City of Nedlands

# Shenton Bushland Management Plan

2019–2024

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## ACRONYMS AND ABBREVIATIONS

| ACRONYM/ ABBREVIATION | DESCRIPTION |
|---|---|
| AHD | Australian Height Datum |
| DBCA | Department of Biodiversity Conservation and Attractions |
| DEC | Department of Environment and Conservation |
| DFES | Department of Fire and Emergency Services |
| DPaW | Department of Parks and Wildlife |
| EPBC Act | Environmental Protection and Biodiversity Conservation Act |
| GPS | Global Positioning System |
| ha | Hectare |
| POW | Prisoner of War |
| the City | City of Nedlands |
| WALGA | Western Australian Local Government Association |
| WESROC | Western Suburbs Regional Organisation of Councils |

Cover Photo: Dani Boase-Jelinek
Hairy Ink Cap *(Coprinopsis lagopus)*
Internal photo Sally Wallace

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Syrinx Environmental Pl
Technology One Limited

## 3. SUMMARY

This Management Plan is dedicated specifically to the management of Shenton Bushland. Detailed information and actions relating to all natural areas within the City of Nedlands such as surveying methods, rehabilitation, environmental weed control, climate change, geomorphology and soils, planning context, interpretation, priority flora and fauna, fire management, community involvement, access and feral animal management has been detailed on pages 1-102 of the Natural Areas Management Plan 2019-2024.

The Shenton Bushland Management Plan 2019-2024 has drawn heavily from the following documents:

- Shenton Bushland Management Plan 1996 (Ecoscape, 1996)
- Shenton Bushland Management Plan 2005-2010 (Ecoscape, 2005)
- Shenton Bushland Management Plan 2013-2018 (City of Nedlands, 2014).

A five year Management Plan has been developed that provides management actions and strategies for the conservation and restoration of Shenton Bushland. A summary of key actions for Shenton Bushland are listed below.

Table 1: Summary of Shenton Bushland Management Actions 2019-2024.

| Management Actions 2019-2024 | |
|---|---|
| **MANAGEMENT BOUNDARIES** | |
| 1. | Manage Shenton Bushland on the basis of 8 Zones. |
| **REHABILITATION** | |
| 2. | Focus rehabilitation on good condition bushland areas as a priority. |
| 3. | Develop rehabilitation plans for degraded sites (including soil mounds) that are to be the focus of reconstruction. These should include as a minimum the boundary of works, a planting list and native plants present that require protection. |
| 4. | Coordinate the removal of soil mounds with path upgrade works. |
| 5. | Asbestos if found in the bushland should be left alone and reported to the City. |
| 6. | Implement 'Asbestos', 'Plant Pathogen' and 'Rehabilitation' actions detailed in the Natural Areas Management Plan 2019-2024. |
| 7. | Improve the appearance of the Lemnos Street frontage by activities such as litter removal, planting and mulching. |
| **REVEGETATION** | |
| 8. | If revegetation work is proposed work with local nurseries to grow species found in low abundance. |
| 9. | Select species for use at low fuel sites using the online fire wise plants key. |
| 10. | Implement 'Revegetation' actions detailed in the Natural Areas Management Plan 2019-2024. |
| **WEED CONTROL** | |
| 11. | Undertake annual monitoring and control of *Chasmanthe floribunda*, *Centranthus macrosiphon*, *Gladiolus undulatus*, *Lachenalia bulbifera*, *Asparagus asparagoides*, *Acacia longifolia* and Coast Teatree to ensure they do not spread or reestablish. |

| | |
|---|---|
| 12. | Continue to control the following weeds as a high priority: *Ehrharta calycina, Euphorbia terracina, Ferraria crispa, Freesia alba x leichtlinii, Ixia maculata, Lachenalia reflexa, Moraea flaccida, Pelargonium capitatum and Watsonia meriana.* |
| 13. | Control Weeds in Zones A & B as a priority. |
| 14. | Continue to liaise with the Department of Defence regarding weeds adjacent to Shenton Bushland, within Irwin Barracks. |
| 15. | Continue to collaborate with the Health Department for weed management on Health Department owned land. |
| 16. | Control weeds in The Barrens and along the front fence periodically so they do not invade adjacent bushland areas. |
| 17. | Implement 'Weed Control' actions in the Natural Areas Management Plan 2019-2024. |
| **MONITORING** | |
| 18. | Undertake biannual monitoring of transects and photo monitoring points every five years. |
| 19. | Monitor, control and document the distribution of new invasive weeds as they arise. |
| 20. | Annually monitor weeds with the potential to expand rapidly and map changes in their distribution if required. |
| 21. | Collate historical mapping and monitoring data to report on management activities within the bushland. |
| 22. | Monitor and remove invasive weeds found at the base of Tuarts and large trees as required. |
| 23. | Continue to map priority weeds through management plan reviews. |
| **FIRE MANAGEMENT** | |
| 24. | Implement 'Fire Management' actions detailed in the Natural Areas Management Plan 2019-2024. |
| **ACCESS** | |
| 25. | Implement 'Access' actions in the Natural Areas Management Plan 2019-2024. |
| **NATIVE ANIMALS** | |
| 26. | Survey native fauna, including invertebrates, when funding is available. |
| 27. | Carefully relocate reptiles if they are encountered when removing soil mounds. |
| 28. | Minimise fires that may destroy tree hollows. |
| 29. | Retain tree hollows for their habitat value. |
| 30. | Undertake ongoing control of feral European Bees. |
| 31. | Protect Rainbow Bee-eater nests. |
| 32. | Continue implementing feral cat and fox control programs. |
| 33. | Contribute to regional feral bird control programs coordinated by WALGA. |
| **COMMUNITY INVOLVEMENT** | |
| 34. | Invite adjacent organisations and residents to be involved in activities to improve the Lemnos frontage and increase awareness of the bushland. |

# 4. BACKGROUND

## 4.1 Study Site

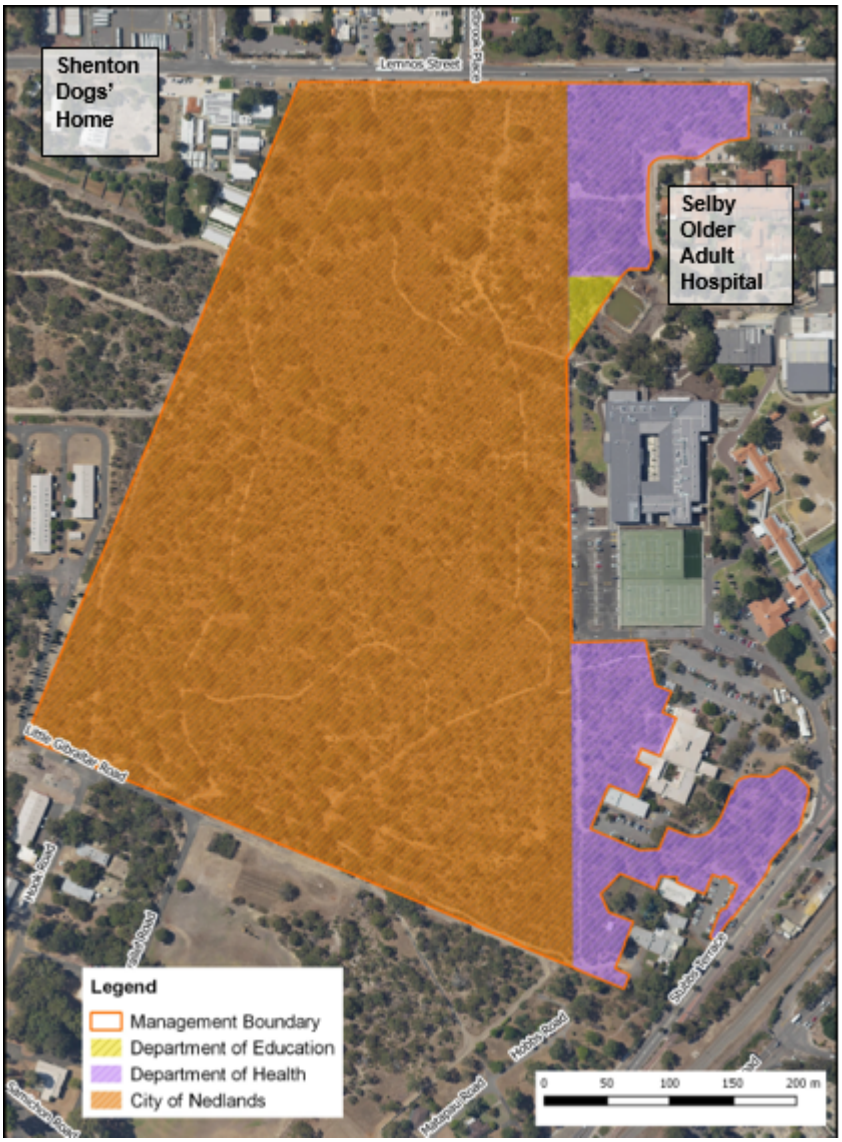
Shenton Bushland is bordered by Selby Older Adult Mental Health Hospital and Grace Vaughn House to the east, Irwin Army Barracks to the south and west and the Shenton Park Dogs' Home to the north west. It is located in the City of Nedlands approximately 7 km west south west of the Perth Central Business District as shown in Figure 1 on the next page.

Shenton Bushland contains A Class Reserve 43161 vested in the City of Nedlands for "Conservation and Recreation" it covers an area of approximately 21 hectares (ha). Prior to 1993 this Reserve was vested with the State Government for 'Health Purposes' and zoned Light Industry under the Metropolitan Region Scheme (MRS).

Shenton Bushland also contains C Class Reserves 20074 and 53001 which are vested with the Department of Health for 'Health Purposes – Hospital and Allied Purposes' and zoned Public Purposes under the MRS. Reserves 20074 and 53001 cover an area of approximately 8 ha which 3.46 ha consists of bushland. A 1 ha portion of Reserve 20074 that was previously vested with the Department of Health was transferred to the Department of Education in 2016 for the development of additional school buildings at Shenton College. Following the land transfer the Health Department owned bushland was then split into two Reserves (20074 and 53001).

The remaining 3.46 ha of bushland located on Reserves 20074 and 53001 is cooperatively managed between the City of Nedlands, the Friends of Shenton Bushland and the Department of Health. Memorandums of Understanding (MOUs) between the City and the Department of Health have been in place since 2013. These MOUs outline the Department of Health's financial contribution towards natural area management on Reserves 20074 and 53001, the current MOU is due to be reviewed in 2022. A small area of bushland (0.11 ha) is also owned by the Department of Education on the north eastern edge of the Shenton College site. This small portion of bushland is located outside the school boundary fencing and is vested for "School" purposes. Shenton Bushland vesting is detailed in Figure 2 on the next page.

Figure 1: Location of Shenton Bushland and Vesting




## 4.2 Disturbance Factors

Shenton Bushland has experienced a long history of disturbance including illegal dumping (comprising of rubbish, building materials, soil, garden waste and car bodies), logging activities, frequent fires, weed invasion, clearing, informal access and other activities such as construction of the Prisoner of War Camp (POW) along the western portion of the bushland.

## 4.3 Implementation of Previous Management Plans

Previous management plans developed for Shenton Bushland include the Shenton Bushland Management Plan (Ecoscape, 1996), the Shenton Bushland Management Plan 2005-2010 (Ecoscape, 2005) and the Shenton Bushland Management Plan 2013-2018 (City of Nedlands, 2014).

Following the development of the 1996 Management Plan the bushland has been actively managed by the City of Nedlands and the Friends of Shenton Bushland. The remaining 4.8 ha of bushland owned by the Department of Health on Reserves

20074 and 53001 has been cooperatively managed between the City of Nedlands, the Friends of Shenton Bushland and the Department of Health since 2007.

The 2013-2018 Management Plan consolidated information regarding activities undertaken since the development of the 2005 Management Plan along with reviewing and updating the information detailed in the 2005 Plan. A summary of the implementation of the 2013-2018 Management Plan is shown in Appendix 5. Twenty eight actions were developed of which four were not implemented and one was partially implemented. These are shown in Table 2 below.

Table 2: Implementation of the 2013-2018 Actions

| ACTIONS | | IMPLEMENTED YES/NO/PARITALLY | NOTES |
|---|---|---|---|
| 1. | Coordinate the removal of soil mounds with path upgrade works. | NO | No path upgrade works have been undertaken. |
| 2. | Use species such as *Allocasuarina humilis, Conostylis aculeata, Conostylis setigera, Rhagodia baccata, Jacksonia sericea, Scaevola canescens and Scaevola repens* at low fuel sites. | NO | No revegetation work has been undertaken in low fuel sites. |
| 3. | Continue to liaise with the Department of Defence regarding weeds adjacent to Shenton Bushland, within Irwin Barracks. | NO | There has been no recent contact with the Department of Defence. |
| 4. | Consider installing additional photo monitoring points. | NO | |
| | **COMMUNITY INVOLVEMENT** | | |
| 5. | Collaborate with adjacent organisations on projects to improve the Lemnos frontage and increase awareness of the bushland. | PARTIALLY | Organisations were approached however they were not involved in the improvement works for the Lemnos Street Boundary. |

### 4.4 Management Activities, Challenges and Successes

Shenton Bushland has been actively managed since the late 1990s. Since that time the Department of Biodiversity Conservation and Attractions (DBCA), the Friends of Shenton Bushland and the City of Nedlands have undertaken a significant amount of weed mapping and other monitoring activities in the bushland.

Review of historical mapping data shows that over the years there has been a significant reduction in the density and/or distribution of the following environmental weeds across Shenton Bushland:

- Black wattle (*Acacia longifolia*)

- Black Flag (*Ferraria crispa*) – density only
- Blue and Narrow-leaf lupin (*Lupinus cosentinii* and *Lupinus angustifolius)*
- Flinders Ranges Wattle (*Acacia iteaphylla*)
- Fountain Grass (*Pennisetum setaceum*)
- *Freesia* (*Freesia alba x leichtlinii*)
- Geraldton Carnation Weed (*Euphorbia crispa*)
- *Lachenalia* (*Lachenalia reflexa*)
- Rose Pelargonium (*Pelargonium capitatum*) – particularly on Mount Pelargonium
- Perennial Veldt Grass (*Ehrharta calycina*)
- *Watsonia* (*Watsonia meriana*).

Whilst the above listed weeds have significantly reduced other weeds are increasing such as Fumitory, *Oxalis* and Vetch (*Vicia sativa*). These highly invasive weeds are increasing following the removal of many grass weeds across the bushland. They require monitoring and a control program developed before they increase to unmanageable levels.

Coinciding with the sewer upgrade works on the adjacent Department of Health land a highly invasive weed, Golden Crown Beard (*Verbesina encelioides*), was located in spring 2018 for the first time. This weed is listed as an 'alert' weed by the Department of Biodiversity Conservation and Attractions as it has the ability to displace native species. It should be monitored and controlled as a high priority.

In 2008 two small infestations of the weed Pretty Betsy *(Centranthus macrosiphon)* were found in Shenton Bushland. They were weeded consistently for two years following their discovery and have not been recorded in the bushland for the last five years. They are now considered eradicated however they should be monitored and removed if required.

Small seedlings of Prickly Pear (*Opuntia stricta*) found near the Grace Vaughn House entrance were removed by the Friends of Shenton Bushland in 2005 and 2009. They have not reappeared since and should be monitored and removed if required.

Following Shenton Bushlands long term management program native vegetation is naturally regenerating. This is a testament to the ongoing successful rehabilitation of Shenton Bushland where natural regeneration is occurring due to the reduction of invasive weeds and other disturbance factors such as informal access and illegal dumping.

This is evident in winter and spring when large patches of *Podolepis gracilis* (Slender Podolepis) are seen colonising areas where they form the dominant annual species. Furthermore, many new orchids are being found each year that were previously not recorded at Shenton Bushland. Since 2015 Hare, Mantis, Snail, Bird, Jug, Cinnamon and Leopard Orchids have been recorded for the first time. In addition to this historically there was only one Blue Sun Orchid known to occur at Shenton

Bushland. However over the last few years Blue Sun Orchids are now found large patches in numerous areas across the bushland.

Documentation of Activities

The Friends of Shenton Bushland began using GPS equipment to monitor bushland activities in 2004 and in 2008 began to identify which weed(s) were being controlled. The data below summarises activities for the main weeds targeted (*Freesia*, Geraldton Carnation Weed, *Lachenalia*, Veldt Grass and *Watsonia*).

*Freesia* and *Lachenalia*

Hand weeding of *Freesia* and *Lachenalia* by the Friends of Shenton Bushland was quite intensive up until 2008. It has been less of a focus in recent years since the City of Nedlands increased chemical bulbous weed control.

In recent years the incidence of both *Freesia* and *Lachenalia* appears to be declining, so the focus of the Friends of Shenton Bushland has been to remove isolated patches of *Freesia* and *Lachenalia* that have been missed by spraying. The City of Nedlands also organises hand weeding to remove seed heads from *Lachenalia* and *Freesias* missed by the spraying program. This works to stop germination of new seedlings the following year. However, it does not remove the bulb and therefore the existing mature plants missed by the spraying program resprout the following year.

Lessons learnt:

- Chemical control appears to be more effective than hand control (less soil disturbance, and more significant reduction of density and distribution of the weeds).
- Hand control is useful for isolated patches that have been missed by the spraying contractors or those species growing amongst plants at risk of off target damage.

Geraldton Carnation Weed

Geraldton Carnation weed has been a major focus for over 15 years and where it occurs its density has now been reduced to less than 1 percent (%) cover. This is as result of persistent hand weeding programs, ongoing removal is imperative to stop it from increasing in distribution and density.

Lessons learnt:

- Geraldton Carnation Weed is a highly invasive weed and requires ongoing monitoring and control.

Veldt Grass

There are patches of Veldt Grass that are not responding to herbicide treatment and herbicide resistance is assumed in these areas. In 2014 herbicide resistance was discovered in the Annual Veldt Grass population at Hollywood Reserve following scientific testing of both Annual and Perennial Veldt Grass. Furthermore, in 2018 herbicide resistance in Perennial Veldt Grass, whilst not scientifically tested, has been presumed to be occurring at certain isolated areas across a few reserves including Shenton Bushland. In order to address this issue the City has modified its grass spraying program ensuring that at all reserves hand weeding of Perennial

Veldt Grass (and annual grasses provided resources are available) occurs following completion of the annual grass control program. This program includes Shenton Bushland.

The City of Nedlands has been spraying Veldt Grass consistently for over 15 years. During that time its density has significantly reduced. Any remnants that have survived the spraying or that have emerged in response to autumn or summer rain are hand weeded by the Friends of Shenton Bushland and the City of Nedlands. Hand weeding now concentrates on most areas of the bushland especially focusing on areas that appear to be unresponsive to the spraying program.

Lessons learnt:

- Chemical control has resulted in the bushland being almost free of Veldt Grass.
- The reduction of Veldt Grass has great benefits for the bushland including reduced fire risk and increased space for native species to grow. However, invasive species such as Geraldton Carnation Weed also have the potential to take advantage.
- Hand weeding of Veldt Grass following the annual spraying program is useful for reducing the likelihood of potential re-infestation emerging from late autumn and summer rain and slowing the development of herbicide resistance.
- Continued spraying is required otherwise Veldt Grass will reestablish dense infestations very quickly.

*Watsonia*

*Watsonia* control is possibly the most successful management activity that has been undertaken by the Friends of Shenton Bushland over the past ten years. The *Watsonia* infestation was initially targeted by one person, then the whole Friends Group for several years until it came under control.

There are still a few isolated plants that emerge each year from residual bulbs. However, these are removed as they emerge which prevents them from seeding therefore eliminating the establishment of new plants.

Lessons learnt:

- During the first few years *Watsonia* was hand weeded intensively which succeeded in reducing its density to a level where it could be controlled with only one or two visits per year.
- Removing *Watsonia* bulbs is essential to stop them from re-emerging.
- Chemical control does not appear to be necessary for small infestations.

Miscellaneous Weeds

A number of weeds (such as Coast Teatree, Flinders Ranges Wattle, Fountain Grass, and *Pelargonium*) are being controlled whenever they are encountered. The Coast Teatree infestation comes from plantings on the adjacent Department of Defence land. Whilst the area is quite large, the plants are scattered, take a number of years to mature and are easy to detect and remove. *Pelargonium* is the most widespread of the miscellaneous weeds listed above, and there are a few

infestations that require concentrated effort. Generally, it seems that they can be controlled simply by removing them when they are encountered.

Lessons learnt:

- Remove miscellaneous weeds whenever they are encountered. If the plant is too large to remove they should be GPS mapped for later removal.
- *Pelargonium* infestations can become problematic if left too long, therefore large patches need to be monitored and removed annually.

*Albuca canadensis*

Another infestation of a potentially invasive weed is *Albuca canadensis* which has been a focus in recent years as it was increasingly becoming dense and spread out.

Lessons learnt:

- The Albuca infestation was neglected for too long, and is now proving to be quite-time consuming to deal with. The plants are quite difficult to remove because they produce many bulbuls that tend to remain in the soil after the main bulb is removed, so we have to take quite a bit of soil with each plant.
- The Coast Teatree infestation is not a major problem and is easily controlled with occasional visits during summer when things are quieter in the bushland.

# 5. BIOLOGICAL ENVIRONMENT

## 5.1 Landscape Elements

Shenton Bushland is characterised by a major north/south ridgeline located towards the eastern boundary of Reserve 43161 which would have once been the crest of a coastal dune. This ridge varies in height from 31 m Australian Height Datum (AHD) adjoining Lemnos Street to the highest point in the bushland, 34 m AHD in the south east corner of Reserve 43161. There is a uniform westerly slope from this ridge to the lowest part of the bushland, at only 8 m AHD in the south west corner.

In discrete places within Shenton Bushland the topsoils have been modified due to the introduction of foreign materials. These include lateritic gravels laid to stabilise vehicle tracks, build the Prisoner of War (POW) camp and mixed topsoils of stone, rubble and organic material introduced via previous illegal dumping of debris and rubbish in the bushland.

## 5.2 Soils and Geomorphology

Shenton Bushland lies on the Spearwood Dune System of McArthur & Bettenay (1960). There is no outcropping rock in the bushland itself, but Tamala Limestone is exposed in the nearby railway cutting. The sand which underlies the bushland (and presumably overlies the limestone there) is clearly derived from that unit. It is a pale yellow or grey, moderately well-sorted, moderately well-rounded, medium-grained, quartz sand, with occasional feldspar grains and calcareous fragments. Tuart (*Eucalyptus gomphocephala*) and dense Parrot Bush (*Banksia sessilis*), particularly in the northeastern and southeastern sectors, indicate the near-surface presence of limestone.

As in other parts of the central Spearwood Dune System, soils throughout the bushland are poorly developed and infertile. In the nomenclature of Bolland (1998), they belong to the 'grey phase of the Karrakatta sands'. The soil is conspicuously modified -- in places, the entire surface is obscured with building rubble; items of general household rubbish are incorporated in the profile; there are mounds and trenches throughout the bushland. Scattered pea-gravel (lateritic pisoliths) and granitic mica flakes are probably the remains of surfacing material imported from the Darling Range (or possibly even further inland).

## 5.3 Vegetation

Vegetation Complex Heddle et al (1980)

Shenton Bushland is mapped as occurring on the Karrakatta Complex – Central and South. This Complex is characteristic of the Karrakatta Soil Association and consists of predominately low open-forest of Tuart/Jarrah/Marri. Tuart is dominant on the western side of the Complex, particularly on hills and ridges, where limestone is nearer the surface with Jarrah replacing Tuart on deeper sands, and Marri occurring on localised moister soils.

Floristic Community Type Gibson (1994)

Floristic Community Types (FCTs) classify vegetation into groups of plant species that tend to co-occur in small to medium areas. The Floristic Community Type detailed in Bush Forever (2000) for Shenton Bushland was determined to be Spearwood *Banksia attenuata* – *Eucalyptus* woodland (FCT 28) which forms part of Super Group 4 - Uplands Centred on Spearwood and Quindalup Dunes.

Structural Plant Community - Natural Area Initial Assessments

In the Natural Area Initial Assessments undertaken in 2008 the structural plant community across the entire bushland was mapped as Jarrah-Banksia Woodland over open *Xanthorrhoea preissii* shrubland with mixed shrub and herb/grass layer. This information is detailed on the WALGA Local Biodiversity Program Natural Area Initial Assessment database for Shenton Bushland.

Site-Specific Classification of Vegetation

The 1996 Management Plan identified three vegetation associations:

- Jarrah–Banksia Woodland
- Banksia Woodland
- Tuart–Banksia Woodland.

However these were remapped as two vegetation associations in the 2005 Management Plan which included:

- Jarrah–Banksia Woodland
- Banksia Woodland.

This excluded the densest stands of Tuarts that were mapped as Tuart–Banksia Woodland in the 1996 Management Plan. In the 2005 Management Plan it was noted that those denser stands of Tuart were limited in extent with no noticeable understorey difference, and that Tuarts occurred throughout the bushland in very low numbers. In 2005 all Tuarts were individually mapped and included within the two major vegetation associations identified.

According to Ecoscape (2005[2]), the distribution of the two communities onsite is a typical manifestation of variation in topography and soil. Beard (cited in Ecoscape 2005[2]) noted that *Eucalyptus gomphocephala* usually occurs on ridges and that *Banksia menziesii* and *Banksia attenuata* (with scattered *Eucalyptus todtiana*) tend to occur to the exclusion *of Eucalyptus marginata* on deep white sands or limestone outcrops carrying little or no soil, and where moisture levels are very low. The location of the Jarrah–Banksia Woodland and Banksia Woodland communities are shown in the map section in Appendix 6 and are detailed further below (as they were described in the 2005 Management Plan).

*Jarrah–Banksia* Woodland

This community is the most common on the site, covering most of the Bushland. The woodland is dominated in the upper storey by Jarrah (*Eucalyptus marginata*) which varies in density throughout the Bushland. The small tree layer is comprised of Candle or Slender Banksia (*Banksia attenuata*) and Firewood Banksia (*Banksia menziesii)* with the latter species being less common than the former two. Sheoak (*Allocasuarina fraseriana*) is not a dominant overstorey species onsite, and is mainly distributed along the interface of the Jarrah-Banksia Woodland and Banksia Woodland.

The shrub layer is dominated by *Jacksonia furcellata, Hakea prostrata* and most commonly by grass trees (*Xanthorrhoea preissii*). The greatest floristic richness is found in the lower vegetation stratum, comprising small shrubs, herbs and grasses. Small shrubs include Prickly Moses (*Acacia pulchella*), *Gompholobium tomentosum, Jacksonia sericea, Hovea trisperma, Hibbertia hypericoides, Daviesia nudiflora,*

*Grevillea vestita, Daviesia triflora, Scaevola canescens, Scaevola paludosa* and Pixie Mops (*Petrophile linearis*). Herbs include *Conostylis, Haemodorum spicatum, Burchardia umbellata, Lomandra* and various orchids. Native sedges that are dominant include *Mesomelaena pseudostygia* and *Alexgeorgea nitens* with the latter forming extensive mats in the bushland.

*Banksia* Woodland
Patches of Banksia woodland also occur along the ridge, noticeable by an absence of Jarrah. It is dominated by *Banksia attenuata, Banksia menziesii* and some Bull Banksia (*Banksia grandis*). However, Bull Banksia are no longer present in the bushland (as at 2018).

The understorey is generally less diverse than the Jarrah-Banksia Woodland and is dominated by Prickly Moses, *Acacia pulchella*. The 1996 Management Plan records the more common shrubs, herbs and grasses as including *Jacksonia furcellata, Hakea prostrata, Xanthorrhoea preissii, Acacia pulchella, Jacksonia sericea, Mesomelaena pseudostygia, Hardenbergia comptoniana, Scaevola canescens, Conostephium pendulum, Corynotheca micrantha* and *Alexgeorgea nitens*.

### 5.4 Bush Forever Site 218 and Corridor Value

Shenton Bushland forms part of Greenway 19 identified in '*A Strategic Plan for Perth's Greenways*' by Tingay and Associates (1998). This Greenway extends from Bold Park to Kings Park via Underwood Avenue, Bedbrook Place and Shenton Bushland. Shenton bushland also forms important ecological linkages with the Irwin Barracks bushland, the Railway Reserve and Hollywood Reserve.

The City of Nedlands administered portion of Shenton Bushland is identified as regionally significant through its inclusion in Bush Forever as Site 218. Bush Forever noted the structural units of vegetation and flora as:

*"Uplands: Eucalyptus marginata Woodland over Banksia attenuata, B. menziesii and Allocasuarina fraseriana and Low Woodland; Banksia attenuata, B. menziesii and Allocasuarina fraseriana Low Woodland with scattered emergent Eucalyptus marginata and with occasional emergent Eucalyptus gomphocephala."*

Its recognition as regionally significant bushland in Bush Forever is in part due to:

- Being part of a regionally significant potential bushland/wetland linkage
- The rich reptile assemblage for the size of the Reserve
- Significant reptile species Gould's Goanna (*Varanus gouldii*)
- Significant bird species Category 1 (1), Category 3 (3), Category 4 (3)
- Significant flora *Jacksonia sericea* (Priority 3 – currently reclassified as P4).

### 5.5 Bushland Condition

The methodology applied for bushland condition assessments undertaken in 2018 is detailed on pages 34-36 of the Natural Areas Management Plan 2019-2024. Bushland condition is useful in tracking large changes over time and should continue to be measured each time this Management Plan is reviewed. This allows changes to be regularly monitored and recorded.

Historical Bushland Condition Assessment Data

Over the years bushland condition was mapped using different methods and scales. Bushland condition was not mapped in the 1996 Management Plan. It was mapped in the 2005 Management Plan using the Kaesehagen Scale. These maps were digitised however they did not use 20 x 20 m polygons and condition ratings were allocated strictly on the basis of local native species present

The Bush Forever Site Description for Shenton Bushland (2000) assessed the bushland condition using the Keighery Scale as >50% *Very Good* to *Excellent*, <50% *Good* to *Degraded*, with areas of severe localised disturbance. The bushland condition mapping undertaken in 2005 using the Kaesehagen Scale assessed just over half the bushland as *Fair – Excellent* condition and just under half as *Poor – Very Poor* condition. The poorer condition bushland in 2005 was generally located around the periphery of the site, along tracks and in "The Barrens".

The bushland condition mapping undertaken in 2008 using the Keighery Scale for the Natural Area Initial Assessments assessed the majority of the bushland as *Good* condition with small patches of *Degraded* to *Completely Degraded* in "The Barrens".

2013 and 2018 Bushland Condition Assessment

Bushland condition mapping in 2013 and 2018 was undertaken in spring by using the Keighery Scale and divided the bushland into 20 x 20 m polygons. The Keighery Scale ratings assessed the impact of disturbance on vegetation structure for each 20 x 20 m polygon and provided a rating from *Very Good*, *Good*, *Degraded* to *Completely Degraded*. Unlike all other bushlands in the City the Keighery Scale was not modified for use at Shenton Bushland and condition ratings were allocated strictly on the basis of local native species present.

Table 2: Bushland Condition Assessment 2018

| Bushland Condition | Area Vested with City of Nedlands | Area Vested with the Department of Health | Area Vested with the Department of Education | Total Area (ha) |
|---|---|---|---|---|
| Very Good | 11.39 | 1.17 | 0.05 | 12.61 |
| Good | 7.21 | 1.3 | 0.02 | 8.53 |
| Degraded | 2.32 | 0.78 | 0.03 | 3.13 |
| Completely Degraded | 0.09 | 0.21 | 0.01 | 0.31 |
| **Total** | 21.01 ha | 3.46 ha | 0.11 ha | 24.58 ha |

## 5.6 Flora

There are 268 flora species recorded at Shenton Bushland. Of the 268 flora species 167 are identified as native species and 101 as introduced weed species please refer to the flora lists in Appendix 1. The flora lists have been updated as additional species are discovered or renamed.

The flora lists are expected to contain the majority of the plants known to occur onsite. This is because the Government of WA through Bush Forever (2000)

considered that previous inventories for the site (which only included 109 native plants) included more than 90% of the expected flora.

The flora list for Shenton Bushland is comprehensive and has been based on a number of surveys undertaken over the years which have been updated as additional species are discovered or renamed. These include:

- Ian Fordyce 2018
- Ongoing observations by the Friends of Shenton Bushland and the City of Nedlands
- Ecoscape 2005
- Ecoscape 1996
- Bush Forever 2000.

Changes in plants recorded in Shenton Bushland since the 2013-2018 Management Plan.

Since 2013, the below listed local provenance species have not been previously recorded in the flora inventories at Shenton Bushland:

- Kangaroo Paw (*Anigozanthos manglesii*)
- Marri (*Corymbia calophylla)*
- Pansy Orchid (*Diuris magnifica*)
- Bird Orchid (*Pterostylis barbata*)
- Jug Orchid (*Pterostylis recurve*)
- Short-eared Snail Orchid (*Pterostylis - short sepals*)
- Silky Scaevola (*Scaevola anchusifolia*)
- Procumbent Siloxerus (*Siloxerus humifusus)*
- Leopard Orchid (*Thelymitra benthamiana)*
- Blue Lady Orchid (*Thelymitra crinite)*
- Chestnut Sun Orchid (*Thelymitra fuscolutea)*
- Shy Sun Orchid (*Thelymitra graminea).*

Native Species of Significance or of Low Abundance within the Bushland

Plant species that are either rare in Western Australia or in Shenton Bushland, should be monitored and considered for special management to ensure their survival onsite. Four species have been identified in Shenton Bushland that fit into this category.

Species identified as being of low abundance within the bushland include:

- Dwarf Sheoak (*Allocasuarina humilis*) – one male plant
- Catspaw (*Anigozanthos humilis*)
- Tuart (*Eucalyptus gomphocephala*) – twenty six mature trees recorded currently being assessed as a Threatened Ecological Community
- *Jacksonia sericea* is identified as a Priority 4 species under the Biodiversity Conservation Act 2016.

*Jacksonia sericea* is also listed as *Endangered* under the International Union for Conservation of Nature (IUCN). This is because of its restricted range in the highly populated urban area of Perth and the reserves where it is found are highly fragmented and suffer from threats such as dieback.

## 5.7 Plant Pathogens

A survey of plant pathogens undertaken across the City's natural areas in 2010 did not isolate any plant pathogens at Shenton Bushland. Shenton Bushland was the only natural area that did not test positive for the plant pathogen *Phytophthora*. There were 8 Jarrah trees sampled and the following observations noted:

- All 8 Jarrahs exhibited Crown thinning and Epicormic growth
- Two were being attacked by insect borers
- 5 exhibited symptoms of drought stress such as 'crown collapse'.

Since 2010 the plant pathogen *Maskiella globosa* (Armoured Scale) has been confirmed at Shenton Bushland. Management of *Maskiella globosa* is detailed in the Natural Areas Management Plan 2019-2024 and consists of reducing disturbance, applying systemic and/or soil treatments and mechanical removal provided funding is available.

The identification and management of plant pathogens and other causes of tree decline has been detailed further in the Natural Areas Management Plan 2019-2024.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Implement 'Plant Pathogen' actions contained in the Natural Areas Management Plan 2019-2024. |

## 5.8 Weeds

There are 101 weeds recorded in Shenton Bushland some of these include native plants to Western Australia that are found outside their normal range such as *Leschenaultia biloba* which was brought in with gravel transported from the Perth Hills. The distributions of 13 of these were mapped and are shown in the map section in Appendix 6.

Weed mapping

The methodology applied for weed mapping is detailed on pages 34-36 of the Natural Areas Management Plan 2019-2024. Weed mapping was undertaken in spring 2018 using 20 x 20 m polygons and the Department of Environment and Conservation (DEC) Standard Operating Procedure SOP 22.1. *Techniques for Mapping Weed Distribution and Cover in Bushland and Wetlands*. These procedures were developed to address the subjectivity that can be encountered when different people undertake mapping. In order to address this subjectivity, the below listed broad cover classes were developed and were used to undertake the 2013 and 2018 weed mapping:

- Individual plants (mapped as GPS points – this was limited to woody weeds)
- Less than 5%
- 6-75%
- 76-100%.

Using SOP 22.1 for the weed mapping undertaken in spring 2013 and 2018 addressed the subjectivity involved in mapping weed cover. However, in order to refine weed management for the 2014-2019 Management Plan actual cover was also mapped. These cover classes included:

- Less than 1%
- 2-5%
- 6-10%
- 11-20%
- Then 9% increments until 100%.

The purpose of additionally mapping actual cover in 2018 was to allow for more refined and focussed reporting of weed cover and density. Whilst the broad cover classes assisted with standardising the mapping process, addressing issues with subjectivity; and identifying focus areas and actions. The cover classes did not accurately reflect weed management programs success or failures. For example, if a weed species was mapped as 6-75% in the 2013-2018 Management Plan it may have undergone a significant reduction after five years of management however it had the potential to still be mapped in the same cover class for the 2019-2024 Management Plan.

Furthermore, the City has undertaken long term management of some species such as Perennial Veldt Grass which was primarily mapped as less than 5% in 2013. However, in reality the cover of Perennial Veldt grass is now less than 1% in some reserves and it would still have been mapped as less than 5% in 2018 if the broad cover classes were used in isolation.

In the map section in Appendix 6 only one 'Actual Cover' map has been provided. This map details *Oxalis* as it had high weed cover above 5%. Generally, the majority of the weed species mapped at Shenton Bushland had broad cover classes of less than 5% and an actual cover of less than 1%.

Target Species for Weed Mapping 2018
In 2018 the weeds listed in Table 3 below were mapped:

Table 3: Weed Species Mapped in 2018

| No | SPECIES | Actual Cover Map |
|---|---|---|
| 1. | Albuca canadensis | No |
| 2. | Cenchrus setaceaus (Fountain Grass) | No |
| 3. | Black Flag *(Ferraria crispa)* | No |
| 4. | *Freesia alba x leichtlinii (Freesia*) | No |
| *5.* | Fumitory | No |
| *6.* | Geraldton Carnation Weed *(Euphorbia terracina)* | No |
| 7. | *Gladiolus undulatus* and *angustus* (Wild ladiolus/Long-tubed Painted Lady) these were mapped together as they could not be differentiated at the time of surveying | No |
| *8.* | *Lachenalia reflexa* (*Lachenalia*) | No |
| *9.* | *Moraea flaccida* (One-leaf Cape Tulip) | No |
| 10. | *Oxalis Pes-Caprae* (Soursob) | Yes |
| 11. | Perennial Veldt Grass *(Ehrharta calycina)* | No |
| *12.* | Rose Pelargonium *(Pelargonium capitatum*) | No |
| *13.* | *Watsonia meriana* | No |

Limitations of weed mapping

Only the above listed priority weeds were mapped due to the time and the cost involved with mapping. Unfortunately, there are always going to be limitations encountered with weed mapping including timing of the survey and weather variations. These are detailed further below.

Timing of Survey

Surveying should always be undertaken in spring when weeds are active. There are six natural areas in the City that require mapping and they all cannot all be surveyed simultaneously. Therefore at the time of surveying some weeds may have germinated, may not be flowering, may be covered over by taller weeds (and therefore not visible) or they may have been removed through weeding activities. Also some weeds do not flower every year and therefore they may be difficult to identify at the time of the survey.

Weather variations from year to year

Some years can have early rain which will provide an early flowering and germination period. Other years have late rain that extends into spring which provides successive germination events by which time the survey could have concluded.

### 5.9 Fungi

There are 49 fungi species that have been recorded in Shenton Bushland to date which are listed in Appendix 2. This list was compiled from data provided through Fungi Forays undertaken by Dr Neale Bougher and Roz Hart (Perth Urban Bushland Fungi Project) along with ongoing observations by the Friends of Shenton Bushland and Roz Hart.

The number of fungi known to occur in Shenton Bushland has increased significantly since original fungi inventories were first developed in 2004. Fungi are the second largest group of organisms in the world, after the insects. Australia is estimated to have about 250 000 species, of which only about five per cent have been described. The majority of fungi in the Perth region are probably yet to be discovered, well defined or named. Due to the nature of fungi, which fruit irregularly and intermittently, it is necessary to conduct ongoing surveys to produce an accurate inventory of fungi present in Shenton Bushland.

### 5.10 Native Fauna

Birds

There are 52 native bird species recorded as occurring in Shenton Bushland which are listed in Appendix 3. This includes three species protected under the Environmental Protection Biodiversity Conservation Act 1999 (EPBC Act) the Carnaby's Black-Cockatoo *(Calyptorhynchus latirostris)* which is listed as *Endangered,* the Forest Red-tailed Black-Cockatoo *(Calyptorhynchus banksii)* which is listed as *Vulnerable* and the Rainbow Bee-eater *(Merops ornatus)* which is listed as a *Marine* species.

Mammals
There are three mammals recorded in Shenton Bushland. These include Brushtail Possum *(Trichosurus vulpecula),* Goulds Wattle Bat (*Chalinolobus gouldii)* and the White-striped Freetail Bat (*Tadarida australis*).

Herpetofauna (Reptiles & Amphibians)
There are 28 reptile and amphibian species, including 12 skinks, 5 geckoes, 3 frogs, 3 legless lizards, 2 goannas and 2 snakes. These are listed in Appendix 3.

Invertebrates
There is little information available of the invertebrates inhabiting Shenton Bushland. However the bushland was surveyed for butterflies and day-flying moths through research undertaken by Curtin University and DPaW between 2001 and 2005. The surveying resulted in the following findings:

- Two resident butterflies (the Western Grass-Dart Butterfly (*Taractrocera papyria*) and Marbled Xenica Butterfly (*Geitoneura klugii*))
- One Resident Moth (the Graceful Sun Moth (*Synemon gratiosa*))
- One non-resident butterfly (the Australian Painted Lady (*Vanessa kershawi)).*

The Graceful Sun Moth was surveyed and recorded again in 2010 by the Friends of Shenton Bushland. The Graceful Sun Moth species is associated with two habitat types:

- Coastal heathland on Quindalup Dunes where it is restricted to secondary sand dunes due to the abundance of the preferred host plant *Lomandra maritima.*
- Banksia woodland on Spearwood and Bassendean Dunes, where the second known host plant *Lomandra hermaphrodita* is widespread.

Their remaining habitat is considered severely fragmented where populations are separated by urban and agricultural areas. The Graceful Sun Moth is identified by DPaW as Priority 4 (Rare, Near Threatened and other taxa in need of monitoring).

### 5.11 Introduced Fauna

Feral animal management strategies have been detailed on pages 85-90 of the Natural Areas Management Plan 2019-2024.

Mammals
The only confirmed introduced mammals of concern in Shenton Bushland include Fox*es (Vulpes vulpes*) and cats (*Felis catus*). Other possible (unconfirmed) introduced fauna include the House Mouse (*Mus musculus*) and the Black Rat (*Rattus rattus)*.

Invertebrates
One introduced invertebrate of concern in Shenton Bushland includes the European Honey Bee *(Apis mellifera).* The Cabbage White Butterfly (*Pieris rapae*) is another introduced invertebrate present at Shenton Bushland (Williams, Cited in Ecoscape 2005[2]).

Introduced Birds

There are seven known introduced or feral birds within Shenton Bushland these include the Rock Dove (*Columba livia*), Spotted Dove (*Streptopelia chinensis*), Laughing Dove (*Streptopelia senegalensis*), Rainbow Lorikeet (*Trichoglossus haematodus*), Laughing Kookaburra (*Dacelo novaeguineae*) and Little and Long-billed Corellas' (Cacatua sanguinea and *tenuirostris*).

# 6. PLAN FOR MANAGEMENT

General management principles and weed control strategies that relate to all natural areas has been detailed in the 'Plan For Management' section on pages 39-51 of the Natural Areas Management Plan 2019-2024.

## 6.1 Management Zones

External Boundaries

For management purposes it is important to distinguish between parkland and bushland zones. At Shenton Bushland the boundaries between bushland and parkland areas is well defined by fences and car parks.

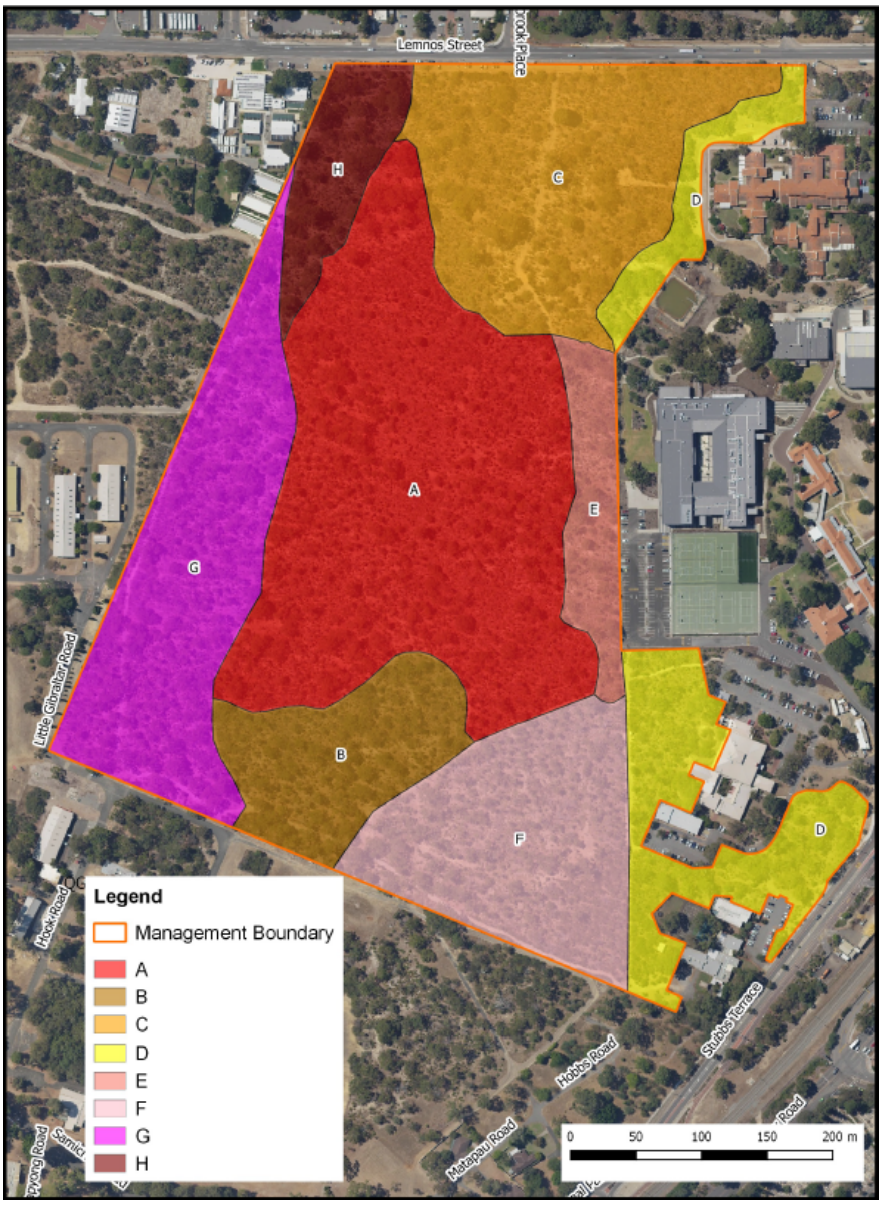
Internal Boundaries

Over the years the Friends of Shenton Bushland have managed Shenton Bushland on the basis of 8 Zones and used paths as boundaries between these Zones. The management Zones are shown in Table 3 below and Figure 2 on the following page.

Table 4: Management Zones

| Zone | Zone Name | Primary Zone Consideration |
|---|---|---|
| A | Core Bushland | Conservation |
| B | Core Bushland | Conservation |
| C | Lemnos | Conservation |
| D | Education and Health Department | Protection |
| E | Lemnos | Protection |
| F | Karrakatta | Protection |
| G | Karrakatta | Protection |
| H | Dog Home | Protection |

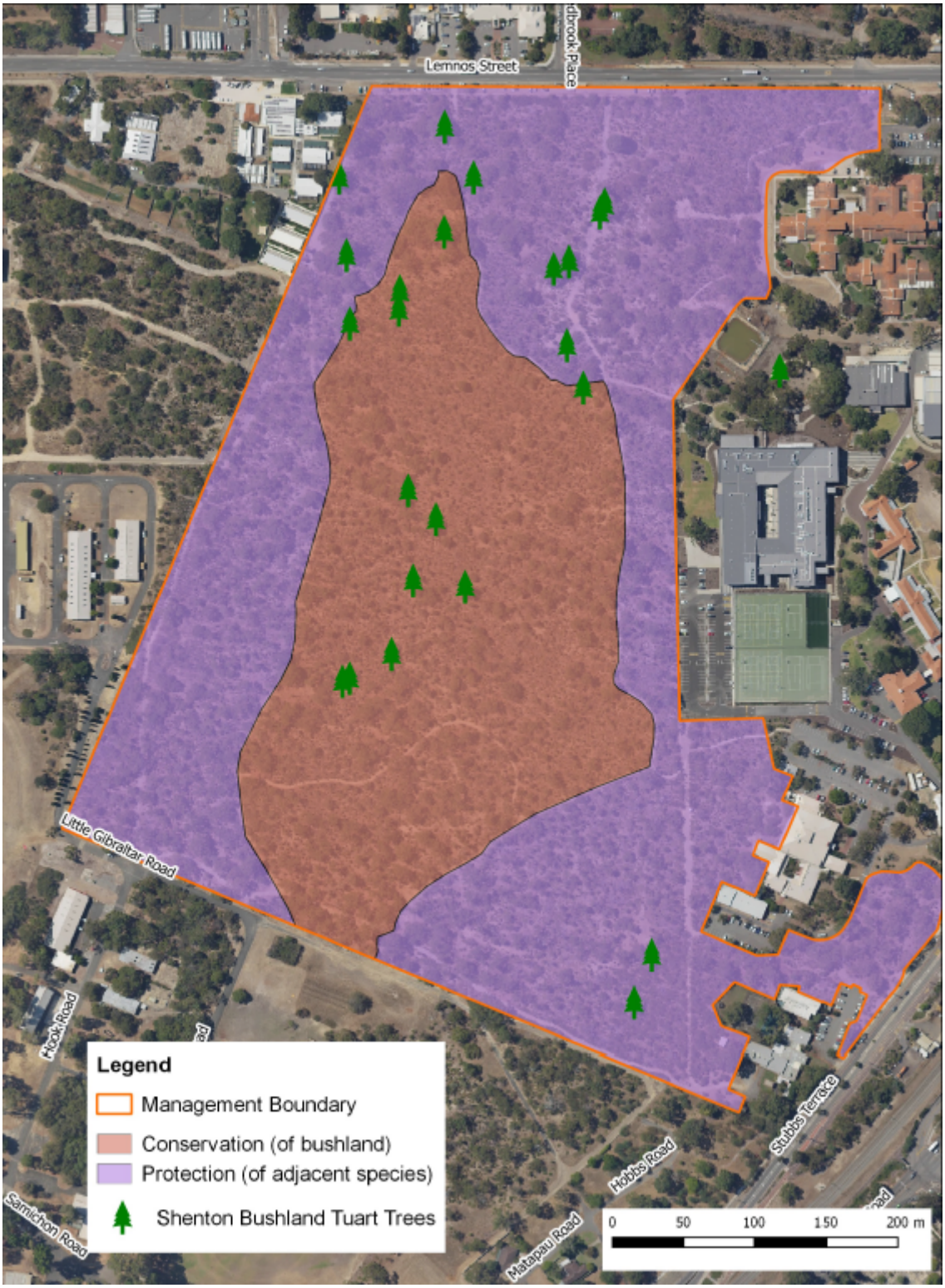
Figure 2: Management Zones in Shenton Bushland.




All Zones have previously been designated as either Primary Protection or Conservation Zones. These two designations indicate where protection of neighbouring infrastructure should take precedence over ecological values in managing fire hazards within the bushland. Essentially the internal Zones are Conservation Zones and the external Zones are Fire Hazard Protection Zones. The Conservation and Protection Zones are shown in Figure 3 on the next page.

Zone C on the northern boundary of the bushland includes “The Barrens” which was until 2015 a highly degraded site characterised by building rubble and soil mounds with no vegetation cover. It was the focus of a Community Banksia Grant that was applied for by the Friends of Shenton Bushland. This project removed several tonnes of dumped soil and building rubble and revegetated the area with local provenance seedlings. ‘The Barrens’ is well on its way to being restored. The revegetation works have been successful and in 2018 Spider Orchids and *Kennedia prostrata* that were not used in the revegetation program were observed naturally colonising the site.

Figure 3: Conservation and Protection Zones




| Management Actions 2019-2024 | |
|---|---|
| 1. | Manage Shenton Bushland on the basis of 8 Zones. |

## 6.2 Rehabilitation

The improvement of bushland condition at Shenton Bushland will be achieved by assisting natural regeneration through weed control as the highest priority. As a secondary priority, if funding were available, then improvements in bushland condition could be achieved through reconstruction at selected degraded sites. Once bushland condition improves at selected reconstruction sites these sites can then become assisted natural regeneration sites.

Sites

Sites are areas within Zones where resources for rehabilitation and monitoring are focused. Areas where rehabilitation has previously occurred are also considered Sites. A rehabilitation plan should be developed for each area requiring reconstruction to minimise any possible detrimental impacts such as trampling, erosion, spraying native species in low abundance or the introduction of weed species.

Assisted natural regeneration following the Bradley Method is best undertaken in bushland that contains *Good* condition bushland or better and reconstruction should be undertaken in *Degraded* or *Completely Degraded* condition areas. At Shenton Bushland reconstruction should only occur at sites that have been specifically identified for reconstruction as detailed in Table 4 below.

Potential Reconstruction Sites

The sites to be considered for reconstruction are shown in Table 4 below and discussion on the basis for these priorities included thereafter.

Table 5: Priorities for Sites Requiring Reconstruction

| Site | Priority |
|---|---|
| Mount Pelargonium | High |
| Northeast boundary with Selby Lodge | Moderate |
| Southeast boundary with Grace Vaughn House and Education Department | Moderate |
| Junction of Tracks | Moderate |
| Southern Boundary | Moderate |
| Degraded patches along path edges | Moderate |
| The Sump | High |
| Weed mounds adjacent to good bushland | High |

A rehabilitation plan should be developed for each site requiring reconstruction to minimise any possible detrimental impacts such as trampling, spraying native species in low abundance or the introduction of weed species.

Mount Pelargonium

There are degraded areas at Mount Pelargonium that require rehabilitation. Mount Pelargonium is a high priority because:

- Revegetation of this site will consolidate and expand the surrounding area of *Very Good* bushland to the north and west and *Good* condition bushland to the west and south
- The site supports a number of juvenile Tuarts (*Eucalyptus gomphocephala*), which is significant given that there were only twenty six mature trees recorded across the entire site.

Eastern boundary with the Department of Education
Rehabilitation of the boundary along the Department of Education owned land is a high priority as recent building works have caused increased weed invasion along the boundary. This weed invasion will cause ongoing management issues and threaten adjacent *Very Good* condition bushland in this area.

Northeast Boundary with Selby Lodge
This site is a medium priority as it forms the interface between *Degraded* edges adjacent to the lawn area on the firebreak and good condition bushland establishing in 'The Barrens'.

Southeast boundary with Grace Vaughn House and Family Pathways
This is a moderate priority as the majority of the bushland in this area is in *Good* to *Very Good* condition. Weed invasion from Grace Vaughn House and Family Pathways should however be addressed.

The northeast and south-eastern boundaries with the Selby Lodge, Grace Vaughn House and Family Pathways are on land managed by the Department of Health. They therefore fall under the MOU developed between the City and the Department for natural area management on Department of Health owned land.

Southern Boundary
This site is a moderate priority as it occupies a narrow strip along the firebreak and is vulnerable to weed re-invasion from adjacent land along with requiring ongoing firebreak maintenance. If restoration is undertaken in this area, plants used for revegetation will need to be low spreading plants that can suppress weeds, and tolerate incidental slashing or traffic. This is discussed further in the Revegetation Section below.

Junction of Access Tracks
This site has some localised *Degraded* patches adjacent to *Very Good* and *Good* bushland condition areas. The focus for this area should be to consolidate and expand the surrounding *Very Good* and *Good* condition areas. One of the tracks should be maintained as a Fire Access Way and should therefore not be revegetated.

Rubbish and Other Disturbances
Over the years, Shenton Bushland has been subjected to a significant amount of illegal dumping in the form of rubbish, soil and garden waste and car bodies. This was a result of the bushland having little surveillance due to its relative isolation from passive surveillance, combined with easy access for vehicles from Lemnos Street prior to the limestone wall being installed.

The majority of rubbish, car bodies and soil mounds have been removed from 'The Barrens'. However some soil and rubble mounds remain in other locations. The majority of the mounds located directly adjacent to the pathways were likely produced during the creation of the path network and these mounds have relatively few weeds in them. However, this is not the case for soil mounds located off away from pathways.

The soil mounds were mapped by the Friends of Shenton Bushland for the 2005 Management Plan and some of them have since been removed. In the 2005-2010 Management Plan, a five year target to remove 80 soil and rubbish mounds was established. These mounds were selected where they were adjacent to tracks. With the mounds that were more than 5 m from tracks to be assessed on a case by case basis. It was noted in the 2005 Management Plan that advantage should be taken if a fire occurred as this may provide improved access to certain mounds not located along pathways.

No soil mounds have been removed in recent years. This is due to the difficulty in removing the remaining soil mounds without causing damage to the existing eroded pathways and/or native vegetation adjacent to the mounds.

Soil mounds should only be removed if their removal does not cause damage to pathways or native vegetation. Previously three mounds were removed and their removal caused significant damage to the paths. The pathways in Shenton Bushland are due to be upgraded in 2021-2022 in accordance with the City's Natural Area Path Network Policy. The removal of soil mounds should be reviewed when path upgrades are scheduled.

Two rubbish bins were installed along the Lemnos Street boundary in 2015. This was undertaken to address issues with rubbish accumulation along the Lemnos Street frontage especially adjacent to the bus shelter. Installation of rubbish bins on Lemnos Street has assisted in reducing the rubbish build up along Lemnos Street. However further actions are still required to identify the bushland as a conservation zone. These include:

- Installing bollards to stop cars from parking directly in front of the entrance
- Undertaking regular litter removal along the frontage
- Installing benches in the bushland at appropriate locations provided they do not cause ongoing management issues.

<u>Asbestos</u>

The management of asbestos and its related actions has been detailed on pages 52-54 of the Natural Areas Management Plan 2019-2024. Asbestos is a building material that was used widely between the 1940s to late 1980s. After many years of use in the building industry in Western Australia, the tiny fibres in asbestos were found to pose health risks. If left untouched, asbestos poses no immediate danger. However, if asbestos products are broken or disturbed they can release hazardous fibres. Asbestos contaminated material must only be removed by appropriately qualified and trained personnel.

The entire bushland area at Shenton Bushland is classified as Contaminated Site 3628 "*Contaminated Remediation Required*" by the Department of Water and

Environmental Regulation under the Contaminated Sites Act 2003. This classification is largely due to historical waste disposal, which included quantities of household and commercial solid and liquid waste.

At Shenton Bushland the main asbestos contamination is located in an area called "The Barrens" and also some areas along the Lemnos Street front boundary which were historically used for landfill. Both friable and non-friable asbestos have been found in these locations. Asbestos fragments have also been found in various isolated locations across the bushland and the Lemnos Street front verge.

An amount of asbestos cement products was identified predominantly in "The Barrens" in the north-eastern corner of the site. The type and nature of asbestos material present is consistent with construction and demolition materials. Materials identified included:

- Asbestos sheeting
- Panelling and piping
- Woven asbestos material
- Asbestos rope such as fireplace or oven door seal.

Various consultant investigations have been completed for "The Barrens" with progressive "hand based" remedial activities being implemented since that time. The site is being managed in accordance with the Department of Health – "Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia 2009".

Isolated asbestos piles and fragments have also been removed from Shenton Bushland several times over the years and further clean ups will be required into the future. The reason for this is because ongoing erosion occurs as the soil weathers and following rain events more fragments will become exposed on the surface.

As Shenton Bushland requires ongoing management an asbestos management plan needs to be developed for the entire bushland site.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Focus rehabilitation on good condition bushland areas as a priority. |
| 2. | Develop rehabilitation plans for degraded sites (including soil mounds) that are to be the focus of reconstruction. These should include as a minimum the boundary of works, a planting list and native plants present that require protection. |
| 3. | Coordinate the removal of soil mounds with path upgrade works. |
| 4. | Asbestos if found in the bushland should be left alone and reported to the City. |
| 5. | Implement 'Asbestos' actions detailed in the Natural Areas Management Plan 2019-2024. |
| 6. | Improve the appearance of the Lemnos Street frontage by activities such as litter removal, planting and mulching. |

### 6.3 Revegetation

Over the years limited revegetation has been undertaken along the degraded edges of the bushland and within the bushland at localised degraded sites using local

provenance seed collected from within the bushland. A large rehabilitation project was undertaken in "The Barrens' in 2015 and 2016 with funding received from a Department of Parks and Wildlife's Community Banksia Grant received to the Friends of Shenton Bushland.

Species Selection

Ideally species used for revegetation in reconstruction sites would consist of the entire collection of plants that naturally occur at the sites. This is not always possible as not all species can be propagated.

Species of Significance or Low Abundance

There are a number of species of significance or found in very low numbers within Shenton Bushland special consideration should be given to maintain these populations. They should be mapped, monitored and if possible propagated, for revegetation at reconstruction sites. These species include:

- *Jacksonia sericea*
- *Allocasuarina humilis*
- *Anigozanthos humilis*
- *Eucalyptus gomphocephala*.

Species for Low Fuel Sites

To select fire retardant species, the naturally occurring species found in the bushland should be assessed using the online fire wise plants key www.cfa.vic.gov.au/plants . Although developed in Victoria, this key is relevant across Australia as it focuses on the plant properties rather than a species for example small versus large leaves, dry versus succulent plants, stringy versus thick/coarse bark.

| Management Actions 2019-2024 | |
|---|---|
| 1. | If revegetation work is proposed work with local nurseries to grow species found in low abundance. |
| 2. | Select species for use at low fuel sites using the online fire wise plants key. |
| 3. | Implement 'Revegetation' actions detailed in the Natural Areas Management Plan 2019-2024. |

### 6.4 Environmental Weed Control

A total of 35 priority weeds have been listed for management in Shenton Bushland (Table 6). Each priority weed has been provided management notes and the Weed Prioritisation Process rating (DBCA 2016). Priority weeds will be managed according to management notes provided on the DBCA Florabase website at https://florabase.dpaw.wa.gov.au and are detailed in Appendix 4.

Priority weeds have been selected from:

- Swan Region Weed Prioritisation Process (DPaW 2013)
- Swan Impact and Invasiveness Ratings (DBCA 2016)
- Local knowledge from 'Friends of' groups and City staff that assisted with the development of the priority weed list
- Their ability to contribute to fuel loads
- State and federal weed lists
- Their ability to be controlled without causing disturbance.

Table 6: Priority Weeds for Control – (Ratings taken from DBCA 2016 (Swan Region)).

| Species Name | | Common Name | Notes | Rating |
|---|---|---|---|---|
| *1.* | *Acacia iteaphylla* | Flinders Range Wattle | Requires ongoing monitoring and control. | High/Rapid |
| *2.* | *Arctotheca calendula* | Cape Weed | Ongoing control required in conjunction with Bur Medic along pathways. | High/Rapid |
| *3.* | *Asparagus asparagoides* | Bridal Creeper | Monitor and control as required. | High/Slow |
| *4.* | *Avena fatua* | Wild Oat | Control required in conjunction with grass spraying program. | High/Medium |
| *5.* | *Brachychiton populneus* | Kurrajong | Requires ongoing monitoring and control. | High/Rapid |
| *6.* | *Carpobrotus edulis* | Hottentot Fig | Monitor for re-infestation. | High/Rapid |
| *7.* | *Cenchrus setaceus* | Fountain Grass | Requires ongoing monitoring for re-infestation. | High/Rapid |
| *8.* | *Chamelaucium uncinatum* | Geraldton Wax | Monitor spread and control if necessary. | Medium/Slow |
| *9.* | *Centranthus macrosiphon* | Pretty Betsy | Monitor and hand weed populations annually. | Medium/High |
| *10.* | *Chasmanthe floribunda* | African Cornflag | Requires ongoing monitoring and control for re-infestation. | High/Medium |
| *11.* | *Disa bracteata* | South African orchid | Control required as populations increasing | Unrated/Rapid |
| *12.* | *Eragrostis curvula* | African Lovegrass | Ongoing control required along Health Department boundary. | High/Rapid |
| *13.* | *Ehrharta calycina* | Perennial Veldt Grass | Ongoing control required. | High/Rapid |
| *14.* | *Euphorbia terracina* | Geraldton Carnation Weed | Ongoing hand weeding required. | High/Rapid |

| | Species Name | Common Name | Notes | Rating |
|---|---|---|---|---|
| 15. | *Ferraria crispa* | Black Flag | Ongoing control required. | High/Rapid |
| 16. | *Freesia alba x leichtlinii* | Freesia | Ongoing control required. | High/Rapid |
| 17. | *Fumaria capreolata* | Climbing Fumitory | Hand weeding or spraying with selective herbicides if funding is available. | High/Rapid |
| 18. | *Gladiolus angustus* | Long Tubed Painted Lady | Ongoing control required. | High/Unrated |
| 19. | *Gladiolus undulatus* | Wavy Gladiolus | Monitor and control as required. | High/Rapid |
| 20. | *Ixia maculata* | Yellow Ixia | Ongoing control required. | Unrated/Rapid |
| 21. | *Lachenalia aloides* | Soldiers | Control required. | High/Unrated |
| 22. | *Lachenalia bulbifera* | Soldiers | Ongoing monitoring and control required. Hand remove populations in degraded sites. | High/Unrated |
| 23. | *Lachenalia reflexa* | Soldiers | Ongoing control required. | High/Rapid |
| 24. | *Leptospermum laevigatum* | Coast Teatree | Requires ongoing monitoring for re-infestation. | High/Rapid |
| 25. | *Moraea flaccida* | One-leaf Cape Tulip | Ongoing control required. | High/Rapid |
| 26. | Melinis repens | Red Natal Grass. | Control if funding is available in collaboration with the Department of Health. | Unrated/Medium |
| 27. | *Olea europaea* | Olive | Requires ongoing monitoring for re-infestation/ resprouting. | High/Rapid |
| 28. | *Oxalis pes-caprae* | Soursob | Ongoing control required. Undertake control in conjunction with *Freesias*. | High/Slow |
| 29. | *Pelargonium capitatum* | Rose Pelargonium | Ongoing control required. Only remove large infestations where native vegetation has established. | High/Rapid |
| 30. | *Schinus terebinthifolia* | Brazilian Pepper | Requires ongoing monitoring for re-infestation/ resprouting. | High/Medium |

| | Species Name | Common Name | Notes | Rating |
|---|---|---|---|---|
| *31.* | Trachyandra divaricata | Dune Onion Weed | Monitor and control as required (only small population located along South eastern fire break). | Medium/Rapid |
| *32.* | Verbesina encelioides | Crownbeard, Wild Sunflower | Control required as new population found and it's an alert weed. | Unrated/Alert. |
| *33.* | *Vicia sativa* | Common Vetch | Hand weeding or spraying with selective herbicides if funding is available. | Unrated |
| *34.* | *Watsonia meriana* | Watsonia | Requires ongoing monitoring and control. | High/Rapid |

Table 7: Alert Weeds for Shenton Bushland.

| Species Name | Common Name | Notes |
|---|---|---|
| *Acacia longifolia* | Sydney Golden Wattle | Previously removed from Shenton Bushland |
| *Asparagus asparagoides* | Bridal Creeper | One or two small infestations exist seedlings are distributed by seed eating birds |
| *Verbesina encelioides* | Golden Crown Beard | Seedlings found in north eastern section following sewer upgrade |

Strategy

Priority weeds should be controlled in all management sectors across Shenton Bushland in accordance with management notes in Appendix 4.

Of the priority weeds listed in Table 6 the following weeds are considered the highest priority for management:

- *Ehrharta calycina*
- *Euphorbia terracina*
- *Ferraria crispa*
- *Freesia alba x leichtlinii*
- Fumitory
- *Gladiolus angustus*
- Golden Crown Beard
- *Lachenalia reflexa*
- *Oxalis*
- Cape Weed
- *Ixia maculata*
- *Moraea flaccida*
- *Pelargonium capitatum*
- Vetch
- *Watsonia meriana.*

If for some reason, funding is not available to control priority weeds in all management sectors, then priority areas for weed control should be focused on areas of better condition bushland as shown in Table 8 below.

Table 8: Priority for Weed Control by Zones.

| Priority | Zone |
|---|---|
| High | A & B |
| Intermediate | E, F & G |
| Lowest | C, D & H |

It is important to undertake weed control across the entirety of Shenton Bushland every year. However, if this is not possible then Zones A and B should continue to have weed control every year.

Ongoing weed control will always be required in the other Zones to protect the values of *Good* bushland condition areas, reduce fuel loads from exotic grasses and reduce reinfestation of weeds that were previously controlled.

Collaboration with Adjacent Landowners

The Department of Health provides annual funding towards weed management on the Department's land in accordance with a Memorandum of Understanding. Previously, the Friends of Shenton Bushland and the City have liaised with the Department of Defence regarding control of invasive weeds such as Geraldton Carnation Weed, Tagasaste and *Lachenalia* on Irwin Barracks. In the past Department of Defence has actively co-operated in controlling those weeds. The City and the Friends of Shenton Bushland should continue to collaborate with the Department of Health and the Department of Defence for the purposes of weed management.

Maintenance Areas

Numerous weeds are present in "The Barrens", the sump, along the fence line on Lemnos Street, the old tracks to the south and in degraded areas near Mount Pelargonium. Weeds in these areas include Tall Fleabane *(Conyza bonariensis*), Flat Weed *(Hypochaeris glabra*), Prickly Lettuce *(Lactuca serriola*), Soursob *(Oxalis pes-capre*), Nightshade *(Solanum nigrum*), Climbing Fumitory *(Fumaria capreolata*) and Lupinus. They require ongoing maintenance so they do not invade nearby *Good* bushland areas.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Undertake annual monitoring and control of *Chasmanthe floribunda*, *Centranthus macrosiphon*, *Gladiolus undulatus*, *Lachenalia bulbifera*, *Asparagus asparagoides*, *Acacia longifolia, Golden Crown Beard,* and Coast Teatree to ensure they do not spread or reestablish. |
| 2. | Control the following weeds as a high priority: *Ehrharta calycina, Euphorbia terracina, Ferraria crispa, Freesia alba x leichtlinii, Ixia maculata, Oxalis,* Fumitory*, Vetch, Lachenalia reflexa, Moraea flaccida, Pelargonium capitatum and Watsonia meriana* |
| 3. | Control Weeds in Zones A and B as a priority. |
| 4. | Continue to liaise with the Department of Defence regarding weeds adjacent to Shenton Bushland, within Irwin Barracks. |
| 5. | Continue to collaborate with the Health Department for weed management on Health Department owned land. |
| 6. | Control weeds in The Barrens and along the front fence periodically so they do not invade adjacent bushland areas. |
| 7. | Implement 'Weed Control' actions in the Natural Areas Management Plan 2019-2024. |

## 6.5 Monitoring

The methodology followed for bushland condition assessments undertaken in 2018 is detailed on pages 34-36 of the Natural Areas Management Plan 2019-2024. Bushland condition is useful in tracking large changes over time and should continue to be measured each time this Management Plan is reviewed. However subtle improvements are not necessarily reflected in the results. Subtle changes are better measured more frequently by monitoring the distribution and abundance of selected

weed species, or quantitative data collected from fixed quadrats or transects and photo points.

Transect Monitoring

The City of Nedlands and the Friends of Shenton Bushland have collected quantitative data on flora along transects within Shenton Bushland. These include *Lachenalia*, *Freesia* and *Watsonia* transects which are being monitored every two years. The data collected from transect monitoring provide monitoring data that can be used to report on the success of management activities within the bushland.

Photo Points

The Friends of Shenton Bushland have photo monitoring points aligned along pathways which are photographed every five years. These photographs provide a useful record of changes over time.

Grass Tree Burn Monitoring

In 2017 and 2018 Grass Tree skirts were burnt across 3ha of bushland, in three locations, on the western and eastern boundaries of the bushland. In order to monitor the controlled burn the City undertook before and after fuel load assessments as well as ongoing monitoring of Grass Tree health; and weed and native species recruitment within the burn sites on the western boundary.

Monitoring of Grass Tree health; and weed and native species recruitment is detailed below.

Two separate monitoring studies are currently being conducted near the south western corner of Shenton Bushland to track the impacts of the recent Grass Tree burning:

1) A transect survey (three 100m transects), which examines aspects of the population structure, e.g. the relative proportions of the different size/age-classes, the relative proportions of adults & juveniles, the timing & intensity of flowering, mortality & morbidity rates.
2) A quadrat survey (twenty 1×1m quadrats) examining ground storey in burnt compared to unburnt areas, along with regrowth under individual grasstrees.

In the transect survey, there are small differences at a population level between the grasstrees on individual transects, but none that can be unequivocally ascribed to burning. Results to date indicate that burning in the area has promoted flowering in unburnt plants. However, no effects have been detected on either the population structure, or the mortality/morbidity.

Regrowth under burnt grasstrees is dominated by exotic weeds, such as *Hypochaeris glabra, Urospermum picroides, Avena barbata*. Unburnt ground storey, on the other hand, tends to be much more diverse. It is rarely dominated by a single species, and includes an overwhelmingly higher proportion of natives.

Intuitively, it seems unlikely that grasstree burning has no effect at all; nevertheless, no effects have been detected yet (only a year & a half after the initial burn, and only a few months since the most recent burn).

Weed Mapping

Of the 101 weeds identified as occurring within Shenton Bushland, the distribution and density of 14 weeds were mapped along with woody weeds. These should continue to be mapped every five years as part management plan reviews. Historical weed mapping data should also be incorporated into a report on the management activities and condition of Shenton Bushland.

Weed Monitoring

Species that have small populations or have previously been removed from the bushland and require annual monitoring and control. These include:

- *Chasmanthe floribunda*
- Pretty Besty
- *Lachenalia bulbifera*
- *Asparagus asparagoides*
- Golden Crown Beard
- Coast Teatree – adjacent infestations on Defence land.

Blue Leschenaultia

A patch of Blue Leschenaultia that has heritage value occurs on the western side of the bushland. It was transported into the bushland with gravel from Perth Hills for the construction of the POW camp. Blue Leschenaultia is not native to Shenton Bushland and it appears to be increasing its distribution. Its normal range is confined to the gravel soils of the Darling Scarp. It is unknown whether it will increase its distribution beyond the remnants of the gravel that it was transported with for the construction of the POW camp. Its distribution in the bushland should therefore be monitored and consideration should be given to finding a balance between managing heritage and conservation values.

Base of Tuarts

In addition to areas in *Poor* condition or those adjacent to weed infestations, the base of tuart trees are susceptible to the establishment of weeds. Tuarts are generally significantly taller than other bushland trees are often used preferentially for roosting by birds. As a consequence there are a number of weeds that often establish at the base of Tuarts which include *Asparagus asparagoides, Asparagus crispus, Brachychiton populneus, Carpobrotus edulis, Lycium edulis, Lycium ferocissimum, Olea europaea, Rhamnus alaternus, Solanum linnaeanum, Solanum nigrum* and *Zantedeschia aethiopica* (Keighery, Cited in Ecoscape 2005[2]). The weeds at the base of Tuarts and other large trees should therefore be monitored and removed as required.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Undertake biannual monitoring of transects and photo monitoring points every five years. |
| 2. | Continue to map priority weeds through management plan reviews. |
| 3. | Monitor, control and document the distribution of new invasive weeds as they arise. |
| 4. | Annually monitor weeds with the potential to expand rapidly and map changes in their distribution if required. |

| | |
|---|---|
| 5. | Collate historical mapping and monitoring data to report on management activities within the bushland. |
| 6. | Monitor and remove invasive weeds found at the base of Tuarts and large trees as required. |

## 7. FIRE MANAGEMENT

Fire management actions for all natural areas has been detailed on pages 61-67 of the Natural Areas Management Plan 2019-2024 and the fire history map shown in the map section in Appendix 6.

In the 2005 Management Plan certain areas within Shenton Bushland were designated as either Primary Protection or Conservation Zones. These two designations indicate where protection of neighbouring infrastructure should take precedence over ecological values in managing fire hazards at Shenton Bushland. Essentially, the internal Zones are Conservation Zones and the external Zones are Fire Hazard Protection Zones. These are shown in the map section in Appendix 6.

Summary of Current Practices

The City undertakes the following fire management practices at Shenton Bushland:

- Annual review of the Shenton Bushland Fire Pre-Plan with Department of Fire and Emergency Services (DFES)
- Maintenance of firebreaks prior to the 30th November annually
- Annual program to manually reduce fuel loads by removing fine fuels especially within Fire Hazard Protection Zones
- Ongoing management of grass weeds
- Fuel load assessments (as required) to monitor fuel loads and respond accordingly
- Follow up maintenance of bush fire risk assessment actions.

DFES has a Fire Pre-Plan for Shenton Bushland which was developed in conjunction with relevant stakeholders and is reviewed annually. This plan details: site information, ecological requirements, vulnerable property, risk management strategies and responsibilities; a communications plan, hazards and fire suppression strategies and tactics.

In 2013 the City undertook bushfire risk assessments in all of City's natural areas using Australian Standard AS 3959 (Buildings in Bush Fire Prone Areas) and ISO AS/NZ 31000-2009 (Risk Management - Principles and Guidelines). Whilst this was not a requirement for the City and is only a legislative requirement for developments occurring in bush fire prone areas. It was undertaken as a proactive measure by the City to assist in managing fire risk. As a result of these assessments several actions were identified and implemented for Shenton Bushland and follow up maintenance has been scheduled (as required) in order to maintain these actions.

Fuel load assessments were undertaken for all natural areas in 2015 using methodology described within the DFES Visual Fuel Load Guide for the Swan Coastal Plain and Darling Scarp (DFES, 2015). Following these assessments a number of actions were undertaken to reduce fuel loads at Shenton Bushland. In addition to this the City also has an annual grass weed management program that reduces fuels loads and a manual fuel load reduction program.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Implement 'Fire Management' actions detailed in the Natural Areas Management Plan 2019-2024. |

## 8. ACCESS

The "*Objectives for Access*" has been detailed for all natural areas on pages 68-73 of the Natural Areas Management Plan 2019-2024. Generally the fences, walls and path network within Shenton Bushland are considered appropriate. A small section of the path network from the Lemnos Street front entrance to the noticeboard provides for disability access. This is shown on the map of pathways in the map section in Appendix 6.

Based on the current funding provided to implement the City of Nedlands Natural Area Path Network Policy the pathways within Shenton Bushland will be upgraded until 2021/22. The current paths are only 1.2 meters wide, once upgraded they will be a minimum of 2 meters wide and will consist of red asphalt. When the paths are upgraded, consideration should be given to coordinating the removal of soil mounds along pathways.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Implement 'Access' actions in the Natural Areas Management Plan 2019-2024. |

## 9. CULTURAL HERITAGE, INTERPRETATION & EDUCATION

Cultural Heritage, Interpretation and Education has been detailed for all natural areas on pages 74-82 of the Natural Areas Management Plan 2019-2024.

Background

At present interpretation at Shenton Bushland is in the form of:

- Information on the Friends of Shenton Bushland website and facebook page
- Two information shelters within the bushland.

Strategy

Information Shelter

The information shelters allow information to be displayed including work undertaken by the Friends of Shenton Bushland and values of the bushland. Ongoing maintenance of the information shelters should be undertaken as required.

Whadjuk Trails

The Whadjuk Trail Network is a project that is being undertaken by the Western Suburbs Regional Organisation of Councils (WESROC) and natural area 'Friends of' groups in the Western Suburbs. The Whadjuk Trail Network consists of a series of walking trails that link all natural areas in the Western Suburbs, including the Cities of Stirling, Fremantle and Perth.

Currently six out of seven trails have been installed. The trail that traverses Shenton Bushland is the Bush to Beach Trail and it extends from Rosalie Park in Subiaco to Grant Marine Park in Cottesloe. It connects to the Yange Kep Bidi, the Bidi Bo Djinoong, the Wardun Beelier Bidi, the Karak Bidi and the Karda Bidi trails within the Whadjuk Trail Network. Directional signage on pathways and bollards directs walkers through Shenton Bushland on the Bush to Beach Trail. Interpretive signage is also located along the trail detailing the environmental, Aboriginal and European significance of Allen Park.

Other Forms for Presenting Information

Printed materials go out of date quickly. Preference is to have information that can be updated easily. Both the City of Nedlands and the Friends of Shenton Bushland provide information on Shenton Bushland on the internet. This information should be reviewed and updated as required.

## 10. NATIVE ANIMALS

Background

Shenton Bushland has been extensively surveyed over the years and there are 63 confirmed native animal species (52 birds, 3 mammals, 28 reptile and amphibian species and 4 invertebrates). At present all these species are managed indirectly through improving bushland condition and control of feral animals which have the potential to predate, compete with, or displace native animals This is discussed in the feral animal management section on pages 85-90 of the Natural Areas Management Plan 2019-2024.

Strategy for Protection of Native Animals

Three mammals have been recorded at Shenton Bushland these include Gould's Wattled Bat, White-striped Freetail Bat and Brushtail Possums.

Gould's Wattled Bat (*Chalinolobus gouldii)*

Gould's Wattled Bat is common throughout mainland Australia except for Cape York Peninsula. They roost in tree hollows and buildings and occur in many towns and cities (Menkhorst & Knight, cited in Ecoscape 2005[2]).

White-striped Freetail Bat (*Tadarida australis)*

White-striped Freetail Bat weigh about 37 grams and are 40-55 mm long. They roost in singular or in small groups within tree hollows and are common and widespread across the southern two-thirds of Australia (Menkhorst & Knight, cited in Ecoscape 2005[2]).

Brushtail Possum

Brushtail Possums are among the most adaptable of the native mammals they live in a variety of habitats often favouring open forest and woodland areas with older trees that provide hollows.

Due to the adaptability and resilience of the Brushtail Possum, no specific measures are proposed to manage them onsite. However, hollows in larger old and dead trees should be retained as refuges and ongoing control of feral European Honey Bees should be undertaken as they can displace native animals from hollows.

Birds

Of the 52 native bird species recorded onsite there are three species protected under the EPBC Act 1999. These include the Carnaby's Black-Cockatoo *(Calyptorhynchus latirostris)* which is listed as *Endangered,* the Forest Red-tailed Black-Cockatoo *(Calyptorhynchus banksii)* which is listed as *Vulnerable* and the Rainbow Bee-eater *(Merops ornatus)* which is listed as a *Marine* species.

Carnaby's and Red-tailed Black-Cockatoos are regularly seen foraging at Shenton Bushland. Carnaby's have roost sites at Perry Lakes and Hollywood Hospital and Red-tailed Black-Cockatoos have a roost site near McGillivray Oval.

Rainbow Bee-eaters migrate annually in summer and nest in Perth's sandy soils where they are regularly seen nesting and foraging in Shenton Bushland. If nests are encountered in the bushland they should be protected so that any restoration work that is undertaken does not disturb their nests. This can be achieved by installing

logs adjacent to nests to stop vehicles from driving over them and informing contractors of their locations so they do not inadvertently disturb the nests. Ongoing feral cat and fox control should also be undertaken as they can predate on Bee-eater nests.

Feral birds

Feral birds compete with native birds for foraging material and nesting hollows. Some also carry diseases which have the potential to infect native bird populations such as the Rainbow Lorikeet that carry Beak and Feather disease. The Department of Biodiversity Conservation and Attractions (DBCA) undertook a five year regional feral bird control program focussing on Rainbow Lorikeets and Long-billed Corellas. This program has now been taken over by the Western Australian Local Government Association who are currently seeking funding from local governments to continue this program.

The protection of the mammals and birds in Allen Park can be achieved through:

- Fire risk management to minimise fires that may destroy tree hollows
- Retaining hollows for refuges in large old and dead trees
- Controlling feral European Bees
- Protecting nests of Rainbow Bee-eaters
- Ongoing feral cat and fox control programs
- Contributing to regional feral bird programs coordinated by WALGA.

Reptiles and Amphibians

Reptiles and amphibians are much more persistent in urban areas within the Swan Coastal Plain than mammals. 21 of 33 mammal species have become locally extinct since European settlement but only 2 of the 71 reptile species and none of the 15 amphibians have become locally extinct during the same period. A relatively large group of lizards can persist on small and modified patches of native vegetation, and areas as small as 4 ha in size is important to maintain lizard assemblages in inner urban areas (How & Dell, cited in Ecoscape 2005[2]).

There are a number of reptiles recorded onsite that How & Dell (1994) have identified as being able to persist in urban gardens and the inner city of Perth. These are the least likely to be lost from Shenton Bushland and include:

- Marbled Gecko *(Phyllodactylus marmoratus)*
- Fence Skink *(Cryptoblepharus plagiocephalus)*
- Two-toed earless Skink *(Hemiergis quadrilineata)*
- West Coast Four-toed Lerista (*Lerista elegans)*
- Western Worm Lerista (*Lerista praepedita)*
- Common Dwarf Skink (*Menetia greyii)*
- Bobtail or Shingleback (*Tiliqua rugosa).*

How & Dell, cited in Ecoscape 2005[2], also noted that the Spiny-tailed Gecko (*Diplodactylus spinigerus)* can survive in recently developed urban areas provided some bushland remains. There are a number of species in Shenton Bushland that are identified by How and Dell (cited in Ecoscape 2005[2]) as being at the southern limits of their distributions on the Swan Coastal Plain in Perth. These include:

- White-spotted Ground Gecko (*Diplodactylus alboguttatus)*
- Keeled Legless Lizard *(Pletholax gracilis)*
- West Coast Line-spotted Lerista (*Lerista lineopunctulata)*
- West Coast Four-toed Lerista (*Lerista elegans)*
- Western Worm Lerista (*Lerista praepedita)*
- Black Tailed Monitor *(Varanus tristis).*

Several of these species are recorded as uncommon on the Swan Coastal Plain by Bush *et al* (cited in Ecoscape 2005[2]), including the Black Tailed Monitor *(Varanus tristis)* and Keeled Legless Lizard *(Pletholax gracilis)*.

It is worth noting that in January 2005, 11 years since the West Australian Museum began animal trapping in Shenton Bushland, the South-western Spiny-tailed Gecko (*Strophurus spinigerus)* was caught for the first time in Shenton Bushland. This is an indication that monitoring over long periods is required to fully document the fauna inhabiting or visiting sites such as Shenton Bushland including those species that are not usually expected to occur (this gecko favours heathland and coastal dune habitat such as is found in areas of Bold Park and Allen Park and has not been recorded in Kings Park).

Only two snakes have been recorded in Shenton Bushland, and whilst comprehensive searches have not been undertaken for them, How and Dell (cited in Ecoscape 2005[2]) noted that snakes appear less able to accommodate habitat fragmentation on the Swan Coastal Plain.

When soil heaps and rubbish are removed, care should be taken to note whether any native animals are being disturbed as species such as:

- Western Slender Bluetongue (*Cyclodomorphus branchialis*) which is a nocturnal lizard that shelters beneath dense, low vegetation, leaf litter, limestone, rubbish and inside soil heaps.
- Turtle Frogs (*Myobatrachus gouldii*) which can occur in soil heaps.
- Western Limestone Ctenotus *(Ctenotus lesueurii)* which has burrows at the base of shrubs, beneath rocks or rubbish.
- Bobtails (*Tiliqua rugosa*) can shelter amongst rubbish such as corrugated iron (Bush *et al*, cited in Ecoscape 2005[2]).

These reptiles may utilise the soil and rubbish mounds onsite, but are not dependent upon them for habitat and therefore given the issue of weeds and aesthetics these mounds should still be removed. However, consideration should be given to the process of removing the mounds to minimise impacts (e.g. by initial sorting through mounds by hand or shovel) and if such animals are discovered then handling should be minimised and the animals placed in a well vegetated area nearby.

Care also needs to be exercised by volunteers moving soil and rubbish mounds that that are not bitten by Bobtail (*Tiliqua rugosa)* which have very powerful jaws that can inflict a painful bite but are only likely to bite if mishandled or Dugites (*Pseudonaja affinis*) which are dangerously venomous but will only bite if trodden on, handled or threatened.

Invertebrates

There are four confirmed invertebrates at Shenton Bushland (two butterflies including the Western Grass-Dart Butterfly (*Taractrocera papyria*) and Marbled Xenica Butterfly (*Geitoneura klugii*); the Graceful Sun Moth (*Synemon gratiosa*); and the Australian Painted Lady (*Vanessa kershawi*). These are all managed indirectly through improving bushland condition, maintaining habitat and reducing fires.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Survey native fauna, including invertebrates, when funding is available. |
| 2. | Carefully relocate reptiles if they are encountered when removing soil mounds. |
| 3. | Minimise fires that may destroy tree hollows. |
| 4. | Retain tree hollows for their habitat value. |
| 5. | Undertake ongoing control of feral European Bees. |
| 6. | Protect Rainbow Bee-eater nests. |
| 7. | Continue implementing feral cat and fox control programs. |
| 8. | Contribute to regional feral bird control programs coordinated by WALGA. |

## 11. COMMUNITY INVOLVEMENT

The objectives and strategies for community involvement for the City's Community Friends Groups are detailed on pages 83-84 Natural Areas Management Plan 2019-2024. In summary, the activities of bushland community groups should continue to be supported by the City through the Community Friends Group Policy, and assistance should be provided to help Friends Groups remain sustainable through advertising and the volunteer referral centre. Specific details of the Friends of Shenton Bushland (FOSB) are stated below.

The FOSB formed in 1991 to protect the bushland from development as a light industrial estate, and preserve it for conservation and recreation purposes. The Friends, in conjunction with the City of Nedlands and local residents, succeeded in having the Reserve vested to the City of Nedlands as an A Class Reserve in 1993. The Friends Group became incorporated on 12th May 1994, and have collaborated with the City of Nedlands, the Department of Health and Shenton College to manage the bushland since that time.

The Friends of Shenton Bushland generally concentrate their efforts in the south western portion of the bushland. Their weed control activities depend on the time of year. Some of their focus species for control include Geraldton Carnation Weed, Perennial Veldt Grass (and other perennial grasses), *Pelargonium*, *Watsonia, Freesia* and Flinders Range Wattles.

The City of Nedlands overseas weed spraying for bulbous weeds such as Black Flag, *Freesias*, *Lachenalia* and grass weeds (primarily Perennial Veldt Grass). Teams undertaking bushland maintenance focus hand weeding on Geraldton Carnation Weed, *Centranthus macrosiphon*, Perennial Veldt Grass and Lupins and Wild Radish (in some degraded areas).

The Friends of Shenton Bushland are very active in the management of Shenton Bushland and meet every Sunday from 8-10am. Projects the Friends of Shenton Bushland are involved in include:

- Revegetation
- Seed collection
- Environmental weed management
- Community education and guided walks
- Weed mapping
- Flora surveys
- Development of management actions for Shenton Bushland
- Projects with Shenton College
- Sourcing grant funding for project such as the installation of bat boxes
- Photographing flora and fauna.

The Friends of Shenton Bushland are keen to involve anyone interested in caring for Shenton Bushland. The contact details for the Friends of Shenton Bushland are:

Convenor Dani Boase-Jelinek
bojel@iinet.net.au
0420334601
Activities blog http://shenton-bushland.blogspot.com.au
Website http://members.iinet.net.au/~kerribj/shenton
Urban Bushland Council http://www.bushlandperth.org.au/member-groups/3-north-of-the-river/59-friends-of-shenton-bushland

Community Projects to Increase Awareness and Conservation

The Lemnos Street frontage of the bushland provides an opportunity to develop mutually beneficial partnerships with adjacent organisations such as the Arthritis Centre, Cat Haven, Dogs' Home and a number of businesses along Lemnos Street. Such partnerships could be utilised to foster a sense of community ownership of the bushland and thereby attract volunteers and reduce littering and dumping of rubbish.

Some ideas and potential projects to be explored for developing such partnerships include:

- Raising the profile of the bushland and the activities of the Friends Group by liaising more closely with adjacent organisations and residents.
- Exploring options for involving the community to improve the appearance of the bushland along the Lemnos Street frontage such as regular litter removal, maintenance of grass, removal of dead branches, mulching and planting local species and installing seating and a picnic table near the entrance.
- Providing information about bushland activities and opportunities for community involvement.

| Management Actions 2019-2024 | |
|---|---|
| 1. | Invite adjacent organisations and residents on projects to improve the Lemnos frontage and increase awareness of the bushland. |

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**Appendix 1: Flora Inventory**
**Native Plant Inventory**

| Scientific Name | Common Name |
|---|---|
| *Acacia cochlearis* | Rigid Wattle |
| *Acacia cyclops* | Coastal Wattle |
| *Acacia huegelii* | |
| *Acacia pulchella* | Prickly Moses |
| *Acacia saligna* | Golden Wreath Wattle |
| *Acacia stenoptera* | Narrow Winged Wattle |
| *Acacia willdenowiana* | Grass Wattle |
| *Alexgeorgea nitens* | |
| *Allocasuarina fraseriana* | Sheoak |
| *Allocasuarina humilis* | Dwarf Sheoak |
| *Anigozanthos humilis* | Catspaw |
| *Anigozanthos manglesii* | Mangles' Kangaroo Paw |
| *Astroloma pallidum* | Kick Bush |
| *Austrostipa compressa* | |
| *Austrostipa flavescens* | Spear Grass |
| *Banksia attenuata* | Slender Banksias |
| *Banksia dallanneyi* | Couch Honeypot |
| *Banksia menziesii* | Firewood Banksia |
| *Banksia sessilis* | Parrot Bush |
| *Bossiaea ornata* | Broad Leaved Brown Pea |
| *Burchardia congesta* | Milkmaids |
| *Caesia micrantha* | Pale Grass-lily |
| *Caladenia flava* | Cowslip Orchid |
| *Caladenia latifolia* | Pink Fairy Orchid |
| *Calandrinia corrigioloides* | Strap Purslane |
| *Calandrinia liniflora* | Parakeelya |
| *Callitris preissii* | Rottnest Island Pine |
| *Centrolepis drummondiana* | |
| *Comesperma calymega* | Blue-spike Milkwort |
| *Conostephium pendulum* | Pearl Flower |
| *Conostephium preissii* | |
| *Conostylis aculeata* | Prickly Cottonhead |
| *Conostylis setigera* | Bristly Cottonhead |
| *Corymbia calophylla* | Marri |
| *Corynotheca micrantha* | Tangle Lily |
| *Crassula colorata* | Dense Stonecrop |
| *Daviesia decurrens* | Prickly Bitter-pea |
| *Daviesia divaricata* | Marno |
| *Daviesia nudiflora* | |
| *Daviesia triflora* | |
| *Desmocladus flexuosa* | |
| *Dianella revoluta* var. *Divaricata* | Flax Lily |
| *Diuris corymbosa* | Common Donkey Orchid |
| *Diuris magnifica* | Pansy Orchid |
| *Drosera erythrorhiza* | Red Ink Sundew |

| Scientific Name | Common Name |
|---|---|
| *Drosera glanduligera* | Pimpernel Sundew |
| *Drosera macrantha* | Bridal Rainbow |
| *Drosera paleacea* | Dwarf Sundew |
| *Drosera pallida* | Pale Rainbow |
| *Drosera stolonifera* | Leafy Sundew |
| *Eryngium pinnatifidum* | Blue Devils |
| *Eucalyptus gomphocephala* | Tuart |
| *Eucalyptus marginata* | Jarrah |
| *Gastrolobium capitatum* | Bacon And Eggs |
| *Gompholobium tomentosum* | Hairy Yellow Pea |
| *Grevillea vestita* | |
| *Haemodorum laxum* | |
| *Haemodorum paniculatum* | Mardja |
| *Haemodorum spicatum* | Mardja |
| *Hakea prostrata* | Harsh Hakea |
| *Hardenbergia comptoniana* | Native Wisteria |
| *Hibbertia huegelii* | |
| *Hibbertia hypericoides* | Yellow Buttercups |
| *Hibbertia racemosa* | Stalked Guinea Flower |
| *Homalosciadium homalocarpum* | |
| *Hovea trisperma* | Common Hovea |
| *Hybanthus calycinus* | Wild Violet |
| *Hypocalymma robustum* | Swan River Myrtle |
| *Isolepis marginata* | Coarse Club-rush |
| *Isotropis cuneifolia* | Granny Bonnets |
| *Jacksonia furcellata* | Grey Stinkwood |
| *Jacksonia sericea* | Waldjumi |
| *Kennedia prostrata* | Scarlet Runner |
| *Lagenophora huegelii* | |
| *Leschenaultia linarioides* | Yellow Leschenaultia |
| *Lepidosperma apricola* | |
| *Lepidosperma squamatum* | |
| *Leporella fimbriata* | Hare Orchid |
| *Leucopogon propinquus* | |
| *Levenhookia stipitata* | Common Stylewort |
| *Lomandra caespitosa* | Tufted Mat Rush |
| *Lomandra hermaphrodita* | |
| *Lomandra maritima* | |
| *Lomandra micrantha* | Small Flowered Mat Rush |
| *Lomandra nigricans* | |
| *Lomandra preissii* | |
| *Luzula meridionalis* | Field Woodrush |
| *Lyginia barbata* | |
| *Macrozamia riedlei* | Zamia |
| *Mesomelaena pseudostygia* | Semaphore Sedge |
| *Microlaena stipoides* | Weeping Grass |
| *Microtis media* | Common Mignonette Orchid |

| Scientific Name | Common Name |
|---|---|
| *Monotaxis grandiflora* | |
| *Olearia elaeophila* | Diamond of the Desert |
| *Olearia axillaris* | Coastal Daisybush |
| *Opercularia vaginata* | Dog Weed |
| *Orthrosanthus laxus var. laxus* | Morning Iris |
| *Persoonia saccata* | Snottygobble |
| *Petrophile brevifolia* | |
| *Petrophile linearis* | Pixie Mops |
| *Petrophile macrostachya* | |
| *Pithocarpa cordata* | |
| *Pheladenia deformis* | Blue Fairy Orchid |
| *Philotheca spicata* | Pepper and Salt |
| *Pimelea sulphurea* | Yellow Banjine |
| *Podolepis gracilis* | Slender Podolepis |
| *Poranthera microphylla* | Small Poranthera |
| *Pterostylis barbata* | Bird Orchid |
| *Pterostylis recurva* | Jug Orchid |
| *Pterostylis* sp. *short sepals* | Short-eared Snail Orchid |
| *Pterostylis vittata* | Banded Greenhood |
| *Ptilotus drummondii* | Narrowleaf Mulla Mulla |
| *Ptilotus polystachyus* | Prince Of Wales Feathers |
| *Pyrorchis nigricans* | Red Beaks |
| *Quinetia urvillei* | |
| *Rhagodia baccata* | Berry Saltbush |
| *Scaevola anchusifolia* | Silky Scaevola |
| *Scaevola canescens* | Grey Scaevola |
| *Scaevola repens* | Prostrate Scaevola |
| *Schoenus clandestinus* | |
| *Schoenus curvifolius* | |
| *Schoenus grandiflorus* | Large Flowered Bog Rush |
| *Siloxerus humifusus* | Procumbent Siloxerus |
| *Sowerbaea laxiflora* | Purple Tassels |
| *Spyridium globulosum* | Basket Bush |
| *Stirlingia latifolia* | Blueboy |
| *Stylidium brunonianum* | Pink Fountain Triggerplant |
| *Stylidium schoenoides* | Cow Kicks |
| *Synaphea spinulosa* | |
| *Tetraria octandra* | |
| *Thelymitra benthamiana* | Leopard Orchid |
| *Thelymitra crinita* | Blue Lady Orchid |
| *Thelymitra fuscolutea* | Chestnut Sun Orchid |
| *Thelymitra graminea* | Shy Sun Orchid |
| *Thelymitra macrophylla* | Scented Sun Orchid |
| *Thysanotus arenarius* | |
| *Thysanotus manglesianus* | Fringed Lily |
| *Thysanotus sparteus* | |
| *Thysanotus triandrus* | |

| Scientific Name | Common Name |
|---|---|
| *Trachymene pilosa* | Native Parsnip |
| *Tricoryne elatior* | Yellow Autumn Lily |
| *Wahlenbergia preissii* | |
| *Waitzia suaveolens* | Fragrant Waitzia |
| *Xanthorrhoea brunonis* | |
| *Xanthorrhoea preissii* | Grass Tree |
| *Xanthosia huegelii* | |

Native plant inventory reviewed and updated by Ian Fordyce and Associates.

**Weed Inventory**

| Scientific Name | Common Name |
|---|---|
| *Acacia cardiophylla* | West Wyalong Wattle |
| *Acacia iteaphylla* | Flinders Range Wattle |
| *Acacia longifolia* | Sydney Wattle |
| *Acacia podalyriifolia* | Queensland Silver Wattle |
| *Acacia restiacea* | |
| *Agonis flexuosa* | Peppermint Tree |
| **Aira caryophyllea* | Silvery Hair Grass |
| **Albuca canadensis* | |
| **Arctotheca calendula* | Cape Weed |
| **Asphodelus fistulosus* | Wild Onion |
| **Avena fatua/ A. barbata* | Wild Oats/ Bearded Oats |
| *Brachychiton populneus* | Kurrajong |
| **Briza maxima* | Blowfly Grass |
| **Briza minor* | Shivery Grass |
| *Bromus diandrus* | Great Brome |
| **Buddleja madagascariensis* | Orange Buddleja |
| **Carpobrotus edulis* | Pigface |
| **Centaurium tenuiflorum* | Slender Centaury |
| **Centranthus macrosiphon* | Pretty Betsy |
| **Chamaecytisus palmensis* | Tagasaste |
| *Chamelaucium uncinatum* | Geraldton Wax |
| **Chasmanthe floribunda* | African Cornflag |
| **Conyza* bonariensis | Flaxleaf Fleabane |
| **Cynodon dactylon* | Couch |
| **Disa bracteata* | South African Orchid |
| **Dittrichia graveolens* | Stinkwort |
| **Ehrharta calycina* | Perennial Veldt Grass |
| **Ehrharta longiflora* | Annual Veldt Grass |
| **Eragrostis curvula* | African Love Grass |
| **Erodium botrys* | Long Storksbill |
| **Erodium moschatum* | Musky Crowfoot |
| **Euphorbia peplus* | Petty Spurge |
| **Euphorbia terracina* | Geraldton Carnation Weed |
| **Ferraria crispa* | Black Flag |
| **Freesia alba × leichtlinii* | Freesia |
| **Fumaria capreolata* | Whiteflower Fumitory |
| **Geranium molle* | Dove's Foot Cranesbill |

| Scientific Name | Common Name |
|---|---|
| **Gladiolus angustus* | Long-tubed Painted Lady |
| **Gladiolus caryophyllaceus* | Wild Gladiolus |
| *Grevillea leucopteris* | White-plumed Grevillea |
| **Heliophila pusilla* | Fine Sunflax |
| **Hypochaeris glabra/ radicata* | Smooth Catsear/ Flatweed |
| **Ixia maculata* | Yellow Ixia |
| **Lachenalia aloides* | Opal Flower |
| **Lachenalia bulbifera* | Red Lachenalia |
| **Lachenalia reflexa* | Yellow Soldiers |
| **Lactuca saligna* | Wild Lettuce |
| **Lactuca serriola* | Prickly Lettuce |
| **Lagurus ovatus* | Hares Tail Grass |
| *Leptospermum laevigatum* | Coast Teatree |
| **Lolium perenne* | Perennial Rye Grass |
| **Lupinus angustifolius* | Narrowleaf Lupin |
| **Lupinus cosentinii* | Sandplain Lupin |
| *Lysimachia arvensis* | Pimpernel |
| **Medicago polymorpha* | Burr Medic |
| **Melinis repens* | Red Natal Grass |
| **Monoculus monstrosus* | Stinking Roger |
| **Moraea flaccida* | One-leaf Cape Tulip |
| **Narcissus tazetta* | Jonquil |
| **Oenothera drummondii* | Beach Evening Primrose |
| **Olea europaea* | Olive |
| **Opuntia stricta* | Common Prickly Pear |
| **Orobanche minor* | Lesser Broomrape |
| **Oxalis corniculata* | Yellow Wood Sorrel |
| **Oxalis glabra* | Finger Leaf Oxalis |
| **Oxalis pes-caprae* | Soursob |
| **Oxalis purpurea* | Large Flower Wood Sorrel |
| **Pelargonium capitatum* | Rose Pelargonium |
| **Pennisetum clandestinum* | Kikuyu Grass |
| **Pennisetum setaceum* | Fountain Grass |
| **Petrorhagia dubia* | Velvet Pink |
| **Poa annua* | Winter Grass |
| **Polycarpon tetraphyllum* | Fourleaf Allseed |
| **Polygala myrtifolia* | Myrtleleaf Milkwort |
| **Raphanus raphanistrum* | Wild Radish |
| **Romulea flava* | Yellow Froetang |
| **Romulea rosea* var. *australis* | Guildford Grass |
| **Schinus terebinthifolia* | Brazilian Pepper |
| *Senecio pinnatifolius* var. *latilobus* | Variable Groundsel |
| **Silene gallica* | French Catchfly |
| **Solanum nigrum* | Black Berrry Nightshade |
| **Sonchus oleraceus/ asper* | Common Sowthistle/ Rough Sowthistle |
| **Stellaria media* | Chickweed |

| Scientific Name | Common Name |
|---|---|
| **Stenotaphrum secundatum* | Buffalo Grass |
| **Trachyandra divaricata* | Dune Onion Weed |
| **Trifolium angustifolium* | Narrowleaf Clover |
| **Trifolium arvense* | Hare's Foot Clover |
| **Trifolium campestre* | Hop Clover |
| **Trifolium dubium* | Slender Suckling Clover |
| **Trifolium subterraneum* | Subterranean Clover |
| **Urospermum picroides* | False Hawkbit |
| **Ursinia anthemoides* | Ursinia |
| **Vicia sativa* | Common Vetch |
| **Vulpia bromoides* | Squirrel Tail Fescue |
| **Vulpia myuros* | Rat's Tail Fescue |
| **Wahlenbergia capensis* | Cape Bluebell |
| **Watsonia meriana* | Watsonia |
| **Zantedeschia aethiopica* | Arum Lily |

Weed inventory reviewed and updated by Ian Fordyce and Associates.

**Appendix 2: Fungi Inventory 2000-2019**

| FUNGUS | HABITAT |
|---|---|
| Mycorrhizal (plant partner) Fungi | |
| *Amanita preissii* | litter/ground |
| *Amanita sp. A "turnip base"* | litter/ground |
| *Amanita sp. B "powdery"* | litter/ground |
| Vermillion Grisette *Amanita xanthocephala* | litter/ground |
| Mueller's Funnel Cap *Austropaxillus muelleri* | litter/ground |
| Bolete *Boletus sp.* | litter/ground |
| Birds Nest fungus | litter |
| Funnel Cap *Clitocybe sp.* | litter/ground |
| Ink Cap *Coprinus sp* | litter/ground |
| Golden Tuart Cortinarius *Cortinarius ochraceofulvus* | litter/ground |
| *Cortinarius sp. 1 purple tinge | litter/ground |
| *Cortinarius sp 2 gold top* | litter/ground |
| *Cortinarius sp 3 gold top white stem* | litter/ground |
| *Gyroporus sp.* | litter/ground |
| Fibrehead *Inocybe sp.* | litter/ground |
| Brick Red Laccaria *Laccaria lateritia* | litter/ground |
| Slimacella *Limacella pitereka* | litter/ground |
| Bleeding Mycena *Mycena kuurkacea* | litter/ground |
| *Mycena sp*. brown top | litter/ground |
| Parasol Ink Cap *Parasola plicatilis* | litter, ground, grassy areas |
| Golden Splash tooth *Phlebia mycoacea* | litter/ground |
| Cleland's Gilled Bolete *Phylloporus clelandii* | litter/ground |
| Dog Poo Fungus *Pisolithus sp.* | litter/ground |
| Slender Coral Fungus *Ramaria gracilis* | litter/ground |
| Coral Fungus *Ramaria sp.* | litter/ground |
| Rhodocollybia sp. | litter/ground |
| Earthball *Scleroderma sp.* | litter/ground |
| *Tomentella sp.* | dead wood (both saprotrophic & mycorrhizal) |
| Saprotrophic (decomposer) Fungi | |
| Egg Yolk Fungus *Bolbitius vitellinus* | litter/ground/dung |

| FUNGUS | HABITAT |
|---|---|
| Scotsman's Beard *Calocera guepinoides* | dead wood |
| Red Fingers *Colus pusillus* | litter/sand |
| Eucalypt Crepidotus *Crepidotus eucalyptorum* | living eucalypt trees |
| Saprotrophic (decomposer) Fungi | |
| *Little Cups *Dasyscyphus sp.* | dead wood |
| *Entoloma sp.* | litter/ground |
| Witches Butter *Exidia glandulosa* | dead wood |
| **Galerina eucalyptorum* | dead wood |
| *Galerina unicolor* | litter/ground/moss |
| *Galerina sp.* | moss |
| Golden Wood Fungus *Gymnopilus allantopus* | dead wood |
| *Psathyrella sp.* | litter, ground |
| Scarlet Bracket Fungus, *Pycnoporus coccineus* | dead wood |
| Split Gill Fungus *Schizophyllum commune* | dead wood |
| *Tubaria sp.* | dead wood/litter |
| Strawberry Slime Mould *Tuberifera ferruginosa* | Dead, often burnt, wood |
| Yellow Brain Fungus *Tremella mesenterica gp.* | dead wood |
| Common Rosegill *Volvariella speciosa* | litter, ground |
| Rooting Shank *Xerula australis* | litter, ground |
| Parasitic Fungi | |
| The Bolete Eater *Sepedonium parasitising a Bolete* | other fungi (mushrooms) |
| Ghost Fungus *Omphalotus nidiformis* | dead or dying wood but also parasitic |

List compiled from many Fungi Forays held between June 2000 to June 2013. Identifications provided by Neale Bougher (2000 Foray and 2004 Perth Urban Bushland Fungi Foray) and Roz Hart.

*Three fungi vouchered into the WA Herbarium fungi collection

**Appendix 3: Fauna Inventory**
**Bird Inventory**

| Birds | Common Name | Rob Davis 2006/07 | Dani Boase-Jelinek 2004 | Introduced Birds |
|---|---|---|---|---|
| *Tadorna tadornoides* | Australian Shelduck | X | | |
| *Chenonetta jubata* | Australian Wood Duck | X | | |
| **Columba livia* | Rock Dove (Feral Pigeon) | | X | * |
| **Streptopelia senegalensis* | Laughing Dove | | X | * |
| ** Streptopelia chinensis* | Spotted Dove | | X | * |
| *Phaps chalcoptera* | Common Bronzewing | X | | |
| *Threskiornis moluccus* | Australian White Ibis | X | | |
| *Elanus notatus* | Black-shouldered Kite | | X | |
| *Accipiter fasciatus* | Brown Goshawk | | X | |
| *Accipiter cirrocephalus* | Collared Sparrowhawk | X | | |
| *Falco peregrinus* | Australian Hobby | | X | |
| *Turnix varius* | Painted Button-quail | X | | |
| *Calyptorhynchus banksii* | Forest Red-tailed Black-Cockatoo | | X | |
| *Calyptorhynchus latirostris* | Carnaby's Black-Cockatoo | | X | |
| *Cacatua roseicapilla* | Galah | | X | |
| **Cacatua sanguinea* | Little Corella | | | * |
| **Cacatua tenuirostris* | Long-billed Corella | X | | * |
| **Trichoglossus haematodus* | Rainbow Lorikeet | X | X | * |
| *Glossopsitta porphyrocephala* | Purple-crowned Lorikeet | X | | |
| *Barnardius zonarius* | Australian Ringneck | X | X | |
| *Purpureicephalus spurius* | Red-capped Parrot | | X | |
| *Neophema elegans* | Elegant Parrot | X | | |
| *Chrysococcyx basalis* | Horsfield's Bronze-Cuckoo | X | | |
| *Chrysococcyx lucidus* | Shining Bronze-Cuckoo | X | | |
| *Ninox novaeseelandiae* | Southern Boobook | X | | |
| **Dacelo novaeguineae* | Laughing Kookaburra | | X | * |
| *Merops ornatus* | Rainbow Bee-eater | | X | |
| *Malurus lamberti* | Variegated Fairy-wren | X | | |
| *White-browed Scrubwren* | White-browed Scrubwren | X | | |
| *Smicrornis brevirostris* | Weebill | | X | |
| *Gerygone fusca* | Western Gerygone | | X | |
| *Acanthiza chrysorrhoa* | Yellow-rumped Thornbill | X | | |
| *Acanthiza apicalis* | Inland Thornbill | X | | |

| Birds | Common Name | Rob Davis 2006/07 | Dani Boase-Jelinek 2004 | Introduced Birds |
|---|---|---|---|---|
| *Pardalotus punctatus* | Spotted Pardalote | X | | |
| *Pardalotus striatus* | Striated Pardalote | | X | |
| *Acanthorhynchus superciliosus* | Western Spinebill | | X | |
| *Lichenostomus virescens* | Singing Honeyeater | | X | |
| *Anthochaera lunulata* | Western Wattlebird | X | | |
| *Anthochaera carunculata* | Red Wattlebird | | X | |
| *Epthianura albifrons* | White-fronted Chat | X | | |
| *Gliciphila melanops* | Tawny-crowned Honeyeater | X | | |
| *Lichmera indistincta* | Brown Honeyeater | | X | |
| *Phylidonyris novaehollandiae* | New Holland Honeyeater | X | | |
| *Phylidonyris niger* | White-cheeked Honeyeater | X | | |
| *Coracina novaehollandiae* | Black-faced Cuckoo-shrike | | X | |
| *Lalage tricolor* | White-winged Triller | X | | |
| *Pachycephala pectoralis* | Golden Whistler | X | | |
| *Pachycephala rufiventris* | Rufus Whistler | | X | |
| *Colluricincla harmonica* | Grey Shrike-thrush | X | | |
| *Artamus cinereus* | Black-faced Woodswallow | X | | |
| *Cracticus torquatus* | Grey Butcherbird | | X | |
| *Gymnorhina tibicen* | Australian Magpie | | X | |
| *Rhipidura albiscapa* | Grey Fantail | X | | |
| *Rhipidura leucophrys* | Willie Wagtail | X | | |
| *Corvus coronoides* | Australian Raven | | X | |
| *Grallina cyanoleuca* | Magpie-lark | X | | |
| *Zosterops lateralis* | Silvereye | | X | |
| *Hirundo neoxena* | Welcome Swallow | | X | |
| *Hirundo nigricans* | Tree Martin | | X | |

Bird surveys by Rob Davis in 2006/2007

Other list compiled by Dani Boase-Jelinek 2004 for the 2005-2010 Management Plan

**Mammals, Reptiles, Amphibians and Invertebrates Inventory**

| Mammals | | Introduced |
|---|---|---|
| *Trichosurus vulpecula* | Brushtail Possum | |
| *Chalinolobus gouldii* | Gould's Wattled Bat | |
| *Nyctinomus australis* | White-striped Freetail Bat | |
| *Vulpes vulpes* | Fox | * |
| *Felis catus* | Cat | * |

| Reptiles and Amphibians | |
|---|---|
| **(a) Geckoes** | |
| *Diplodactylus alboguttatus* | White-spotted Ground Gecko |
| *Diplodactylus polyophthalmus* | Speckled Stone Gecko |
| *Diplodactylus spinigerus* | Spiny-tailed Gecko |
| *Phyllodactylus marmoratus* | Marbled Gecko |
| *Strophurus spinigerus* | South-western Spiny-Tailed Gecko |
| ***(b) Legless Lizards*** | |
| *Aprasia repens* | South-western Sandplain Worm Lizard |
| *Liasis burtonis* | Burton's Snake lizard |
| *Pletholax gracilis* | Keeled Legless Lizard |
| ***(c) Dragons*** | |
| *Tympanocryptis adelaidensis* | Western Heath Dragon |
| ***(d) Skinks*** | |
| *Cryptoblepharus plagiocephalus* | Fence Skink |
| *Ctenotus fallens* | West Coast Ctenotus |
| *Ctenotus lesueurii* | Western Limestone Ctenotus |
| *Cyclodomorphus branchialis* | Western Slender Bluetongue |
| *Hemiergis quadrilineata* | Two-toed earless Skink |
| *Lerista elegans* | West Coast Four-toed Lerista |
| *Lerista lineopunctulata* | West Coast Line-spotted Lerista |
| *Lerista praepedita* | Western Worm Lerista |
| *Menetia greyii* | Common Dwarf Skink |
| *Morethia lineoocellata* | Western Pale-flecked Morethia |
| *Morethia obscura* | Southern Pale-flecked Morethia |
| *Tiliqua rugosa* | Bobtail or Shingleback |
| ***(e) Goannas*** | |
| *Varanus gouldii* | Gould¹s Monitor |
| *Varanus tristis* | Black-tailed Monitor |
| ***(f) Frogs*** | |
| *Heleioporus eyrei* | Moaning Frog |
| *Limnodynastes dorsalis* | Banjo Frog |
| *Myobatrachus gouldii* | Turtle Frog |
| ***(g) Snakes*** | |
| *Pseudonaja affinis* | Dugite |
| *Ramphotyphlops australis* | Southern Blind Snake |

## Appendix 4: Priority Weed Management Notes (Compiled from WA Herbarium DBCA Florabase Website)

| Species Name | | Common Name | Management Strategy | Timing (optimal) |
|---|---|---|---|---|
| 1. | *Acacia iteaphylla* | Flinders Range Wattle | Hand pull seedlings. Fell mature plants. | Mar - July |
| 2. | *Avena fatua* | Wild Oat | Spray at 3-5 leaf stage with Fusilade Forte at 16 ml/10 L and wetting agent. Repeat treatment over following 2 years. Prevent seed production and seedbank inputs each year. For small infestations hand removal may be feasible. | Aug - Nov |
| 3. | *Asparagus asparagoides* | Bridal Creeper | Dig out juvenile seedlings in degraded areas. Spray 0.2 g metsulfuron methyl + Pulse in 15 L water (or 2.5 - 5g /ha + Pulse). Best results achieved when flowering. Biological control agents available such as the Leafhopper and the rust. | July - Aug |
| 4. | *Brachychiton populneus* | Kurrajong | Hand pull seedlings. For mature plants try stem injection with 50-100% glyphosate or apply 250 ml Access in 15 L of diesel to basal 50 cm of trunk (basal bark) or cut and paint with 50% glyphosate. | Sept - April |
| 5. | *Carpobrotus edulis* | Hottentot Fig | Manual methods appear to be the most effective means of control. Roll up large mats removing all roots and stem fragments and remove from site. Follow up with removal of any germinating plants. Only remove when flowering. | Sept - Nov |
| 6. | *Chamelaucium uncinatum* | Geraldton Wax | Cut to base and paint with 50% glyphosate. Control seedlings following fire. | All Year |
| 7. | *Centranthus macrosiphon* | Pretty Betsy | Hand remove isolated populations. | August - September |
| 8. | *Chasmanthe floribunda* | African Cornflag | Dig out isolated plants. | June - Sept |
| 9. | *Eragrostis curvula* | African Lovegrass | Cut out small plants or small infestations. Alternatively spray with 1-2% glyphosate when plants are green and actively growing. Following fire spray regrowth when 5-10 cm high. Always requires follow-up treatment. | Nov - May |
| 10. | *Ehrharta calycina* | Perennial Veldt Grass | For small infestations, cut out plants ensuring crown removal. Do not slash. Alternatively spray with Fusilade Forte 13 ml/L or 3.3-6.6 L/ha + wetting agent on actively growing and unstressed plants. Use higher rate in dense undergrowth or on older less vigorous plants. Follow-up in subsequent years. Use unplanned fires to spray regrowth and seedlings within 4-6 weeks of germination. | June – Sep (herbicide) and Nov – Feb (manual) |

| | Species Name | Common Name | Management Strategy | Timing (optimal) |
|---|---|---|---|---|
| 11. | *Euphorbia terracina* | Geraldton Carnation Weed | Manually remove populations. Undertake control after any fire event. | June – Nov |
| 12. | *Ferraria crispa* | Black Flag | Hand remove very small populations in degraded sites. Sift soil to find all corms. Spray 2,2 DPA 10 g/L + Pulse when flowering. In degraded sites try glyphosate 1% + metsulfuron methyl 0.2 g/15 L + Pulse. Takes a number of years to control populations. | Aug - Sept |
| 13. | *Freesia alba x leichtlinii* | Freesia | Spot spray metsulfuron methyl 0.2 g/15 L + Pulse or 2.5-5 g/ha + Pulse. Apply just on flowering at corm exhaustion. | July – Aug |
| 14. | *Fumaria capreolata* | Climbing Fumitory | Hand remove seedlings in good bushland areas or spray selectively. | July – Aug |
| 15. | *Gladiolus angustus* | Long Tubed Painted Lady | Spot spray metsulfuron methyl 0.2 g/15 L + glyphosate 1% + Pulse in degraded sites. | July – Aug |
| 16. | *Gladiolus undulatus* | Wavy Gladiolus | Spot spray metsulfuron methyl 0.2 g/15 L + Pulse or 2.5-5 g/ha + Pulse. Herbicide application should be just on corm exhaustion. Physical removal can result in spread of cormels. Once the parent corm is killed cormels in the soil tend to lose dormancy and germinate. | July |
| 17. | *Ixia maculata* | Yellow Ixia | Spot spray metsulfuron methyl 0.2 g/15 L + Pulse or 2.5-5 g/ha + Pulse. Apply just on flowering at corm exhaustion. Read the manufacturers' labels and material safety data sheets before using herbicides. | July - Sept |
| 18. | *Lachenalia aloides* | Soldiers | Spot spray metsulfuron methyl 0.2 g/15 L + Pulse or 2.5-5 g/ha + Pulse. Apply just on flowering at corm exhaustion. | July - Sept |
| *19.* | *Lachenalia bulbifera* | Soldiers | Two small patches in degraded areas – dig out making sure to remove all bulbils. | July - Aug |
| 20. | *Lachenalia reflexa* | Soldiers | Spot spray metsulfuron methyl 0.2 g/15 L + Pulse (2.5g-5 g/ha). | July - Aug |
| 21. | *Leptospermum laevigatum* | Coast Teatree | Hand pull seedlings. Fell mature plants. Resprouting has been recorded in some areas. Where resprouting has been observed, apply 250 ml Access in 15 L of diesel to bottom 50 cm of trunk (basal bark). | July - Oct |

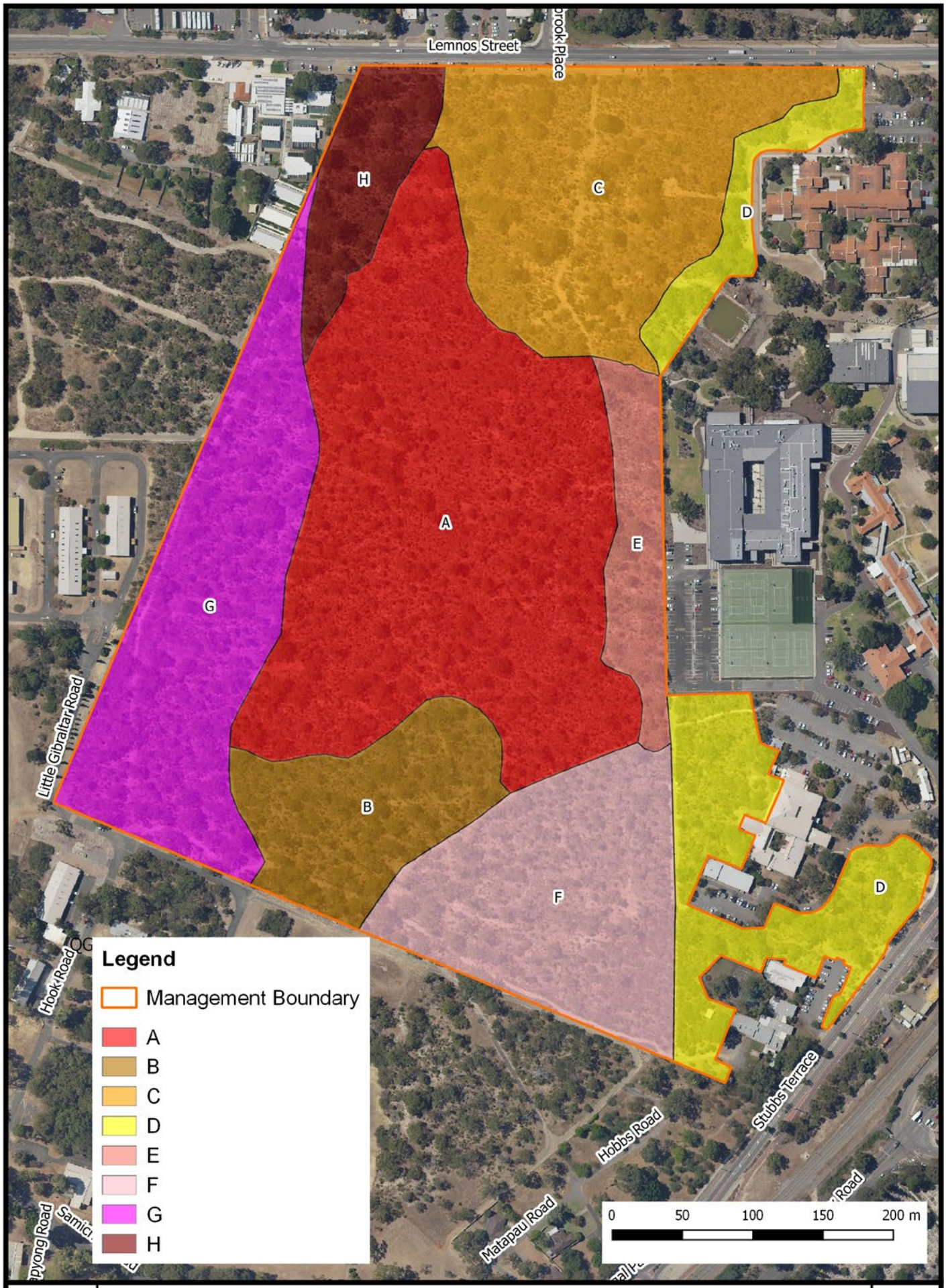
| | Species Name | Common Name | Management Strategy | Timing (optimal) |
|---|---|---|---|---|
| 22. | *Moraea flaccida* | One-leaf Cape Tulip | Spot spray metsulfuron methyl 0.2 g/15 L or chlorsulfuron 0.2 g/15 L + Pulse or 2.5-5 g/ha + Pulse or 2,2 DPA 55 g/10 L + Pulse. | July - Aug |
| 23. | Melinis repens | Red natal grass. | Prevent seed set. Cut out small populations. Spray 13 ml/L (3.3-6.6 L/ha) Fusilade Forte + wetting agent. In less sensitive areas spot spray glyphosate at 1-2% solution + surfactant prior to flowering and seed set. | Nov - Dec |
| *24.* | *Olea europaea* | Olive | Hand pull or dig out seedlings and small plants ensuring removal of all roots. For mature plants cut to base and paint 50% glyphosate or apply 250 ml Access in 15 L of diesel to base 50 cm of trunk (basal bark). Monitor sites for seedling recruitment. | March – May and Oct - Dec |
| *25.* | *Pelargonium capitatum* | Rose Pelargonium | Hand pull isolated plants taking care to remove the entire stem as it can reshoot from below ground level. Spot spray metsulfuron methyl 5 g/ha + Pulse. Easily controlled after fire. | June - Oct |
| *26.* | *Pennisetum clandestinum* | Kikuyu Grass | Difficult to manually control as all rhizomes must be removed. Spray with 1% glyphosate or Fusilade Forte at 16mL/L + wetting agent. 2-3 sprays over a single growing season are often required. Use unplanned fire events to effectively control regrowth. | Nov - Jan |
| *27.* | *Schinus terebinthifolia* | Brazilian Pepper | Hand pull seedlings ensuring removal of all root material. Stem inject older plants using 50% glyphosate or basal bark with 250 ml Access in 15 L of diesel to bottom 50 cm of trunk during summer. Avoid root disturbance until trees are confirmed dead. | Dec - March |
| *28.* | Trachyandra divaricata | Dune Onion Weed | Only control when native vegetation has established. Manually remove isolated or small infestations prior to flowering. 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. | June - August |
| *29.* | *Vicia sativa* | Common Vetch | Hand remove small/isolated populations. Lontrel 10 mL/10 L + wetting agent provides effective control in early growth stages, otherwise apply metsulfuron methyl 0.1 g/10 L + wetting agent. | July - Sept |
| *30.* | *Watsonia meriana* | Watsonia | Dig out isolated plants | June - Sept |

**Appendix 5: Implementation of the 2013-2018 Management Plan.**

| | ACTIONS | IMPLEMTED YES/NO/PARITALLY |
|---|---|---|
| **MANAGEMENT BOUNDARIES** | | |
| 1. | Manage Shenton Bushland on the basis of 8 Zones. | Yes |
| **REHABILITATION** | | |
| 2. | Focus rehabilitation on good condition bushland areas as a priority. | Yes |
| 3. | Develop rehabilitation plans for degraded sites (including soil mounds) that are to be the focus of reconstruction. These should include as a minimum the boundary of works, a planting list and native plants present that require protection. | Yes |
| 4. | Coordinate the removal of soil mounds with path upgrade works. | No |
| 5. | Asbestos if found in the bushland should be left alone and reported to the City. | Yes |
| 6. | Improve the appearance of the Lemnos Street frontage by installation of a rubbish bin and bollards and activities such as litter removal, planting and mulching. | Yes |
| **REVEGETATION** | | |
| 7. | If revegetation work is proposed work with local nurseries to grow species found in low abundance. | Yes |
| 8. | Use species such as *Allocasuarina humilis; Conostylis aculeata, Conostylis setigera, Rhagodia baccata, Jacksonia sericea, Scaevola canescens and Scaevola repens* at low fuel sites. | No |
| **WEED CONTROL** | | |
| 9. | Undertake annual monitoring and control of *Chasmanthe floribunda*, *Centranthus macrosiphon*, *Gladiolus undulatus*, *Lachenalia bulbifera*, *Asparagus asparagoides*, *Acacia longifolia* and Coast Teatree to ensure they do not spread or reestablish. | Yes |
| 10. | Continue to control the following weeds as a high priority: *Ehrharta calycina, Euphorbia terracina, Ferraria crispa, Freesia alba x leichtlinii, Ixia maculata, Lachenalia reflexa, Moraea flaccida, Pelargonium capitatum and Watsonia meriana.* | Yes |
| 11. | Control Weeds in Zones A & B as a priority. | Yes |
| 12. | Continue to liaise with the Department of Defence regarding weeds adjacent to Shenton Bushland, within Irwin Barracks. | No |
| 13. | Continue to collaborate with the Health Department for weed management on Health Department owned land. | Yes |

| ACTIONS | | IMPLEMTED YES/NO/PARITALLY |
|---|---|---|
| 14. | Control weeds in The Barrens and along the front fence periodically so they do not invade adjacent bushland areas. | Yes |
| **MONITORING** | | |
| 15. | Undertake biannual monitoring of transects and photo monitoring points every five years. | Yes |
| 16. | Consider installing additional photo monitoring points. | No |
| 17. | Continue to map priority weeds through Management Plan reviews. | Yes |
| 18. | Monitor, control and document the distribution of new invasive weeds as they arise. | Yes |
| 19. | Annually monitor weeds with the potential to expand rapidly and map changes in their distribution if required. | Yes |
| 20. | Collate historical mapping and monitoring data along with management activities undertaken in the bushland since the late 1990s by DPaW, the City and the Friends of Shenton Bushland. | Yes |
| **FIRE MANAGEMENT** | | |
| 21. | Undertake annual management of grass weeds to reduce fuel loads. | Yes |
| **NATIVE ANIMALS** | | |
| 22. | Carefully relocate reptiles if they are encountered when removing soil mounds. | Yes |
| 23. | Retain hollows for refuges in large old and dead trees. | Yes |
| 24. | Control feral European Bees as they can displace native animals. | Yes |
| 25. | Protect nests of Rainbow Bee-eaters if they are encountered. | Yes |
| 26. | Continue the feral fox control program. | Yes |
| 27. | Undertake surveying to determine if there are any marsupials in the bushland. | Yes |
| | Carefully relocate reptiles if they are encountered when removing soil mounds. | Yes |
| **COMMUNITY INVOLVEMENT** | | |
| 28. | Collaborate with adjacent organisations on projects to improve the Lemnos frontage and increase awareness of the bushland. | Partially |

# Appendix 6
# Maps




Map 1: Management Zones

Shenton Bushland Management Plan 2019-2024

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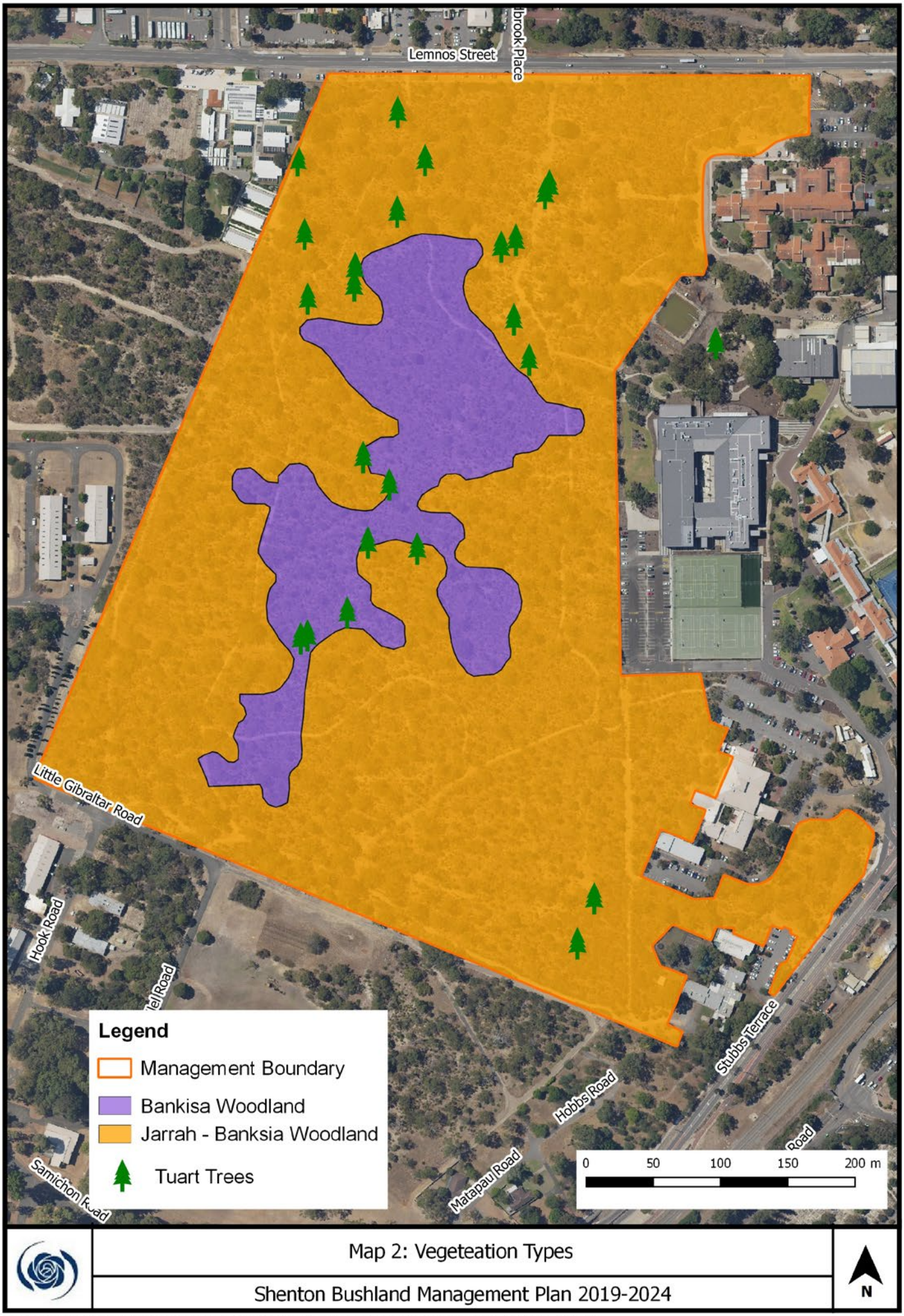


Map 2: Vegeteation Types

Shenton Bushland Management Plan 2019-2024

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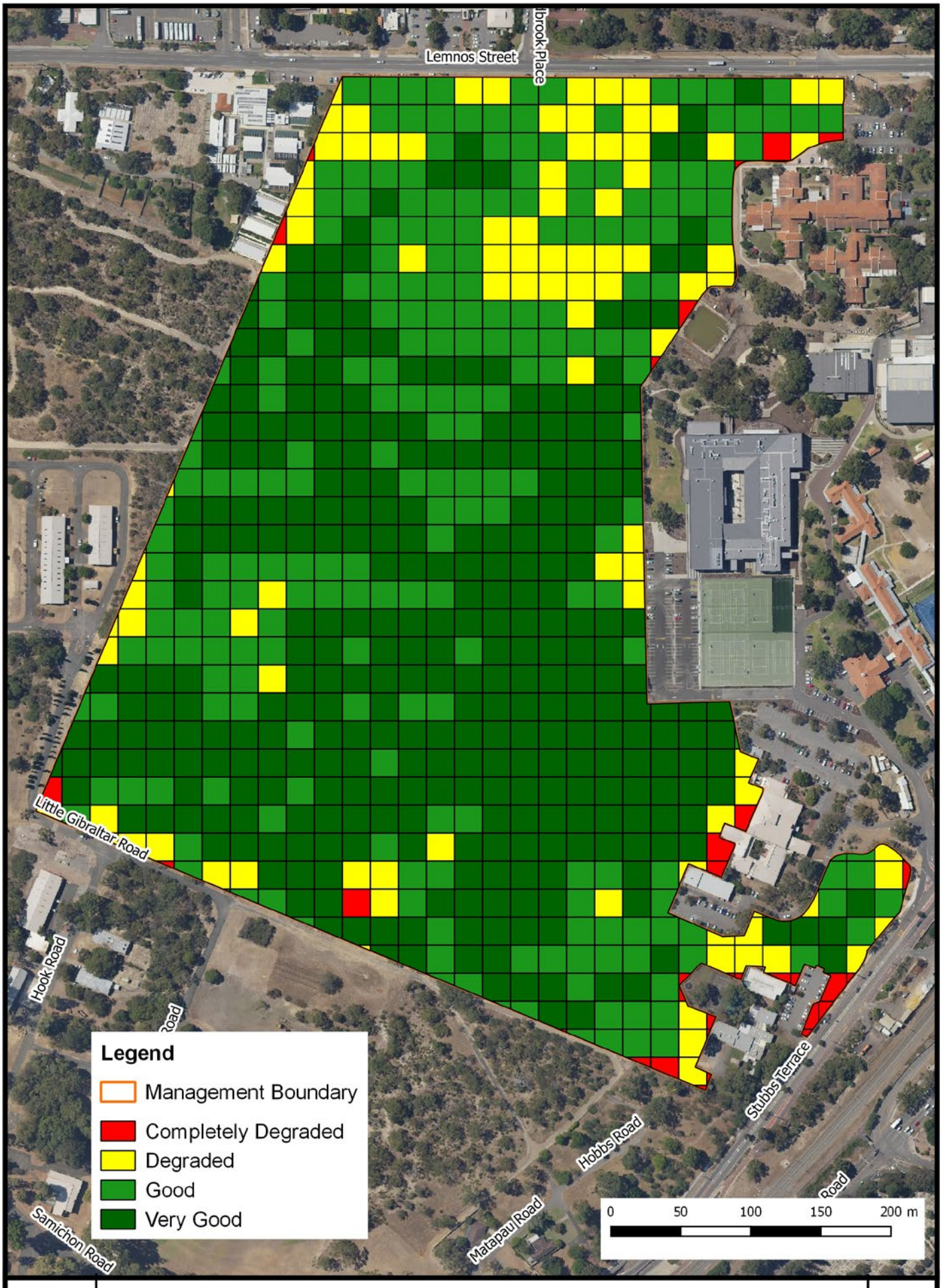


Map 3: Bushland Condition

Shenton Bushland Management Plan 2019-2024

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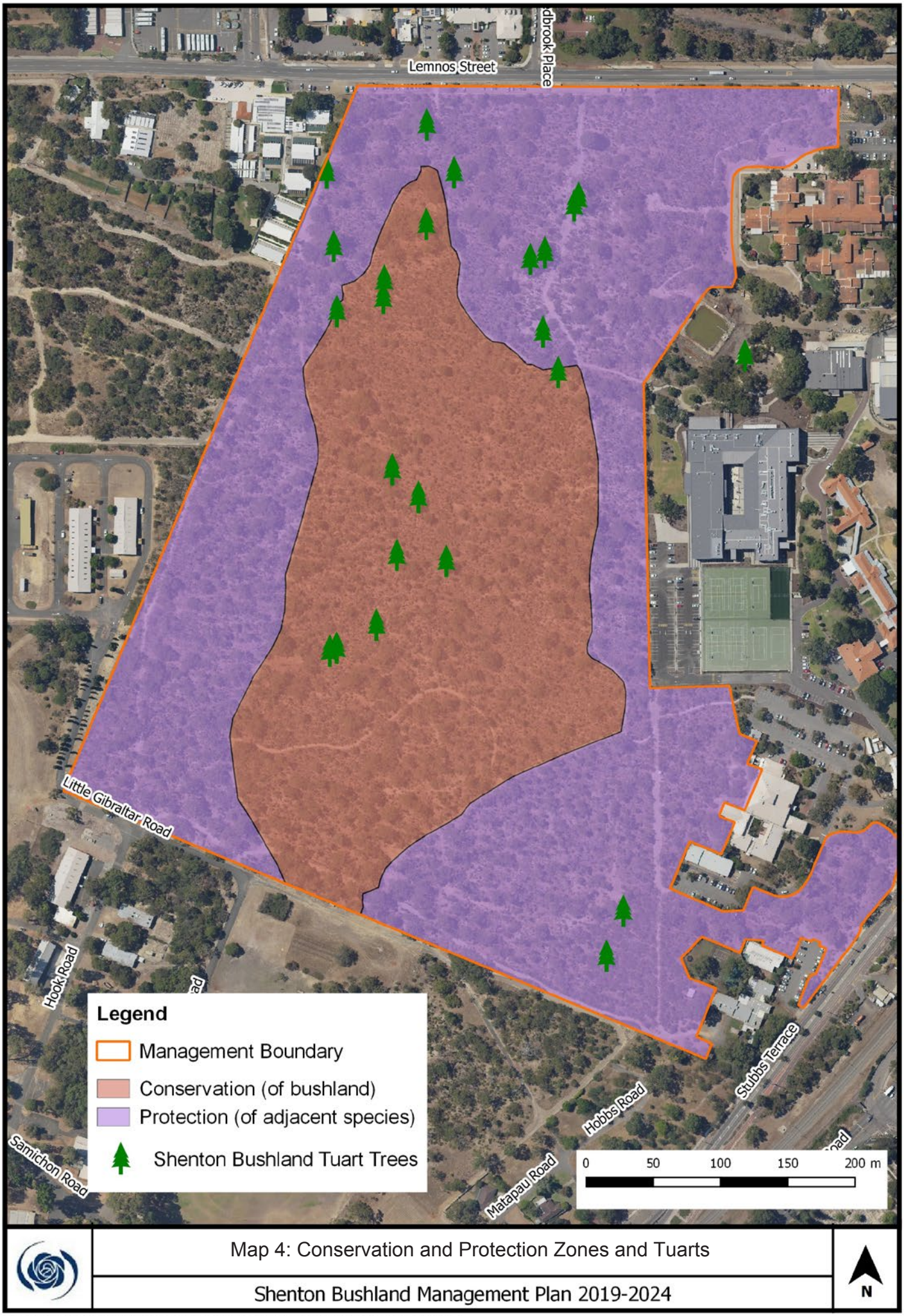


Map 4: Conservation and Protection Zones and Tuarts

Shenton Bushland Management Plan 2019-2024

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Map 5: Fire History

Shenton Bushland Management Plan 2019-2024

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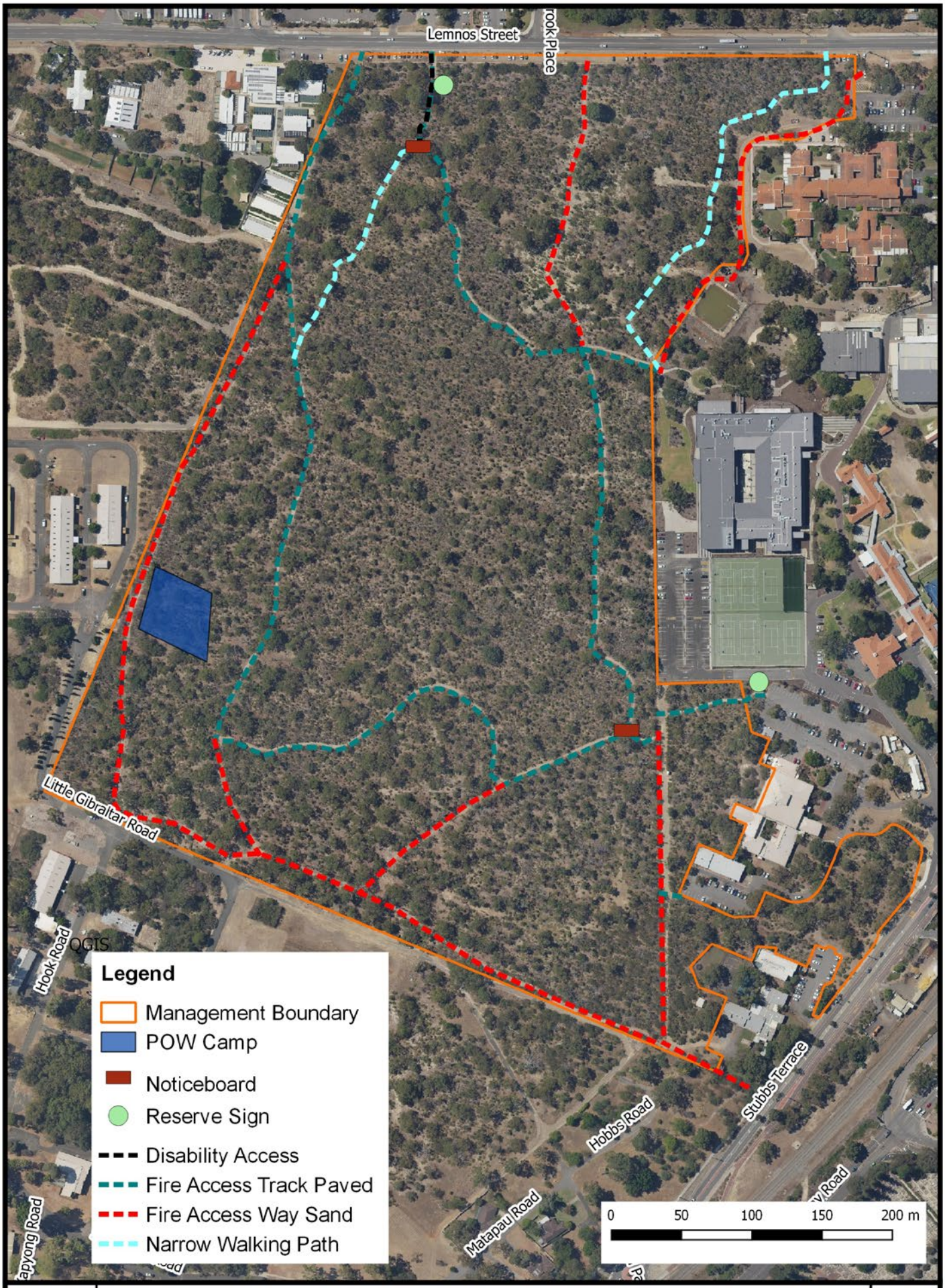


Map 6: Access, Pathways and Interpretation

Shenton Bushland Management Plan 2019-2024

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Map 7: *Albuca canadensis*

Shenton Bushland Management Plan 2019-2024

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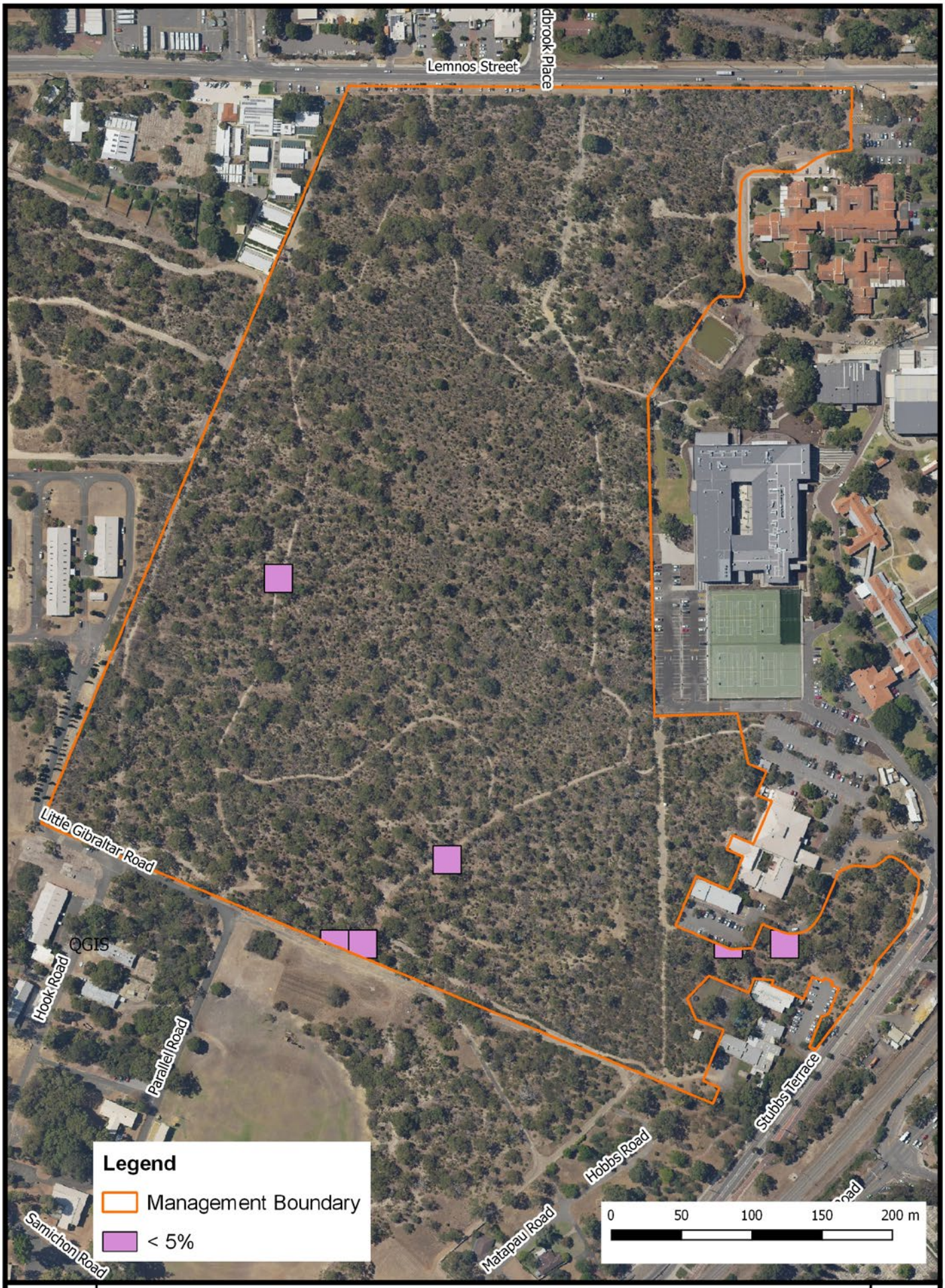


Map 8: *Cenchrus setaceus* - Fountain Grass

Shenton Bushland Management Plan 2019-2024

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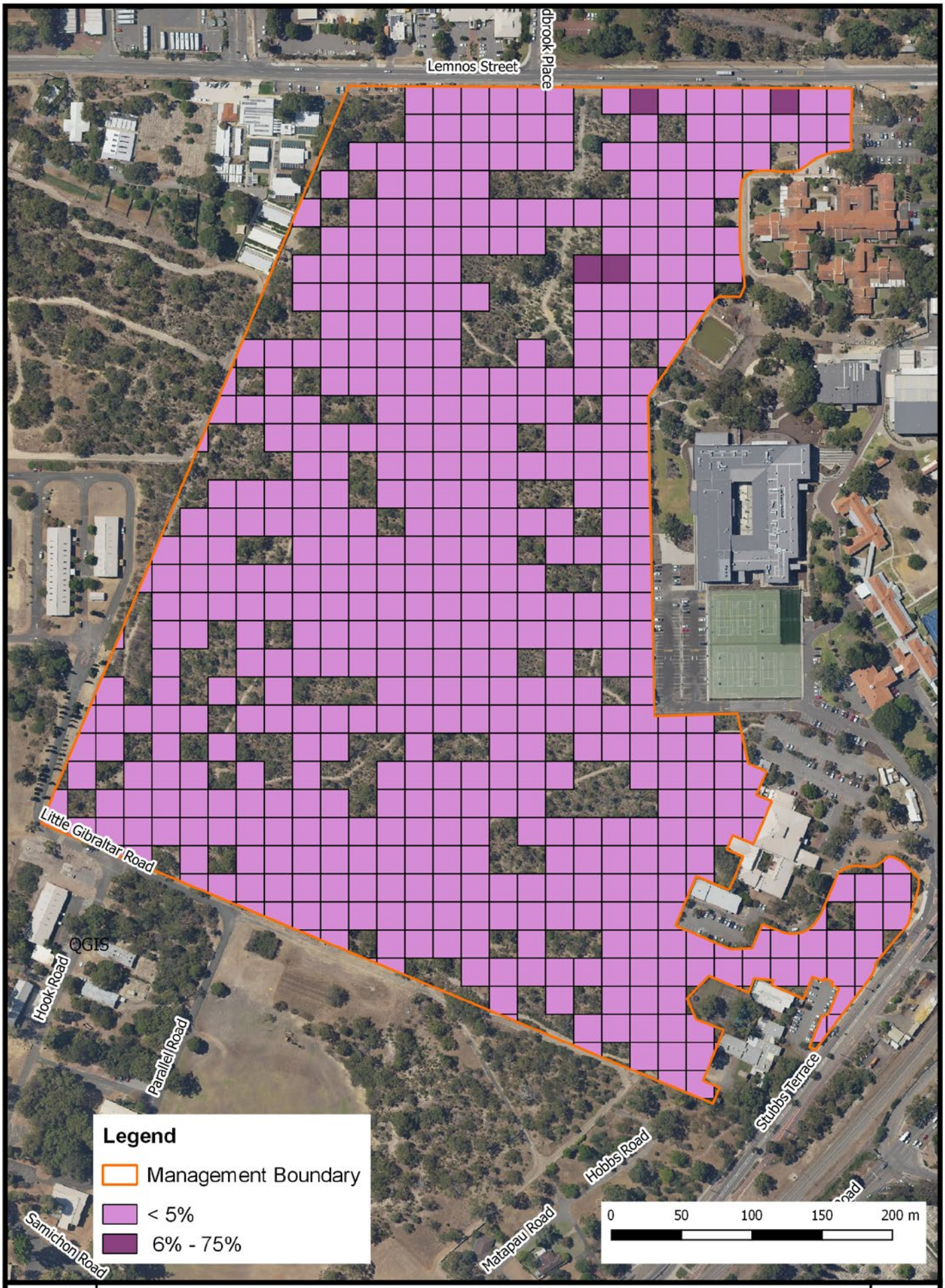


Map 9: *Ehrharta calycina* - Perennial Veldt Grass

Shenton Bushland Management Plan 2019-2024

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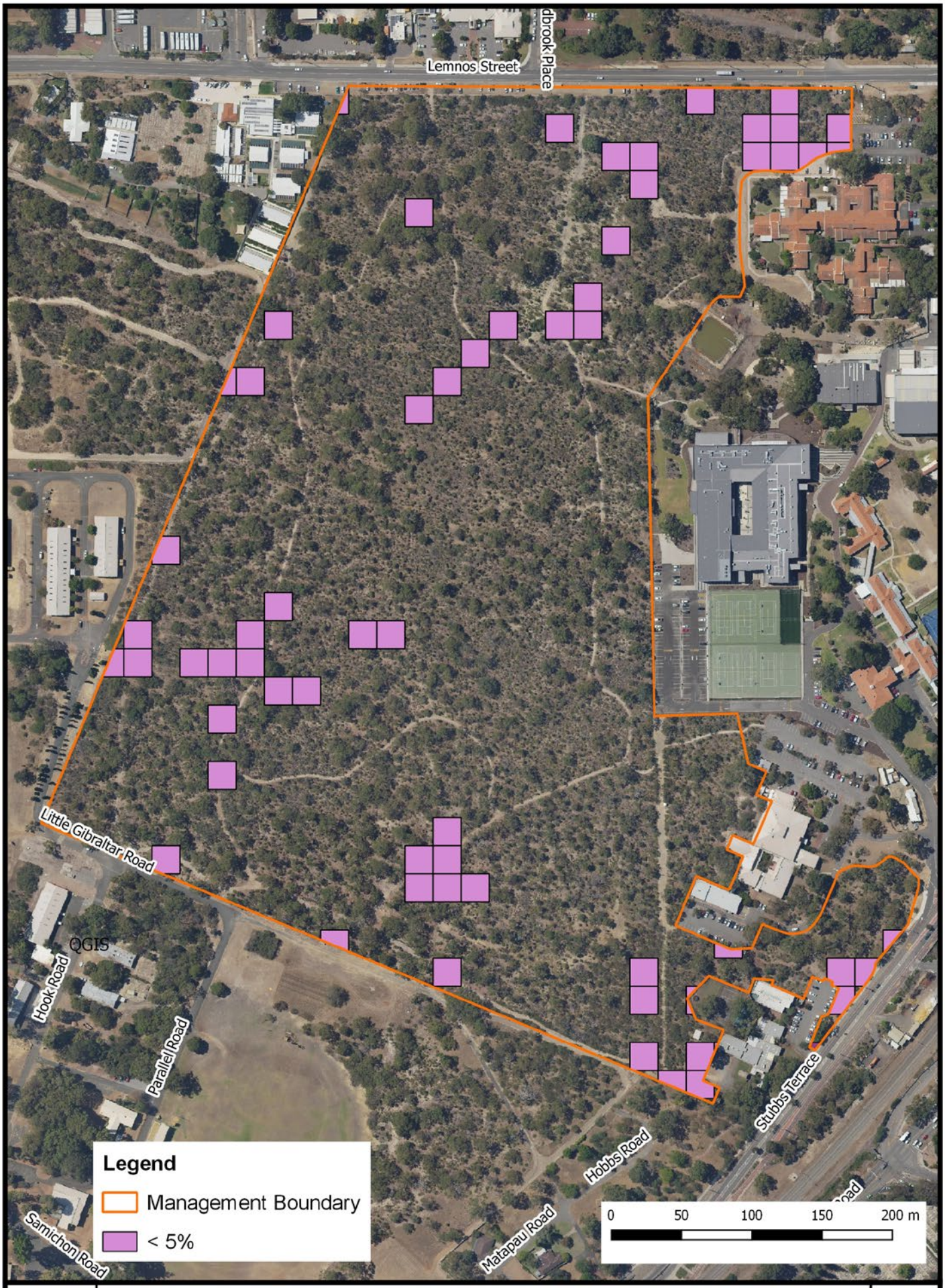


Map 10: *Euphorbia terracina* - Geraldton Carnation Weed

Shenton Bushland Management Plan 2019-2024

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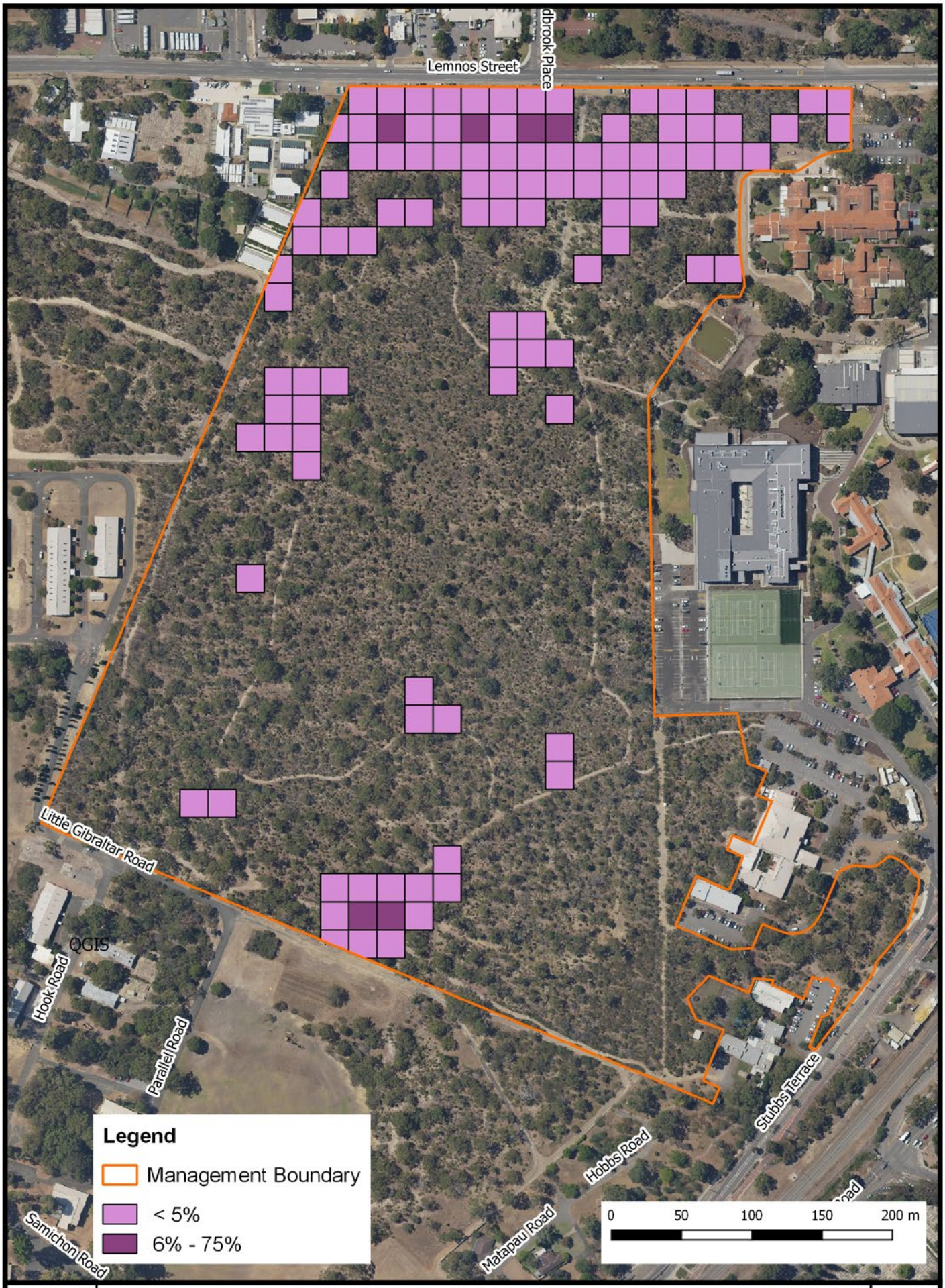


Map 11: *Ferraria crispa* - Black Flag

Shenton Bushland Management Plan 2019-2024

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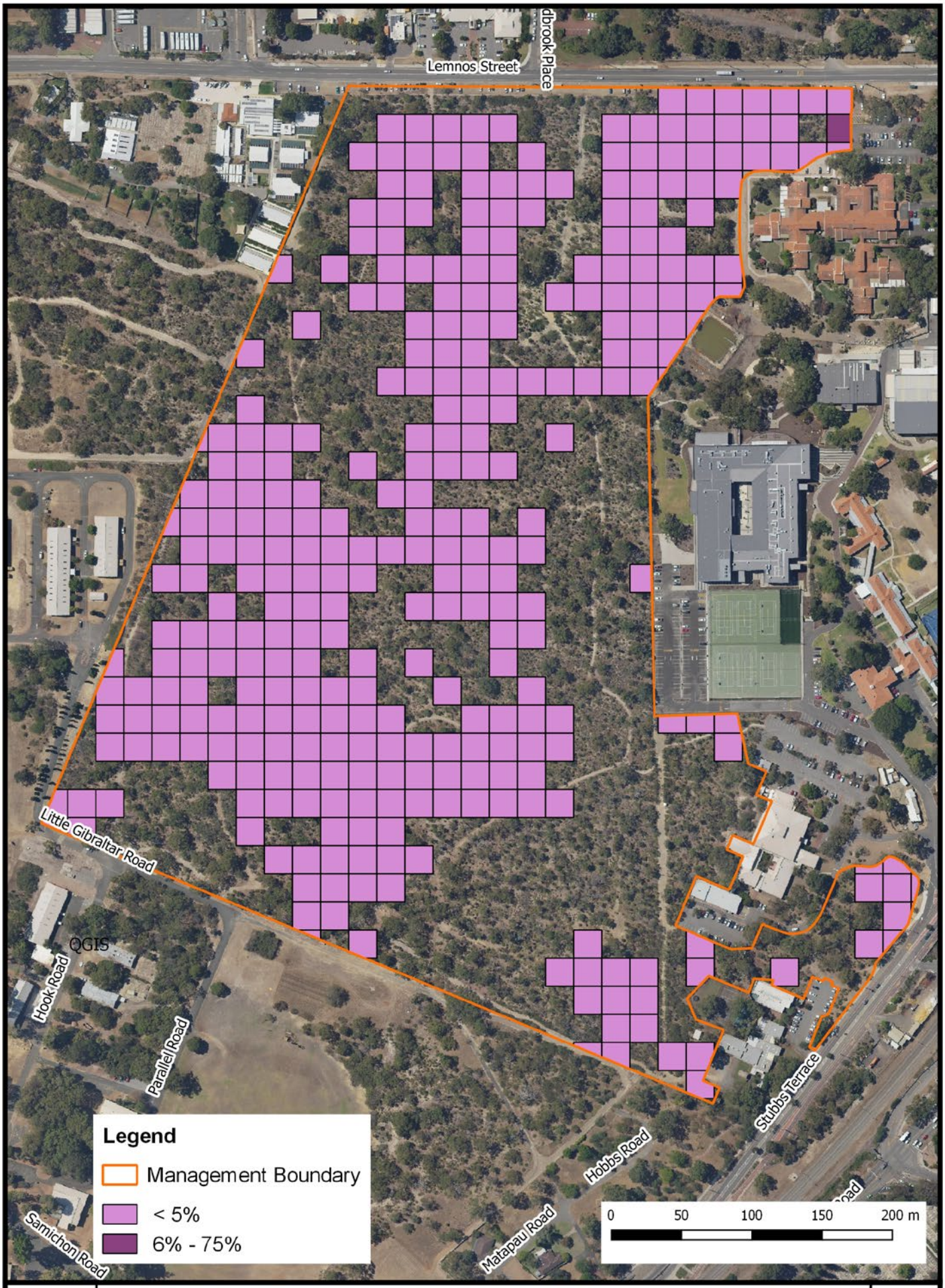


Map 12: *Freesia alba × leichtlinii - Freesia*

Shenton Bushland Management Plan 2019-2024

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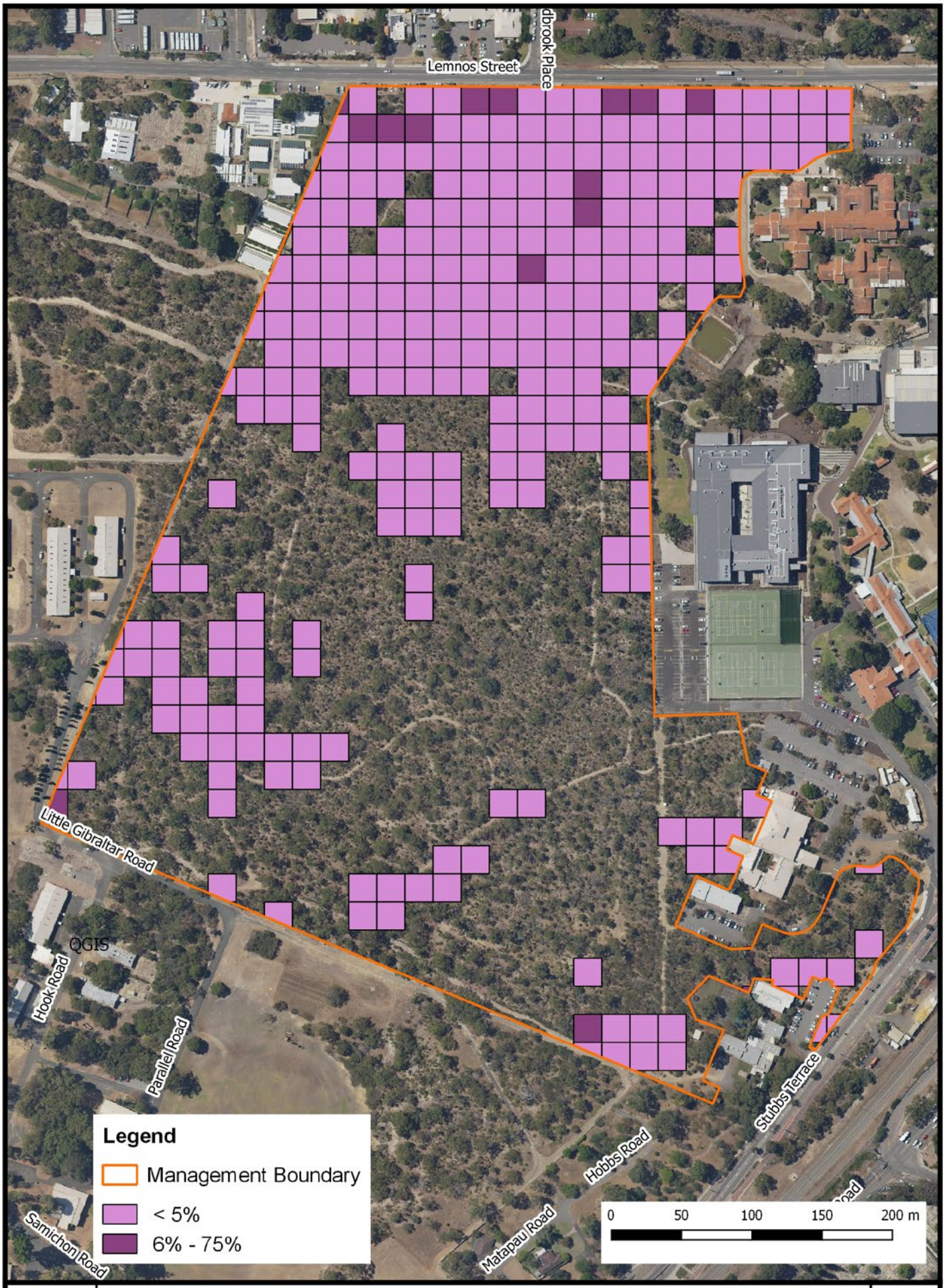


Map 13: *Fumaria* – Fumitory

Shenton Bushland Management Plan 2019-2024

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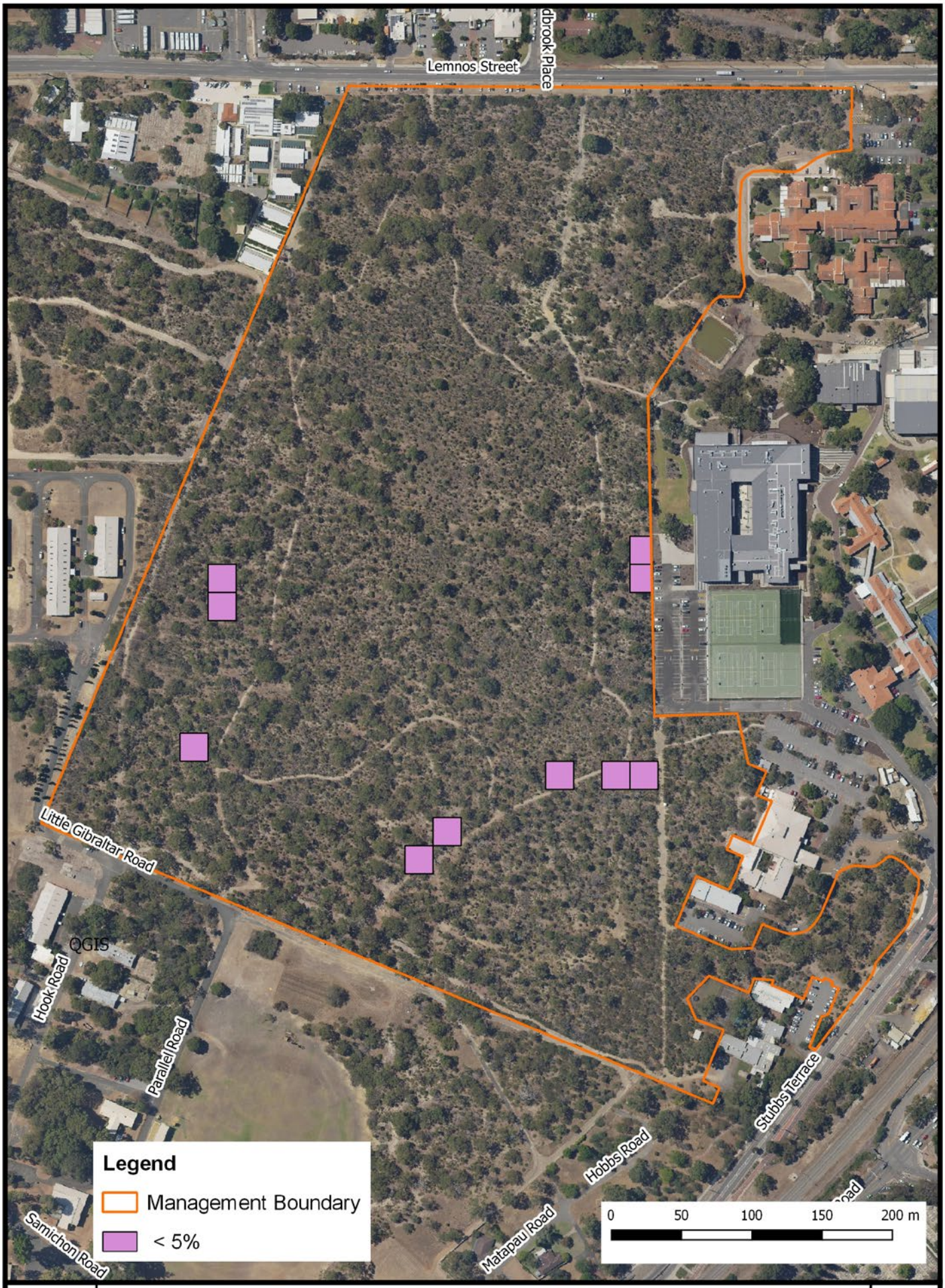


Map 14: *Gladiolus undulatus and angustus – Gladiolus*

Shenton Bushland Management Plan 2019-2024

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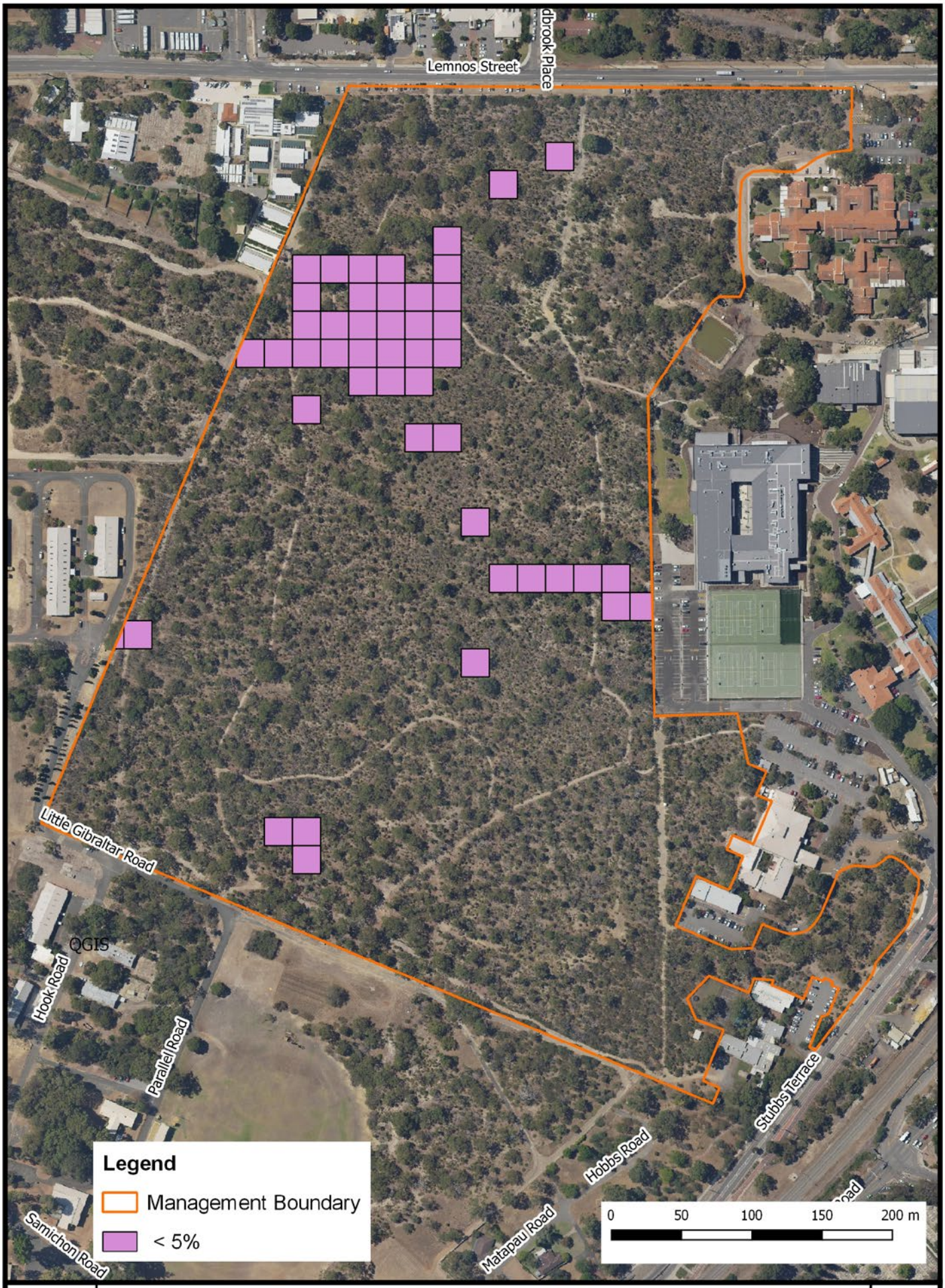


Map 15: *Lachenalia reflexa* - Yellow Soldiers

Shenton Bushland Management Plan 2019-2024

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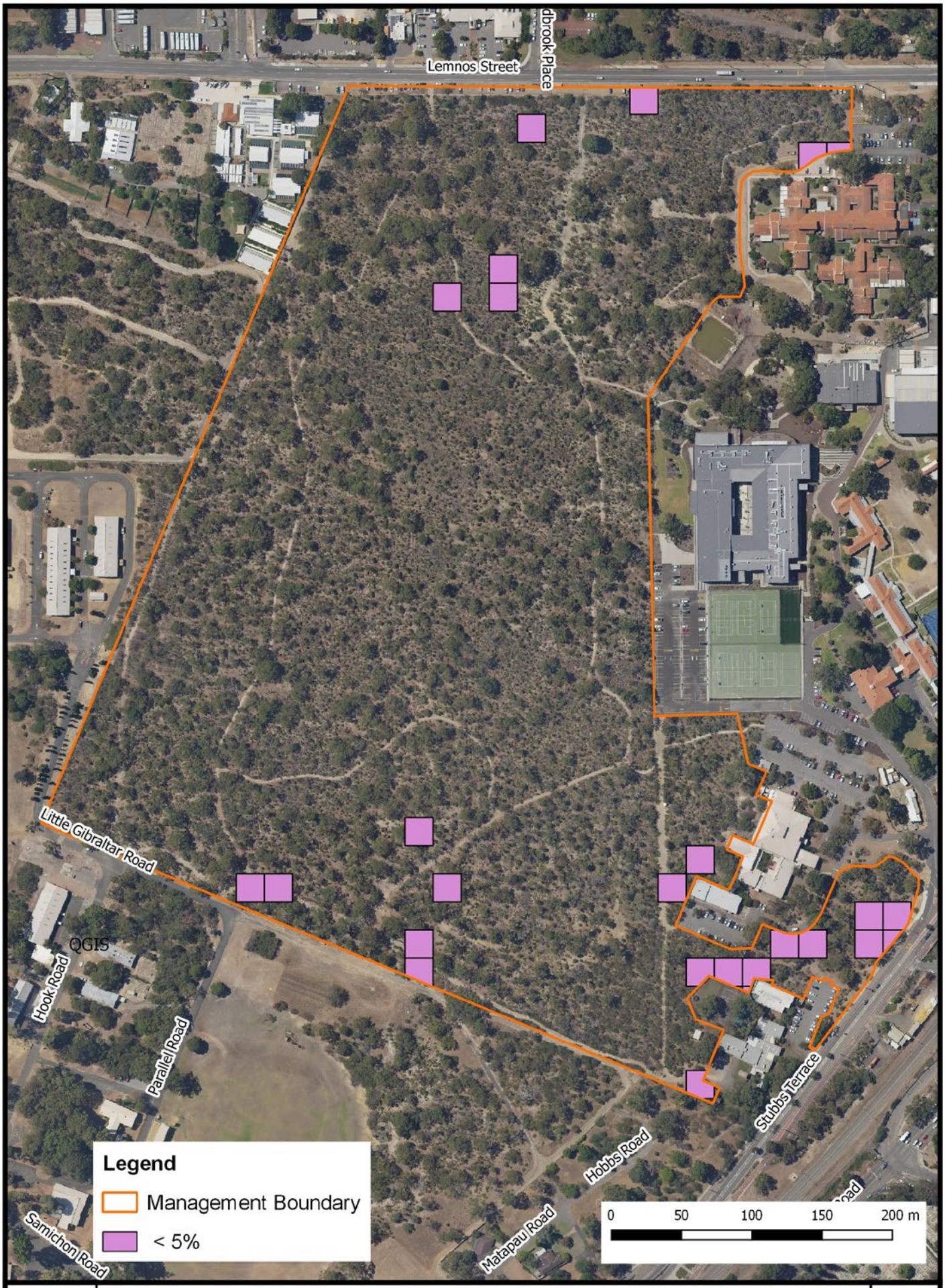


Map 16: *Moraea flaccida* - One-leaf Cape Tulip

Shenton Bushland Management Plan 2019-2024

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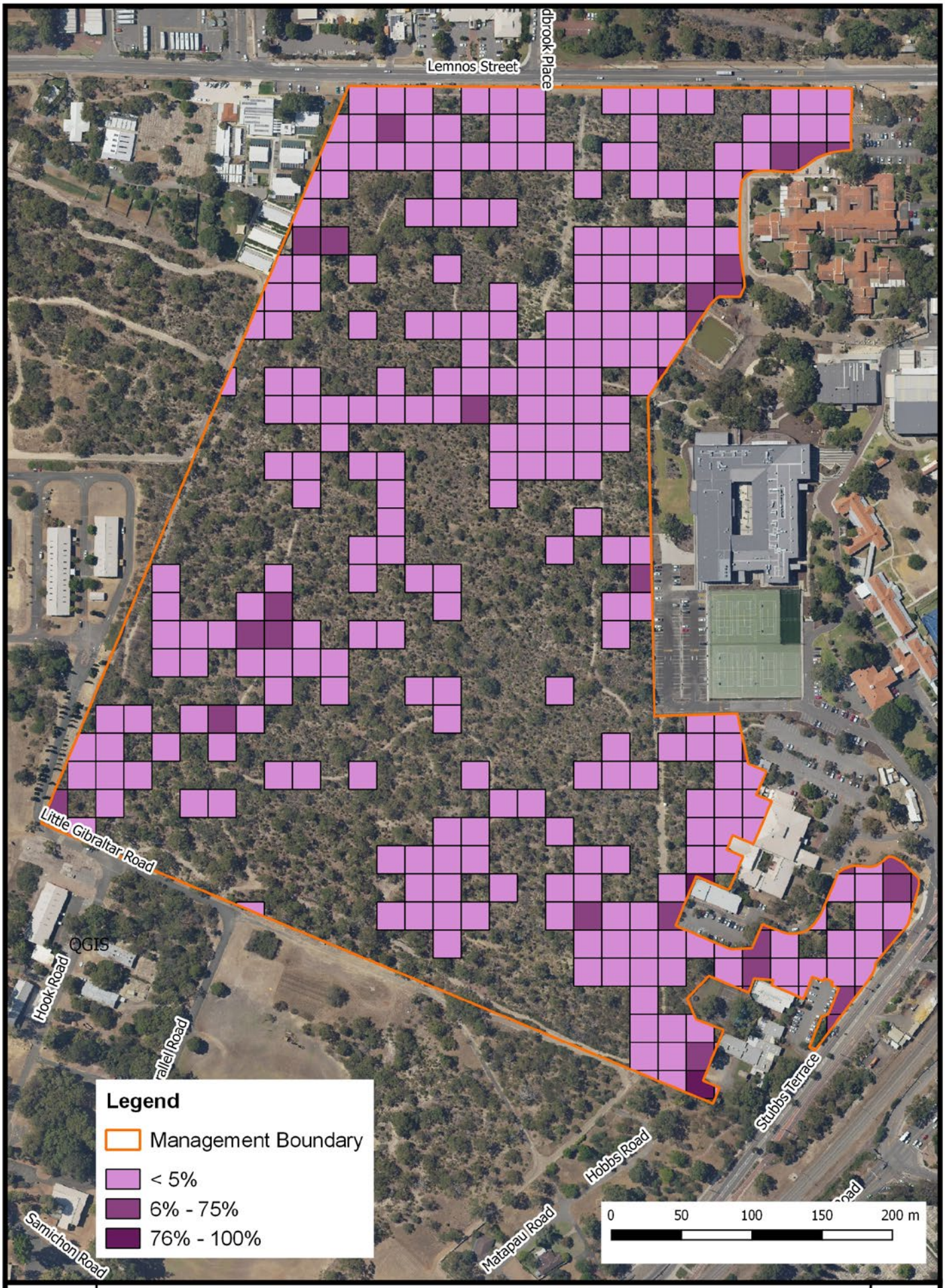


Map 17: *Oxalis* - Soursob

Shenton Bushland Management Plan 2019-2024

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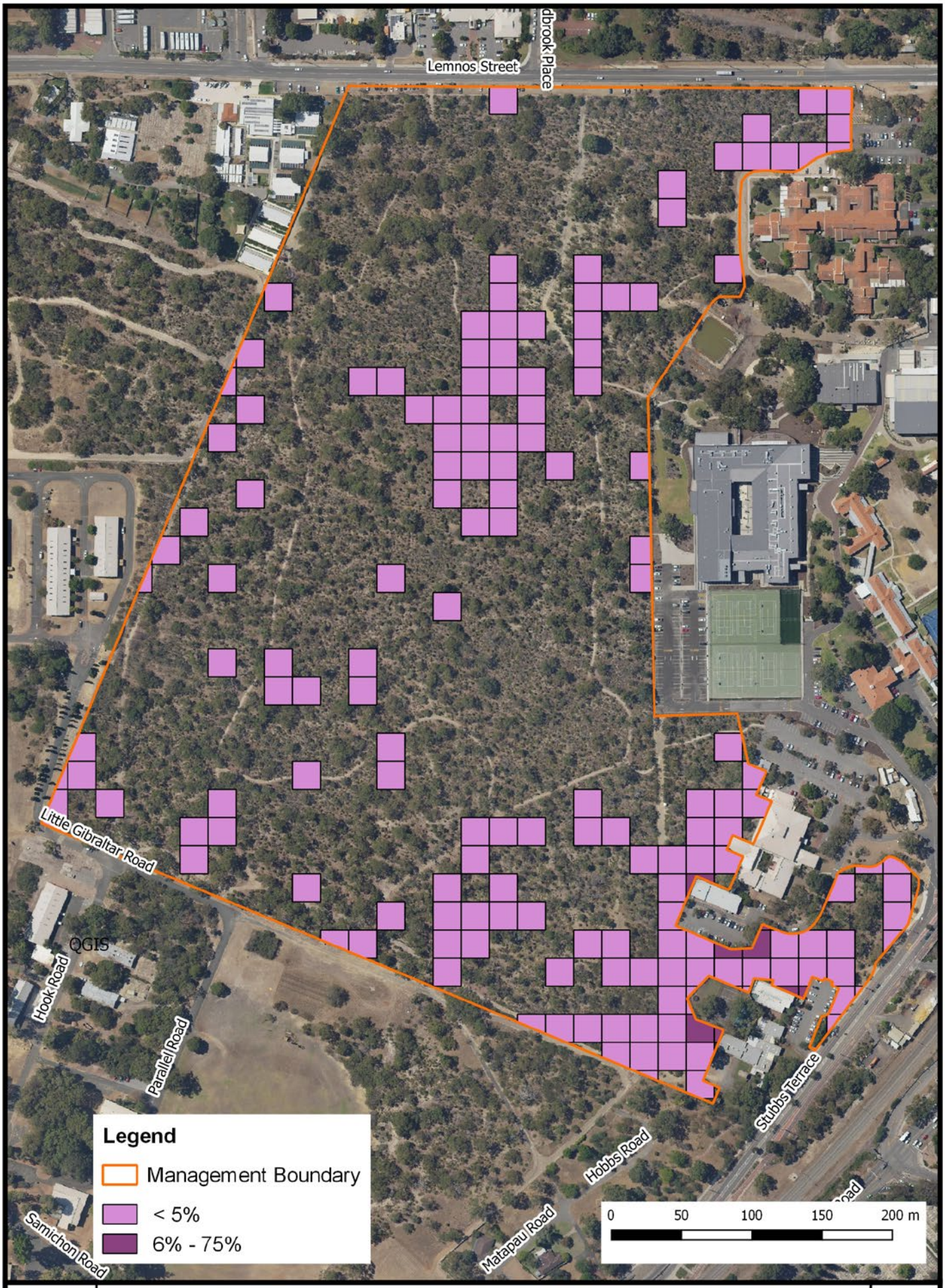


Map 18: *Pelargonium capitatum* - Rose Pelargonium

Shenton Bushland Management Plan 2019-2024

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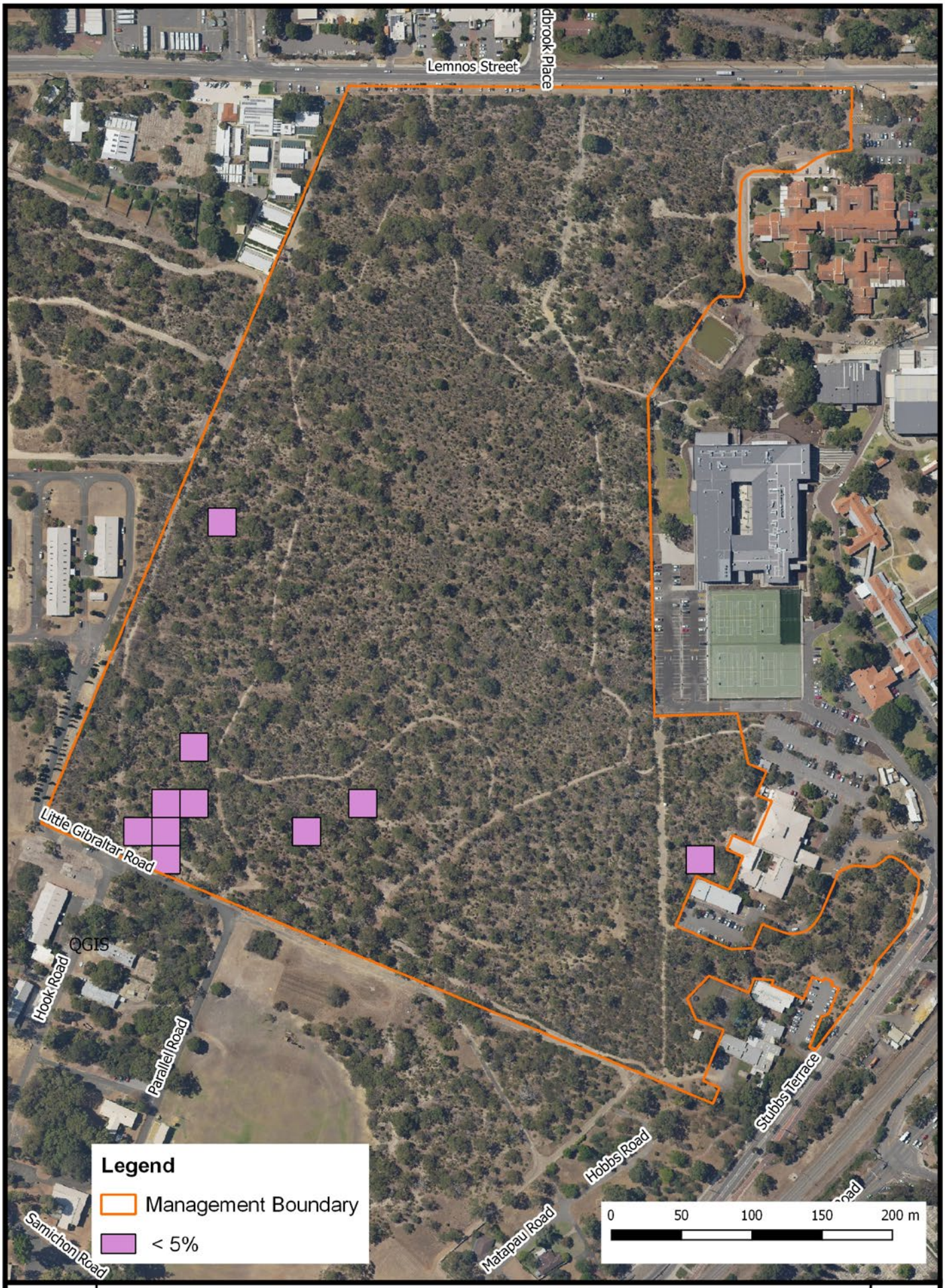


Map 19: *Watsonia meriana* - *Watsonia*

Shenton Bushland Management Plan 2019-2024

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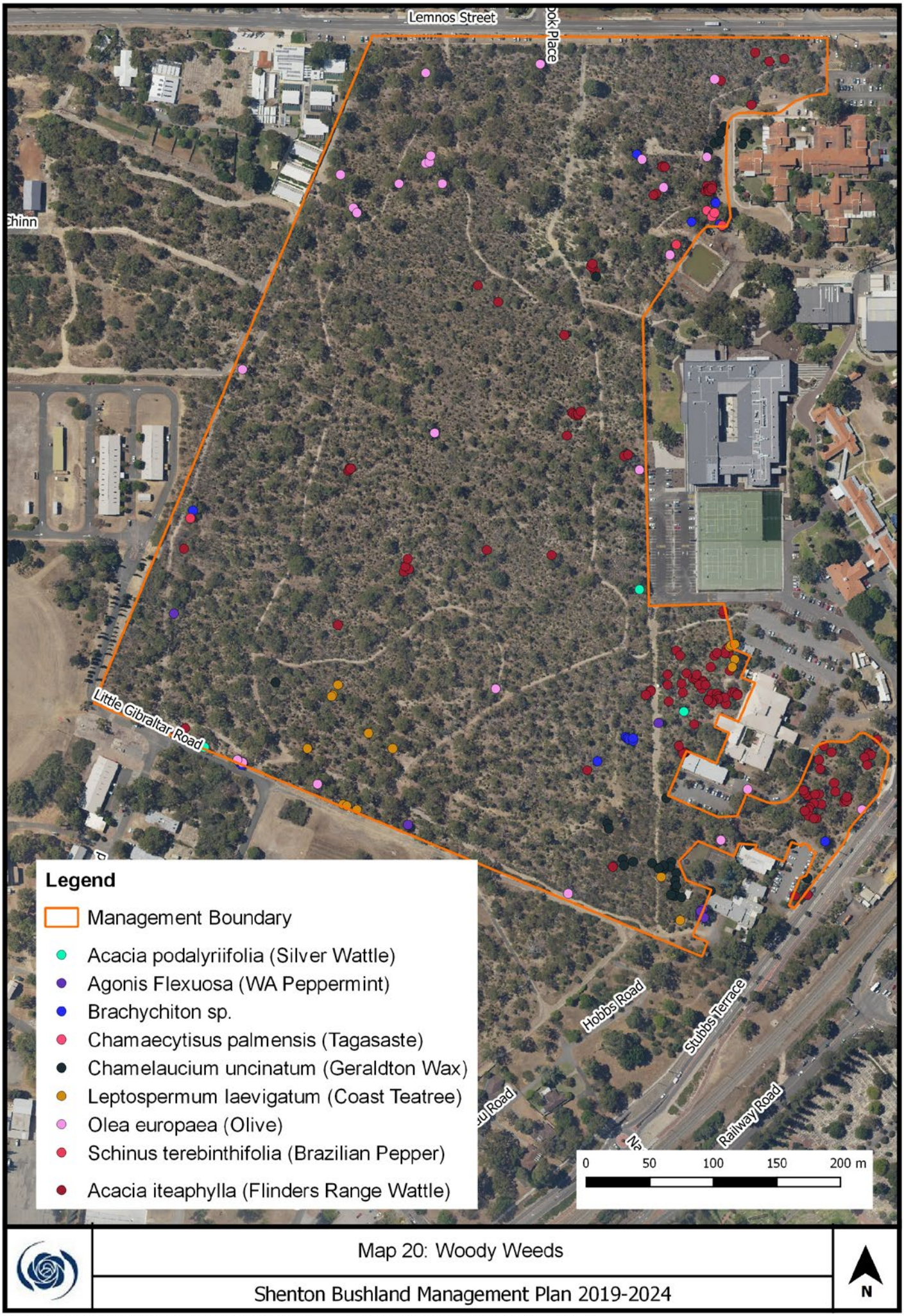


Map 20: Woody Weeds

Shenton Bushland Management Plan 2019-2024

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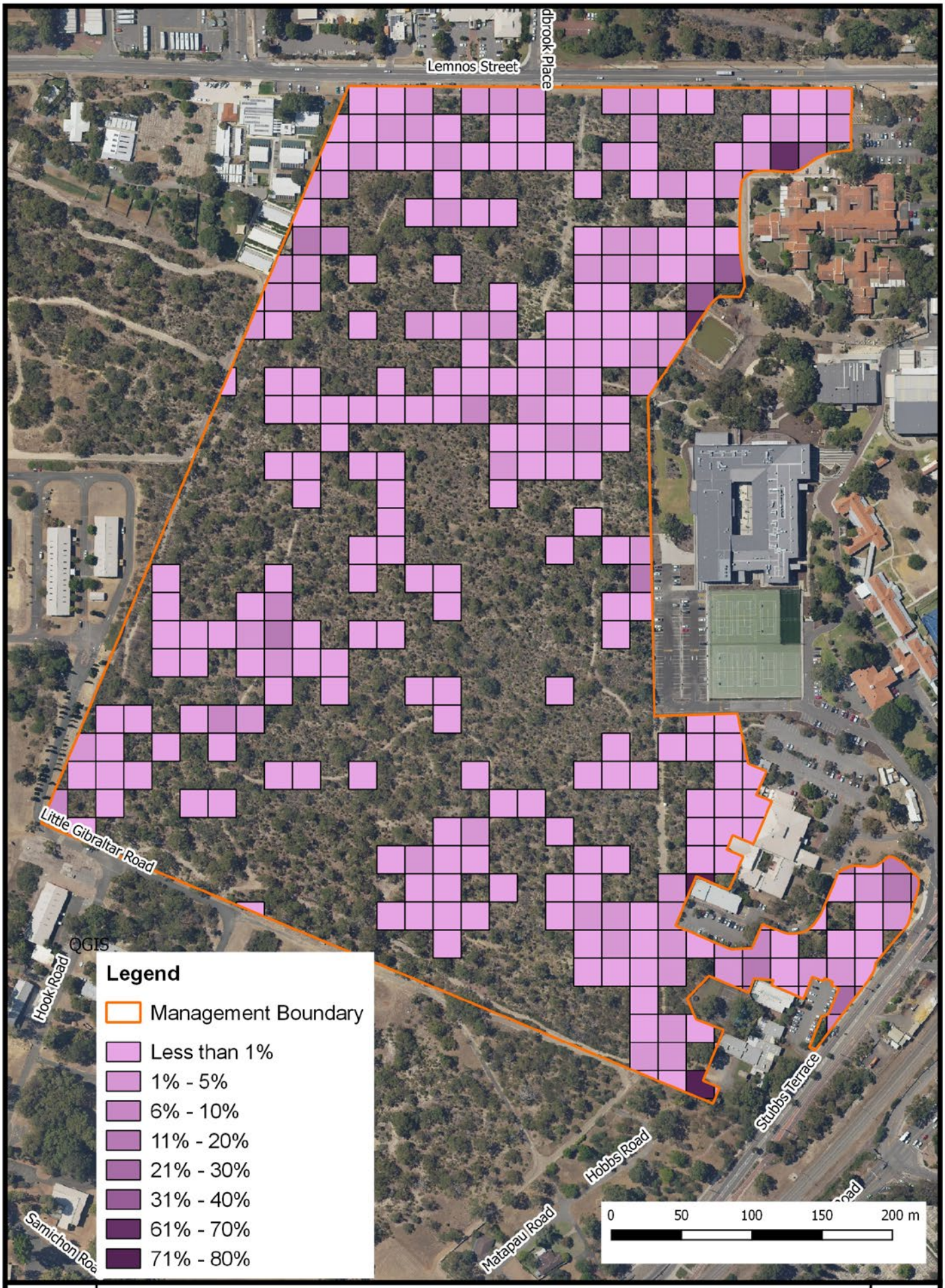


Map 21: Actual Cover *Oxalis* - Soursob

Shenton Bushland Management Plan 2019-2024

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# Appendix 7
# Natural Areas Management Plan 2019-2024

City of Nedlands

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9273 3500
council@nedlands.wa.gov.au

**nedlands.wa.wa.gov.au**