladioli are present and increasing in the W2 area (see the diagrams with weed control). The Cape Tulip is also quite rampant.	Figure 15 (Location of Invasive Weed Species in Lilburne Park) was created from a flora survey conducted in February 2012 and therefore doesn't capture all of the winter weeds. A winter weeds survey in 2016/17 is recommended as a management action in Section 3.1 and 4.7. No amendments to Draft Lilburne Park Management Plan required.
	Sue Shean	Bins at entry points.	A recommended management action will be added to Section 3.5 and 4.7 to 'install a rubbish bin at the main entrance to Lilburne Park on Lilburne Road and incorporate the bin into the City weekly bin emptying schedule'.
	Tony Moore	No that I can think of at this stage.	Comment noted.
	Pam Algar	I would like to see plans to involve our schools in helping to increase education to the general public. The most obvious cause of problems is human destruction and interference with nature. I did place an application for a grant for my school to work with weeding, placing bird nests up high and having children write effective signs onto tin. The grant was knocked back, however I am keen to involve children and need some help and backup from council.	The City is currently investigating the establishment of a school based program to raise awareness of biodiversity values and develop bushland management skills. No amendments to Draft Lilburne Park Management Plan required.
		I would like to see the management plan include the bushland adjacent to Duncraig High School and Glengarry Primary as these areas are linked.	The Draft Lilburne Park Management Plan does not include the bushland sites at Glengarry Primary School and Duncraig Senior High School as they are not directly linked to Lilburne Park and are not owned or managed by the City of Joondalup. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		I would like to see the plan extended to COMMUNICATE with the general public	In section 3.7 and 4.7, there is a recommended management action from 2012/13 to 2016/17 to 'implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.' The Environmental Education Program will include different methods of communication and community engagement. No amendments to Draft Lilburne Park Management Plan required.
	Marilyn Zakrevsky	If monitoring is monthly, ensure that "dumping" and other illegal activities reported by local residents are promptly dealt with. In the event of a Friends group not being resuscitated and being active, incentives for residents to report fires and invasive activities like making cubbies and BMX tracks.	The City of Joondalup has conducted an Expression of Interest process for community members to register for a Friends of Lilburne Park group. The Friends Group process for a Lilburne Park group will be facilitated by the City of Joondalup in 2012/13. In section 3.7 and 4.7, there is a recommended management action from 2012/13 to 2016/17 to 'implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.' No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		Increase hand weeding hours per annum. 150 hours is insufficient for a 5 hectare reserve. except	There is a recommended management action in Section 3.1 and 4.7 to undertake regular weed control by implementing the Annual Bushland Schedule and Weekly Bushland Schedule in 2012/13-2016/17 using the person hours of Natural Areas Team 442 hrs/year and Contractor 150 hrs/year. This is a total of 592 hrs/year for weed control. Amend person hours for weeding in Section 4.7 to Natural Areas Team 416 hrs/year and Contractor 220 hours/year (spraying 70 hrs/year and hand weeding 150 hrs/year).
		The emphasis on the Bradley method for rehabilitation is inappropriate. Weeds from adjacent areas need to be targeted also. An overall strategic weed reduction plan is needed.	Comment noted. The City is developing a City of Joondalup Weed Management Plan in 2012/13.
		Target the internal area W6 because weeds like Pelargoniums spread widely and fast to nearby good areas.	*Pelargonium capitatum* (Rose Pelargonium) is targeted as the highest priority, as shown in Table 5 of the Draft Lilburne Park Management Plan. Hand weeding is conducted in summer/autumn and spraying in winter. No amendments to Draft Lilburne Park Management Plan required.
		Spraying outcomes should be carefully monitored so that the least amount of herbicide is used for the best results.	Comment noted. As stated in Section 3.1, City of Joondalup staff use a weed spraying procedure and conduct weed trials periodically to evaluate the most effective weed management methods. No amendments to Draft Lilburne Park Management Plan required.
		Herbicide applications along firebreaks should be on the basis of best practice. The cost of herbicides, and their potential adverse effects on nearby residents must be a high priority. Residents should be given 24 hour warning prior to application.	Fire access tracks are currently maintained through the herbicide application of Glyphosate one to two times a year and slashing is conducted when required. Residents on the City's 'Chemically Sensitive Register' are notified 24 hours prior to application. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		Tracyandra divaricata (Onion weed) is best dug out with a special tool and the roots bagged. My observation is that herbicides are ineffective ultimately with this particular weed.	The Western Australian Herbarium Florabase (DEC) suggested method of management and control for *Trachyandra divaricata* (False Onion Weed) is to manually remove isolated or small infestations prior to flowering and to wipe with 50% glyphosate solution before flowering. For dense infestations in degraded areas spot spray 0.4 g chlorosulfuron plus 25 ml wetting agent in 10 L of water when plants actively growing. (http://florabase.dec.wa.gov.au/browse/profile/1368) The City of Joondalup manages and controls *Trachyandra divaricata* (False Onion Weed) through hand weeding, and the application of glyphosate or metsulfuron, as stated in Table 5 of the Draft Lilburne Park Management Plan. No amendments to Draft Lilburne Park Management Plan required.
		When $s are spent on the sump, it should be made environmentally friendly instead of steep walls that can be graffitied.	The Draft Lilburne Park Management Plan states that 'retrofitting the sump at Lilburne Park could improve the water quality of stormwater being discharged and enhance the visual appeal of the current sump area, incorporating it into public open space'. The Plan also states that 'the City of Joondalup undertakes a City Sump Improvement Program as part of the capital works Stormwater Drainage Program utilising Water Sensitive Urban Design and water quality improvement principles. Water Sensitive Urban Design incorporates water supply, wastewater, stormwater and groundwater management, urban design and environmental protection into an integrated design of the urban water cycle.' There is a recommended management action to 'consider including Lilburne Park sump in the City Sump Improvement Program to improve the water quality of the stormwater being discharged and enhance the visual appeal and community usability of the area'. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
		Bee and fox control budget of $200 p.a. may be insufficient funding so this amount should be increased. If foxes and rabbits move in, they should be targeted immediately with the view of complete eradication	Comment noted
	Brian Buzzard	The paths could be greatly improved.	In Section 3.5 and 4.7 the Draft Lilburne Park Management Plan states the recommended management action in 2014/15 that 'future upgrades to Lilburne Park are to address access issues by providing gates and paths that can be used by people with a disability.' These upgrades will improve the paths. No amendments to Draft Lilburne Park Management Plan required.
	Dr Marjorie Apthorpe	Yes, many. A few suggestions: 1) Increase the annual allocation of hours for weed control, and reduce the plant identification hours for staff, by making the latter a field-based training activity conducted during weed control.	Comment noted.
		The development of a separate, costly, paper Weed Management Plan by Strategic and Organisational Development is unnecessary. You have a list of weeds and control methods already in the report. What is required is the will and commitment to actually carry out the weed control on the ground.	Comment noted.
		2) Survey the reserve for flora in spring, right now. Do not put off this important step until 2015-16.	Comment noted.
		3) Survey the weeds immediately (late winter/spring). This is critical for informed and intelligent weed control.	Comment noted.
		4) Implement control of Cape Tulip by hand wiping or hand pulling, and of Fumaria by hand weeding, immediately, before both go to seed.	Table 5 of the Draft Lilburne Park Management Plan states that *Moraea flaccida* (One-leaf Cape Tulip) will be sprayed in Aug/Sept and *Fumaria capreolata* (Whiteflower Fumitory) will be sprayed in June/July and hand weeded in July-Oct. No amendments to Draft Lilburne Park Management Plan required.
		5) Carry out the remaining required surveys on fauna, fungi etc at appropriate times of year, in 2013.	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
		6) Assess whether the $98,000 to be used on path upgrades is warranted in view of the level of reserve usage, and whether rammed limestone paths, and gates that are wheelchair or pram accessible would not be a satisfactory and cheaper alternative. On a recent Sunday afternoon in spring, with wildflowers in full bloom, not a single person was observed in any part of Lilburne Reserve.	Comment noted.
Other comments?	Kathy Sheridan	I want to address the chapter on the social and built environment, as I don't think it accurately describes how this reserve is currently being utilised, and it over-emphasises the benefits to the community. The use of the word "cubbies" is a gross euphemism for what these areas are used for. There are always smashed bottles and bongs and they are full of rubbish that spills out into the rest of the park. And they are the source of bushfires EVERY YEAR. This is extreme antisocial behaviour and risks the safety of lives and surrounding homes. It does not feel like a safe location to visit. I don't feel safe walking the dog through on my own.	In Section 3.5 the Draft Lilburne Park Management Plan states that 'monthly inspections are conducted and cubbies are dismantled by City of Joondalup as required.' In Section 3.5 and 4.7 the Plan also states an ongoing recommended management action to 'dismantle cubby houses as required to discourage the disposal of rubbish in this area'. Comments noted.
		The Plan describes how Lilburne Reserve is used by dog walkers. You should note that the only reason it is used is because it is simply the ONLY place available to residents. The closest park is 15-20 min walk away, - this is a considerable distance, especially for young children or people with disabilities. And dog walkers risk their dogs stepping on broken glass along all paths throughout the reserve. Also, these walkers are only in the park for a few minutes...they just go straight through...there is no place to stop and enjoy the wildlife.	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
		The Lilburne reserve is located directly opposite a high school and a deli, which attracts teenagers to loiter unobserved after school hours, constructing so called "cubbies". A way to reduce this antisocial behaviour is to increase visibility to all areas of the reserve to reduce options for hideouts. This could be achieved by attracting visitors from all neighbourhood demographics, not just teenagers or adult dog walkers: a. Increase number of paths criss-crossing the park, with improved paths, so older people, children and prams/bikes/scooters have reasonable access. b. Convert a section of the reserve to a grassed park with payground, seating/BBQs, basketball hoop etc so more people can utilise.	Comments noted.
		I like the idea of educational signs but these are pointless if no one uses the reserve in the first place - they would just be graffiti targets.	Comment noted.
		The Management Plan should consider needs of residents, not just biodiversity conservation. Currently there is a risk to safety of users and surrounding homes. And there is a community need to have a local communal area to exercise, socialise with family and pets and feel safe to enjoy. The environment would be better protected if the community felt more ownership of the reserve, instead of it being a place to avoid because of the rubbish and drug users. The first step in managing the reserve as a diverse environment is to attract visitors who will take a pride in and develop an appreciation for what it has to offer. Otherwise you are wasting the rate payers money.	The City of Joondalup has conducted an Expression of Interest process for community members to register for a Friends of Lilburne Park group. The Friends Group process for a Lilburne Park group will be facilitated by the City of Joondalup in 2012/13. A Friends of Lilburne Park group would increase a sense of community ownership of the reserve. No amendments to Draft Lilburne Park Management Plan required.

Feedback Form Question/ Section	ID	Comment	City Response
	Mike Norman	I make these comments in my role as a "key environmental stakeholder", being: Coordinator, "Friends of Sorrento Beach", and, Coordinator,- "Friends of Porteous Park", and, Coordinator - "Friends of Harman Park", and, Chairman - "Joondalup Community Coast Care Forum, Inc" I would be happy to meet with any Friends Group established for Lilburne Park to show them how I approach the management of the parks I am involved with, in order to to get on-ground results as quickly as possible.	Comments noted.
	John Hosgood	As to the above: If absolutely necessary I would be available.	Comment noted.
	Wendy Crawford	I was very impressed with the document.	Comment noted.
	Ron Cann	I have observed (in previous years) spider orchids in the N.E. corner of the park.	The Draft Lilburne Park Management Plan refers *Caladenia huegelii* (Grand Spider Orchid), potentially existing in Lilburne Park. Comment noted.
	Rosaleen Appelhans	As a local resident I have done a lot of hand weeding of Cape Tulip and Pink Gladioli in past years. At times I have simply had to resort to cutting off flowers and preventing seeding, leaving the tubers - as there have been so many. I would really like to be part of a group that can co-ordinate with the City in providing resources for hand weeding.	The City of Joondalup has conducted an Expression of Interest process for community members to register for a Friends of Lilburne Park group. The Friends Group process for a Lilburne Park group will be facilitated by the City of Joondalup in 2012/13. No amendments to Draft Lilburne Park Management Plan required.
		Donkey Orchids are also present in Lilburne Park	Comment noted.
	Tony Moore	I like the way you have informed the local residents of your intentions to manage the park.	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
	Pam Algar	I have previously been a friend of Hepburn. I sometimes take a bag and collect rubbish when I walk - I would like to see baskets for this to do away with using plastic bags.	A recommended management action will be added to Section 3.5 and 4.7 to 'install a rubbish bin at the main entrance to Lilburne Park on Lilburne Road and incorporate the bin into the City weekly bin emptying schedule'.
		I have lots of ideas how to involve more of the people who pass by the bushland. My main interest is in communicating with people so as they appreciate what lives in the bush and what is harmful to it and so as their help is acknowledged. I don't think this would be hard to do. I am interested in producing a work package for local schools and in working with someone from council to do so. I am busy in my job and will not spend time on red tape - is someone can do the political side, I can do the practical work.	The City of Joondalup has conducted an Expression of Interest process for community members to register for a Friends of Lilburne Park group. The Friends Group process for a Lilburne Park group will be facilitated by the City of Joondalup in 2012/13. In section 3.7 and 4.7, there is a recommended management action from 2012/13 to 2016/17 to 'implement initiatives of a 'Think Green Biodiversity' campaign (part of the Environmental Education Program) targeting issues such as: • pathogens; • weeds; • fire; • flora and fauna awareness; • prevention of hand feeding wildlife; and • responsible pet ownership.' The City is currently investigating the establishment of a school based program to raise awareness of biodiversity values and develop bushland management skills. No amendments to Draft Lilburne Park Management Plan required.
	Clive Nealon	Good that it appears to be receiving attention.	Comment noted.

Feedback Form Question/ Section	ID	Comment	City Response
	Marilyn Zakrevsky	My comments are based on 30 years experience as a volunteer in bush and dune rehabilitation and still an active,on-ground working member of three Friends groups. As weeds establish themselves in disturbed areas, no new paths or firebreaks should be made. Relatively new weeds like Fumaria and One Leaf Cape Tulip and Brassica are a threat to the integrity of the bushland and should be aggressively targeted, as well as Euphorbia, Pelargonium, Gazanias, Onion Weed and bulbous weeds such as Black Flag, Freesias and Marching Soldiers	*Euphorbia terracina* (Geraldton Carnation Weed), *Pelargonium capitatum* (Rose Pelargonium) and *Ferraria crispa* (Black Flag) are included in Table 5 as high priority. *Fumaria capreolata* (Whiteflower Fumitory), *Moraea flaccida* (One-leaf Cape Tulip) and *Freesia alba x leichtlinii* (Freesia) are to be included in the Highest Priority section of Table 5. *Diplotaxis tenuifolia* (Sand Rocket – from the Brassicaceae family) and *Gazania linearis* (Gazania) have a low rating and *Trachyandra divaricata* (False Onion Weed) has a mild rating in the Environmental Weed Strategy of WA (DEC 1999). It is assumed that Marching Soldiers means Yellow Soldier. *Lachenalia reflexa* (Yellow Soldier) has not been identified in Lilburne Park as yet.
		There should be no prescribed burning because it results in an increase of weeds; it sets a bad example to firebugs and smoke is harmful to people with respiratory conditions.	Section 3.6 of the Draft Lilburne Park Management Plan states that 'the City of Joondalup does not currently have a prescribed burn management regime for the area'. No amendments to Draft Lilburne Park Management Plan required.
	Brian Buzzard	No more building in that park!!	Comment noted.
	Dr Marjorie Apthorpe	A very disappointing timetable for the Management Plan. By the time these actions are actually implemented, the biodiversity values of Lilburne Reserve will be lost due to severe weed invasion. There is no point in writing paper management plans if there is no intention to implement them in a timely manner.	Comment noted.

No. of community members or stakeholders who provided feedback on Draft Lilburne Park Management Plan: 15
Requests for feedback were sent to 679 local residents (400 m radius to Lilburne Park) and 23 stakeholders.
No. of people interested in being involved in a Friends of Lilburne Park Group: 9