City of Stirling

Trigg Bushland Reserve Management Plan

Final - 14 April 2015

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City of Stirling

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Executive Summary

Trigg Bushland Reserve is a 170 ha Class A reserve located within the City of Stirling suburbs of Trigg and Karrinyup. It is bound by the Trigg/Scarborough dune swale and the Indian Ocean to the west, Karrinyup Road and Lynn Street to the north and east, Elliott and Jeanes Roads to the south. The Reserve is fragmented as a result of road construction, and comprises a total of six sectors. These range from the coastal strip at Trigg through to the high, quaternary dunes towards Karrinyup. Accordingly, there are a number of vegetation types and thus differing habitats present within Trigg Bushland Reserve. The majority of vegetation in Trigg Bushland Reserve may be classed as 'Good' to 'Very Good' condition using an accepted classification applicable to the Perth metropolitan area, noting that the rating scale applies at a particular point in time and does not take into consideration future risks.

The dunal structure and the diverse array of vegetation and fauna contribute to the high conservation, ecological and environmental values within the Reserve. The significance of Trigg Bushland is recognised through its listing as Bush Forever Site 308 and inclusion on the State Heritage Register for its landscape values.

The Reserve supports:

- 15 vegetation types as a direct result of the geology and topography of the site
- a total of 318 flora species, of which 216 are native species
- two priority listed flora species, namely *Conostylis pauciflora* subsp. *euryrhipis* (P4) and *Jacksonia sericea* (P4)
- three threatened or priority ecological communities
  - SCP 24 – Northern Spearwood shrublands and woodlands
  - SCP 29b – Acacia shrublands on taller dunes, southern Swan Coastal Plain
  - SCP 30a – *Callitris preissii* forests and woodlands, Swan Coastal Plain
- a total of 187 fauna species, including 122 birds, 41 reptiles, five amphibians and 19 mammals
- five fauna species are listed as threatened or in need of protection under the *Wildlife Protection Act 1950* (WA), with three also listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
  - *Calyptorhynchus banksia naso* – Forest Red-Tailed Cockatoo
  - *Calyptorhynchus latirostris* – Carnaby's Cockatoo
  - *Isoodon obesulus fusciventer* – Southern Brown Bandicoot (Quenda)
  - *Neelaps ornatus* – Black-striped Snake
  - *Rostratula australis* – Australian Painted Snipe
- migratory birds including the Rainbow Bee-eater (*Merops ornatus*), the Great Egret (*Ardea alba*) and the Cattle Egret (*Ardea ibis*)
- a diverse array of fungi species.

Trigg Bushland Reserve faces a number of threatening processes that have the potential to reduce its conservation values. The key threatening processes include:

- weeds

- erosion
- increased fire frequency
- construction of illegal structures and associated rubbish and hazardous wastes
- the presence of domestic and introduced fauna species
- physical disturbances including trampling and track creation
- dumping of waste, including building materials and rubbish not associated with the construction of 'illegal structures'.

Management strategies for Trigg Bushland Reserve are aimed at promoting its environmental and conservation values, particularly those relating to flora, fauna and the landform. These include:

- expanding weed mapping to include an indication of species density and spread, and using that information to target weed control activities
- continuing to promptly remove illegal structures (cubbies) and rubbish when they are located
- undertaking regular observation and assessment of flora, fauna, fungi, vegetation type and vegetation condition
- undertaking feral fauna control as required
- updating signage across the site, including installing locator and directional signs
- extending the heritage trail.

Recommendations

A number of recommendations have been made in various sections of the Management Plan for consideration by the City of Stirling. For convenience, these are listed under the heading of the section in which they are discussed.

1. Reservation and Management Authority

1.1 Determine, via the Department of Lands, whether a management authority has been assigned in reference to Reserve 29706.

1.2 Nominate the City as the responsible authority for Reserve 29706 if none has been assigned by the Department of Lands.

1.3 Revise the management purpose of the various Reserves that collectively make up Trigg Bushland Reserve as outlined under Table 1 of the Management Plan to reflect the conservation and other values of the Reserve.

2. Reserve Significance

2.1 Adjust the boundary of Bush Forever Site 308 to include that portion currently not included in the southern part of Trigg Bushland Reserve as highlighted in Figure 3.

2.2 Investigate the current situation with the derelict cottage in Sector 1, and determine an appropriate plan for its future.

3. Wetlands and Drainage

3.1 Assess drain outlets in all sectors of the Reserve with the view to the installation of attenuation mechanisms where appropriate to reduce the velocity of stormwater flow and/or consider the installation of silt/sediment traps.

3.2 Consider, in regard to drain outlets, the installation of biofilters or silt/sediment traps where appropriate to ensure the containment of pollutants.

3.3 Carry out, in regard to drain outlets, annual inspections for litter and sediment accumulation and weed invasion of adjoining bushland and to undertake the required clean-out and weed control.

4. Vegetation Type

4.1 Implement a programme for a resurvey of vegetation types (flora surveys) every five years to update the biodiversity database for the Reserve.

5. Threatened and Priority Ecological Communities

5.1 Undertake further investigation into the extent and condition of the Threatened Ecological Community 'SCP 30a Callitris preissii forests and woodlands'.

5.2 Develop and implement, pending the investigation as per 5.1 above, appropriate management strategies for this Threatened Ecological Community.

5.3 Undertake, pending the investigation as per 5.1 above, the removal of any *Callitris preissii* deemed to have been planted in inappropriate locations within the Reserve.

6. Vegetation Condition

6.1 Implement a programme for a re-assessment of vegetation condition every five years to determine changes that may have occurred over time.

7. Non-native Trees

7.1 Investigate and establish the identity of the original parent Fig tree near the derelict cottage.

7.2 Undertake, pending the investigation as per 7.1 above, the removal of all other Fig trees in the vicinity of the parent tree.

8. Weed Mapping

8.1 Include, as part of annual weed mapping surveys, a density rating in addition to the extent of weed infested areas or weed dispersion to assist with assignment of priority areas for treatment.

8.2 Undertake, as part of formal flora surveys, an indication of changes over time of weed species types.

9. Weed Treatment Strategy

9.1 Adopt a holistic approach to weed treatment to include both chemical and manual control methods in accordance with City's current policies and practices.

9.2 Ensure that weed control is carried out the City's trained crews or a licensed bushland weed control contractor in accordance with conditions of herbicide licence(s) and/or off label permit uses.

10. Plant Pathogens and Disease

10.1 Undertake assessments for *Phytophthora* Dieback within Sectors 1, 2, 3, and 5, in addition to Sector 4.

10.2 Ensure that the City's field personnel and contractors are aware of the risk of Dieback being spread from the neighbouring Jeanes-Prisk Reserve into Trigg Bushland Reserve and that appropriate preventative measures and hygiene are adopted.

10.3 Consider the installation of a disinfectant foot-bath at the Trigg Bushland Reserve entrance closest to Jeanes-Prisk as a means of reducing the potential for Dieback infestation by pedestrians entering the Reserve.

10.4 Undertake an analysis for *Armillaria* infection if this is suspected at any time in previously infected parts of the Reserve.

10.5 Consider the removal of infected dead tree stumps if analysis confirms the presence of *Armillaria* in previously infected areas so as to remove potential growth substrates for the fungus and to inhibit its spread.

11. Fungi

11.1 Consider the inclusion of a survey for fungi and associated micro-flora whenever formal flora surveys are undertaken within Trigg Bushland Reserve.

12. Fire

12.1 Undertake a post-fire flora survey of areas that been subjected to bushfires to determine the recovery rate of inherent local native species as well as weed species to determine likely impacts on vegetation type and condition.

12.2 Undertake post-fire surveys of fauna within burnt areas to determine impacts and rate of recovery following the fire.

12.3 Undertake the control of weed emergence after bushfires to maximise the regeneration potential of local native species.

12.4 Inform local residents about potential fire hazards in private property and inform them about the management measures that they could undertake to reduce risks.

12.5 Due to the past fire history and the risks of biodiversity from frequent fires, a controlled burn policy is not advocated at this Reserve.

13. Wildlife

13.1 Undertake observations and record the presence or movement of any fauna during regular maintenance and other visits to the Reserve.

14. Introduced Fauna

14.1 Implement a programme for the control of feral fauna species and undertake annual controls in accordance with the City's current practices and procedures.

15. Introduced Avifauna

15.1 Continue to monitor and record the presence of introduced avian fauna and consider control options with the Department of Parks and Wildlife if numbers increase significantly.

16. Domestic Animals

16.1 Develop and implement a community awareness programme regarding the impact of dogs to the bushland ecosystem and the responsibilities of dog-owners contribution to the conservation of these areas.

16.2 Continue to require dog owners to have their dogs under effective control in the interest of bushland conservation although no declaration will be made of Trigg Bushland Reserve as a 'dogs on leash' area.

16.3 Undertake a review of the above approach at the end of 2015 to determine its success or otherwise with the view to the adoption of alternate strategies, if required.

16.4 Develop and implement a community awareness programme about the Reserve's designation as a cat-exclusion zone under the City's Keeping and Control of Cats Local Law 1999 and the requirements under the *Cat Act 2011* (WA).

16.5 City officers continue to educate the community and enforce the provisions of the *Dog Act 1976* (WA), the City of Stirling Local Dog Laws (2008), and the provisions of *the Cat Act 2011* (WA).

17. Termites

17.1 Undertake regular observation of termite presence during regular maintenance visits to the Reserve.

17.2 As termites are a natural part of the environment with an important role to play in terms of nutrient cycling, undertake treatment only in situations where their continued presence could cause trees or branches to fall down resulting in damage to nearby buildings or infrastructure or pose a safety risk to Reserve users.

17.3 Undertake inspections of the infested tree in vicinity of nearby buildings in Sector 4 to determine the risk of falling branches and determine if termite treatment is warranted.

18. Facilities

18.1 Undertake ongoing assessment of public usage within all Sectors of the Reserve to confirm usage patterns and associated pressures on the bushland areas and possible impacts on other values.

18.2 Replace fencing in Sector 4 that is currently in poor condition.

18.3 Consider the installation of further seating within the various Sectors of the Reserve.

18.4 Install additional litter bins and dog 'poo pouches' at suggested locations shown in Figure 21.

18.5 Extend the paved access from its current location to the lookout in Sector 6.

18.6 Undertake a general upgrade of the lookout in Sector 6, including providing seating, shade and informative signage.

19. Signage

19.1 Design and install directional signage at strategic locations in the Reserve together with locator panels.

19.2 Adopt an appropriate trail/ track referencing or naming system to ease navigation around the Reserve.

19.3 Develop a comprehensive heritage trail highlighting historical and inherent ecological values and these be trail marked with appropriate signage and directional markers in a manner that complements the existing heritage trail within and external to the Reserve.

19.4 Identify and remove all unnecessary and redundant signs, such as the 'Dune under Repair' signs in Sector 5.

20. Graffiti and other Vandalism

20.1 Undertake prompt removal of graffiti and reinstatement of damage from other forms of vandalism discovered during routine maintenance inspections.

21. Illegal Structures

21.1 Undertake prompt removal of illegal structures (e.g. makeshift campsites and drug dens) and clean-up of associated rubbish as soon as practicable following discovery.

21.2 Reinstate or restore damage to bushland areas as soon as possible following discovery and where required, have these areas revegetated.

22. Rubbish

22.1 Undertake prompt removal and clean-up of dumped rubbish as soon as possible following discovery.

22.2 Carry out dissemination of public information relating to the ecosystem impacts of dumping garden waste (e.g. pruning's and lawn clippings) in bushland areas.

23. Trail and Motorbikes

23.1 Monitor and evaluate the impact of trail bike and motor bike access via tracks and trails.

23.2 Consider the use of chicanes or similar mechanisms to limit unauthorised access by trail bikes and motor bikes.

24. Geocaching

24.1 Promptly remove any geo-cache container discovered during routine maintenance inspections of the Reserve.

24.2 Promptly reinstate areas impacted or damaged by geo-caching activity.

25. Access

25.1 Review the situation at the access gate at the south-eastern portion of Sector 5 near Jeanes-Prisk Reserve and either repair the sandy eroded area or remove the gate.

25.2 Undertake the closure and rehabilitation of goat trails identified in Sectors 1 and 5.

25.3 Formalise the track from Karrinyup Road through to Elliott Road in the absence of alternative access points nearby, including the installation of gates, bins, and 'poo-pouch' bags.

25.4 Undertake the prompt closure and rehabilitation of new goat trails identified in future.

25.5 Remove the gate in Sector 5 that is contributing to the continued use of the current goat trail associated with this access.

25.6 Undertake the removal of gates in similar situations in other locations within the Reserve.

25.7 Install safety signage to denote 'Crest' just on the track that crosses the ridge crest in Sector 2 to indicate limited visibility.

25.8 Review all turnstile-type access gates to enable easier access by a greater number of legitimate users, including those with prams and wheelchairs but excluding trail bikes and motor bikes; a chicane-type access design would facilitate this.

26. Emergency Access

26.1 Install an additional emergency vehicle access gate in Sector 2 as outlined in Section 3.2.1 of the Management Plan.

27. West Coast Highway

27.1 Investigate, in consultation with Main Roads WA, the cost effectiveness of installing a vehicle barrier along the section of West Coast Highway that is frequently subject to vehicle crashes into bushland.

27.2 Request Main Roads to investigate whether or not speed limit signs are missing in the vicinity of the affected area, and if so, to have them replaced.

28. Other Trigg Land Managers

28.1 Establish communication with adjoining land managers, principally, the WA Water Corporation and St Mary's Anglican Girls School to ensure that land management activities on neighbouring areas are consistent with the broader conservation and recreational objectives of Trigg Bushland Reserve with specific focus on issues such as green waste dumping, weed control, and fire management.

28.2 Conduct routine assessment of neighbouring land uses for possible impacts, such as weed invasion, green waste dumping, fire hazards and other risks.

29. Research and other Collaborative Opportunities

29.1 Investigate, in conjunction with the Friends of Trigg Bushland, joint opportunities for ecological research and community education that will contribute to improved management of Trigg Bushland Reserve.

30. Pressures for Future Use

30.1 Future development activities within Trigg Bushland, or those in areas external to the Reserve that have the potential to impact on the conservation and other values of the site, are considered and minimised where possible to do so.

30.2 Further fragmentation of the Reserve is avoided.

Table of Contents

1.0 Introduction

Trigg Bushland Reserve is a Class A reserve located approximately 11 km north west of the Perth central business district (CBD) in the suburbs of Karrinyup and Trigg, within the City of Stirling. The initial Trigg Bushland Reserve Management Plan was prepared by the City of Stirling in 1991, hence the need to review and update the plan to reflect current conditions and environmental expectations in terms of conservation and competing land uses.

This Management Plan has been prepared by Natural Area Holdings Pty Ltd trading as Natural Area Consulting (NAC) at the request of the City of Stirling and with consideration of Section 49 of the *Land Administration Act 1997* (WA), which provides for the preparation of management plans by management bodies. The format of the Management Plan is consistent with that provided in Section 4.8 of the *Crown Land Administration and Registration Practice Manual* (Department of Regional Development and Lands, 2012). It is also consistent with the provisions of City of Stirling operational documents, including the Local Biodiversity Strategy (City of Stirling, 2010).

1.1 Location – Trigg Bushland Reserve

Trigg Bushland Reserve comprises approximately 170 ha, and is bound by the Trigg/Scarborough dune swale and the Indian Ocean to the west, Karrinyup Road and Lynn Street to the north and east, Elliott and Jeanes Roads to the south (Figure 1). As the Reserve extends from the coast to the quaternary dune, it comprises a range of vegetation types and associated habitats (Brown, 1986). The site is managed as a number of discrete areas due to fragmentation by various roads including Karrinyup Road and West Coast Highway. The management areas have arbitrarily been assigned numbers and are:

1. ***Elliott Road – West Coast (south) sector*** in Trigg. It is bound by Elliott Road to the east and south east, West Coast Highway to the north, north-west and west, and urban development near Peet Crescent, Bournemouth Parade and West Coast Terrace to the south. This sector comprises large secondary dunes and swales, and is very steep in places. Vegetation is broadly characterised by coastal shrubland species.
2. ***Elliott Road – West Coast (north) sector*** in Trigg. It is bound by Elliott Road to the north, West Coast Highway to the east and south, West Coast Drive to the west, with urban areas also directly adjacent to portions of this sector near Hepworth Road, Spence Street and King Albert Road. This sector comprises by secondary and tertiary dunes and swales, and is broadly characterised by coastal shrubland species.
3. ***Karrinyup Road, Trigg sector***, which is bound by West Coast Hwy to the east, Karrinyup Road to the north, Lefroy Street to the west, and Elliott Road to the south within the suburb of Karrinyup. It is characterised by a steep dune to the north towards Karrinyup Road that extends downwards towards Elliott Road. Vegetation is *Acacia* and coastal scrub species.
4. ***Duart-Arnott sector*** located in Trigg and bound by Arnott Street to the west, Lynn Street to the north, Duart Road to the east and Karrinyup Road to the south in Karrinyup. It is a relatively flatter area that is characterised by dryland Banksia Woodland vegetation.
5. ***Karrinyup Road – Jeanes Road sector***, which is bound by Karrinyup Road to the north and north east, Jeanes Road to the south and south east, and Elliott Road to the west. It includes Millington Reserve and Kevan Langdon Reserve, but excludes St Mary's Anglican Girls

School. This sector comprises tertiary and quaternary dunes and their swales, and is characterised by dryland vegetation of varying types.

6. The ***coastal strip*** south of the Trigg Beach car park to approximately Bournemouth Parade to the northern end of the Scarborough Beach car park (approximately equivalent to the location of Pearl Parade). Trigg Beach provides the western boundary and West Coast Highway to the east. It includes the primary dunes and is characterised by coastal dune vegetation.

Ongoing management activities will need to take the fragmented nature of the Reserve into consideration, with further fragmentation avoided as far as it possible.

1.2 Reservation and Management Authority

Trigg Bushland is crown land classified as 'parks and recreation' under the Metropolitan Regional Scheme. The State of Western Australia through Department of Lands (previously the Department of Regional Development and Lands) has overall management responsibility for Trigg Bushland Reserve. This responsibility has largely been delegated to the City of Stirling, via a series of management orders, which is responsible for the day-to-day management of the site. A summary of the reservation details and management orders is provided in Table 1. Figure 2 shows the location of each of the Reserves that collectively are known as Trigg Bushland.

Reserve 29706 at 165 Karrinyup Road (Sector 5) appears to have no agency assigned to be responsible for the day to day management of the site. For transparency and consistency with the overall management of Trigg Bushland Reserve, a clear indication of which organisation is the responsible agency is recommended.

The management purpose of a number of the Reserves that make up Trigg Bushland varies – for example, Reserve 46428 is currently 'recreation' (Sector 6). The vegetation of this area is currently in very good condition and the main recreational node is towards Trigg Point, and outside of Trigg Bushland Reserve. The management purpose of Reserve 27204 at 2 Jeanes Road (Sector 5) is currently recreation. This area is well vegetated, with the vegetation in very good condition. It is a component of the parabolic dune system that contributes to the high conservation values of Trigg Bushland. It is recommended that the management purpose of all Reserve components be adjusted to reflect the conservation and recreational values of the site, as outlined within Table 1. These changes in classification will be consistent with the broader conservation values of Trigg Bushland, whilst also providing for passive recreational usage in nominated Sectors.

Recommendations

1.1 Determine, via the Department of Lands, whether a management authority has been assigned in reference to Reserve 29706.

1.2 Nominate the City as the responsible authority for Reserve 29706 if none has been assigned by the Department of Lands.

1.3 Revise the management purpose of the various Reserves that collectively make up Trigg Bushland Reserve as outlined under Table 1 of the Management Plan to reflect the conservation and other values of the Reserve.

Table 1: Trigg Bushland – Reservation and Management Orders

Reserve Name	Reserve Number	Address	Lot/Plan Number	Current Purpose	Proposed Change	Reason for Change	Sector	Agency
Trigg Bushland	12992	368 West Coast Drive	Lot 8 on Plan 240238	Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	6	CoS
Trigg Bushland	12992	189 Karrinyup Road	Lot 7443 on Plan 209023	Water Supply	Conservation, Dune Protection, Education, and Water Supply	Recognises the water supply function is secondary to conservation values	5	MWA
Kevan Langdon	27203	42 Elliott Road	Lot 42 on Plan 209135	Parking and Recreation	None, as per Council Resolution 0315/057 of 31 March 2015		N/A	CoS
Millington Reserve	27204	2 Jeanes Road	Lot 43 on Plan 209135	Recreation	None, as per Council Resolution 0315/057 of 31 March 2015		5	CoS
Trigg Bushland	29706	165 Karrinyup Road	Lot 459 on Plan 172900	Drainage	Conservation, Dune Protection, Education, and Drainage	Recognises that drainage functions are secondary to the conservation values	5	?
Herb Elliott	30398	20 Rinaldi Crescent	Lot 44 on Plan 209135	Recreation	Recreation and Conservation	Recognises that conservation is as important as active and passive recreation	N/A	CoS
Trigg Bushland	31727	101 Karrinyup Road	Lot 474 on Plan 176239	Drainage	Conservation, Dune Protection, Education, and Drainage	Recognises that drainage functions are secondary to the conservation values	5	CoS
Trigg Bushland	32559	88 Lynn Street	Lot 9 on Plan 217890	Conservation, Dune Protection, Education, Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	4	CoS
Trigg Bushland	32559	95 Arnott Street	Lot 25 on Plan 367598	Conservation, Dune Protection, Education, Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	4	Cos
Trigg Bushland	32559	No street address	Lot 24 on Plan 195238	Conservation, Dune Protection, Education, Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	3	CoS
Trigg Bushland	32559	10 Elliott Road	Lot 10 on Plan 217809	Conservation, Dune Protection, Education, Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	1, 2	CoS
Trigg Bushland	32559	498 West Coast Highway	Lot 498 on Plan 217891	Conservation, Dune Protection, Education, Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	3, 5	CoS
Trigg Bushland	46428	157 West Coast Highway	Lot 21 on Plan 221021	Recreation	Conservation, Dune Protection, Education, and Passive Recreation	Recognises the conservation values of the site, along with the preference for passive rather than active recreation within a conservation area	6	CoS

Figure 1: Site Location – Trigg Bushland Reserve

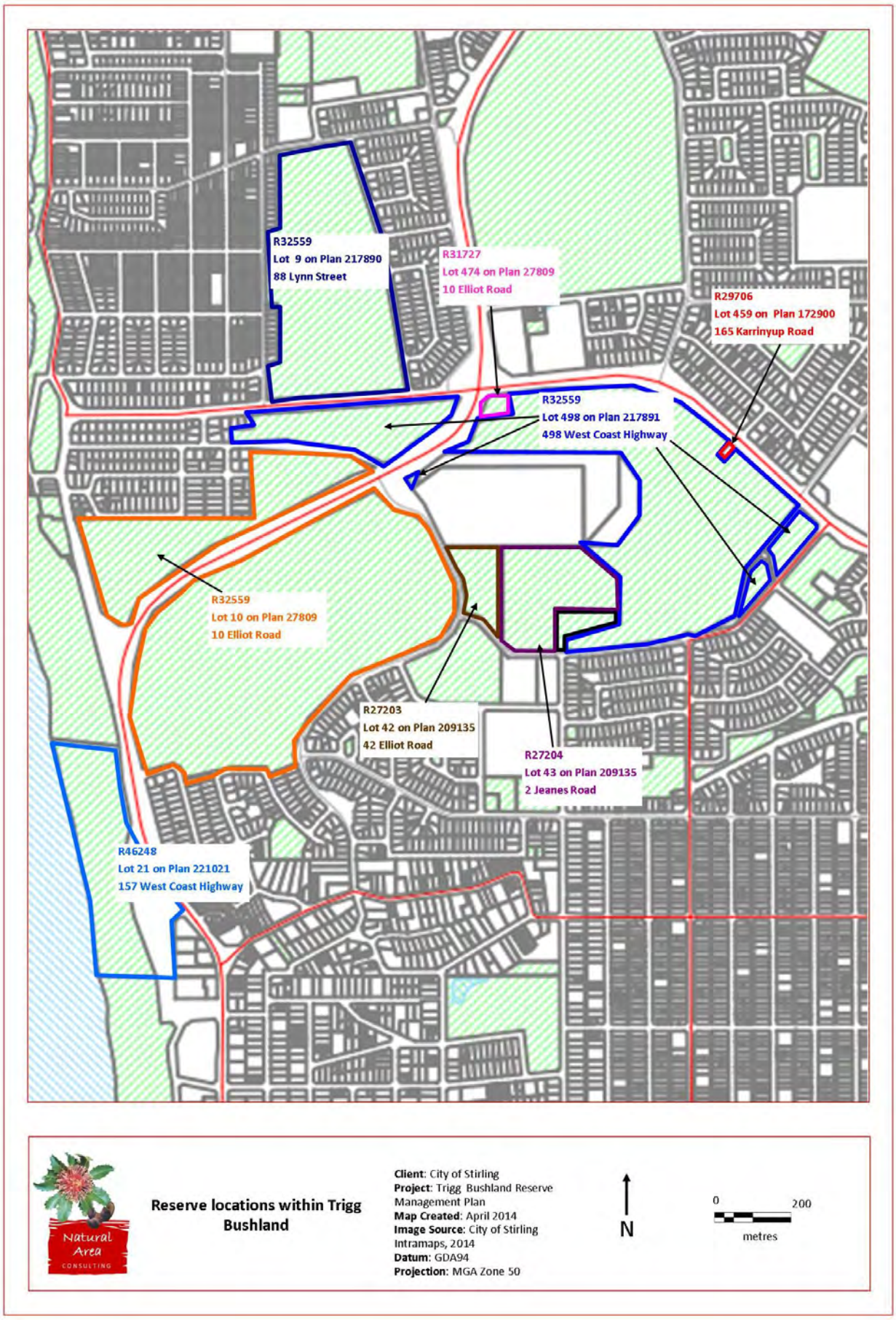


Figure 2: Reserve Locations within Trigg Bushland

1.3 Adjoining Land

The primary uses of land adjoining Trigg Bushland Reserve is residential development and roads. The privately owned St Mary's Anglican Girls School is located off Elliott Road within the Karrinyup-Jeanes Sector. Nearby reserves include Jeanes-Prisk Reserve to the south east and which is bound by Jeanes Road to the north-west, Karrinyup Road to the north east, Prisk Street to the south and south west, Taris Place and urban development to the south east. Herb Elliott Reserve is located to the south of Trigg Bushland between Jeanes Road, Elliott Road, and Rinaldi Crescent. It is a largely parkland cleared area with some remnant trees present. An aged care facility on private property is located immediately to the east of Herb Elliott oval in the area bound by Jeanes Road, Deanmore Road and Rinaldi Crescent.

1.4 Reserve Significance

The significance of Trigg Bushland is evident in its designation as a Class A reserve as defined by *Land Administration Act 1997* (WA) and in the *Crown Land Administration and Registration Practice Manual* (Department of Regional Development and Lands, 2012), listing on the State Heritage Register (Heritage Council of Western Australia, 1995) and designation as Bush Forever Site 308 (Government of Western Australia, 2000). Reserves designated as Class A are those that have high conservation or high community values, and provides the highest level of protection for Crown land reserves. Trigg Bushland includes both high conservation values and community values. It is described by Brown (1986) as being the last remaining location along the Perth metropolitan coastline where the vegetation sequence from frontal dunes through to Tuart/Jarrah/Banksia woodlands can be found in good condition.

Trigg Bushland is a regionally significant reserve listed on the State Heritage Register due to its landscape values (Heritage Council of Western Australia, 1995). It was also listed on the Register of the National Estate until that the Register ceased operation in 2007 and references to it removed from the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (Department of the Environment, 2014).

Much of Trigg Bushland is also recognised as Bush Forever Site 308 (Government of Western Australia, 2000) because it meets all six specific coastal reserve criteria, including:

- types of dune system present
- the size of the Reserve allows the continuation of natural processes from the coast to dryland terrestrial areas towards Karrinyup and Jeanes Roads
- provides some linkages with other vegetated areas within the coastal strip and nearby reserves
- presence of restricted species, such as the *Callitris preissii*
- the range of habitats present from the coastal area through to the dryland areas to the east.

Note that the boundary of Bush Forever Site 308 includes areas within the Trigg coastal foreshore reserve that are not included within the boundary of Trigg Bushland Reserve.

It is also noted that a portion of Reserve 27204 at 2 Jeanes Road appears to have been excluded from Bush Forever Site 308 (Figure 3). Site assessment activities carried out by Natural Area Consulting indicate that the site is well vegetated, with the vegetation in Very Good Condition. On

this basis, it is recommended that the City of Stirling undertake discussions with the Department of Planning to initiate adjustment of the boundary to Site 308 to include that portion of Reserve 27204 that is currently excluded.

1.4.1 Heritage

Various heritage values are recognised within the Trigg Bushland Reserve. These include Aboriginal heritage values, particularly along the foreshore within Sector 6 (Clifton, 2010), and the derelict cottage within Sector 1, which is considered to be of local significance (City of Stirling, 2014). At present, the cottage is overgrown with weeds, and in a poor state of repair. It is recommended that the City of Stirling review the current situation with the cottage and determine an appropriate plan for its ongoing future.

Recommendation

2.1 Adjust the boundary of Bush Forever Site 308 to include that portion currently not included in the southern part of Trigg Bushland Reserve as highlighted in Figure 3.

2.2 Investigate the current situation with the derelict cottage in Sector 1, and determine an appropriate plan for its future.

Figure 3: Bush Forever Site 308

1.5 Ecological Linkages

Trigg Bushland Reserve also acts as both a regional and local ecological linkage that allows for the protection of biological diversity within various reserves in the City of Stirling (Figure 4). Regional linkages are described in the Local Biodiversity Strategy (City of Stirling, 2010) as being vegetated movement corridors that act as 'stepping stones' which link regionally significant areas with each other via strategically located local natural areas. Trigg Bushland acts as a regional ecological linkage with Star Swamp to the north and the coastal strip to the south. Nearby local natural areas include Jeanes-Prisk Reserve and Lake Gwelup Reserve to the east.

1.6 Management Plan Aim

As a Class A reserve, the overall management aim for Trigg Bushland is to preserve the natural ecological and environmental and sense of place values of Trigg Bushland Reserve whilst maintaining appropriate levels of passive recreation and education. This aim is consistent with the proposed management orders for conservation, dune protection, education and passive recreation as outlined in Table 1 in Section 1.2, and the significance of Reserve, as outlined in Section 1.4.

1.7 Community Involvement

The views of interested community members and other key stakeholders were taken into consideration during the preparation of this Management Plan. Consultation activities included:

- meetings with representatives of the City of Stirling, including the Natural Environment Working Group
- input from representatives of Friends of Trigg Bushland
- providing a copy of the plan to key stakeholders, including the Department of Parks and Wildlife, the Department of Fire and Emergency Services, the Bush Forever Branch of the Department of Planning
- input from community members through a public open day held on Saturday 04 October 2014 at Kevan Langdon Reserve.

Comments received during the community consultation period and response are provided in Appendix 11.

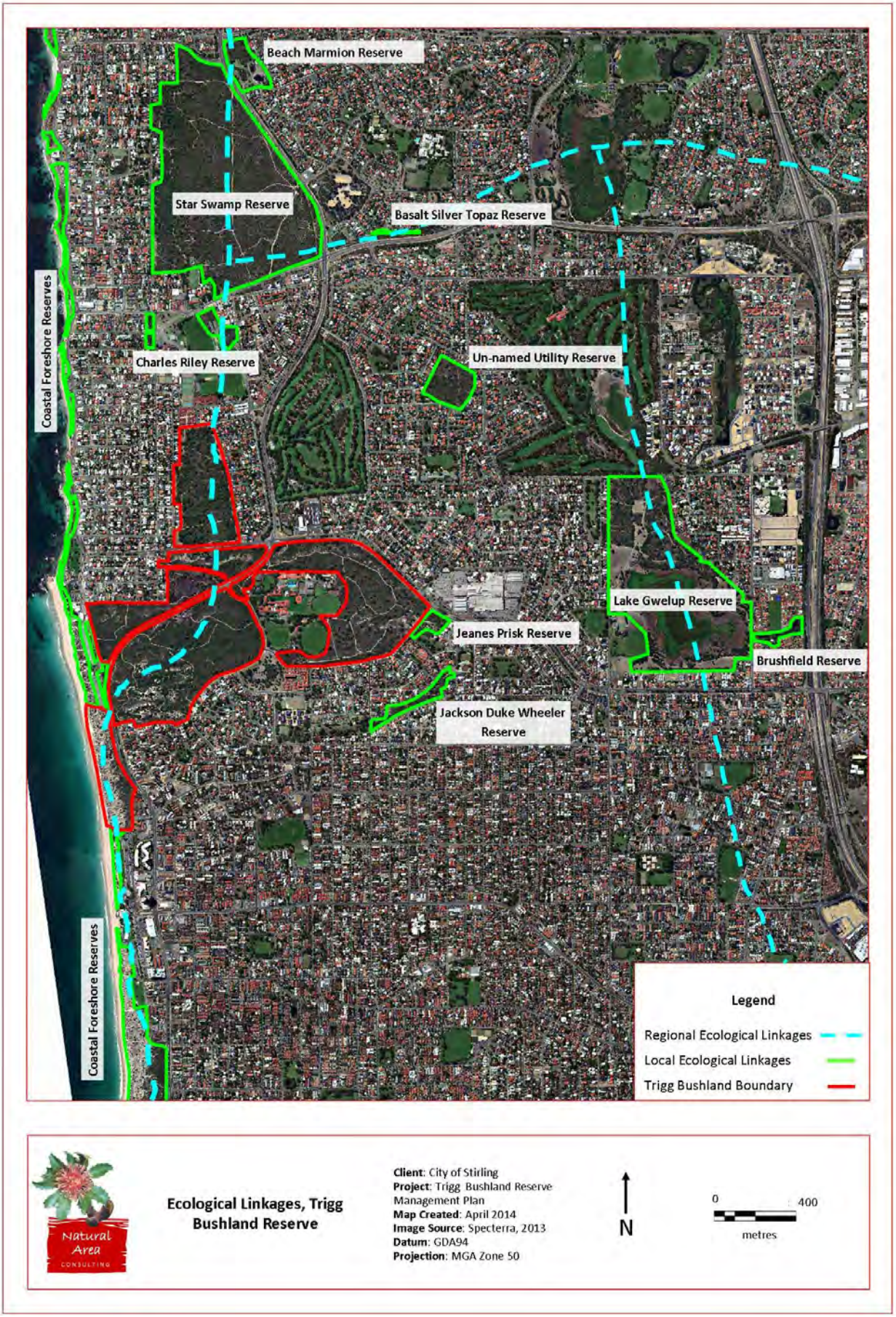


Figure 4: Ecological Linkages, Trigg Bushland Reserve

2.0 Natural Resources

An understanding of the natural features and resources of a particular area assists with identifying site specific threats and opportunities. The natural resources that contribute to the environmental values of Trigg Bushland Reserve include its geology, soils, topography, climate, flora, vegetation and fauna. Each are discussed in this section.

2.1 Geology, Soils and Topography

The geology, soils and topography at Trigg Bushland contribute to the vegetation types found in the various sectors of the reserve, and thus also the fauna species. Trigg Bushland Reserve is listed on the State Heritage Register due to its landscape values (Heritage Council of Western Australia, 1995).

2.1.1 Geology

Trigg Bushland Reserve extends from the coast through to Karrinyup and Jeanes Roads in the North. It is situated on both the Quindalup and Spearwood Dune Systems within the Swan Coastal Plain. The Quindalup Dune System is the youngest of the dune systems that make up the Swan Coastal Plain. It comprises a series of parabolic calcareous sand dunes of different ages (McArthur and Bartle, 1980). The Spearwood Dune System is identified as being low hilly to undulating terrain with a core of sandy limestone, capped by secondary calcite overlain by siliceous sand (McArthur and Bartle, 1980).

Trigg Bushland Reserve consists of a series of dunes, with the primary, secondary and tertiary dunes located with an approximate 500 m distance from the coast. The primary and secondary dunes are located entirely within the coastal strip (Sector 6), while the tertiary dunes are confined to the western 200 – 300 m of Sectors 1 and 2. The larger, quaternary dunes for which Trigg Bushland is renowned cover the rest of the site.

2.1.2 Soils

Four soil types are recognised by the SLIP NRM Portal (Department of Agriculture and Food, Western Australia, 2014), comprising two phases of the Quindalup soils and two phases of the Spearwood soils. Descriptions are provided in Table 2 and locations of each shown in Figure 5. The Quindalup Dunes over much of the Reserve are overlying the Spearwood (Cottesloe) soils.

Table 2: Soil types, Trigg Bushland

Map Unit	Name	Description	Sector
211Qu_S1	EnvGeol S1 Phase	Calcareous sand, white, fine to medium-grained, sub-rounded quartz and shell debris, of eolian origin	Coastal strip (6)
211Qu_S2	EnvGeol S2 Phase	Calcareous sand, white, fine to medium-grained, sub-rounded quartz and shell debris, of eolian origin	Coastal strip (6), Elliott Road – West Coast south (1), Elliott Road West Coast north (2) Karrinyup Road, Trigg (3) Karrinyup Road – Jeanes Road (5)
211Sp_LS1	EnvGeol LS1 Phase	Limestone, light, yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin, minor heavy minerals	Duart-Arnott (4), Karrinyup Road – Jeanes Road (5)
211Sp-S7	EnvGeol S7 Phase	Sand, pale and olive yellow, medium to coarse-grained, sub-angular to sub-rounded quartz, trace of feldspar, moderately sorted, of residual origin	Duart-Arnott (4), Karrinyup Road – Jeanes Road (5)

Source: Department of Agriculture and Food Western Australia, 2014

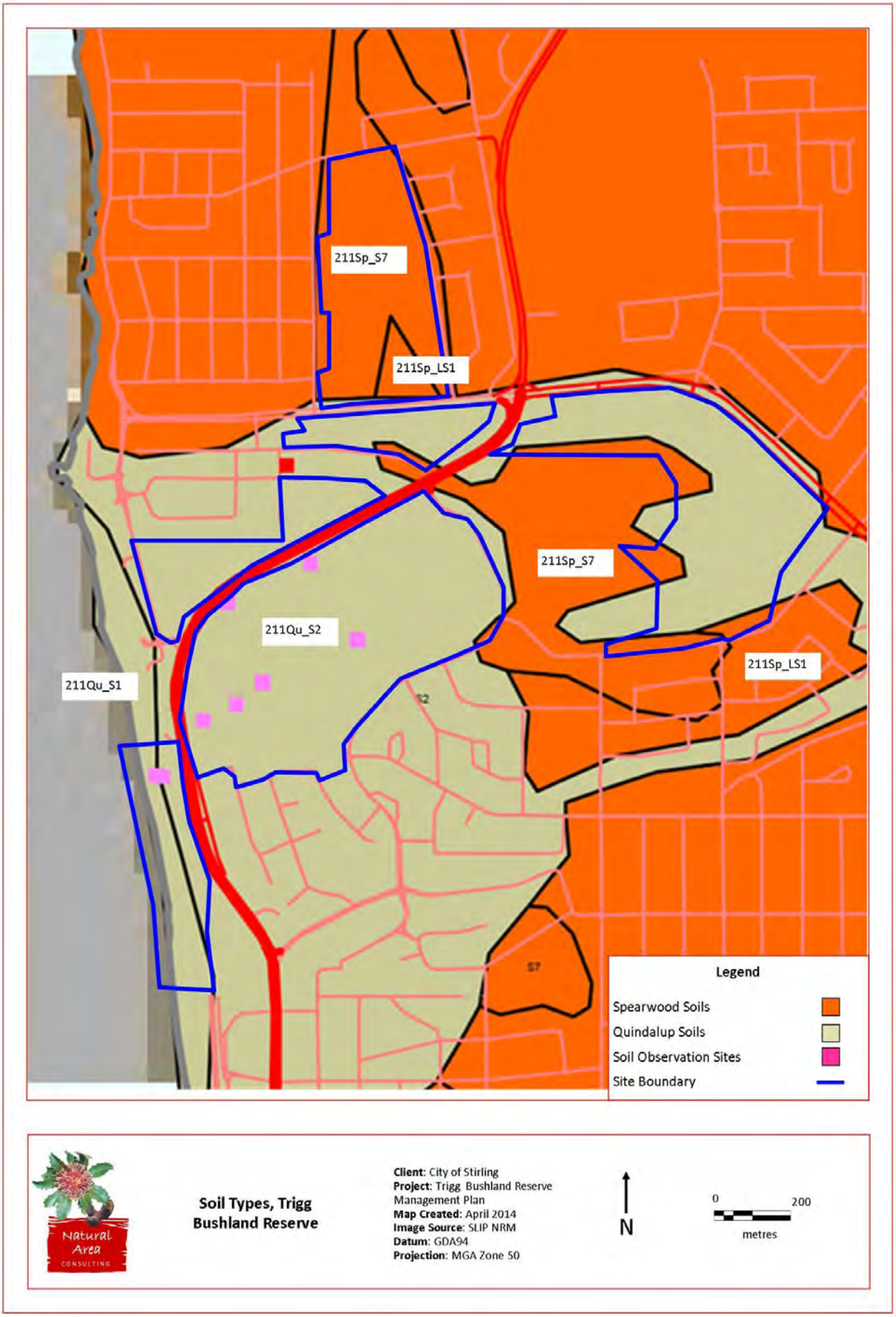


Figure 5: Soil Types, Trigg Bushland Reserve

2.1.3 Topography

Topography throughout the reserve ranges from low towards the coast and within interdunal swales, increasing to maximum levels along dune crests. A summary of the topography for each sector is provided in Table 3. The topography of the site is shown in Figure 6. It should be noted that portions of the dunes that contribute to the topography in the vicinity of Trigg Bushland have been modified to accommodate development for urban areas, St Mary's Anglican Girls School and various roads.

Table 3: Topography, Trigg Bushland sectors

Sector Number	Name	Topography
1	Elliott Road – West Coast (south)	Includes a series of nested parabolic dunes and swales in a north – south orientation, with dune ridges as high as 35 m AHD and swales as low as 4.0 m AHD
2	Elliott Road – West Coast (north)	Characterised by a large dune, rising to 38 m AHD and swale areas as low as 7 m AHD in the western portion, with the northern portion adjacent to Elliott Road characterised by an interdunal swale ranging from 7 – 15 m AHD
3	Karrinyup Road, Trigg	Characterised by a dune ridge oriented in an east – west direction, ranging from 12 – 32 m AHD that is an extension of the dunes in Sector 5
4	Duart-Arnott	Located in an interdunal swale, with a 25 m dune crest to the west. Elevation ranges from 3 – 5 m in the west near Arnott Street, to an average of 6 – 8 m in the east towards Duart Road
5	Karrinyup Road – Jeanes Road	Includes a steep parabolic dune in the vicinity of Karrinyup and Jeanes Roads, ranging from 10 m AHD near Elliott Road to the west and a maximum of 50 m AHD towards the east
6	Coastal strip	Extends from sea level (0 m AHD) to 13 m AHD towards West Coast Highway

Source: (Department of Water, 2014b)

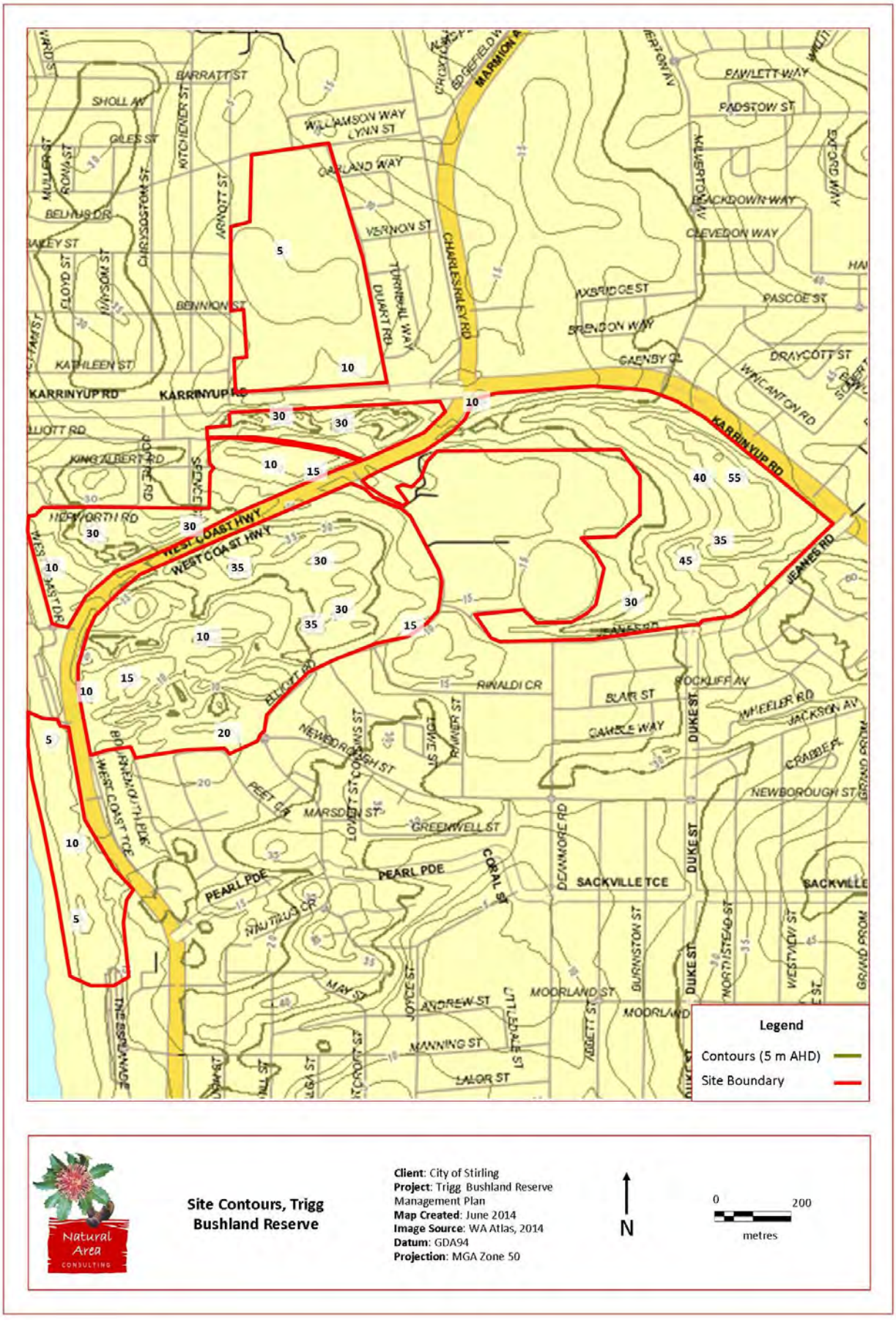


Figure 6: Site Contours, Trigg Bushland Reserve

2.2 Wetlands and Drainage

No wetlands occur within the boundary of Trigg Bushland Reserve. Groundwater flows from the east towards the ocean, with the groundwater table located at approximately 2 m AHD near the intersection of Karrinyup and Jeanes Roads, and 1 m AHD in the vicinity of Elliott and Duart Roads (Department of Water , 2014a). Accordingly, depth to groundwater from the surface at a particular location within the Reserve is dependent on the height of the dunes, and ranges from < 1 m – 48 m (Department of Water, 2014b).

A number of stormwater drains direct water away from urban areas into Trigg Bushland (Figure 7). These have the potential to contribute to erosion from high velocity flow, the spread of weeds associated with the transportation of seeds and vegetative material from plants that can become established within the reserve, and the spread of pathogens such as *Phytophthora* Dieback and *Armillaria*. There is also the increased potential for pollution from chemicals such as pesticides, herbicides and heavy metals. While a number of these drains direct stormwater to sumps, others allow drainage directly in bushland areas. The location of drains is shown in Figure 8, with detailed drainage maps for each sector provided in Appendix 1).

Sector 2	Sector 1	Sector 4

Figure 7: Drain Outlets

The drain across from Bailey Street in Sector 4 has been identified by the City of Stirling as needing particular attention. It is a linear drain line with an east-west orientation, and has been subject to alluvial erosion from high velocity flow. It is suggested that treatment involve the planting of suitable water tolerant plants than will act reduce the flow velocity and act as a filter for nutrients. Drains that allow the infiltration of stormwater into bushland areas may also need to be reconfigured to reduce the exit velocity of stormwater and reduce the potential for erosion.

Recommendations

3.1 Assess drain outlets in all sectors of the Reserve with the view to the installation of attenuation mechanisms where appropriate to reduce the velocity of stormwater flow and/or consider the installation of silt/sediment traps.

3.2 Consider, in regard to drain outlets, the installation of biofilters or silt/ sediment traps where appropriate to ensure the containment of pollutants.

3.3 Carry out, in regard to drain outlets, annual inspections for litter and sediment accumulation and weed invasion of adjoining bushland and to undertake the required clean-out and weed control.

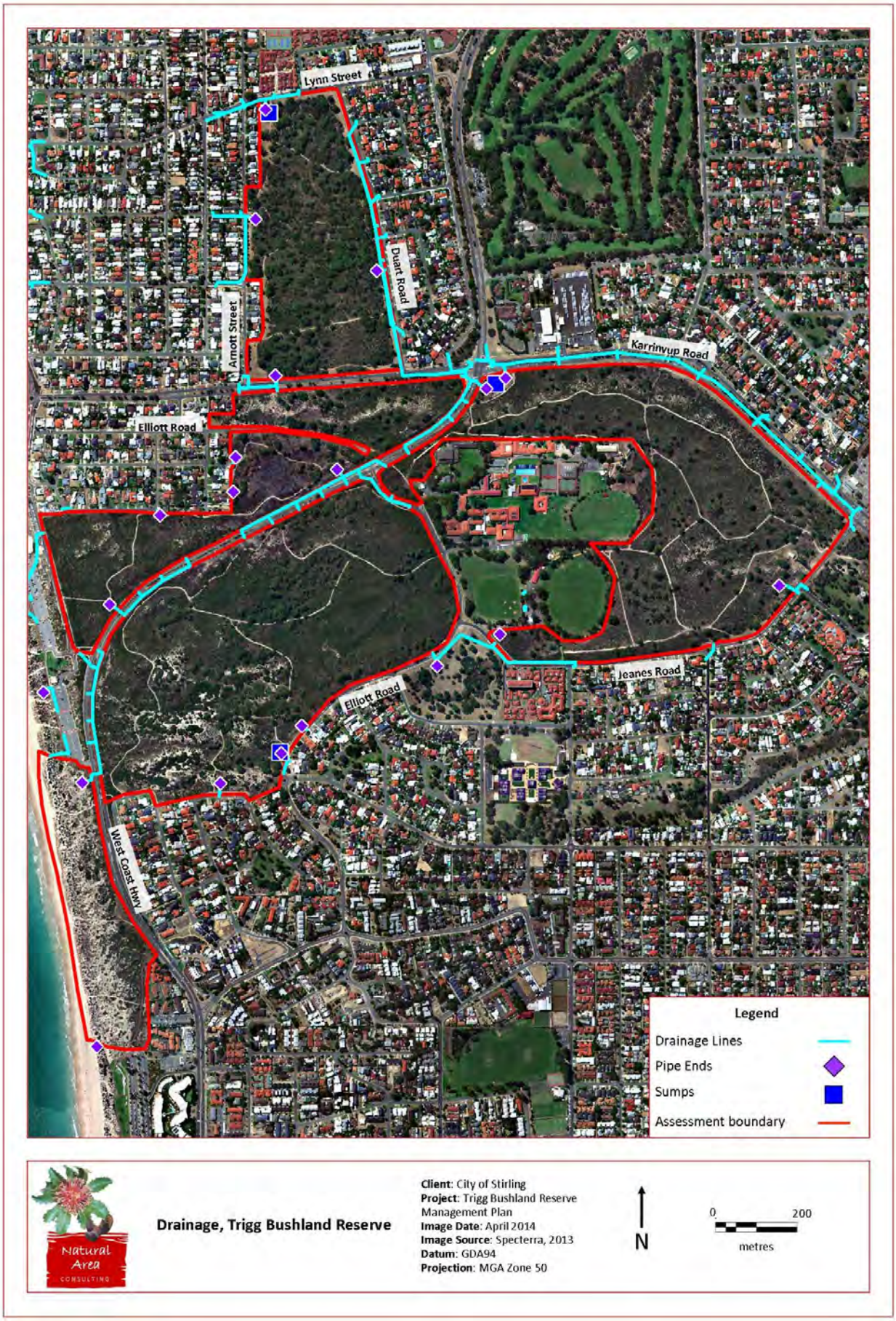


Figure 8: Drainage, Trigg Bushland Reserve

2.3 Climate

According to the Bureau of Meteorology (2014), the climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. Statistics taken from Perth Airport (Station ID 009021, Figure 9) indicate:

- average rainfall is 728 mm pa, with the majority falling between May and August
- average maximum temperature ranges from 17.7 °C in winter to 33.4 °C in summer, with the highest recorded maximum being 46.7 °C
- average minimum temperatures range from 8.2 °C in winter to 17.6 °C in summer, with the lowest recorded minimum being -1.3 °C
- the predominant wind directions include morning easterlies and westerly sea breezes during summer months when the risk of fire is greatest, with an average wind speed of 23.8 km/h and gusts of more than 100 km/h, particularly during storm events.

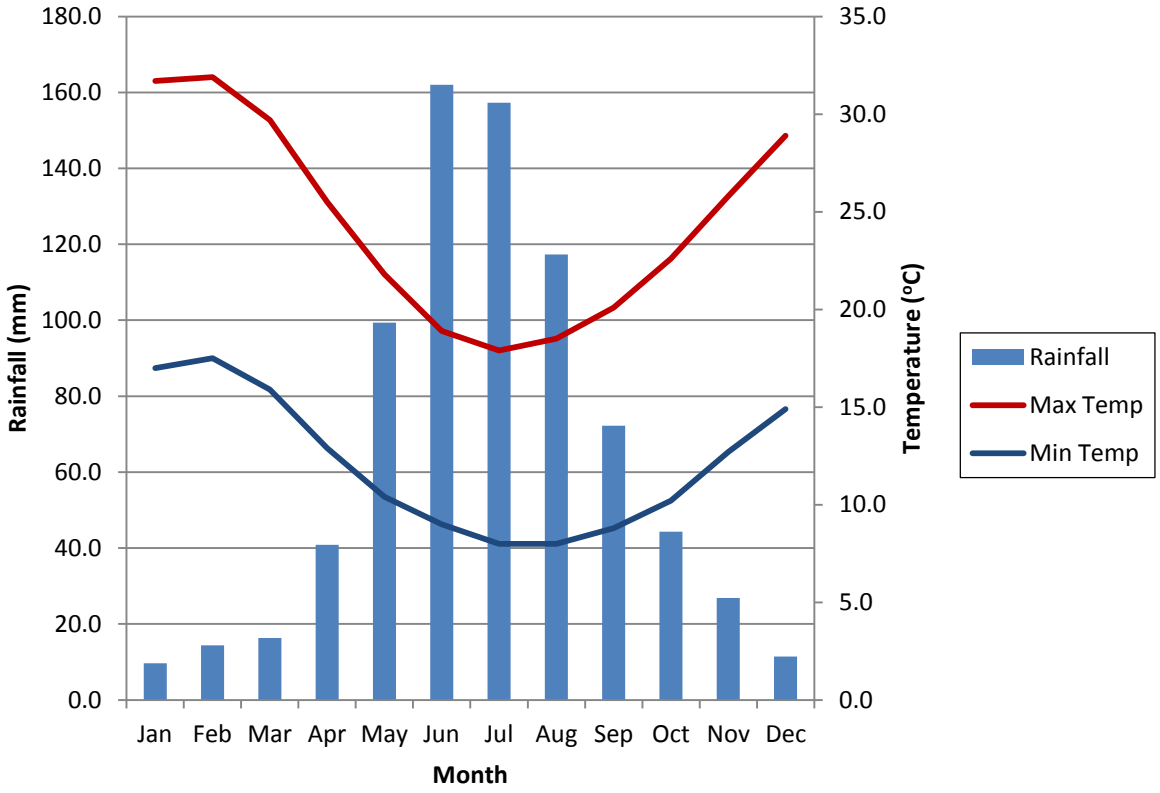


Figure 9: Average Climate Data, Perth

2.3.1 Climate Change

The topic of climate change and its impacts are receiving greater attention as government and others aim to determine what changes are possible and develop strategies to mitigate negative aspects of climate change on the natural and human environment. Broad impacts associated with climate change are projected to include changes in vegetation types and growing zones (Clifton, 2010). Within a Reserve such as Trigg Bushland, it is difficult to anticipate the actual nature, type and degree of impact directly associated with climate change. It is possible that the type and nature of the vegetation found within the Reserve will alter over time, with secondary effects altering fauna communities dependent on those vegetation types.

2.4 Flora and Vegetation

2.4.1 Flora

A number of flora survey activities have been undertaken at Trigg Bushland by the City of Stirling (1991), the Friends of Trigg Bushland (2006). There is also data from the preliminary quadrat surveys attributed to the then Department of Environmental Protection and others in lead up to the listing of the site as Bush Forever Site 308 (Department of Environmental Protection *et al*, 2005). Species lists from each of these sources have been reviewed, collated, and updated to reflect current species and family names. Information from NatureMap has also been included in the species list, as have those species observed by Natural Area Consulting personnel during site assessment activities.

A total of 318 species have been identified at the Reserve from the various sources, including:

- 105 monocotyledons, with 66 native species and 38 weeds
- 213 dicotyledons, with 149 native species and 64 weeds
- one conifer
- two cycads.

A combined species list is provided in Appendix 2.

Of these, there are six species that are considered to be significant (Table 4):

- none are listed as threatened under the *Wildlife Conservation Act 1950* (WA) (Schedule 1)
- two are listed as priority under the *Wildlife Conservation Act 1950* (WA) (Schedule 2)
- none are listed as matters of national environmental significance (MNES) under the *Environment Protection and Diversity Conservation Act 1999* (Cwlth)
- four are listed as significant in the Bush Forever listing information (Government of Western Australia, 2000).

One weed, the One-leaf Cape Tulip (*Moraea flaccida*), is listed as a P1 declared plant under the *Agriculture and Related Resources Protection Act* 1976 (WA), which means its movement or introduction of the plant into a particular area is prohibited. There are no Weeds of National Significance (WONS) within Trigg Bushland Reserve.

Table 4: Significant Flora Species

Species Name	Common Name	State	Bush Forever
Allocasuarina lehmanniana	Dune Sheoak		✓
Callitris preissii	Rottnest Island Pine		✓
Conostylis pauciflora subsp. *euryrhipis*		P4	✓
Gyrostemon ramulosus	Corkybark		
Jacksonia sericea	Waldjumi	P4	
Lechenaultia linarioides	Yellow Lechenaultia		✓

2.4.2 Vegetation Communities

Trigg Bushland Reserve occurs within the Cottesloe Central and South and Quindalup vegetation complexes of the Swan Coastal Plain. The Cottesloe Central and South Vegetation Complex is described as a mosaic of *Eucalyptus gomphocephala* Woodlands, Open Forests of *Eucalyptus gomphocephala/Eucalyptus marginata/Corymbia calophylla* and Closed Heaths on limestone outcrops (City of Stirling, 2010). The Quindalup Complex is described as coastal dune vegetation

consisting of two major alliances, namely the strand and foredune alliance and the mobile and stable dune alliance. Local variations include the *Acacia rostellifera* Closed Scrub and the Low Closed Forest of *Melaleuca lanceolata* and *Callitris preissii* (City of Stirling, 2010).

2.4.3 Vegetation Types

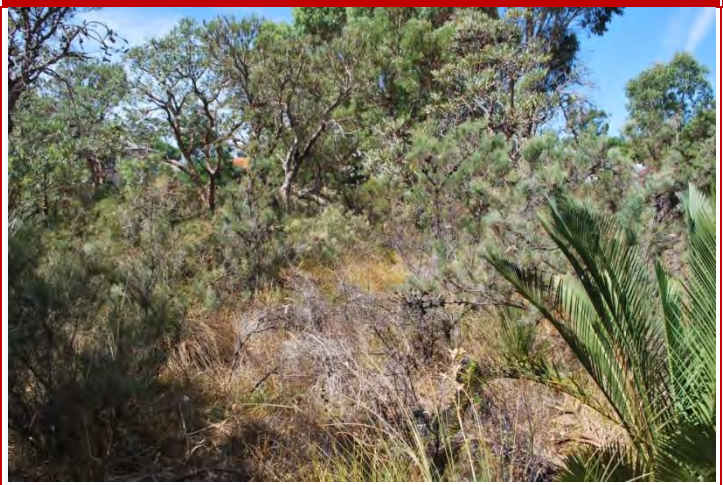
A vegetation type assessment was carried out by Natural Area Consulting during January and February 2014 using the Natural Area Inventory Assessment (NAIA) template developed by WALGA as part of the Perth Biodiversity Project. This process identified a total of 15 vegetation types. These are summarised in Table 5, with quadrat data and locations provided in Appendix 3. The overall location of the vegetation types is provided in Figure 10, with detailed sector maps provided in Appendix 4. It is recommended that vegetation types are assessed every five years to facilitate the identification of change over time from causes such as fire, weed infestation, the dumping of garden/green waste, or introduction of garden escapees.

Recommendation

4.1 Implement a programme for a resurvey of vegetation types (flora surveys) every five years to update the biodiversity database for the Reserve.

Table 5: Vegetation Types

Number	Code	Name	Description	Photograph	Sector(s)
TBR 1	EgCcEmBaBm BgXp	Open Eucalypt, Corymbia and Banksia Woodland	Open Woodland of *Eucalyptus gomphocephala*, *Corymbia calophylla*, *Eucalyptus marginata*, *Banksia attenuata*, *B. menziesii* and *B. grandis* over *Xanthorrhoea preissii*, mixed shrubs and sedges		4
TBR 2	MhSaAp	*Melaleuca huegelii* and *Santalum acuminatum* Shrubland	*Melaleuca huegelii* and *Santalum acuminatum* Shrubland over *Acacia pulchella* and other low shrubs sedges and herbs		4

Number	Code	Name	Description	Photograph	Sector(s)
TBR 3	EgBmBaAh	Open Eucalyptus and Banksia Woodland	Open *Eucalyptus gomphocephala*, *Banksia menziesii* and *B. attenuata* Woodland over *Allocasuarina humilis* and other low shrubs and sedges.		4
TBR 4	ArSgMsLm	Mixed Coastal Shrubland	Mixed Coastal Shrubland of *Acacia rostellifera*, *Spyridium globulosum* and *Melaleuca systena* over *Lomandra maritima* and other sedges and grasses		1, 2 and 3

Number	Code	Name	Description	Photograph	Sector(s)
TBR 5	EgMsCqAp	Open *Eucalyptus gomphocephala* Woodland	Open *Eucalyptus gomphocephala* Woodland over *Melaleuca systena*, *Calothamnus quadrifidus*, *Acanthocarpus preissii* and other mixed shrubs and sedges		3 and 5
TBR 6	AlMsGc	Open Shrubland of *Allocasuarina lehmanniana* subsp. *lehmanniana*	Open Shrubland of *Allocasuarina lehmanniana* subsp. *lehmanniana* over *Melaleuca systena*, *Grevillea crithmifolia* and other mixed low shrubs and sedges		5

Number	Code	Name	Description	Photograph	Sector(s)
TBR 7	Ar	*Acacia rostellifera* Tall Open Shrubland	Tall Open Shrubland of *Acacia rostellifera* over mixed low shrubs and sedges		1, 2, 3 and 5
TBR 8	EgArSg	Open *Eucalyptus gomphocephala* Woodland over *Acacia rostellifera* Shrubland	Open *Eucalyptus gomphocephala* Woodland over *Acacia rostellifera*, *Spyridium globulosum* and other low shrubs and sedges		1 and 2

Number	Code	Name	Description	Photograph	Sector(s)
TBR 9	EgLg	Open *Eucalyptus gomphocephala* Woodland over *Lepidosperma gladiatum* Sedgeland	Open *Eucalyptus gomphocephala* Woodland over *Lepidosperma gladiatum* Sedgeland with scattered shrubs and herbs		2 and 5
TBR 10	EgEmAfBp	*Eucalyptus* Woodland	*Eucalyptus gomphocephala* and *Eucalyptus marginata* Woodland, with Allocasuarina fraseriana and Banksia prionotes over mixed shrubs and sedges		5

Number	Code	Name	Description	Photograph	Sector(s)
TBR 11	CpSaSgAc	*Callitris preissii* Open Woodland	Open Woodland of *Callitris preissii* over *Santalum acuminatum*, *Spyridium globulosum*, *Acacia cyclops* and other low shrubs		1
TBR 12	EgCpAcSg	Open Woodland of *Eucalyptus gomphocephala* and *Callitris preissii*	Open Woodland of *Eucalyptus gomphocephala* and *Callitris preissii* over *Acacia cyclops*, *Spyridium globulosum* and low shrubs and herbs		1

Number	Code	Name	Description	Photograph	Sector(s)
TBR 13	ArOaScSlLg	Mixed Open Heathland	Mixed Open Heathland of *Acacia rostellifera*, *Olearia axillaris*, *Scaevola crassifolia* and other low shrubs over *Spinifex longifolius* and *Lepidosperma gladiatum*		6
TBR 14	OaRbScFn	*Olearia axillaris* Open Heathland	*Olearia axillaris* Open Heathland over *Rhagodia baccata*, *Scaevola crassifolia* and other low shrubs, *Ficinia nodosa* and other sedges and herbs		6

Number	Code	Name	Description	Photograph	Sector(s)
TBR 15	AaOaSh	Marram Grass (*Ammophila arenaria*) Grassland	Marram Grass (*Ammophila arenaria*) Grassland with scattered shrubs of *Olearia axillaris* and small areas of *Spinifex hirsutus*		6

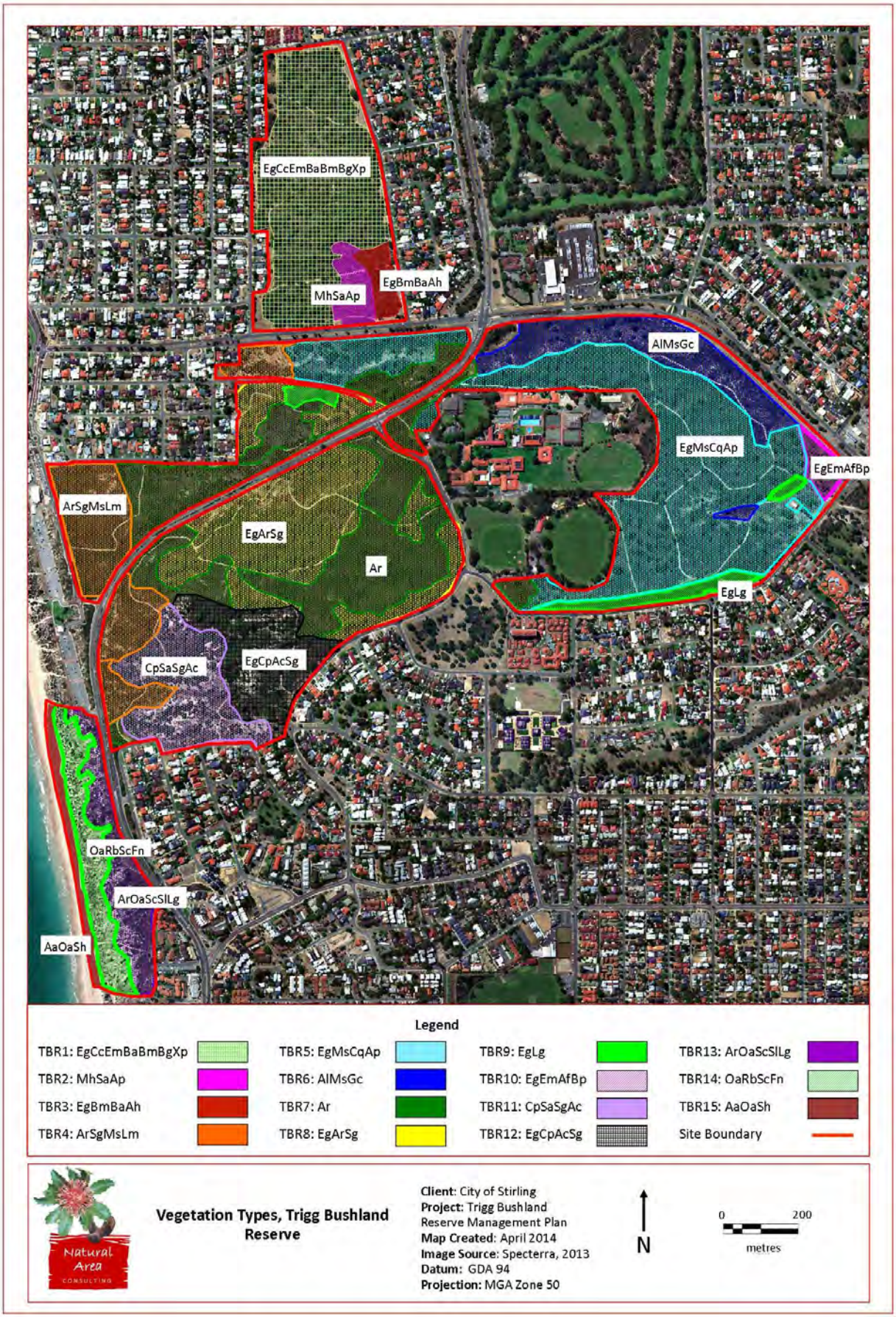


Figure 10: Vegetation Types, Trigg Bushland Reserve

2.4.4 Threatened and Priority Ecological Communities

According to the Department of Parks and Wildlife (DPaW) (2014c), a threatened ecological community is described as an ecological community that is presumed to be or at risk of becoming totally destroyed, and a priority ecological community is one that is possibly threatened but does not meet survey criteria for listing as a threatened ecological community. Listing levels for threatened ecological communities are:

- presumed totally destroyed
- critically endangered
- endangered
- vulnerable.

Listing levels for priority ecological communities range from priority one to priority five. A description of the various conservation codes is provided in Appendix 5.

Three threatened or priority ecological communities potentially occur within Trigg Bushland, and are described in Table 6. Management activities described in the various sections of this Management Plan will also provide for the protection of the threatened and priority ecological communities that occur within Trigg Bushland. These activities include regular flora and vegetation surveys, weed mapping and treatment, and ongoing maintenance.

It should be noted that there has been some professional debate surrounding whether or not *Callitris preissii* occurs naturally on the Swan Coastal Plain or whether it has been planted (City of Stirling, 2014). This species is the basis of community type SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) Forests and Woodlands on the Swan Coastal Plain. Heddle, Loneragan and Havel (1980) indicate in their description of the vegetation of the Quindalup Complex that 'The low closed-forest of *Melaleuca lanceolata* – *Callitris preissii* is restricted to small localised pockets. This formation was once more widespread along the coast.', quoting Baird in 1958 and Seddon in 1972 as the information sources.

Observations by Natural Area Consulting note that the *Callitris preissii* in Sector 1 appears to be a natural stand because it is well established and is the dominant over storey species. In contrast, there are anecdotal indications that the stand of *Callitris preissii* in Sector 5 was planted along the top of the ridge and has since spread into the stand of *Allocasuarina lehmanniana* subsp. *lehmanniana*, possibly after fire. These observations are consistent with those provided by:

- Keighery to the City of Stirling (2014), where he indicates that the species is native to the City of Stirling where it forms the threatened ecological community, but it is not native along the ridge in Sector 5 where it was planted and is now spreading into nearby vegetation communities. Keighery's recommendation was that those trees in Sector 5 are removed due to their potential to bring about change within the existing floristic community
- Loneragan (1986), that some of the *Callitris preissii* trees present at least 20 – 30 years old, with a few individuals potentially 4 – 5 times older.

Accordingly, further investigations relating to threatened ecological community SCP30a are recommended.

Table 6: Description of threatened and priority ecological communities

Community Type	Description	Level
SCP 24	**Northern Spearwood shrublands and woodlands**: Heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include *Dryandra sessilis, Calothamnus quadrifidus*, and *Schoenus grandiflorus*.	Priority 3(i)
SCP 29b	**Acacia shrublands on taller dunes, southern Swan Coastal Plain:** Community is dominated by Acacia shrublands or mixed heaths on the larger dunes. This community stretches from Seabird to south of Mandurah. No consistent dominant but species such as *Acacia rostellifera, Acacia lasiocarpa,* and *Melaleuca systena (syn. M. acerosa)* were important.	Priority 3(i)
SCP 30a	***Callitris preissii*** (or *Melaleuca lanceolata*) **forests and woodlands**, Swan Coastal Plain	VU

(Source: Department of Parks and Wildlife, 2013, personal communication)

Recommendations

5.1 Undertake further investigation into the extent and condition of the Threatened Ecological Community 'SCP 30a *Callitris preissii* forests and woodlands'.

5.2 Develop and implement, pending the investigation as per 5.1 above, appropriate management strategies for this Threatened Ecological Community.

5.3 Undertake, pending the investigation as per 5.1 above, the removal of any *Callitris preissii* deemed to have been planted in inappropriate locations within the Reserve.

2.4.5 Vegetation Condition

Vegetation condition within Trigg Bushland was assessed by Natural Area Consulting in January and February 2014 using the vegetation condition rating scale attributed to Keighery in Bush Forever Volume 2 (Government of Western Australia, 2000). This assessment provides an indication of the condition of bushland at a particular location and time, but does not consider future risks or threats to the bushland. A description of rating categories is found in Appendix 6. Overall, more than 86% of the Reserve was considered to be in Very Good condition. Note that while this was not the ideal time of year to assess vegetation condition, the aim was to highlight degraded areas that may require remedial work, such as those areas in Sectors 1, 2 and 3 affected by fire during 2013, as well as any excellent areas that should be protected. Table 7 summarises the area and percentage of each category for the Reserve and by Sector, and Figure 11 shows the overall vegetation condition for the Reserve, with condition for each of the Sectors provided in Appendix 7.

Undertaking vegetation condition mapping every five years will assist with determining changes over time within the Reserve, with outcomes identifying areas that will benefit from active management, such as weed control and/or revegetation. The City of Stirling has commenced undertaking aerial multi-spectral analysis of bushland areas within its boundaries. This form of analysis will be useful in

detecting signs of declines in vegetation health, such as those that may be associated with water stress or other causes, at an early stage.

Table 7: Vegetation Condition by Area

	Completely Degraded	Degraded	Good	Very Good	Excellent
Entire Reserve					
Area (ha)	0	2.2	15.6	119.7	1.5
% Area	0	1.6	11.2	86.1	1.1
Sector 1					
Area (ha)	0	0.1	4.6	43.4	0
% Area	0	0.2	9.6	90.2	0
Sector 2					
Area (ha)	0	0.5	7	6.9	0
% Area	0	3.5	48.6	47.9	0
Sector 3					
Area (ha)	0	0	0.8	6.3	0
% Area	0	0	11.3	88.7	0
Sector 4					
Area (ha)	0	0.5	0.4	19	0
% Area	0	2.5	2	95.5	0
Sector 5					
Area (ha)	0	0.1	2.1	40.9	1.6
% Area	0	2	4.7	91.5	3.6
Sector 6					
Area (ha)	0	1	0.3	9.4	0
% Area	0	9.3	2.8	87.9	0

Recommendation

6.1 Implement a programme for a re-assessment of vegetation condition every five years to determine changes that may have occurred over time.

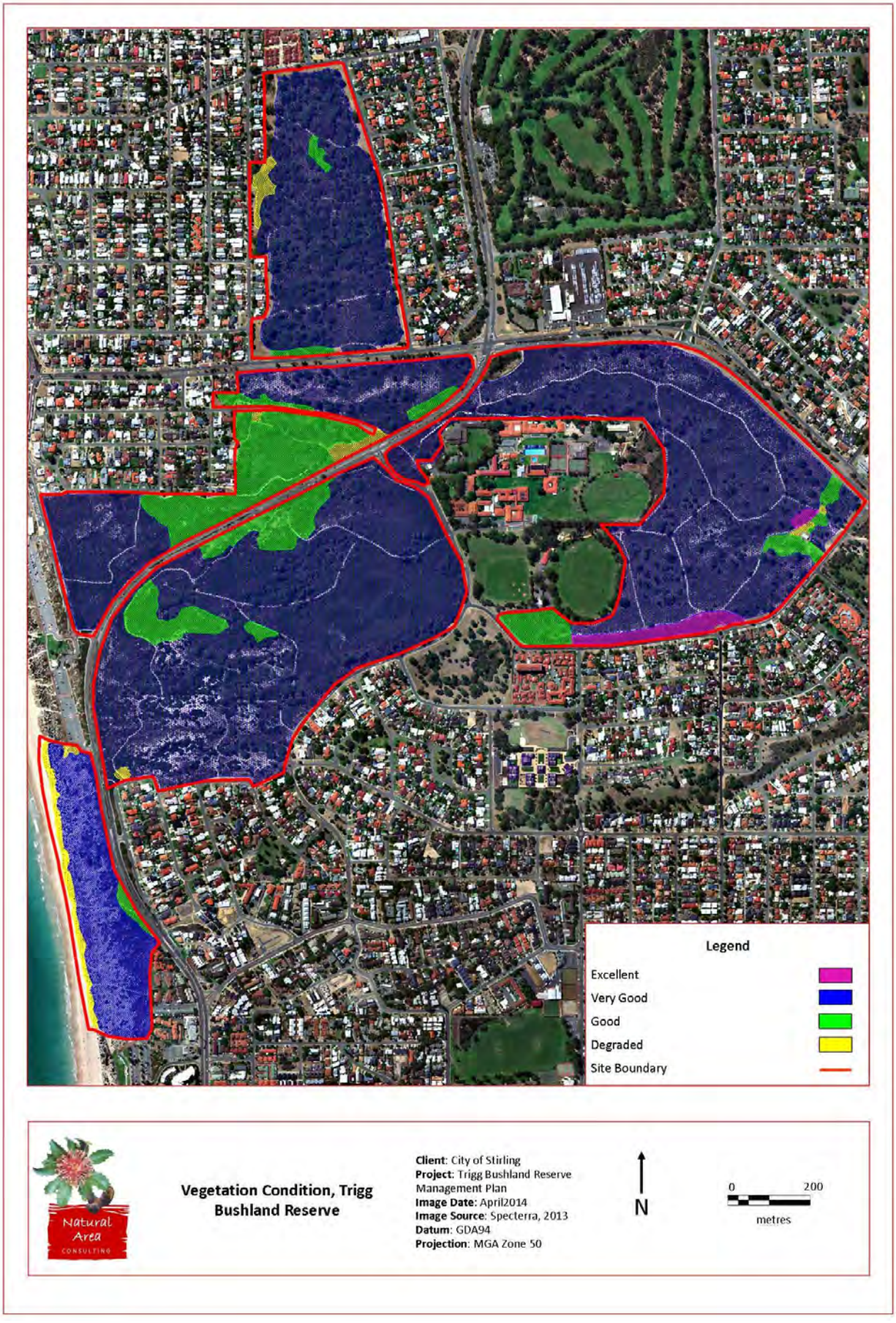


Figure 11: Vegetation Condition, Trigg Bushland Reserve

2.4.6 Weeds

According to the Department of Environment and Conservation (1999), an environmental weed is a plant species that becomes established in an ecosystem and modifies natural processes, usually to the detriment of natural plant forms. All forms of plant life (grasses, bulbs, trees, herbs) can become a weed if conditions allow, with potential adverse effects from their presence including:

- competition for resources including nutrients, space, light and water
- preventing the growth of native species through use of space or creating conditions that actively inhibits the growth of other species
- spreading prolific amounts of seed that readily germinate, in contrast to many native species that require mechanical processes such as the presence of smoke or abrasion before they will germinate
- decreasing the availability of suitable habitat for fauna species, particularly species that might have a close association with some type of plant
- increasing fire fuel loads in a given area.

While the vegetation condition of Trigg Bushland is considered to be Good – Very Good, there are weeds present that if not controlled could be a major threat to the biodiversity of the Reserve in the longer term. These weeds have the potential to diminish the aesthetic and environmental values of the site. The NAIA assessment carried out in 2007 identified approximately 30 weed species within Trigg Bushland. Further assessment by the City of Stirling and Natural Area Consulting increased this to some 35 species; however, it should be noted that NACs assessment was carried out during summer months, so spring flowering species would not have been observed. The most significant weeds based on the abundance noted by NAC and observations by the City of Stirling are provided in Table 8. This list includes the One-leaf Cape Tulip, which is a declared plant listed under the *Agriculture and Related Resources Protection Act 1976* (WA). All weed species are listed in the flora species list included in Appendix 2.

Table 8: Significant Weeds Noted in Trigg Bushland

Species Name	Common Name
Asparagus asparagoides	Bridal Creeper
Avena barbata	Bearded Oat
Brachychiton populneus	Kurrajong
Bromus diandrus	Great Brome
Carpobrotus edulis	Hottentot Fig
Conyza bonariensis	Fleabane
Ehrharta calycina	Perennial Veldt Grass
Ehrharta longiflora	Annual Veldt Grass
Euphorbia terracina	Geraldton Carnation Weed
Freesia alba x leichtlinii	Freesia
Fumaria capreolata	Fumaria
Gladiolus caryophyllaceus	Gladiolus
Lactuca serriola	Prickly Lettuce
Leptospermum laevigatum	Coast Teatree
Lupinus angustifolius	Narrowleaf Lupin

Species Name	Common Name
Moraea flaccida	One-leaf Cape Tulip (P1 declared weed)
Oenothera drummondii	Beach Evening Primrose
Pelargonium capitatum	Rose Pelargonium
Schinus terebinthifolius	(Japanese) Pepper
Tetragonia decumbens	Sea Spinach
Trachyandra divaricata	Trachyandra

Fig Tree

A Fig Tree (*Ficus carica*) associated with an historic property dating back to the 1930's – 1950's is located within the Sector 1 of Trigg Bushland (Figure 12). The Fig is not a native plant species, and would normally be considered as a weed within the context of a native bushland reserve. However, the original tree is to be retained due its association with the site, with any additional trees to be removed when located; this includes those located on the eastern side of the track from the parent tree. Note that the fruit is likely to be a source of food for birds, which can in turn carry seed some distance from the parent tree, thus offspring could occur at any location within Trigg Bushland or elsewhere within the City of Stirling.

Figure 12: Fig (*Ficus carica*) located in vicinity of early dwelling within Trigg Bushland Reserve

Recommendations

7.1 Investigate and establish the identity of the original parent Fig tree near the derelict cottage.

7.2 Undertake, pending the investigation as per 7.1 above, the removal of all other Fig trees in the vicinity of the parent tree.

2.4.7 Weed Mapping

In-house assessment of weeds is currently undertaken by the City of Stirling to guide treatment activities. This usually involves identifying the location of significant populations of selected weed species only, not recording their density. Species of concern identified during site assessment activities are provided in Table 8. Weed species currently in the Reserve are included in the Flora species list in Appendix 1. As the Reserve has not had a formal flora survey undertaken in recent years, it is possible that other species of concern may be present.

It is recommended that the weed mapping currently undertaken by the City of Stirling be updated to accurately reflect the extent of infestations and provide a density rating of weed occurrence, with

mapping reviewed every five years. The Department of Parks and Wildlife (previously the Department of Environment and conservation (DEC)) utilises a standard operating procedure for measuring weed density using the following classes (DEC, 2011):

- less than 5%
- 6 – 75%
- 76 – 100%.

A formal flora survey of the Reserve would aid in identifying weeds species currently present in the Reserve. Formal mapping of the weed species of concern identified from the survey would assist in prioritising weed control measures, highlighting potential problems and provide data on the effectiveness of weed control strategies by monitoring changes over time. Ongoing targeted weed control of all weed types is needed to prevent further degradation of the natural areas within the Reserve.

Recommendations

8.1 Include, as part of annual weed mapping surveys, a density rating in addition to the extent of weed infested areas or weed dispersion to assist with assignment of priority areas for treatment.

8.2 Undertake, as part of formal flora surveys, an indication of changes over time of weed species types.

2.4.8 Weed Treatment Strategy

Weed control for all weed types (grasses, bulbs, trees, herbs) is currently undertaken by the City of Stirling personnel and contractors. The Friends of Trigg Bushland Reserve are also involved in manual weed control of selected species. Weed control is an ongoing activity and will be carried out in accordance with current City policies, practices and procedures. Specific weed management objectives have been documented in the City's Local Biodiversity Strategy (City of Stirling, 2010) and Green Plan 2 (City of Stirling, 2002).

Weed treatment should consider not only the Trigg Bushland Reserve but should also address road verges, nature strips and other sources of weed seed/material that may find its way into the Reserve. A holistic approach that considers herbicide use, manual control and biological controls should be considered and implemented as a program on an ongoing basis. The program should also consider the established control methods available from resources such as Bushland Weeds (Brown & Brooks, 2002), Southern Weeds (Moore and Wheeler, 2008), as well as the most up to date treatments published on FloraBase by the Department of Parks and Wildlife (DPaW, 2014b). A cyclical process involving evaluation (mapping), treatment, monitoring of results, and then adjusting the control program as required should be adopted as this process will ensure that resources are assigned to key areas and that timely responses to changing conditions and weed species can be made. Follow up treatments are important to maintain weeds at manageable densities and to reduce the seed bank. The treatment priorities will be set by the City in response to:

- the City of Stirling's Local Biodiversity Strategy (City of Stirling, 2010)
- Green Plan 2 (City of Stirling, 2002)
- weed mapping outcomes
- focussing efforts on areas of higher bushland condition (Good, Very Good and Excellent).

Herbicide treatments should be undertaken by the City's crews or a licensed subcontractor with suitable bushland experience. Applications are to be undertaken according to license conditions and off label permit instructions as well as complying with any local City of Stirling policies.

Recommendations

9.1 Adopt a holistic approach to weed treatment to include both chemical and manual control methods in accordance with City's current policies and practices.

9.2 Ensure that weed control is carried out the City's trained crews or a licensed bushland weed control contractor in accordance with conditions of herbicide licence(s) and/or off label permit uses.

2.4.9 Plant Pathogens and Disease

Glevan Consulting (2011) undertook an assessment of the potential presence of *Phytophthora* species (dieback) within the Duart – Arnott sector of Trigg Bushland Reserve. A group of dead Tuart (*Eucalyptus gomphocephala*) and Grass Trees (*Xanthorrhoea preissii*) was considered suspicious, with testing showing a negative result for *Phytophthora cinnamomi* and other forms of dieback. Assessment of other sectors was not carried out. It is recommended that dieback assessments are carried out within Sectors 1, 2, 3 and 5 as species prone to *Phytophthora* are present.

Jeanes-Prisk Reserve adjacent to Sector 5 of Trigg Bushland Reserve tested positive for *Phytophthora* Dieback (City of Stirling, 2014). Given the proximity of the infection, there is the potential for spread from Jeanes-Prisk into Trigg. It is recommended that the City of Stirling ensure field personnel and contractors are aware of the infection and adopt appropriate hygiene measures, particularly when moving between locations. It is also recommended that the City of Stirling give consideration to the installation of a disinfectant foot-bath at the entrance of Trigg Bushland across from Jeanes-Prisk to minimise the potential for dieback spread from pedestrians and dog walkers.

Armillaria luteobubalina has been observed within Trigg Bushland Reserve on a number of occasions. This fungus is parasitic and causes root rot of infected plants. Infections may be identified through analysis of aerial photography. An infestation of *Armillaria* occurred when drainage associated with the installation of Marmion Ave directed stormwater into a dune swale, changing the hydrology of the site. *Acacia rostellifera* in the vicinity died off, with testing confirming *Armillaria* as the cause. No observations of *Armillaria* have occurred since at this location. *Armillaria* has also been recorded around the drainage outlet from Marmion Avenue in Sector 6.

Recommendations

10.1 Undertake assessments for *Phytophthora* Dieback within Sectors 1, 2, 3, and 5 in addition to Sector 4.

10.2 Ensure that the City's field personnel and contractors are aware of the risk of Dieback being spread from the neighbouring Jeanes-Prisk Reserve into Trigg Bushland Reserve and that appropriate preventative measures and hygiene are adopted.

10.3 Consider the installation of a disinfectant foot-bath at the Trigg Bushland Reserve entrance closest to Jeanes-Prisk as a means of reducing the potential for Dieback infestation by pedestrians entering the Reserve.

10.4 Undertake an analysis for *Armillaria* infection if this is suspected at any time in previously infected parts of the Reserve.

10.5 Consider the removal of infected dead tree stumps if analysis confirms the presence of *Armillaria* in previously infected areas so as to remove potential growth substrates for the fungus and to inhibit its spread.

2.4.10 Fungi

Fungi play a key role in ecosystem function, with some having a symbiotic relationship with plants and others assisting with the breakdown of plant materials and recycling nutrients within the environment. Others can be pathogenic or parasitic, resulting in disease or harm to the host plant. The most common time to see the fruiting bodies of fungi are after autumn or winter rains. There are five forms of fungi, namely the mushroom or shell, bracket, puffball, jelly fungus, and resupinate (flat). Of these, the mushroom or shell type is the most readily seen within natural ecosystems because of visibility of the fruiting bodies above the ground. Slime moulds also occur within Trigg Bushland Reserve and play a similar role to fungi.

A fungi survey carried out by Perth Urban Bushland Fungi in 2006 in Sector 1 and Sector 4 recorded 45 species of fungi. This number is expected to be an under-representation of species, as low rainfall prior to the survey is likely to have affected the abundance and diversity presenting at the time (Perth Urban Bushland Fungi, 2006). Examples of species encountered during the 2006 survey are provided in Figure 13.

Crepidotus eucalyptorum
Eucalypt Crepidotus

Gymnopilus allantopus
Golden Wood Fungus

Pycnoporus coccineus
Scarlet Bracket Fungus

Calocera guepinioides
Scotsman's Beard

Scleroderma sp.
Earthball

Pisolithus sp.
Dog Poo Fungus

Figure 13: Fungi Recorded within Trigg Bushland Reserve

Recommendation

11.1 Consider the inclusion of a survey for fungi and associated micro-flora whenever formal flora surveys are undertaken within Trigg Bushland Reserve.

2.4.11 Fire

The record of fires within Trigg Bushland is limited with ten recorded in the period 1993 to mid-2014 (Figure 14), four of which have been recorded since 2008. These were:

- March 2014 (estimated) – Sector 3
- January 2013 – Sectors 1, 2, and 3
- November 2010 (estimated) – Sector 5
- 8 December 2008 – Sector 5.

Many Australian flora species have adapted to a fire ecology in that they can withstand the effects of fire and resprout, and some species require fire or smoke to encourage regeneration. Impacts associated with frequent fires include the death of seedlings, changes to vegetation type and structure, loss of fauna and an increased presence of weeds. A very hot or intense fire can also damage the regenerative ability of mature plants such that they do not resprout and eventually die, while others can be killed outright. There have been a number of large fires in the past, including those in 1993, 1998, and 2001. Several smaller fires have since occurred, and which are mainly associated with the building of illegal structures (cubbies). If the frequency increases, there is the potential for changes in vegetation type and flora species present within affected areas. Flora species that flower and set seed infrequently are most likely to die out as a result of frequent fires, with the actual changes will be dependent on the location and frequency of fire within the Reserve. Accordingly, a controlled burn policy is not advocated for this Reserve.

Despite the negative impacts associated with fire, fire also presents an opportunity to carry out targeted weed control when vegetation is less dense, and when it may be possible to eradicate some species that might otherwise be difficult to control. Accordingly, targeted weed control is recommended after fire.

It is recommended that the City of Stirling undertake flora surveys in burnt areas after they have recovered sufficiently to determine whether or not impacts are occurring to flora species present, vegetation type and condition, as indicated by baseline survey data. Surveys of fauna within burnt areas are also recommended at regular intervals to determine impacts and rate of recovery after fire. Post fire weed control is also recommended.

Recommendations

12.1 Undertake a post-fire flora survey of areas that been subjected to bushfires to determine the recovery rate of inherent local native species as well as weed species to determine likely impacts on vegetation type and condition.

12.2 Undertake post-fire surveys of fauna within burnt areas to determine impacts and rate of recovery following the fire.

12.3 Undertake the control of weed emergence after bushfires to maximise the regeneration potential of local native species.

12.4 Inform local residents about potential fire hazards in private property and inform them about the management measures that they could undertake to reduce risks.

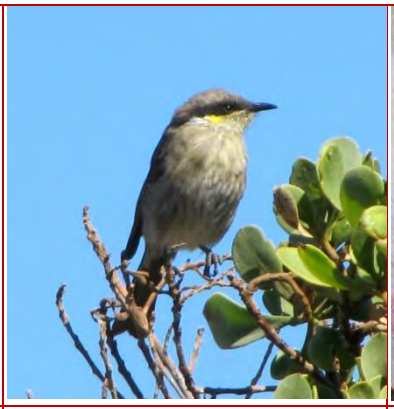
12.5 Due to the past fire history and the risks of biodiversity from frequent fires, a controlled burn policy is not advocated at this Reserve

Figure 14: Recent Fire History, Trigg Bushland (1993 – 2014)

2.5 Wildlife

The diverse array of fauna habitats at Trigg Bushland are closely related to the landforms present and their associated vegetation. Fauna lists have been compiled from the original Management Plan (City of Stirling, 1991), the Friends of Trigg Bushland (2014, personal communication), Birds Australia and the Perth Biodiversity Project (2006), Department of Parks and Wildlife Fauna Trapping Data (Cowan, 2013, personal communication with the City of Stirling), and opportunistic sightings by NAC personnel during site assessment activities. In addition, the Protected Matters Search Tool (Commonwealth) indicates the potential presence of a number of species listed as protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth). Based on the information from each of the above sources, a total of 187 species occur within or utilise habitat within Trigg Bushland Reserve. Of these, five are amphibians, 122 are birds, 41 are reptiles, and 19 are mammals. Of note is the sighting of an echidna (*Tachyglossus aculeatus*) in 2010. Examples of fauna species observed with Trigg Bushland are provided in Figure 15. A species list is provided in Appendix 8.

Simoselaps bertholdi
(Jan's Banded Snake)



Lichenostomus virescens
(Singing Honeyeater)

Heleioporus eyrei
(Moaning Frog)

Morethia obscura
Shrubland Snake-eyed Skink

Ramphotyphlops australis
(Blind Snake)

Coracina novaehollandiae
(Black-faced Cuckoo Shrike)

Figure 15: Fauna Observed within Trigg Bushland Reserve
(Photos: Jo Taylor, City of Stirling)

Recommendation

13.1 Undertake observations and record the presence or movement of any fauna during regular maintenance and other visits to the Reserve.

2.5.1 Significant Fauna

Trigg Bushland Reserve also supports a number of fauna species that are considered to be significant through their listing on rare fauna notices at either State (*Wildlife Conservation Act 1950* WA) or Commonwealth level (*Environment Protection and Biodiversity Conservation Act 1999* Cwlth). The Bush Forever listing information also indicated that a number of fauna species within the Reserve were considered to be significant (Government of Western Australia, 2000). A summary of significant species that are more likely to occur within Trigg Bushland Reserve are provided in Table 9, with examples shown in Figure 16.

Table 9: Significant Fauna Species

Species Name	Common Name	Life Form	State	Commonwealth	Bush Forever
Acanthiza apicalis	Inland Thornbill	Bird			✓
Ardea alba	Great Egret	Bird		IA	
Ardea ibis	Cattle Egret	Bird		IA	
Calyptorhynchus banksia naso	Forest Red-tailed Cockatoo	Bird	T	Vu	
Calyptorhynchus latirostris	Carnaby's Cockatoo	Bird	T	CR	
Ctenophorus adelaidensis	Western Heath Dragon	Reptile			✓
Echiopsis curta	Bardick	Reptile			✓
Isoodon obesulus fusciventer	Southern Brown Bandicoot, Quenda	Mammal	P5		
Malurus lamberti	Variegated Fairy-wren	Bird			✓
Malurus leucopterus	White-winged Fairy-wren	Bird			✓
Malurus splendens	Splendid Fairy-wren	Bird			✓
Merops ornatus	Rainbow Bee-eater	Bird	IA	IA	
Neelaps ornatus	Black-striped Snake	Reptile	P3		✓
Rostratula australis	Australian Painted Snipe	Bird	T	Endangered	
Sericornis frontalis maculatus	White-browed Scrubwren	Bird			✓
Tiliqua occipitalis	Western Blue Tongue	Reptile			✓

Calyptorhynchus banksia naso (Forest Red-tailed Cockatoo)

Tiliqua occipitalis (Western Blue Tongue)

Calyptorhynchus latirostris (Carnaby's Cockatoo)

Figure 16: Significant Fauna Species Recorded in Trigg Bushland

2.5.2 Introduced Fauna

The presence of introduced fauna has the potential to result in reduced site ecological values due to competition for resources and predation of native species. The presence of bees can also pose a safety risk to Reserve visitors. Species or their indicators observed by Natural Area Consulting during site assessment activities included feral bees (Figures 17 and 18), rabbits and foxes. It is also probable that feral cats may be present. It is recommended that control of these species is undertaken on an as required basis in accordance with current City of Stirling management practices.

Bee Hives

Figure 17: Feral bees and their hives within Trigg Bushland

Recommendations

14.1 Implement a programme for the control of feral fauna species and undertake annual controls in accordance with the City's current practices and procedures.

Figure 18: Introduced Fauna, Trigg Bushland Reserve

2.5.3 Introduced Avifauna

A number of introduced avifauna species are or have the potential to be utilising habitat within Trigg Bushland, including the Rainbow Lorikeet (*Trichoglossus haematodus*) (Figure 19). Lorikeets can be aggressive and their presence may restrict the nesting activities of native animals such as the Ringneck Parrot (*Barnardius zonarius*), Australian Shelduck (*Tadorna tadornoides*) and various bat species.

Laughing Kookaburras (*Dacelo novaeguineae*) were observed in Sector 4 of Trigg Bushland Reserve. These birds prey on reptiles and thus having the potential to alter the species composition of lizards, snakes and amphibians. Two introduced doves, namely the Spotted Turtle Dove (*Streptopelia chinensis*) and the Laughing Turtle Dove (*Streptopelia senegalensis*), are also present within the Reserve. These species are cosmopolitan and able to live in urban areas, and only have an indirect impact to the biodiversity of the Reserve, particularly through the spread of weed seeds.

The Eastern Long-billed Corella (*Cacatua tenuirostris*) is also present at Trigg Bushland Reserve. These birds form large flocks, graze on ovals and parkland, compete for nest hollows and can damage native vegetation through chewing the bark from tree trunks.

Figure 19: Introduced Bird Species – Trigg Bushland Reserve: Rainbow Lorikeet (*Trichoglossus haematodus*) and Laughing Kookaburra (*Dacelo novaeguineae*)

Sources: City of Stirling, Natural Area Consulting

While the Department of Parks and Wildlife has carried out some culling of Rainbow Lorikeets and the Eastern Long-billed Corella (Coupar, 2012, personal communication), their large numbers and mobility make them difficult to control at a local level. It is recommended that if numbers of Rainbow Lorikeets (*Trichoglossus haematodus*) and the Eastern Long-billed Corella (*Cacatua tenuirostris*) continue to be problematic that the City of Stirling discuss potential control options with the Department of Parks and Wildlife.

Recommendation

15.1 Continue to monitor and record the presence of introduced avian fauna and consider control options with the Department of Parks and Wildlife if numbers increase significantly.

2.5.4 Domestic Animals

Dogs

The recreational benefits of dog walking are acknowledged in terms of the dog owners and their pets being able to socially meet within a bushland setting. However, it is also important to recognise the impacts that dogs can have on the sustainability of bush areas, especially when uncontrolled forays occur off designated tracks and trails. These impacts include the following:

- effects of dog droppings of flora – nutrient loading of soils and altering the growth conditions of most native plants that have evolved generally under nutrient poor conditions, thereby resulting in poor recruitment of new seedlings
- effects of dog droppings on fauna – this could influence the diversity and abundance of invertebrate fauna, based on a study of dog and non-dog beaches in Scarborough by Koeller (2011)
- vegetation damage – from trampling by dogs and their owners which can become significant over time with sensitive herbaceous plants such as orchids and trigger plants
- creation of short-cut trails – through 'bush-bashing' by dog owners leading to these trails eventually coalescing to form bare areas as evidenced by several examples on site
- weed invasion – in areas rendered bare and nutrient enriched by the above processes the opportunistic colonisation by weeds and ephemerals is encouraged
- impacts on wildlife habitation – dogs tend to leave undesirable scents from their territorial marking which can discourage wildlife habitation in pre-established niche areas
- survival of threatened fauna – the sustainability of established habitat niches by species such as Quenda in Sector 4 could be placed at risk
- attacks on wildlife – as evidenced by photo documented incidents of reptiles such as Bob Tails being mauled
- increased fox activity – dog activity in bushland could incite competitive marking of territory by foxes (and other dogs) as evidenced by photo documented incidents.

The cumulative effects of all the above over time could lead to the loss of biodiversity and other natural values of bushland. In addition, the dogs themselves are at risk in terms of the following when forays into bush areas occur:

- snake bite – this is possible if dogs encounter snakes in bushland
- swooping bird attack – risk of dogs being attacked by swooping Magpies or Red Wattle Birds if not under effective control
- fox trap risk – risk of dogs being caught in fox traps if not under effective control.

It is the assessment of the City that apart from Sector 4, dog walking seldom occurs in the other sectors of the Reserve. On that basis, this Management Plan makes no recommendation to have Trigg Bushland Reserve declared a 'dogs on leash' area. Nevertheless, dog owners are required to have their dogs under effective control for the reasons as outlined above. As per the *Dog Act 1976* (WA), effective control essentially means that a dog is able to respond when called by the owner/ handler, and being close enough to be placed on leash, as necessary.

Incidents of dogs attacking children, recreational walkers and other dogs make it compelling on dog owners to have their pets under control. Dog owners are also required to pick up droppings after their dogs. The accumulation of dog droppings, particularly in bushland areas, fringing walk tracks, and trails has reached a state where it is becoming difficult and unhygienic for bushland conservation staff and volunteers to work in.

It is recommended that a community awareness programme be developed and implemented outlining the impacts of dogs to the bushland ecosystem and about dog ownership responsibilities to assist in the conservation of these important areas. The programme should employ effective mechanisms to inform the public such as via the City's website, Stirling Scoop, appropriate signs on site, public awareness days involving the City's Rangers and conservation staff at Trigg Bushland Reserve and/or the Henderson Environment Centre, North Beach.

Pending the implementation of the community awareness programme, it is recommended that a review be undertaken at the end of 2016 to determine the success or otherwise of the above approach with the view to the adoption of alternate strategies, if required.

Cats

Under the *Cat Act 2011* (WA), owners of cats over the age of six months must ensure that their pets are:

- micro-chipped, wearing a collar and registration tags (for identification purposes if the animal is lost, injured or caught in a feral animal trap)
- sterilised (unless being used for breeding purposes by a Council approved breeder)
- registered with the Local Government.

Additionally, the City's *Keeping and Control of Cats Local Law 1999* indicates that Trigg Bushland Reserve is one of 11 conservation reserves where cats are prohibited in the interests of wildlife protection. More information on the responsibilities of cat owners under the City's Cats Local Law 1999 and the *Cat Act 2011* (WA) can be found on the City's website.

Despite being a designated cat free zone, the Reserve is also likely to be frequented by roaming domestic cats which hunt and often kill native animals, particularly birds, lizards and frogs. It is recommended that the information relating to cats be included on key Reserve signage. The provisions of the *Cat Act 2011* (WA) allow for cats found in public places or private property to be seized.

It is also recommended that City personnel visiting the site reinforce the message through talking to residents about the changes and providing them with copies of any information brochure produced when implementing the changes. City Rangers will continue to have the responsibility for educating the public and enforcing the provisions of the *Cat Act 2011* (WA), the *Dog Act 1976* (WA) and the City of Stirling Local Dog Laws.

Recommendations

16.1 Develop and implement a community awareness programme regarding the impact of dogs to the bushland ecosystem and the responsibilities of dog-owners contribution to the conservation of these important areas.

16.2 Continue to require dog owners to have their dogs under effective control in the interest of bushland conservation although no declaration will be made of Trigg Bushland Reserve as a 'dogs on leash' area.

16.3 Undertake a review of the above approach at the end of 2015 to determine its success or otherwise with the view to the adoption of alternate strategies, if required.

16.4 Develop and implement a community awareness programme about the Reserve's designation as a cat-exclusion zone under the City's Keeping and Control of Cats Local Law 1999 and the requirements under the *Cat Act 2011* (WA).

16.5 City officers continue to educate the community and enforce the provisions of the *Dog Act 1976* (WA), the City of Stirling Local Dog Laws (2008), and the provisions of the *Cat Act 2011* (WA).

2.5.4 Termites

Termites are a natural component of the bushland areas in Australia, including on the Swan Coastal Plain, where they contribute to nutrient recycling through the decomposition of woody organic matter. Evidence of termites was noted in a number of locations, including within Sector 4 of Trigg Bushland Reserve (Figure 20). Treatment or management is recommended only in those cases where their continued presence could result in damage to nearby buildings or infrastructure, or otherwise impact on the effective management of the Reserve. Regular observation of termite infestation during regular visits to the Reserve will assist with the ongoing assessment of the need for treatment or management. One infested tree is in close proximity to buildings in Sector 4, and it is recommended that it is inspected to determine the risk associated with falling branches, and thus most appropriate treatment option (Appendix 9).

Figure 20: Evidence of Termites

Recommendations

17.1 Undertake regular observation of termite presence during regular maintenance visits to the Reserve.

17.2 As termites are a natural part of the environment with an important role to play in terms of nutrient cycling, undertake treatment only in situations where their continued presence could cause trees or branches to fall down resulting in damage to nearby buildings or infrastructure or pose a safety risk to Reserve users.

17.3 Undertake inspections of the infested tree in vicinity of nearby buildings in Sector 4 to determine the risk of falling branches and determine if termite treatment is warranted.

3.0 Existing Use and Management

Trigg Bushland Reserve is largely set aside for conservation, dune protection, education and recreation. While usage across the Reserve is generally consistent with this reservation with variation in use according to sector, there are also a number of human activities that threaten the natural environmental and ecological values of Trigg Bushland. The Reserve also has an intrinsic value to local residents and others via its range of social and cultural values

3.1 Use and Facilities

3.1.1 Use

The major use of Trigg Bushland Reserve is conservation and recreation, with the nature of the site in each sector influencing the type of use. Sectors 1, 2, 3, and 5 are characterised by steeper sections of the parabolic dunes typical of the site, limiting recreational usage in these areas to walking, including the walking of dogs.

The distance from residential areas in Karrinyup to the east to the coastal node in Sector 6 means that the numbers of people walking through the Sectors 2,3, and 5 is not as high as that which occurs in Sector 4, with residential areas immediately to the north, east and west.

Sector 6 is the coastal foreshore section of Trigg Bushland Reserve that includes the dual use path. Usage of the dual use path is high, with walkers and joggers throughout the day.

3.1.2 Facilities

Facilities within Trigg Bushland Reserve are limited. Within Sectors 1 – 5, facilities are largely limited to the provision of tracks and signage at key locations around the edge of the Reserve. A single park bench was installed by local residents in Sector 4 (Friends of Trigg Bushland, 2014). In Sector 6, facilities include the dual use path that runs along the coast, beach access tracks, a lookout, with facilities associated with the Trigg Beach lifesaving club and surrounds, including cafes, parking areas, showers and grassed areas to the north. Bins and dog-poo pouches are provided at entry points within Sectors 1 – 5, and along the dual use path in Sector 6 (Figure 21). Additional bin and dog ‘poo pouch’ locations are recommended at locations as shown in Figure 21. The lookout in Sector 6 is in need of attention, with the cement path to the lookout transitioning to sand a short distance prior to the entry, which makes access by those in wheelchairs or pushing prams difficult. In addition, the provision of seating and shade, along with a general upgrade will be beneficial to users.

These facilities are consistent with the conservation focus of Trigg Bushland Reserve. Recreational usage of the site in Sectors 1 to 5 is largely confined to walking and the exercising of dogs, thus there appears to be little community requirement for an increase in the type of facilities present within Trigg Bushland within any of the sectors. However, it is recommended that consideration is given to providing more park benches along walk trails to allow the opportunity for people to rest or sit and enjoy the bushland setting.

Usage within Sector 6 is largely associated with beach access and use of the dual use path that runs along the coast. However, major beach usage is in the coastal sector and immediately to the north around Trigg Island with its more extensive facilities.

Ongoing assessment of usage in all sectors will be required to ensure any future pressures are identified and appropriate management strategies formulated and implemented. For example, the use of the dual use path and the beach could lead to increased pressure for further parking or other infrastructure.

Fencing occurs around the Reserve, and is generally in good condition. The northern pedestrian track in Sector 4 is also fenced. Other fencing within the reserve is not required and not supported by the City of Stirling. The presence of some old fencing in Sector 4 was noted, and it is recommended that this is removed.

Recommendations

18.1 Undertake ongoing assessment of public usage within all Sectors of the Reserve to confirm usage patterns and associated pressures on the bushland areas and possible impacts on other values.

18.2 Remove fencing in Sector 4 that is currently in poor condition.

18.3 Consider the installation of further seating within the various Sectors of the Reserve.

18.4 Install additional litter bins and dog 'poo pouches' at suggested locations shown in Figure 21.

18.5 Extend the paved access from its current location to the lookout in Sector 6.

18.6 Undertake a general upgrade of the lookout in Sector 6, including providing seating, shade and informative signage.

Figure 21: Bin and Dog 'Poo Pouch Current and Recommended Locations, Trigg Bushland Reserve

3.1.3 Signage

Signage is present around the perimeter of Trigg Bushland Reserve, and indicates acceptable activities. There is also signage within the various Sectors indicating the presence of bushland walk trails (e.g. in Sector 4) and historical features (e.g. in Sector 2). The Friends of Trigg Bushland assisted with signage installed along the Scarborough – Trigg Heritage Trail as part of the Centenary of Federation in 2001 (Friends of Trigg Bushland, 2014). It is noted and recognised that general style of signage within the coastal (Sector 6) and terrestrial components (Sectors 1 – 5) of the Reserve differ, and that this practice will continue in the future. Examples of signage are provided in Figure22.

Figure 22: Signage Examples with Trigg Bushland Reserve

Due to the size of the Reserve and the meandering nature of the existing walk/access trails within Sectors 1 – 5, it is recommended that directional signage is installed to provide users of the site clear indications of distance to key points, along with their current location in the event of an emergency situation. Locator signs near the entrances to the Reserve would provide an indication of the general layout and distances between locations. A suitable naming system for these trails is also recommended. A potential naming system based on the natural attributes (e.g. such as names of flora and/or fauna) is suggested, again due the meandering nature of the trails that would be difficult to designate using names based on grid references. The naming of access ways in the coastal sector (Sector 6) is not required.

The environmental and historical values of the site also suggest that additions to the current signposted walk trail could be well received by the community. Heritage/walk trails could include those within discrete Sectors of the reserve, as well as linked to adjacent Sectors and the wider walk trail network within the City of Stirling.

Any signage will be consistent with the current version of the City of Stirling's Signage Style Guide, including those for entry statements, information and education, warning, entry points and regulatory purposes (City of Stirling, 2012). It is recommended that any unnecessary signs are removed from the Reserve, such as those in Sector 5 indicating dunes are under repair.

Recommendations

19.1 Design and install directional signage at strategic locations in the Reserve together with locator panels.

19.2 Adopt an appropriate trail/ track referencing or naming system to ease navigation around the Reserve.

19.3 Develop a comprehensive heritage trail highlighting historical and inherent ecological values and these be trail marked with appropriate signage and directional markers in a manner that complements the existing heritage trail within and external to the Reserve.

19.4 Identify and remove all unnecessary and redundant signs, such as the 'Dune under Repair' signs in Sector 5.

3.1.4 Inappropriate Use

While the majority of use and activity within Trigg Bushland Reserve is that associated with bushwalking and dog walking, there is also evidence of inappropriate, if not illegal, use and activities. The most common inappropriate activities are graffiti vandalism, the construction of cubbies and the dumping of rubbish. The locations of various disturbances are provided in Appendix 9.

Graffiti and other Vandalism

Graffiti and other forms of vandalism such as damage to vegetation and/or infrastructure is an ongoing problem experienced in many urban locations, including the City of Stirling and Trigg Bushland Reserve. Impacts of this type activity include decreased aesthetics and increased maintenance costs to remove or repair damage to signage, infrastructure, or vegetation. Examples of graffiti and vandalism are provided in Figure 23.

Graffiti – Sector 4

Tree Damage – Sector 1

Damage, Graffiti, Sector 4

Figure 23: Graffiti and Vandalism within Trigg Bushland Reserve

Recommendation

20.1 Undertake prompt removal of graffiti and reinstatement of damage from other forms of vandalism discovered during routine maintenance inspections.

Illegal Structures

Another common activity in many bushland areas involves the construction of some form of 'shelter' or building which are colloquially known as 'cubbies' or even 'drug dens'. While the term 'cubby' is typically associated with a child's play area, such as a tree house, the structures that are of greatest concern within Trigg Bushland Reserve are those constructed by teenagers and adults as a place where alcohol consumption and drug use can occur. Their construction is illegal as it is a form of

camping or squatting, as well as being a form of environmental harm, unauthorised clearing of native vegetation and the taking of protected flora and/or fauna.

Structures range from basic shelters through to more elaborate features that require the transportation of furnishings and other equipment to the site (Figure 24). Whatever their form, the construction of these structures results in damage to the natural environment. Typical impacts include:

- damage to native vegetation through trampling, use of plant materials for construction and/or camouflage purposes, and clearing
- damage to native fauna species, either directly or through habitat destruction
- hazards presented by rubbish, including building materials, furnishings and general rubbish
- increased fire potential through the presence of matches and other flammable materials and the lighting of campfires.

These structures are commonly associated with alcohol consumption and drug use, which is of particular concern as hazardous wastes such as syringes, drug paraphernalia and other materials present a health risk to legitimate users of the site and workers involved with site cleanup and restoration activities.

Figure 24: Examples of Illegal Structures and Drug Use within Trigg Bushland Reserve
(Source: City of Stirling, 2014)

Recommendations

21.1 Undertake prompt removal of illegal structures (e.g. makeshift campsites and drug dens) and clean-up of associated rubbish as soon as practicable following discovery.

21.2 Reinstate or restore damage to bushland areas as soon as possible following discovery and where required, have these areas revegetated.

Rubbish

The dumping of rubbish is another practice that can result in reduced aesthetics and the spread of weeds within Trigg Bushland Reserve. Rubbish that has been dumped includes sand, green waste, commercial and industrial waste, and general household or other waste. All will reduce the aesthetic values of the site and have the potential to encourage the proliferation of pest species such as mice and rats.

Garden and green waste, however, has the potential to result in the most significant impacts through the spread of seeds from weeds and other non-native local plants. As weeds become established and spread within the Reserve, the cost of removal or ongoing treatment increase accordingly. Appropriate communication with residents outlining the impacts of waste and garden waste within the Reserve is recommended. Examples of rubbish dumping are provided in Figure 25.

Figure 25: Rubbish Dumping within Trigg Bushland
(Source: City of Stirling, 2014)

Recommendations

22.1 Undertake prompt removal and clean-up of dumped rubbish as soon as possible following discovery.

22.2 Carry out dissemination of public information relating to the ecosystem impacts of dumping garden waste (e.g. pruning's and lawn clippings) in bushland areas.

Trail and Motorbikes

The use of trail bikes and motorbikes is also an activity with the potential to result in conflicts with pedestrians as well as damage to flora and vegetation. It is recommended that evidence of this type of activity is monitored on an ongoing basis. In addition, when considering improved access options for pedestrians, it is recommended that chicanes or other forms of access that limit the ease of access by trail and motor bike users is installed.

Recommendations

23.1 Monitor and evaluate the impact of trail bike and motor bike access via tracks and trails.

23.2 Consider the use of chicanes or similar mechanisms to limit unauthorised access by trail bikes and motor bikes.

Geocaching

Geocaching, or geographical caching, is an emerging management issue within bushland and natural areas. The practice involves hiding a container (treasure) that others use GPS-enabled devices to find. According to the Geocaching website (2014), geocaching is real-world treasure hunt where participants use their GPS device to navigate to a set of coordinates and attempt to find the geocache container hidden in the area. The containers used in geocaching range in size from the very small, such as film canister, to the very large, such as a container with a 20 L or more capacity (Geocaching, 2014). A 'regular' geocache is described as having a capacity of between 1 and 20 L (Geocaching, 2014).

Caches are often hidden in bushes, buried, placed in a tree, or placed on the ground and covered. Locations can be 'marked' in some way. The cache can stay in place for lengthy periods, resulting in regular visits to its location. Thus, potential environmental impacts associated with this activity include the following:

- trampling or other damage to native vegetation
- rubbish dumping
- habitat destruction
- graffiti to trees and infrastructure
- weed invasion
- spread of *Phytophthora* dieback
- damage to infrastructure such as lawns, reticulation, fences, and gates.

This practice also raises potential safety issues for the so-called geocachers, as they enter into unsafe or unauthorised areas in their effort to find a challenging location to hide their container. This risk remains for those who are looking to find the cache and potentially for others who inadvertently come across the site. Within the City of Stirling, more than 300 geocaching sites have been identified, with 15 located within Trigg Bushland (City of Stirling, 2014).

Interestingly, the Geocaching website (2014) indicates that:

- geocachers should have the permission of land managers/owners before hiding a container on their site
- geocachers should promote the ongoing management of the area where they lodge containers through rubbish removal
- that geocachers hide their containers in locations that are special to them, such as in a local park, at the end of a hike, or underwater
- parks, land managers, and police departments are considered to be a key component of the geocaching community, and offer free premium memberships to personnel in these sectors
- there is a goal to develop and disseminate tools and educational materials in an effort to enhance the awareness, understanding and enjoyment of geocaching.

However, there is no information to outline the potential negative environmental impacts associated with the practice, or provide an 'environmental code of practice for geocachers'.

Recommendations

24.1 Promptly remove any geo-cache container discovered during routine maintenance inspections of the Reserve.

24.2 Promptly reinstate areas impacted or damaged by geo-caching activity.

3.2 Access

Access for pedestrian and vehicle use is available throughout Trigg Bushland Reserve (Figure 26). Note that the majority of tracks are suitable for use by both pedestrians and vehicles, however there are a small number that are suited to pedestrians only, such as the bushland appreciation trail within Sector 4.

The majority of tracks within each Sector are constructed of crushed limestone, which allows pedestrian access as well as providing a trafficable surface suited for the passage of a utility vehicle for maintenance and/or fire fighting activities. Sectors 1, 2, 3, and 5 are fenced with pedestrian and vehicle access gates at key locations around the perimeter. Bollards have been placed around the perimeter of Sector 4 to limit unauthorised vehicle access. Appendix 10 shows the vehicle and pedestrian access within each of the Sectors. General access within the Reserve is considered to be adequate for the current uses.

Current issues with general access include the following:

- the vehicle access way near Jeanes-Prisk Reserve needs attention in that it is very sandy within the verge and difficult to pull safely out onto the road
- the vehicle gate in the south-east portion of Sector 3 does not lead anywhere
- a vehicle gate in the western portion of Sector 2 is overgrown with vegetation and difficult to open
- one of the tracks in Sector 2 traverses a steep dune ridge, and it is difficult to determine the direction of the track and any users on the opposite side (Figure 26)
- turnstile-type access for pedestrians acts to exclude some potential users, including people in wheelchairs and those pushing prams.

A small number of 'goat tracks' are present within Sectors 1 and 5. It is recommended that these are closed and rehabilitated (Figure 26), with the exception of the track from Karrinyup Road through to Elliott Road which is used on a regular basis in the absence of any closer access points. There is also a gate present in Sector 5 that contributes to the formation and continued use of the goat track as there is no pathway from the gate to existing access ways. In order for the closure of the goat track in this sector to be effective and maximise the chance of regeneration, the gate will also need to be removed. This will assist with reducing fragmentation and its associated pressures within the Reserve. Any other gates that are present in areas without access paths should also be removed to reduce the impacts associated with the development of goat tracks. It is likely that other goat tracks will develop over time, and it is recommended that these are reviewed and either allowed to regenerate or be rehabilitated as appropriate.

Recommendations

25.1 Review the situation at the access gate at the south-eastern portion of Sector 5 near Jeanes-Prisk Reserve and either repair the sandy eroded area or remove the gate.

25.2 Undertake the closure and rehabilitation of goat trails identified in Sectors 1 and 5.

25.3 Formalise the track from Karrinyup Road through to Elliott Road in the absence of alternative access points nearby, including the installation of gates, bins, and 'poo-pouch' bags.

25.4 Undertake the prompt closure and rehabilitation of new goat trails identified in future.

25.5 Remove the gate in Sector 5 that is contributing to the continued use of the current goat trail associated with this access.

25.6 Undertake the removal of gates in similar situations in other locations within the Reserve.

25.7 Install safety signage to denote 'Crest' just on the track that crosses the ridge crest in Sector 2 to indicate limited visibility.

25.8 Review all turnstile-type access gates to enable easier access by a greater number of legitimate users, including those with prams and wheelchairs but excluding trail bikes and motor bikes; a chicane-type access design would facilitate this.

3.2.1 Emergency Access

Vehicle entry points also act as emergency vehicle access ways within all Sectors. Requests from the Department of Fire and Emergency Services indicated that they would like the City of Stirling to consider the provision of additional emergency access points in Sectors 1 and 2. A review of the proposed additional access within Sector 1 indicates that this location is unlikely to be feasible due to the steepness of the slopes and the difficulties this could potentially pose to vehicle movement. An additional emergency access location is possible in Sector 2, with a suggested location provided in Figure 27.

Recommendation

26.1 Install an additional emergency vehicle access gate in Sector 2 as outlined in Section 3.2.1 of the Management Plan.

3.2.2 West Coast Highway

It is recognised that damage to Trigg Bushland Reserve fencing occurs from motor vehicle accidents, creating an ongoing management issue for the City of Stirling. It is recommended that some form of additional vehicle barrier is added in affected areas to reduce ongoing repair/maintenance costs. Options include metal or concrete barriers and bollards. Main Roads would need to be consulted on the type of barrier to ensure compliance with current design guidelines. It would also be appropriate for the City of Stirling to have Main Roads investigate whether or not speed limit signs are missing, and if so, have them replaced.

Recommendations

27.1 Investigate, in consultation with Main Roads WA, the cost effectiveness of installing a vehicle barrier along the section of West Coast Highway that is frequently subject to vehicle crashes into bushland.

27.2 Request Main Roads to investigate whether or not speed limit signs are missing in the vicinity of the affected area, and if so, to have them replaced.

Figure 26: Access, Trigg Bushland Reserve

Figure 27: Proposed New Emergency Access Location, Trigg Bushland Reserve

3.3 Current Management Controls and Programs

3.3.1 City of Stirling

Management of Trigg Bushland Reserve is primarily the responsibility of the City of Stirling, as per the management orders documented by the Department of Lands (Section 1.2). Management activities include:

- ongoing day-to-day maintenance activities
- weed control
- planting
- erosion control – (paths and access ways, dunes)
- infrastructure installation and maintenance (e.g. access ways, signs, fences, lookouts, seats, bins)
- pest and feral animal control
- disease management
- rubbish removal
- stormwater drainage
- graffiti and vandalism removal and repair.

All activities are carried out in accordance with City of Stirling standard operating procedures and guidelines as described in the Local Biodiversity Strategy (City of Stirling, 2010) and Green Plan 2 (City of Stirling, 2002). When the use of contractors is necessary to assist with management activities, they are required to adhere to the City's procedures, policies and guidelines.

3.3.2 Other Trigg Land Managers

The Metropolitan Water Authority (now the Water Corporation) has been allocated management orders for a small portion of Trigg Bushland Reserve for water supply purposes. While they have the major responsibility for management of weeds and other issues within their tenure area, it is recommended that such activities are consistent with those carried out by the City of Stirling to ensure the broader management aims and objectives of the Reserve are achieved. The Water Corporation facility has also been the target of regular graffiti vandalism and rubbish in the form of empty spray cans.

St Mary's Anglican Girls School is also located within the broader Trigg Bushland Reserve boundaries, adjacent to Sectors 2, 3 and 5. There is anecdotal information that suggests that inappropriate dumping of garden waste and other materials has occurred within the Reserve boundary in close proximity to the school. As this type of material detracts from the visual amenity of the site and has the potential to spread weeds, regular checking through normal maintenance activities and communication with relevant school personnel as required is recommended.

Recommendations

28.1 Establish communication with adjoining land managers, principally, the WA Water Corporation and St Mary's Anglican Girls School to ensure that land management activities on neighbouring areas are consistent with the broader conservation and recreational objectives of Trigg Bushland Reserve with specific focus on issues such as green waste dumping, weed control, and fire management.

28.2 Conduct routine assessment of neighbouring land uses for possible impacts, such as weed invasion, green waste dumping, fire hazards and other risks.

3.3.3 Friends of Trigg Bushland

The Friends of Trigg Bushland is an active community group with an interest in the protection of the ecological and environmental values of the Reserve (http://www.triggbushland.org.au/). As with many community groups, membership and activity levels can be variable over time. Typical activities carried out within the Reserve by the group include revegetation activities and weed control. The Friends of Trigg Bushland also conduct quarterly nature walks and contribute to public education regarding the environmental, ecological and historical values of the Reserve. These ongoing activities have contributed to the development of a significant knowledge base in relation to the Reserve in general, along with its flora and fauna, with information collected included on the Friends of Trigg Bushland's website. It is expected that the collaboration between the City of Stirling and the Friends of Trigg Bushland will continue in the longer term.

3.3.4 Research and other Collaborative Opportunities

Given the size of Trigg Bushland along with its natural values, there are many opportunities to strengthen and develop new partnerships with a variety of organisations, particularly educational and research institutions. The features, ecological, environmental, social, cultural and heritage values of the Reserve could form the basis of active educational programs in local primary and high schools. The site could contribute to research efforts in a number of subject areas at tertiary and research institutions. Research projects within the Reserve could include those relating to:

- detailed flora and vegetation seasonal surveys to confirm species currently present and those that no longer occur within the Reserve
- fauna surveys, including active trapping programs throughout all sectors of the Reserve
- fungi surveys
- geological components
- heritage/environmental trail route and interpretive locations
- vegetation health decline
- Aboriginal and other heritage values of the site
- visitor usage surveys in each Sector of the Reserve.

The proximity of the Reserve to Star Swamp and the Henderson Environmental Centre offers opportunities as a venue to assist with research projects.

Recommendation

29.1 Investigate, in conjunction with the Friends of Trigg Bushland, joint opportunities for ecological research and community education that will contribute to improved management of Trigg Bushland Reserve.

4.0 Assessment of Management Needs

4.1 Pressures for Future Use

Trigg Bushland Reserve is a large area set aside for conservation, dune protection, recreation and education. The nature of the parabolic dunes means that usage in some areas is limited, and is not likely to increase in the short-to-medium term. Similarly, anecdotal information suggests that the presence of the dunes was a contributing factor to their preservation as they were seen as difficult to build on. Accordingly, future use in Sectors 1, 2, 3 and 5 is unlikely to change significantly from the current situation. However, pressures and impacts within Sector 4 are greater due to its greater accessibility to nearby residential areas. Usage within Sector 6 is largely associated with the dual-use path, and is also not expected to change significantly in the short-to-medium term.

It is recommended that any future development either within the Reserve, or in areas outside the Reserve boundaries are carefully considered in terms of likely impacts to the conservation, ecological and heritage values of the site, with impacts avoided wherever possible to do so. In addition, it is recommended that further fragmentation of the Reserve is avoided.

Recommendations

30.1 Future development activities within Trigg Bushland, or those in areas external to the Reserve that have the potential to impact on the conservation and other values of the site are considered and minimised where possible to do so.

30.2 Further fragmentation of the Reserve is avoided.

4.2 Reserve Management

The current management practices implemented by the City of Stirling have been effective in maintaining the ecological, environmental and heritage values of Trigg Bushland Reserve. However, it is recognised that ongoing vigilance and assessment will enhance those values in the future. Key management activities will continue to be those outlined in Section 3.3.1. A summary of typical management issues and examples of their environmental consequences is provided in Table 10.

Table 10: Trigg Bushland Management Issues and Associated Environmental Consequences

Management Issues	Environmental Consequences
Sector 1	
Domestic animals	▪ Injury or death of native fauna ▪ Reduced biodiversity
Drainage	▪ Introduction of weed species ▪ Pollution – nutrients, herbicides, pesticides, hydrocarbons, phenols ▪ Erosion
Fencing in need of repair	▪ Unauthorised entry into bushland, which may increase the risk of arson, erosion and vegetation degradation ▪ Safety hazard

Management Issues	Environmental Consequences
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual trees if fires too intense
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Illegal structures/cubbies	▪ Destruction of vegetation for building materials ▪ Proliferation of informal tracks ▪ Rubbish, including hazardous wastes ▪ Increased potential for fire ▪ Erosion ▪ Interference with fauna species ▪ Reduced species diversity
Informal pedestrian tracks	▪ Damage to native vegetation ▪ Introduction of weeds ▪ Reduced vegetation condition ▪ Altered vegetation type ▪ Impacts to threatened species and ecological communities ▪ Erosion ▪ Loss of vegetation on dunes
Introduced fauna	▪ Predation of native fauna ▪ Reduced faunal diversity ▪ Erosion ▪ Grazing of native flora species ▪ Competition for food, habitat and other resources – e.g. nesting hollows
No bins	▪ May lead to increased littering ▪ Reduced visual amenity
Soil disturbances/erosion	▪ Damage to native vegetation ▪ Source of weeds ▪ Potential for plant pathogens
Vandalism	▪ Damage and potential death of vandalised plants/trees ▪ Increased potential for pest or pathogen infestation on injured plants ▪ Potential decline in vegetation condition

Management Issues	Environmental Consequences
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Increased risk of fire ▪ Altered vegetation structure ▪ Increased competition with native flora for resources
Sector 2	
Domestic animals	▪ Predation of native fauna ▪ Reduced faunal biodiversity
Drainage	▪ Introduction of weed species ▪ Pollution – nutrients, herbicides, pesticides, hydrocarbons, phenols ▪ Erosion
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual trees if fires too intense
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Introduced fauna	▪ Predation of native fauna ▪ Reduced faunal biodiversity ▪ Grazing of native vegetation ▪ Competition for food, habitat and other resources – e.g. nesting hollows
No vehicle access from West Coast Highway	▪ Reduced ability to undertake maintenance ▪ Reduced emergency access
Old car body	▪ Safety hazard for land managers and emergency personnel ▪ Reduced native vegetation coverage
Overgrown vegetation at vehicle access gate	▪ Reduced ability to undertake maintenance ▪ Reduced emergency access
Steep hill crest	▪ Potential damage to vegetation (if vehicles veers off track) ▪ Injury or death of native fauna ▪ Safety hazard for emergency respondents
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Altered vegetation condition ▪ Increased risk of fire ▪ Increased competition for resources

Management Issues	Environmental Consequences
Sector 3	
Domestic animals	▪ Predation of native fauna ▪ Reduced faunal biodiversity
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual trees if fires too intense
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Informal pedestrian tracks	▪ Introduction and spread of weeds ▪ Reduced vegetation condition ▪ Damage to native vegetation ▪ Altered vegetation structure ▪ Erosion, especially on dunes ▪ Impacts to threatened species and ecological communities
Introduced fauna	▪ Predation of native fauna ▪ Reduced faunal biodiversity ▪ Erosion ▪ Grazing of flora species ▪ Competition for food, habitat and other resources – e.g. nesting hollows
Pedestrian gate that does not lead to any formal pathways	▪ Proliferation of informal tracks ▪ Erosion ▪ Reduced vegetation condition
Vegetation blocking vehicle access gate	▪ Reduced ability to undertake maintenance ▪ Reduced emergency access
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Increased competition for resources for native flora ▪ Increased fire risk ▪ Altered vegetation structure
Sector 4	
Domestic animals	▪ Injury or death of native fauna ▪ Reduced faunal biodiversity

Management Issues	Environmental Consequences
Drainage into sector, and drainage sump	▪ Weed invasion ▪ Pollution – nutrients, herbicides, pesticides, hydrocarbons, phenols ▪ Erosion
Dumped soil	▪ Damage to native vegetation ▪ Introduction of weeds or pathogens
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual trees if fires too intense
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Informal pedestrian track	▪ Damage to native vegetation ▪ Introduction of weeds ▪ Reduced vegetation condition ▪ Altered vegetation type ▪ Impacts to threatened species and ecological communities ▪ Erosion
Introduced fauna	▪ Predation of native fauna ▪ Reduced faunal biodiversity ▪ Grazing of native flora species ▪ Erosion ▪ Competition for food, habitat and other resources – e.g. nesting hollows
Litter	▪ Reduced aesthetic amenity
Old fencing in need of removal/repair	▪ Allows unauthorised entry into bushland, which may increase risk of arson, erosion and vegetation degradation ▪ Safety hazard
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Increased competition for resources for native flora ▪ Increased fire risk ▪ Altered vegetation structure
Sector 5	
Domestic animals	▪ Injury or death of native fauna ▪ Reduced biodiversity

Management Issues	Environmental Consequences
Drainage into sector	▪ Weed invasion ▪ Pollution – nutrients, herbicides, pesticides, hydrocarbons, phenols ▪ Erosion
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual trees if fires too intense
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Graffiti	▪ Loss of visual amenity
Introduced fauna	▪ Predation of native fauna ▪ Reduced native biodiversity ▪ Grazing of native flora species ▪ Erosion ▪ Competition for food, habitat and other resources – e.g. nesting hollows
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Altered vegetation structure ▪ Increased risk of fire ▪ Increased competition with native flora for resources
Sector 6	
Domestic animals	▪ Injury or death of native fauna ▪ Reduced biodiversity
Dumped furniture	▪ Damage to native vegetation ▪ Destruction of habitat ▪ Erosion of dunes ▪ Reduced visual amenity
Fire	▪ Proliferation of fast growing weed species after fire ▪ Reduced habitat and resources for fauna ▪ Altered vegetation type and condition if fires too frequent ▪ Death of individual shrubs if fires too intense

Management Issues	Environmental Consequences
Geocaching	▪ Trampling or other damage to native vegetation ▪ Rubbish dumping ▪ Habitat destruction ▪ Graffiti to trees and infrastructure ▪ Weed invasion ▪ Spread of Phytophthora dieback ▪ Damage to infrastructure such as lawns, reticulation, fences, and gates
Introduced fauna	▪ Predation of native fauna ▪ Reduce biodiversity ▪ Grazing of native flora ▪ Erosion ▪ Competition for food, habitat and other resources
Weeds	▪ Decreased vegetation condition ▪ Decreased biodiversity ▪ Altered vegetation structure ▪ Increased risk of fire ▪ Increased competition with native flora for resources

5.0 Management Proposals

Ongoing management requires identifying strategies and options for maximising the retention of the natural, ecological and environmental values of Trigg Bushland Reserve whilst minimising impacts from human and other activities. These are described in this section.

5.1 Protection Mechanisms

The management of natural areas is guided by various Commonwealth, state and local government legislation, policies, and procedures. Key mechanisms that are relevant to Trigg Bushland Reserve are summarised in Table 11.

Table 11: Key Protection Mechanisms – Trigg Bushland Reserve

Mechanism	Organisation	Purpose
Environment Protection and Biodiversity Conservation Act 1999	Department of Environment (Commonwealth)	Protection of matters of national environmental significance, including threatened flora and fauna species, migratory fauna species, threatened ecological communities, and migratory species protected under international agreements.
Land Administration Act 1997	Department of Lands (WA)	Designation as Class A reserve, which can only be amended through the process defined in Section 4.2(4) of the Act, including the requirement for the Minister to advertise the intent to make amendments at least 30 days prior to the order being made.
Environmental Protection Act 1984	Department of Environment Regulation (WA)	Protection of environmental values of the natural world as a result of development, mining and the operation of industry.
Wildlife Conservation Act 1950	Department of Parks and Wildlife (WA)	Designating threatened and priority flora, fauna and ecological communities listed in Western Australia in need of protection.
State Planning Policy 2 – Environment and Natural Resources	Department of Planning (WA)	Protect, conserve and enhance the natural environment; promote and assist in the wise and sustainable use and management of natural resources.
State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region	Department of Planning (WA)	Planning to ensure the protection of Bush Forever and local bushland areas.
Local Biodiversity Strategy	City of Stirling	Promote natural area conservation and the protection of flora, fauna and ecological communities within the City of Stirling.

Mechanism	Organisation	Purpose
Greenplan 2	City of Stirling	Promote the protection of smaller bushland remnants because of their role in providing local and regional ecological linkages, and their role in the longer term survival of larger bushland areas.

5.2 Goals and Objectives

The overall management goal for Trigg Bushland Reserve is to maintain the natural, ecological and environmental values of the Reserve whilst maintaining appropriate types and levels of recreation and education. Management objectives include:

- maintain the biological diversity of the Reserve, consistent with the City's Local Biodiversity Strategy (City of Stirling, 2010)
- ensure passive recreational activities are carried out within conservation areas, with active recreation confined to designated areas, such as ovals
- manage processes that threaten the biological diversity of Trigg Bushland, including weed, fire, pest and feral fauna, and *Phytophthora* dieback
- resolve site disturbances and protect the integrity of ecosystems in the Reserve
- ensure recreational activities within the Reserve are consistent with its natural, ecological and environmental values
- promote the appropriate ecological and environmental educational opportunities of the Reserve.

5.3 Management Strategies

In order to achieve the goals and objectives, ongoing active management will continue to be required within Trigg Bushland Reserve.

5.3.1 Flora and Vegetation

It is recommended that:

- regular observations of the flora and vegetation occurring within Trigg Bushland Reserve continue to be made and that species data lists are regularly updated
- the management of threatening processes such as the presence of weeds, plant pathogens and diseases, and fire are managed on an ongoing basis in accordance with City of Stirling policies, procedures and management practices
- vegetation condition changes over the medium to longer term in response to threatening processes are monitored, with regular reviews at five yearly intervals to assist with ongoing management
- restoration and revegetation activities occur after disturbance, with activities including weed control, erosion control, and the planting or direct seeding of native species; where possible to do so, local provenance seed is used to grow tubestock used during replanting.

5.3.2 Weeds

The presence of weeds represents the biggest threat to the biodiversity of Trigg Bushland Reserve, and will require ongoing treatment. Weed management strategies include:

- mapping the density and location of weeds every 3 to 5 years
- prioritising weed control measure based on species present and the extend and density of dispersion
- the removal of Fig Trees other than the original historic parent tree in Sector 2 (refer Section 2.4.6)
- mapping and removal of non-local native trees
- prompt removal of dumped garden waste
- developing a balance between chemical control and manual weed removal.

5.3.3 Native Fauna

It is recommended that regular observations of fauna species within Trigg Bushland Reserve be undertaken as a minimum, and where possible formal surveys including trapping activities carried out every five years.

5.3.4 Introduced Fauna

It is recommended that the City of Stirling continue to control pest and feral fauna species in accordance with current policies, practices and procedures. It is expected that target species would include the feral honey bee, the European rabbit and the European fox. The control of introduced avifauna species may require discussion with the Department of Parks and Wildlife.

5.3.5 Domestic Animals

It is recommended that the City develop and implement a community awareness programme outlining the impacts of dogs to the bushland ecosystem and about dog ownership responsibilities to assist in the conservation of these important areas. The aim of the programmes is to require dog owners to have their dogs under effective control in the interest of bushland conservation although no declaration will be made of Trigg Bushland Reserve as a 'dogs on leash' area. Effective control means that a dog is able to respond when called by the owner/ handler, and being close enough to be placed on leash, as necessary. It is also recommended that a review be undertaken of the above approach at the end of 2016 to determine its success or otherwise with the view to the adoption of alternate strategies, if required.

It is also recommended that the City of Stirling develop and implement a community awareness programme about the Reserve's designation as a cat-exclusion zone and the new requirements under the *Cat Act 2011* (WA).

5.3.6 Fire

As frequent fires can result in changes in vegetation over time, it is recommended that the City of Stirling:

- undertake annual site assessments with the Department of Fire and Emergency Services (DFES) on bushfire hazard issues as well as access for emergency response vehicles
- undertake flora surveys in burnt areas after they have recovered sufficiently to determine what impacts are occurring to flora species present, vegetation type and condition

- surveys of fauna within burnt areas are also recommended at regular intervals to determine impacts and rate of recovery after fire
- continue to undertake weed control activities to minimise the potential for their establishment during the post fire recovery period
- pruning overhanging vegetation for compliance with required horizontal and vertical clearances.

An additional emergency access location is recommended in Sector 3 (Figure 27). Other suggested emergency access in Sector 1 is not considered feasible due to the presence of the steep parabolic dunes and the major engineering works that would be required if it were to proceed.

5.3.7 Pathogens and Disease

It is noted that the 2011 Dieback assessment carried out by Glevan and Associates only considered Sector 4, so it is recommended that assessments are carried out in Sectors 1,2,3, and 5. A Dieback assessment in Sector 6 is not warranted due to the presence of limestone sands which can inhibit dieback indicators.

Regular review of aerial imagery in the form of multi-spectral analysis will assist with the identification of Armillaria and other forms of tree health decline.

5.3.8 Access

Pedestrian and vehicle access within Trigg Bushland Reserve is considered to be adequate, with management primarily associated with the maintenance of the existing infrastructure. There are a small number of informal tracks recommended for closure (Sectors 1 and 5), with one from Karrinyup Road to Elliott Road recommended for formalisation (Figure 26). It is recommended that the gate in the vicinity of the Sector 5 track is removed to minimise impacts associated with its ongoing presence.

There is, however, the need for clearer definition of vehicle entry points, particularly for emergency purposes. This may be achieved through standardisation of gate types and signage.

Limestone tracks will be maintained in accordance with current City of Stirling practices and procedures, with those located on steeper areas assessed at least annually due to the increased potential for erosion. General observations will occur during regular inspections by City personnel.

5.3.9 Track Naming

The meandering nature of many of the tracks through the various Sectors within the Reserve means that a naming system based on a grid references will not be feasible. An alternative system, such as naming tracks after plant and/or animal species found within the Reserve, is recommended for consideration by the City of Stirling.

5.3.10 Signage

It is recommended that the City of Stirling ensure signage within the Reserve is consistent with the City's Signage Style Guide (City of Stirling, 2012). The installation of locator signs and directional track names are considered to be a priority, with other signs installed or replaced as required.

It is recommended that major Reserve entry signs are updated and that regulatory signs reflect a desire to resolve issues experienced through providing an indication of the conservation and other values of the site, and how a particular behaviour will contribute to maintaining those. For example, keeping dogs on leashes reduces impacts to flora and fauna within the Reserve.

5.3.11 Heritage Trail

It is recommended that the natural, ecological, and environmental values present within Trigg Bushland Reserve are highlighted through the expansion of the existing heritage trail that complements the existing trail within and external to the Reserve. This could include individual trails within each of the Sectors, as well as considering linkages with the broader City of Stirling walk trail network. It is recognised that signage and trail markers will need to be in conformity with signage already present as part of the Scarborough Trigg Heritage Trail.

5.3.12 Rubbish

Unfortunately, bushland reserves are often the target of illegal dumping activities. Types of dumping include green, commercial industrial and general waste. More effective mechanisms to educate the public about the environmental impacts of rubbish dumping are advocated.

It is recommended that the ongoing, regular checking during normal maintenance activities within Trigg Bushland Reserve will be required, and any rubbish observed removed. It is noted that waste materials have been found in the past within the Reserve in the vicinity of St Mary's Anglican Girls School, and which may necessitate ongoing discussions with relevant school personnel to ensure no material is dumped and that management practices within the school grounds are consistent with the conservation values of Trigg Bushland. Rubbish from varying sources has also been encountered in other locations. Ongoing liaison and communication with neighbours is recommended on this issue.

5.3.13 Graffiti Vandalism

Evidence of graffiti vandalism was noted within the Reserve, with the major targets being the tagging of signs. It is recommended that the ongoing management of graffiti will involve its timely removal and review during regular maintenance activities within the Reserve. Alternate signage designs and materials to reduce graffiti impacts and re-instatement costs could also be investigated by the City of Stirling. Note also that graffiti is increasingly common on natural features, such as trees, and will necessitate an approach to removal that minimises damage to bark and trunks or branches.

5.3.14 Illegal Structures ('Cubbies')

Illegal structures colloquially known as cubbies have been constructed within Trigg Bushland Reserve. As well as damaging native vegetation and/or the soil, the construction of cubbies often

results in large items being brought into the Reserve to aid in their construction. There is also a potential fire hazard when matches, lighters, cigarette butts and similar are disposed of inappropriately. Their continued use can also result in an accumulation of rubbish, including hazardous items such as broken glass and syringes. It is recommended that the management of illegal structures will involve the prompt removal as soon as practicable after they are found, and any disturbance to the soil and vegetation restored where possible to do so. More effective mechanisms to educate the public about the environmental impacts of these structures is also recommended.

5.3.15 Trail and Motorbikes

It is recommended that access by trail and motorbikes is discouraged through the installation of chicanes which make access difficult. It is also recommended that signs of trail and motorbike use is checked for during regular inspection and maintenance activities and any damage repaired as soon as practical to do so.

5.3.16 Geocaching

Geocaching is a new management issue within Trigg Bushland Reserve. It is recommended that evidence of geocaching is reviewed during regular inspection and maintenance activities, with any caches removed and evidence of impacts such as clearing and damage to vegetation restored.

5.3.17 Erosion

Erosion can be a threatening process to the ecological and environmental values of the site, and which may need to be managed on an ongoing basis. The erosion of vehicle and pedestrian access ways is more likely on those with steeper slopes, such as those that occur within Sectors 1, 2, 3 and 5. Assessment of erosion damage on steeper access ways is recommended on an annual basis, while that for those in flatter areas of the reserve can occur less frequently.

The loss of vegetation from the dune system can also lead to erosion in the form of increased sand movement. Management of eroded areas of the dunes will involve revegetation and restoration activities, such as the installation of erosion control matting and active revegetation with local provenance tubestock.

5.3.18 Community and Other Involvement

The importance of community involvement from of the Friends of Trigg Bushland community group and their contribution to the ongoing management of Trigg Bushland Reserve is recognised, with the recommendation that its collaboration with the City of Stirling continue. The values of Trigg Bushland present significant opportunities for education and research in a number of topical areas by primary schools, high schools and tertiary institutions. A number of broad research topics have been suggested in Section 3.3.4 for consideration by the City of Stirling. It is also recommended that all community involvement is carried out in accordance with the *Guide to Working with the Community* and the *Conservation Volunteer Manual* prepared by the City of Stirling.

5.3.19 Stormwater Drainage

Stormwater drainage has the potential to create a number of negative impacts, including:

- pollutant discharge, such as nutrients, herbicides, pesticides, hydrocarbons, and phenols from the surrounding catchment
- discharge of sand, silt and sediment
- movement of seeds from weeds and non-local native flora species
- movement of pathogens, including *Phytophthora* Dieback and Armillaria.

It is recommended that management involve the review of all discharge locations (Figure 8 and Appendix 1), and determining the most appropriate means of minimising impacts of this type. These may include the planting of suitable vegetation to act as a pollutant filter and to reduce the velocity of water exiting the drainpipe, the use of silt traps and/or the installation of rock walls/toes. Community education relating the use of fertilisers, herbicides and pesticides, in particular, is also recommended.

6.0 Implementation

In order to assist with ongoing management, a number of recommendations have been made throughout the management plan for consideration and implementation by the City of Stirling. The recommendations have been summarised in Table 12, with suggested implementation priorities, relevant standards and guidelines, and measurement criteria.

Table 12: Implementation Priorities

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
Reservation and management authority	▪ Consolidation of management authority details	▪ Department of Lands	▪ Determine if a responsible agency has been assigned for Reserve 27906	▪ High	▪ Response from the Department of Lands
			▪ If no responsible agency is assigned for Reserve 27906, the City of Stirling is nominated	▪ High	▪ Response from the Department of Lands
			▪ The management purpose of various Reserves are adjusted in accordance with Table 1 in Section 1.2	▪ Medium – high	▪ Response from the Department of Lands
Reserve significance	▪ Adjustment to Bush Forever Site 308 boundary	▪ Bush Forever documents	▪ Application is made to the Department of Planning to include that portion of Sector 5 highlighted in Figure 3 as part of Bush Forever Site 308	▪ Medium – high	▪ Response from the Department of Planning
Heritage	▪ Ensure cultural heritage values are appropriately recognised	▪ City of Stirling policies and procedures	▪ Investigate current heritage values of the derelict cottage in Sector 1	▪ Medium	▪ Weed removal around the cottage ▪ Outcomes of the review of current state of repair and other values used to determine an appropriate plan for the future of the cottage
Drainage	▪ Minimise pollution and sediment from stormwater in Trigg Bushland Reserve	▪ City of Stirling policies and procedures	▪ The use of sediment traps continues and regular maintenance occurs	▪ Medium	▪ Maintenance records are kept
			▪ Maintaining sumps to ensure adequate stormwater detention time	▪ Ongoing	▪ Water quality within sumps ▪ Maintenance records
			▪ Culverts and stormwater inflow areas are designed and maintained to reduce the velocity of water flow and ensure that erosion is kept to a minimum	▪ As required	▪ Documented design process ▪ Maintenance records ▪ Water quality records
			▪ The use of appropriate vegetation near drain outlets is considered to reduce the velocity of stormwater and act as a pollutant filter	▪ Medium	▪ Design and implementation ▪ Water quality records ▪ Presence of erosion
			▪ Undertake regular inspections for signs of weeds, pathogens and/or pollutants	▪ Ongoing	▪ Inspection and maintenance records are kept
Vegetation type	▪ Update information about current vegetation types present	▪ EPA Guideline Statement 51 – Terrestrial Flora and Vegetation Surveys	▪ Reassess vegetation type every five years	▪ Ongoing	▪ Recording of changes to vegetation type within the Reserve
Threatened and priority ecological communities	▪ Confirm the status and extent of the *Callitris preissii* threatened ecological community (TEC)	▪ *Wildlife Protection Act 1950* (WA) ▪ Department of Parks and Wildlife requirements	▪ Further investigation is carried out in relation to the presence of the *Callitris preissii* TEC	▪ High – medium	▪ Outcomes of discussions with relevant organisations, including the Department of Parks and Wildlife
			▪ Outcomes of the investigative process described above will be used to development appropriate management actions for any *Callitris preissii* (TEC) present	▪ High – medium	▪ Records of the decision making process ▪ Development and documentation of appropriate management strategies

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
			▪ Consider the removal of any *Callitris preissii* confirmed to have been planted in inappropriate locations within the Reserve	▪ High – medium	▪ Records of the decision making and assessment process ▪ Outcomes of decision implementation
Vegetation condition	▪ Update vegetation condition information every five years	▪ Appropriate vegetation condition rating system, such as that attributed to Keighery in Bush Forever Volume 2	▪ Undertake vegetation condition assessments every five years	▪ Ongoing	▪ Recording changes in vegetation condition over time within the Reserve
Fig tree	▪ Other than the original Fig tree, ensure new trees do not become established within the Reserve	▪ City weed management principles	▪ Undertake investigations to determine the original, parent Fig Tree to be retained at the site	▪ High – medium	▪ Identification of original tree and its GPS coordinates
			▪ Remove any additional Fig trees when noted within the Reserve	▪ As required	▪ Number removed
Weed mapping	▪ Enhance weed management activities	▪ DEC (now DPaW) Weed Mapping Standard Operating Procedure (DEC, 2011) ▪ *Agricultural and Related Resources Protection Act 1976* (WA) ▪ Weeds of National Significance ▪ DEC Weed Prioritisation Process 2011	▪ Undertake weed mapping on a regular basis ▪ Include details of weed density ratings as well as locations of infestations when carrying out weed mapping activities	▪ Ongoing, high	▪ Weed mapping outcomes ▪ Recording of weed density ratings with other weed mapping activities ▪ Evaluation of weed control activities over time through flora and vegetation surveys
Weed treatment and management	▪ Control weeds causing damage to bushland	▪ Local Biodiversity Strategy (City of Stirling, 2010) ▪ Green Plan 2 (City of Stirling, 2002).	▪ Control weed species in accordance with current City of Stirling priorities for the site. Treatment will be assessed and monitored in line with the Local Biodiversity Strategy (City of Stirling, 2010b) and Green Plan 2 (City of Stirling, 2002).	▪ High, ongoing	▪ Flora surveys ▪ Vegetation condition mapping ▪ Weed mapping ▪ Weed control records
Plant pathogens and disease	▪ Minimise the decline of trees and other vegetation with Trigg Bushland Reserve	▪ Bush Forever and Conservation values	▪ Undertake regular health monitoring of vegetation during regular management and maintenance activities within the Reserve	▪ Ongoing	▪ Vegetation condition assessment comparisons ▪ Variation over time
			▪ Undertake Dieback evaluation within in Sectors 1, 2, 3 and 5 of the Reserve in addition to Sector 4	▪ High	▪ Consultant reports ▪ Variation over time
			▪ Consider the installation of a disinfectant foot-bath at the nearest entrance to Trigg Bushland from Jeanes-Prisk Reserve to minimise the potential for dieback transfer	▪ High	▪ Decision record ▪ Maintenance records
			▪ Implement an appropriate testing program if an infestation of *Armillaria* is suspected	▪ As required	▪ Outcomes of testing program

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
			▪ Consider the removal of dead material that is hosting the *Armillaria* if an infestation is confirmed	▪ As required	▪ Outcomes of the decision making process ▪ Number and location of stumps and other dead material removed
			▪ Undertake multispectral analysis of vegetation at nominated intervals to assess general declines in vegetation health	▪ Semi-annually	▪ Outcomes of the assessment process provided by the contractor
Fungi	▪ Increase level of knowledge relating to fungi within Trigg Bushland Reserve	▪ Perth Urban Bushland Fungi Field Book	▪ Undertake opportunistic fungi surveys during other assessment activities, particularly flora surveys	▪ Autumn – spring as required	▪ Record of sightings
Fire	▪ Respond to management opportunities represented by fire events within the Reserve	▪ EPA Guideline Statement 51 – Terrestrial Flora and Vegetation Surveys ▪ EPA Guidance Statement 56 – Terrestrial Fauna Surveys ▪ City of Stirling weed management policies practices and procedures	▪ Flora and fauna surveys are undertaken in burnt areas after there has been sufficient recovery to determine level of recovery and changes that can be attributed to fire	▪ As required after a fire event	▪ Outcomes of survey activities
			▪ Undertake weed control after fire to maximise regeneration by native species	▪ As required after a fire event	▪ Maintenance records
			▪ Continue to liaise and work with land owners/occupiers in proximity to Trigg Bushland regarding fire management information and strategies as they relate to the Reserve	▪ Ongoing	▪ Communication records
			▪ Designate Trigg Bushland as an area where no controlled burns are undertaken	▪ High	▪ Documentation of the decision process
Resident liaison	▪ Recognise that influences outside the Reserve boundaries can have an impact ▪ Maintain the 'good neighbour' policy	▪ Catchment management principles and practices	▪ Undertake liaison and communication on management issues and practices as required	▪ Ongoing	▪ Record of communications and outcomes
Fauna observation	▪ Update knowledge of fauna species present within the Reserve	▪ EPA Guidance Statement 56 – Terrestrial Fauna Surveys	▪ Record opportunistic sightings of fauna within the Reserve to complement available data	▪ Ongoing	▪ Outcomes used to update fauna knowledge base
Introduced fauna	▪ Limit the presence of introduced fauna within the Reserve wherever possible	▪ City of Stirling practices and procedures ▪ DPaW and/or Department of Agriculture and Food advice and guidelines	▪ Control populations of the feral Honey Bee, European Rabbit and European Fox ▪ If required, consider the control of the Eastern Long-billed Corella and the Rainbow Lorikeet and consult the Department of Parks and Wildlife to determine the most appropriate control options	▪ Ongoing	▪ Records of control activities ▪ Observations of conditions within the Reserve that can be linked to feral animal control, such as vegetation improvements with reduced rabbit populations
Domestic Animals	▪ Limit impacts associated with the presence of domestic dogs and cats	▪ State and local cat and dog laws, policies and guidelines	▪ Develop and implement a community awareness programme regarding the impact of dogs on the bushland ecosystem and their responsibilities in contributing to the conservation of these areas ▪ Continue to require dog owners to have their animal under control	▪ High	▪ Development and implementation of community awareness program relating to dogs and cats within the Reserve, along with owner responsibilities ▪ Evaluation and review the current approach to dogs within Trigg

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
			▪ Review the approach taken in relation to dogs within Trigg Bushland at the end of 2016 to determine the success or otherwise of the current approach to dogs at Trigg Bushland, with a view to adopting alternative strategies if required ▪ Inform residents that Trigg Bushland is cat-free zone along with the provisions of the *Cat Act 2011* (WA) ▪ Undertake an appropriate public awareness campaign to inform and educate local residents about the proposed changes in relation to dogs and cats and how they will be managed ▪ When the changes relating to dogs and cats are implemented, visits are undertaken by City of Stirling personnel to inform and enforce the changes		Bushland at the end of 2016, and the decision for the way forward in the future ▪ Record of visits, times, infringements or other communications with dog and cat owners
Termites	▪ Ensure termites do not result in damage to property or people	▪ City of Stirling policies, procedures and guidelines	▪ Regular observations of termite presence are recorded	▪ Ongoing	▪ Maintenance and inspection records
			▪ Infestations are treated where their continued presence could result in impacts from falling trees or branches to people or property	▪ As required	▪ Treatment records
			▪ The infested tree in Sector 4 in proximity to nearby buildings is inspected to determine the risk of falling branches and determine if treatment is warranted	▪ High	▪ Decision making record ▪ Treatment outcome
Reserve usage	▪ Assessment of Reserve usage is carried out periodically	▪ Good practice	▪ Regular assessments are carried out to determine the type and frequency of use by visitors ▪ Use outcomes of the assessment process to confirm uses are consistent with management aims and practices	▪ Medium	▪ Assessment outcomes ▪ Adjustments to ongoing management plans and strategies
Fencing	▪ Duty of care	▪ City of Stirling policies, procedures and guidelines	▪ Remove old fencing in a poor state of repair in Sector 4	▪ Medium – high	▪ Maintenance records
Facilities	▪ Contribute to ongoing management aims and objectives	▪ Trigg Bushland Reserve Management Plan ▪ City of Stirling policies and procedures	▪ Install additional bins and dog ‘poo pouches’ in nominated locations ▪ Consider the installation of further seating in various sectors of the Reserve ▪ Extend the paved access from its current location to the lookout in Sector 6 ▪ Undertake a general upgrade of the lookout	▪ Medium	▪ Maintenance records ▪ Seating design and location documents ▪ Documentation relating to extension of paving and other upgrade aspects for the lookout within Sector 6

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
			in Sector 6, including providing seating, shade, and informative signage		
Emergency Access	▪ Ensure appropriate access by fire emergency response vehicles in all Sectors of the Reserve	▪ DFES construction guidelines	▪ Install additional emergency access way in Sector 3	▪ High	▪ Completion of works in consultation with DFES
			▪ Consider installation of gates to replace chain link vehicle barriers	▪ Low	▪ Replacement schedule
Tracks	▪ Tracks and access ways are sufficient and suitable for their purpose	▪ FESA guidelines and policies ▪ Engineering guidelines and requirements	▪ Close off and revegetate designated tracks	▪ Medium – high	▪ Closure and rehabilitation activities
			▪ Formalise the informal track in Sector 3	▪ Medium	▪ Completion of installation works
			▪ Implement a track naming system and install suitable signage	▪ High	▪ Agreed naming system implemented
Heritage/environmental trail	▪ A heritage/environmental trail is developed and installed within Trigg Bushland that complement and links to other designated walk trails	▪ City of Stirling guidelines	▪ Heritage and environmental/ecological or other values are identified within each Sector that will contribute to trails that highlight key features of the Reserve; the trails will also connect with other walk trails within the broader region	▪ Low – medium	▪ Suggested route(s) within each Sector ▪ Heritage and other values highlighted along the trail ▪ Location of interpretation points
Signage	▪ Signage is appropriate and informative	▪ City signage guidelines and policies	▪ Install locator signage	▪ High	▪ Agreed style and implementation
			▪ Install directional signage	▪ Medium – high, ongoing	▪ Changes in signage over time ▪ Community response and changes in behaviour
			▪ Maintain signs on an ongoing basis, including replacing damaged signs and removing those that are no longer required	▪ Ongoing	▪ Maintenance records
Rubbish	▪ Minimise impacts associated with the presence of rubbish	▪ Good practice	▪ Rubbish found during normal maintenance activities is removed and disposed of appropriately	▪ Ongoing	▪ Work records
Graffiti vandalism	▪ Aesthetic values of the Reserve are maintained	▪ City policies and procedures	▪ Removal of graffiti from infrastructure and other locations as soon as is practicable to do so	▪ Ongoing	▪ Number of new graffiti ‘tags’ ▪ Maintenance records
			▪ Procedures for the removal of graffiti from vegetation are developed and implemented	▪ High	
Illegal structures (‘cubbies’)	▪ Degradation associated with cubby construction is repaired as soon as is practicable to do so	▪ City policies and procedures	▪ Cubbies found within the Reserve are dismantled and materials removed ▪ Any clearing or other damage is repaired or restored to its previous condition as appropriate	▪ High, ongoing	▪ Number of new cubbies ▪ Maintenance records
Trail and motor bikes	▪ Access and impacts associated with the use trail and motor bikes is kept to as low as reasonably practical within the Reserve	▪ City policies and procedures ▪ City of Stirling Local Biodiversity Strategy	▪ Ongoing assessment of presence ▪ Restoration of damaged areas ▪ Installation of chicanes or similar at entrance locations	▪ Ongoing	▪ Maintenance and inspection records
Geocaching	▪ Minimise impacts associated with geocaching activities	▪ City policies and procedures	▪ Ongoing assessment of presence ▪ Removal of ‘caches’ ▪ Restoration of disturbed areas	▪ Ongoing	▪ Maintenance and inspection records

Management Category	Objectives	Standard (if applicable)	Management Action	Priority	Measurement Criteria
Other land managers	▪ Maintain good neighbour policy	▪ City policies and procedures	▪ Ongoing communication	▪ As required	▪ Communication records
			▪ Observation of access impacts from neighbouring land uses	▪ Ongoing	▪ Maintenance and inspection records
West Coast Highway	▪ Minimise damage from vehicles to Trigg Bushland from vehicles in the vicinity of West Coast Highway	▪ Main Roads	▪ Investigate the cost effectiveness of installing a vehicle barrier along the section of West Coast Highway where vehicle crashes are known to have resulted in damage to the bushland	▪ Medium	▪ Communication with Main Roads ▪ Investigation of appropriate barrier types ▪ Other documentation associated with the decision of the research process
Research and other collaborative opportunities	▪ Enhance knowledge and partnerships associated with the Reserve	▪ City policies and procedures	▪ In association with the Friends of Trigg Bushland, investigate joint opportunities with for ecological research and community education that will enhance the knowledge base and thus ongoing management of the Reserve	▪ Medium – high	▪ Identification of organisations, such as schools and tertiary institutions that could carry out ecological research ▪ Identification of additional community education options and opportunities ▪ Meeting minutes documenting outcomes of discussion process
Pressures for future use	▪ Maintain and enhance the ecological, environmental and other values of Trigg Bushland	▪ City policies and procedures	▪ Potential impacts from development activities within and external to the Trigg Bushland are considered prior to their implementation with a view to minimising negative outcomes to the various values of the Reserve ▪ Further fragmentation of the Reserve is avoided	▪ Ongoing	▪ Documentation associated with development processes

7.0 Glossary

AHD	Above height datum (height above sea level)
CBD	Central Business District
Cwlth	Commonwealth
DEC	Department of Environment and Conservation (now Department of Parks and Wildlife)
DFES	Department of Fire and Emergency Services
DPaW	Department of Parks and Wildlife
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
ha	Hectare
km	Kilometre
Km/h	Kilometres per hour
mm	Millimetre
MNES	Matters of national environmental significance
NAC	Natural Area Consulting
NAIA	Natural area inventory assessment
pa	Per annum
SCP	Swan Coastal Plain
TBR	Trigg Bushland Reserve
WA	Western Australia
WONS	Weed of national significance

8.0 References

Agriculture and Related Resources Protection Act 1976 (WA)

Birds Australia and Perth Biodiverstiy Program. (2006). *Bird Surveys*. Retrieved March 2014, from Perth Biodiversity Program: http://pbp.walga.asn.au/Publications/BirdSurveys.aspx

Brown, J. (1986). *The Trigg Dune Reserves - Urban Bushland Under Threat*. Retrieved March 31, 2014, from Friends of Trigg Bushland: http://www.triggbushland.org.au/images/Trigg%20Dune%20Reserves%20by%20J%20Brown%20LR.pdf

Brown, K., and Brooks, K. (2002). *Bushland Weeds - A Practical Guide to their Management*. Retrieved September 2014 from: http://www.environmentalweedsactionnetwork.org.au/images/pdf/bushlandweedsbook.pdf.

Bureau of Meteorology. (2014). *Climate Data Online*. Retrieved March 31, 2014, from Bureau of Meteorology: http://www.bom.gov.au/climate/data/

Cat Act 2011 (WA)

City of Stirling. (2008). *Dog Act 1976 Local Government Act 1995 City of Stirling Dogs Local Law 2008*. Retrieved September 2014, from City of Stirling: http://www.stirling.wa.gov.au/Services/Animals-and-pets/Dogs/Dog%20Information/Dogs%20Local%20Law%202008.pdf.

City of Stirling. (2002). *Greenplan 2 (A Strategy for the Conservation of Urban Bushlands to Promote Biodiversity*. Retrieved September 2014 from http://www.stirling.wa.gov.au/Council/Organisational%20information/Strategic%20plans/Green%20Plan%202%20Strategy%20for%20the%20Conservation%20of%20Urban%20Bushlands.pdf#search=greenplan%25202.

City of Stirling. (1999). *Keeping and Control of Cats Local Law 1999.* Retrieved February 2015 from http://www.stirling.wa.gov.au/Services/Animals-and-pets/Cats/Keeping%20and%20Control%20of%20Cats%20Local%20Law%201999.pdf#search=keeping%2520and%2520control%2520of%2520cats%2520local%2520law.

City of Stirling. (1991). *Management Plan - Trigg Bushland Reserve.* Perth, Western Australia: City of Stirling.

City of Stirling. (2010). *Local Biodiversity Strategy.* Perth, Western Australia: City of Stirling.

City of Stirling. (2012). *Signage Style Guide.* City of Stirling, Western Australia: City of Stirling .

City of Stirling. (2014). Personal Communication.

Clifton, D. J. (2010). *Coastal Foreshore Action Plan - Part 2, Trigg Island to Peasholm Street*. Retrieved March 31, 2014, from City of Stirling: http://www.stirling.wa.gov.au/Resident/Sustainability-and-environment/Environment/Environment%20Reports%20and%20Information/Coastal%20Foreshore%20Action%20Plan%20Part%202.pdf

Coupar, G., (2012), Biosecurity Officer, Department of Agriculture and Food WA, personal communication.

Cowan, M. (2013, November). Trigg Bushland Historic Fauna Species Data. *Personal Communication to City of Stirling*.

Department of Agriculture and Food Western Australia. (2014). *Natural Resource Management Shared Land Information Portal* (SLIP NRM Portal). Retrieved September 2014 from http://maps.agric.wa.gov.au/nrminfo/.

Department of Environment and Conservation. (1999). *Environmental Weed Strategy for Western Australia*. Retrieved September 2014 from http://www.dpaw.wa.gov.au/images/documents/plants-animals/plants/weeds/environmental_weed_strategy_wa.pdf.

Department of Environment and Conservation. (2011). *Standard Operating Procedure 22.1 Techniques for Mapping Weed Distribution and Cover in Bushland and Wetlands*. Retrieved September 2014 from http://www.dpaw.wa.gov.au/images/documents/plants-animals/monitoring/sop/sop221_weed_mapping.pdf.

Department of Environmental Protection et al. (2005, May 16). *Flora and Fungi*. Retrieved March 2014, from Friends of Trigg Bushland: http://www.triggbushland.org.au/vegetation.htm

Department of Parks and Wildlife. (2013). *Threatened and Priority Ecological Communities Database Search*. Personal Communication.

Department of Parks and Wildlife. (2014). *Conservation Codes for Western Australian Flora and Fauna.* Retrieved March 31, 2014, from Department of Parks and Wildlife: http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation_code_definitions_18092013.pdf

Department of Parks and Wildlife. (2014b). *FloraBase - the Western Australian Flora*. Retrieved March 2014, from FloraBase: https://florabase.dpaw.wa.gov.au/

Department of Parks and Wildlife. (2014c). *Threatened Species and Communities*. Retrieved March 31, 2014, from Department of Parks and Wildlife: http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities

Department of Regional Development and Lands. (2012). *Crown Land Administration and Registration Practice Manual.* Perth, Western Australia: Government of Western Australia.

Department of the Environment. (2014). *Register of the National Estate - Archive*. Retrieved April 07, 2014, from Department of the Environment: http://www.environment.gov.au/topics/heritage/heritage-places/register-national-estate

Department of Water . (2014a). *Perth Groundwater Atlas*. Retrieved March 31, 2014, from Department of Water: http://www.water.wa.gov.au/idelve/gwa/

Department of Water. (2014b). *Water Information Reporting*. Retrieved March 31, 2014, from Department of Water: http://wir.water.wa.gov.au/_layouts/oawi/ReportViewer.aspx?q=NDM0OTpTaXRlRGV0YWlscw==

Dog Act 1976 (WA)

Environmental Protection Act 1986 (WA)

Environment Protection and Biodiversity Conservation Act 1999 (Cwlth).

Friends of Trigg Bushland. (2006). *Flora and Fungi*. Retrieved March 31, 2014, from Friends of Trigg Bushland: http://www.triggbushland.org.au/vegetation.htm

Friends of Trigg Bushland. (2014). Personal Communication

Geocaching. (2014). *Geocaching*. Retrieved June 2014 from http://www.geocaching.com/.

Glevan Consulting. (2011). *City of Stirling Assessment for the Presence of Phytophthora.* unpublished report prepared for the City of Stirling.

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

Heddle, E. L. (1980). Vegetation Complexes of the Darling System Western Australia. In D. o. Environment, *Atlas of Natural Resources - Darling System, Western Australia* (pp. 37 - 72). Perth: Department of Conservation and Environment, Western Australia.

Heritage Council of Western Australia. (1995, August 21). *State Heritage Register*. Retrieved March 31, 2014, from Trigg/Karrinyup Reserve and Dune System - Place Number 04508: http://register.heritage.wa.gov.au/Public/Inventory/Details/a39cc7a1-2d95-4f8e-8a65-33689a1c1387

Koeller, K. (2011). *Comparison of Invertebrate Diversity and Abundance at Dog and Non-dog Beach Dunes in Scarborough WA*. Unpublished report prepared in completion of Unit of Competency Analyse and Present Research Information as part of the Diploma of Environmental Science (Management) at Central Institute of Technology.

Land Administration Act 1997 (WA)

Landgate. (2014) *WA Atlas*. Retrieved September 2014 from https://www2.landgate.wa.gov.au/bmvf/app/waatlas/

McArthur, W. a. (1980). *Landforms and Soils as an Aid to Urban Planning in the Perth Metropolitan Northwest Corridor, Western Australia.* Australia: Commonwealth and Scientific Research Organisation.

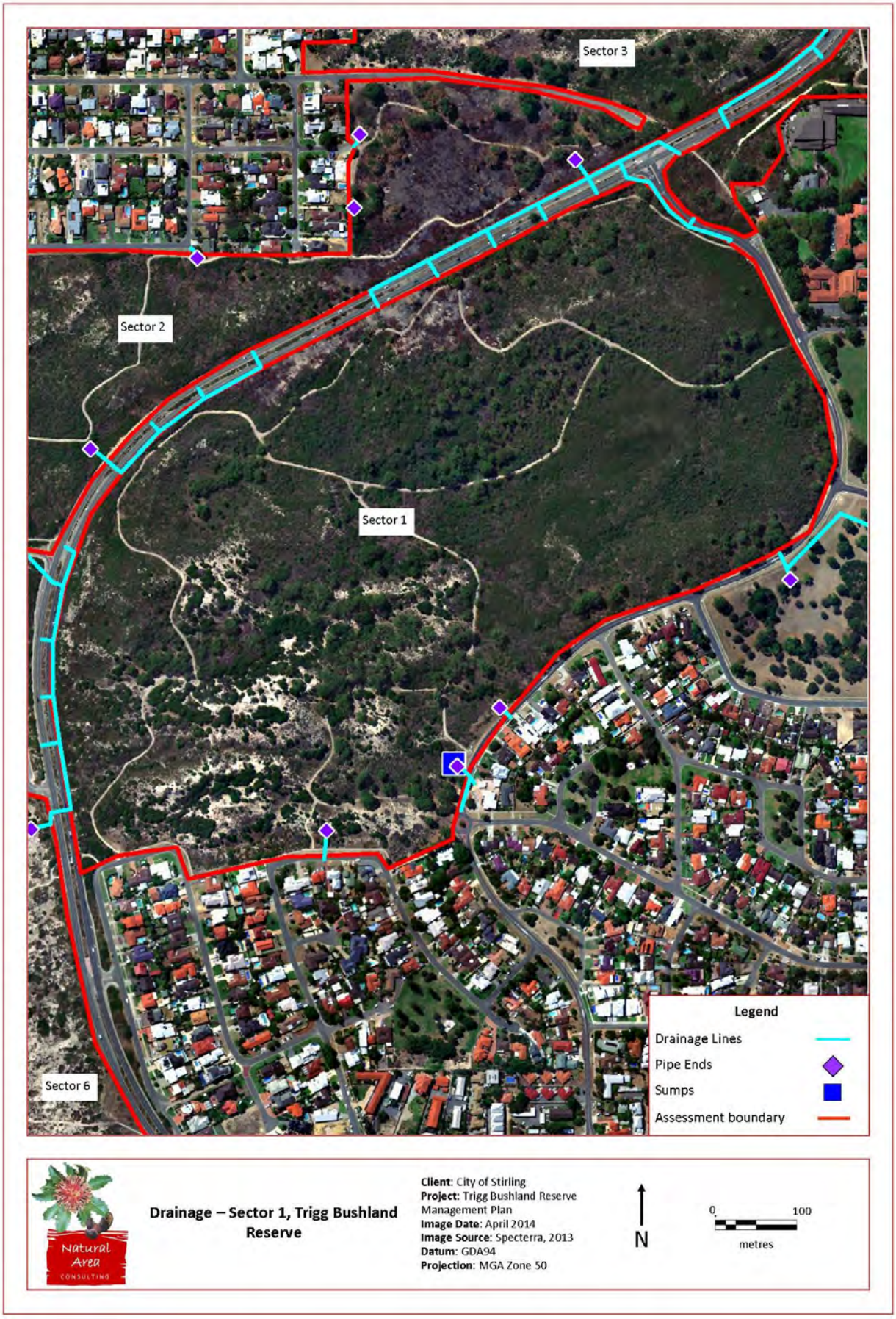
Moore, J., and Wheeler, J. (2008). S*outhern Weeds and their Control*. Bulletin 4744, Department of Agriculture and Food Western Australia, Perth, Western Australia.

Perth Urban Bushland Fungi. (2006, July). *Reports from Fungi Surveys - Trigg Bushland Fungi Repoort 2006*. Retrieved April 28, 2014, from Perth Urban Bushland Fungi: http://www.fungiperth.org.au/Reports-all/Fungi-Surveys.html

Wildlife Conservation Act 1950 (WA).

9.0 Appendices

Appendix 1: Drainage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Sector 2
Sector 1
Sector 6
Legend
Drainage Lines
Pipe Ends
Sumps
Assessment boundary
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Drainage – Sector 1, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
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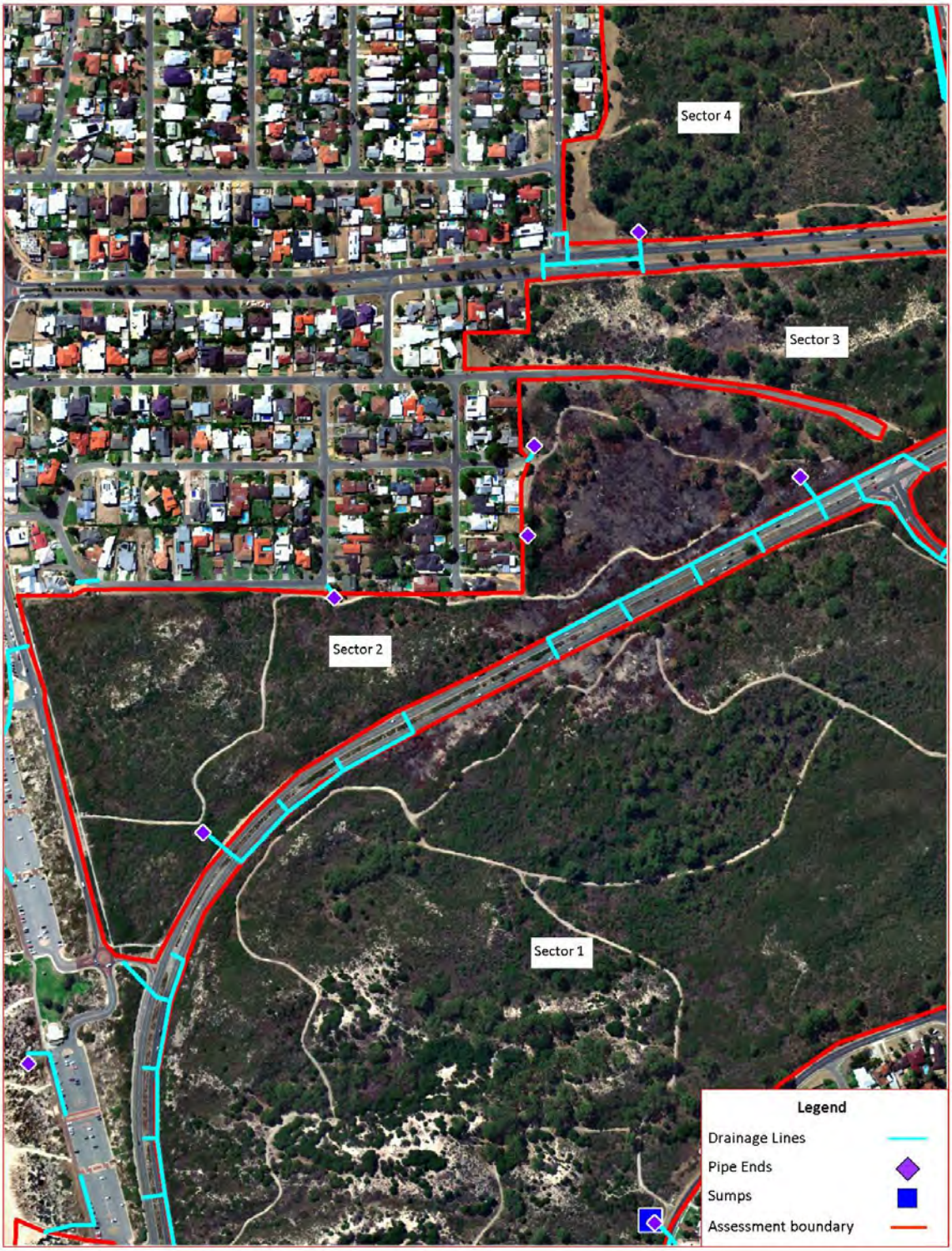
metres



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Project: Trigg Bushland Reserve Management Plan
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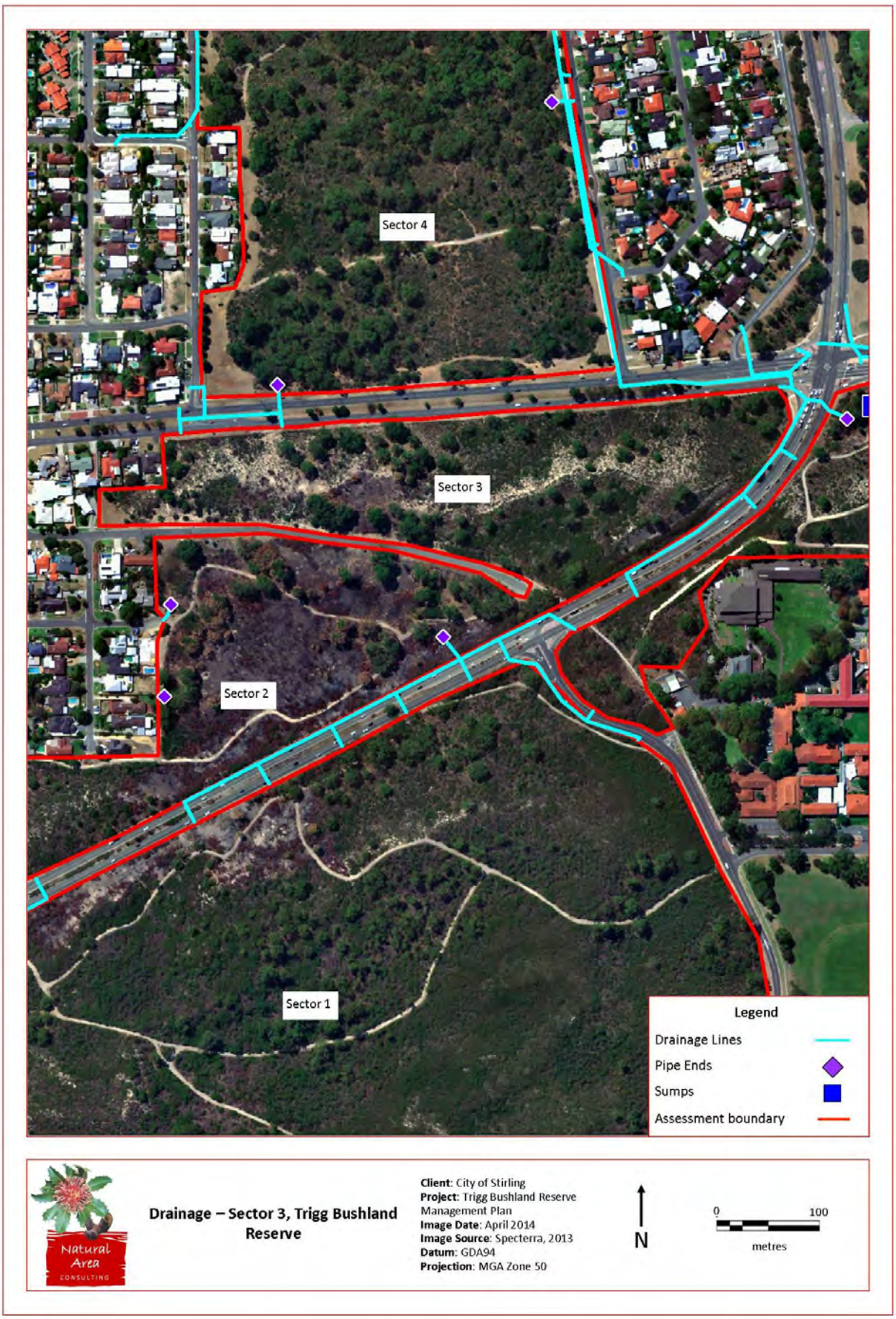
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Pipe Ends
Sumps
Assessment boundary
Natural Area CONSULTING
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Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
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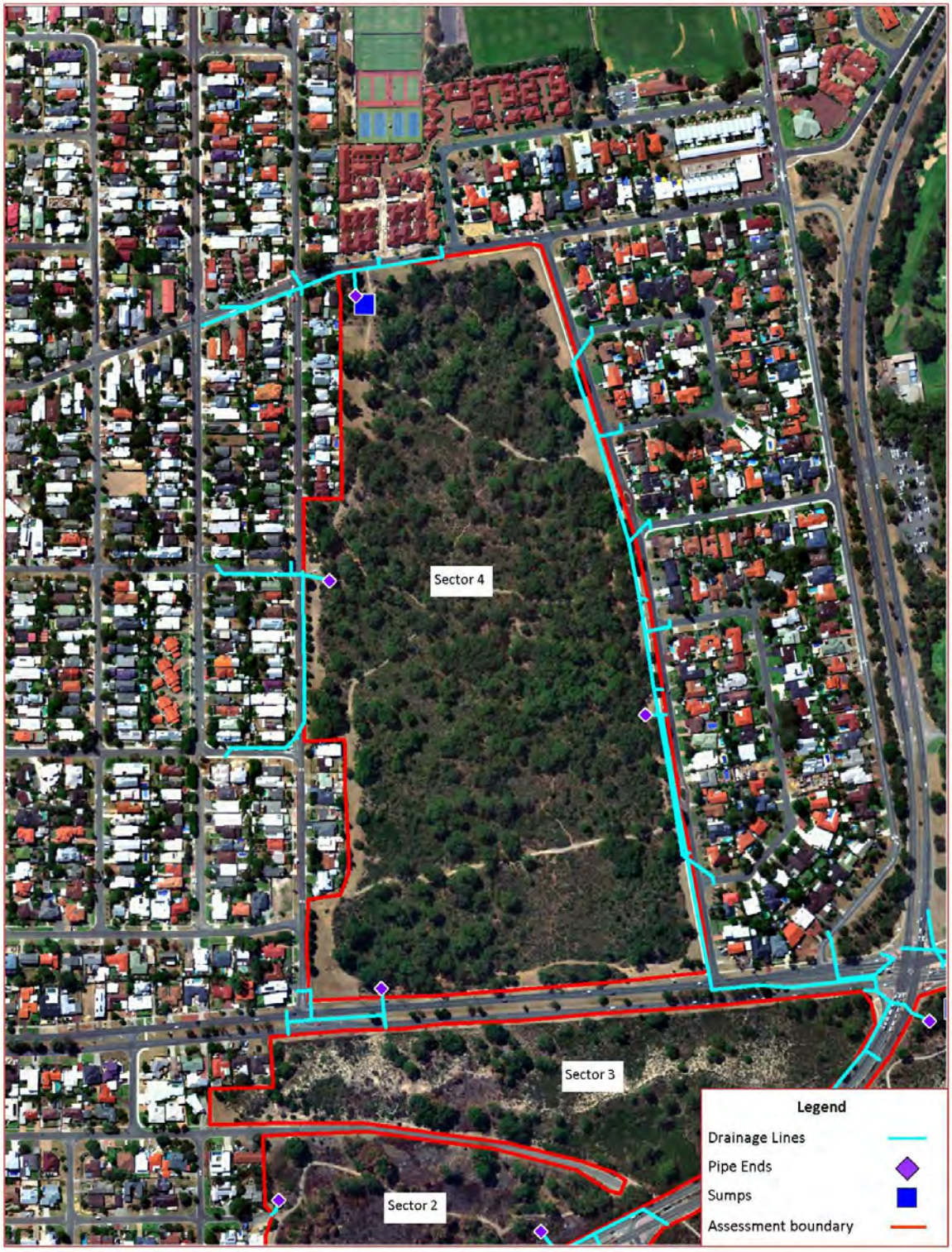
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Legend
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Sumps
Assessment boundary
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Drainage – Sector 4, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
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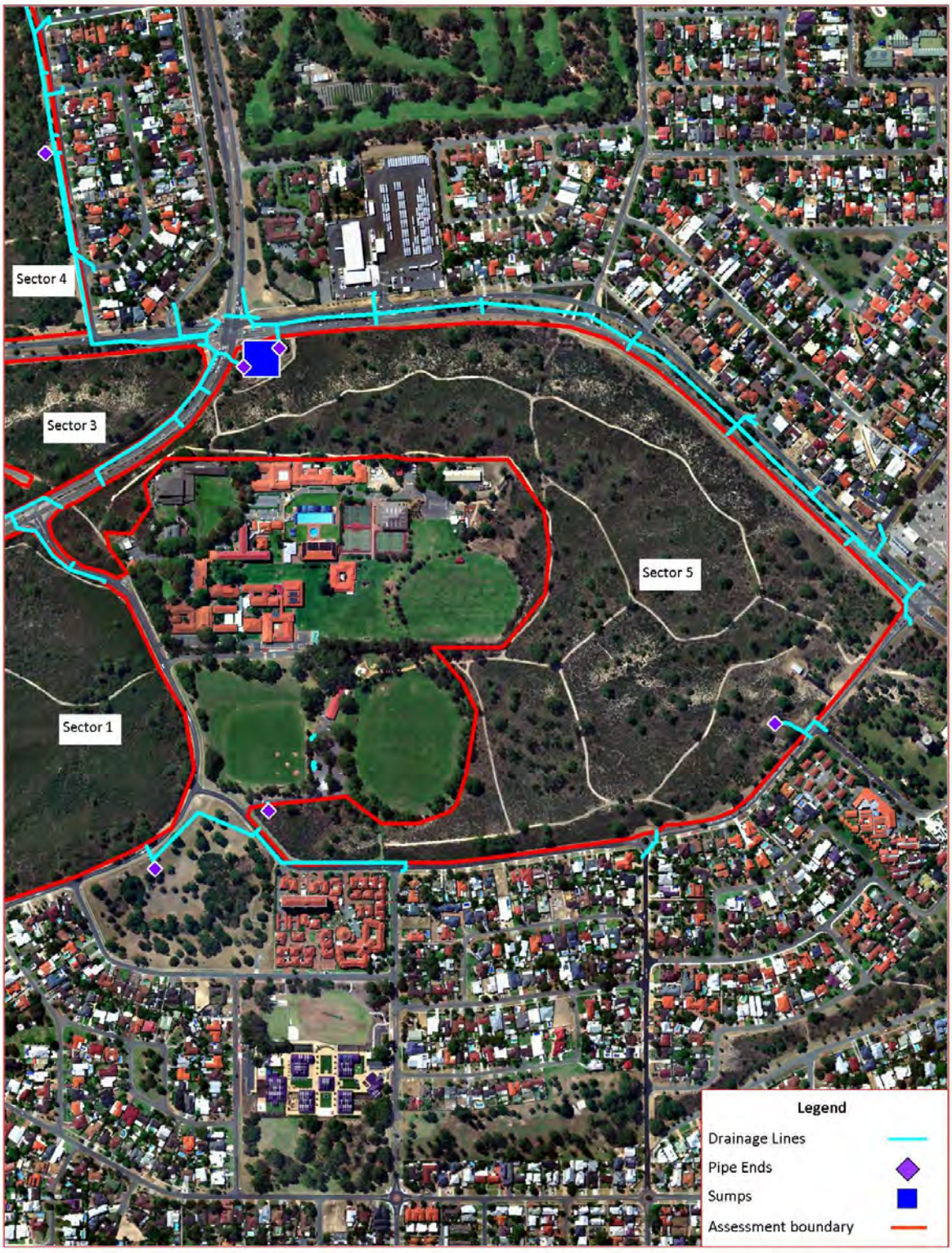
metres



Natural Area CONSULTING

Drainage – Sector 5, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres


Sector 1
Sector 6
Legend
Drainage Lines
Pipe Ends
Sumps
Assessment boundary
Natural Area CONSULTING
Drainage – Sector 6, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50
N
0
100
metres

Appendix 2: Flora Species List

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Class CYCADOPSIDA (Cycads)			
ZAMIACEAE	*Macrozamia fraseri*			
	Macrozamia riedlei		Zamia	
	Class PINOPSIDA (Conifers)			
CUPRESSACEAE	*#Callitris preissii*		Rottnest Island Pine	
	Class LILIOPSIDA (Monocotyledons)			
AGAVACEAE	**Agave americana*		Century Plant	
ASPARAGACEAE	*Acanthocarpus preissii*		Prickle Lily	
	**Asparagus aethiopicus*			
	**Asparagus asparagoides*		Bridal Creeper	
	Dichopogon capillipes			
	Lomandra caespitosa		Tufted Mat Rush	
	Lomandra hermaphrodita			
	Lomandra maritima		Coast Lomandra	
	Lomandra preissii		Mat Rush	
	Lomandra suaveolens		Mat Rush	
	**Ornithogalum arabicum*		Lesser Cape Lily	
	Sowerbaea laxiflora		Purple Tassels	
	Thysanotus arenarius		Limestone Fringed Lily	
	Thysanotus manglesianus		Fringed Lily	
	Thysanotus patersonii		Twining Fringed Lily	
	Thysanotus sparteus		Fringed Lily	
	Thysanotus triandrus		Fringed Lily	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
ASPHODELACEAE	**Trachyandra divaricata*		Dune Onion Weed/Strap Weed	
CANNACEAE	**Canna x generalis*		Canna Lily	
CENTROLEPIDACEAE	*Centrolepis drummondiana*			
COLCHICACEAE	*Burchardia congesta*		Kara/ Milkmaids	
CYPERACEAE	*Baumea juncea*		Bare Twigrush	
	Carex thecata	*Carex preissii*		
	Ficinia nodosa	*Isolepis nodosa*	Knotted Club-rush	
	Isolepis cernua		Nodding Club-rush	
	**Isolepis marginata*		Coarse Club-rush	
	Lepidosperma angustatum			
	Lepidosperma costale			
	Lepidosperma gladiatum		Coast Sword Sedge	
	Lepidosperma gracile		Slender Sword Sedge	
	Lepidosperma longitudinale		Pithy Sword-sedge	
	Lepidosperma squamatum			
	Mesomelaena pseudostygia		Semaphore Sedge	
	Schoenus clandestinus			
	Schoenus grandiflorus		Large Flowered Bogrush	
	Schoenus subfascicularis			
HAEMODORACEAE	*Anigozanthos manglesii*		Mangles Kangaroo Paw	
	Conostylis aculeata		Prickly Conostylis	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Conostylis candicans		Grey Cottonhead	
	Conostylis pauciflora subsp. *euryrhipis*			Priority 4
	Haemodorum laxum			
	Haemodorum paniculatum		Mardja	
	Haemodorum spicatum		Mardja	
HEMEROCALLIDACEAE	*Corynotheca micrantha* var. *micrantha*		Tangled Lilly	
	Caesia micrantha		Pale Grasslilly	
	Dianella revoluta var. *divaricata*	*Dianella divaricata*	Common Dianella	
	Tricoryne elatior		Yellow Autumn Lily	
IRIDACEAE	**Freesia alba x leichtlinii*		Freesia	
	**Gladiolus caryophyllaceus*		Wild Gladiolus	
	**Moraea flaccida*		One-leaf Cape Tulip	
	Orthrosanthus laxus var. *laxus*		Morning Iris	
	**Romulea rosea* var. *australis*		Guildford grass	
	**Sparaxis bulbifera*			
	**Watsonia meriana* var. *bulbillifera*	*Watsonia bulbillifera*	Watsonia	
JUNCAGINACEAE	*Triglochin calcitrapa*		Spurred Arrow Grass	
ORCHIDACEAE	*Caladenia flava*		Cowslip Orchid	
	Caladenia hirta		Sugar Candy Orchid	
	Caladenia latifolia		Pink Fairy Orchid	
	Caladenia longicauda		Spider Orchid	
	**Disa bracteata*			

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Diuris longifolia		Common Donkey Orchid	
	Microtis sp.		Mignonette Orchid	
	Pterostylis sanguinea		Dark Banded Greenhood	
	Pterostylis vittata		Banded Greenhood	
POACEAE	**Aira caryophyllea*		Silvery Hairgrass	
	**Aira cupaniana*		Silvery Hairgrass	
	**Ammophila arenaria*		Marram Grass	
	Amphipogon turbinatus		Greybeard Grass	
	Austrostipa elegantissima			
	Austrostipa flavescens		Tall Speargrass	
	Austrostipa variabilis	*Stipa variabilis*	Variable Spear Grass	
	**Avena barbata*		Bearded Oat	
	**Avena fatua*		Wild Oat	
	**Briza maxima*		Blowfly Grass	
	**Briza minor*		Shivery Grass	
	**Bromus diandrus*		Great Brome	
	**Cenchrus clandestinus*	*Pennisetum clandestinum*	Kikuyu Grass	
	**Cynodon dactylon*		Couch	
	**Desmazeria rigida*		Rigid Fescue	
	**Ehrharta brevifolia* subsp. *cuspidata*		Veldtgrass	
	**Ehrharta calycina*		Perennial Veldtgrass	
	**Ehrharta longiflora*		Annual Veldtgrass	
	**Ehrharta villosa*		Pyp Grass	
	**Eragrostis curvula*		African Lovegrass	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	**Hordeum leporinum*		Barley Grass	
	**Lagurus ovatus*		Hare's Tail Gass	
	**Lolium perenne*		Perennial Ryegrass	
	**Lolium rigidum*		Wimmera Ryegrass	
	Microlaena stipoides		Weeping Grass	
	Neurachne alopecuroidea		Foxtail Mulga Grass	
	**Poa annua*		Winter Grass	
	Poa poiformis		Coastal Tussock Poa	
	Poa porphyroclados		Tussock Poa	
	Rytidosperma caespitosum			
	Rytidosperma occidentale			
	Spinifex hirsutus		Hairy Spinifex	
	Spinifex longifolius		Long-leaf Spinifex	
	**Stenotaphrum secundatum*		Buffalo Grass	
	**Vulpia myuros*		Rats Tail Fescue	
RESTIONACEAE	*Alexgeorgea nitens*			
	Desmocladus fasciculatus			
	Desmocladus flexuosus	*Loxocarya flexuosa*		
	Hypolaena pubescens			
TYPHACEAE	**Typha orientalis*		Bulrush	
XANTHORRHOEACEAE	*Xanthorrhoea preissii*		Grass Tree	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Class MAGNOLIOPSIDA (Dicotyledons)			
AIZOACEAE	**Carpobrotus aequilaterus*		Chilean Pigface	
	**Carpobrotus edulis*		Hottentot Fig	
	Carpobrotus virescens		Coastal Pigface	
	**Tetragonia decumbens*		Sea Spinach	
AMARANTHACEAE	*Ptilotus drummondii* var. *drummondii*		Narrowleaf Mulla Mulla	
	Ptilotus polystachyus		Green Mulla Mulla/Prince of Wales Feather	
	Ptilotus stirlingii		Stirling's Mulla Mulla	
ANACARDIACEAE	**Schinus terebinthifolius*		Japanese Pepper Tree	
APIACEAE	*Daucus glochidiatus*		Australian Carrot	
	Eryngium pinnatifidum subsp. *pinnatifidum*		Sand Devil	
	**Foeniculum vulgare*		Fennel	
	Xanthosia huegelii			
ARALIACEAE	*Trachymene coerulea*		Blue Laced Flower/Rottnest Daisy	
	Trachymene pilosa		Small Laceflower/Native Parsnip	
ASTERACEAE	**Arctotheca calendula*		Cape Weed	
	**Arctotheca populifolia*		Dune Arctotheca	
	**Arctotis stoechadifolia*		White Arctotis	
	Asteridea pulverulenta		Common Bristle Daisy	
	**Conyza bonariensis*		Flaxleaf Fleabane	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	**Conyza sumatrensis*		Fleabane	
	**Dittrichia graveolens*		Stinkwort	
	**Gazania rigens*		Gazania	
	**Hypochaeris glabra*		Flatweed/White Catsear	
	**Lactuca serriola*		Prickly Lettuce	
	Lagenophora huegelii		Coarse Lagenifera	
	Leucophyta brownii	*Calocephalus brownii*	Cushion Bush	
	**Monoculus monstrosus*		Stinking Roger	
	Olearia axillaris		Coastal Daisybush	
	Pithocarpa cordata	*Ozothamnus cordatus, Helichrysum cordatum*		
	Podolepis gracilis		Slender Podolepis	
	Senecio pinnatifolius var. *latilobus*			
	**Sonchus asper*		Rough Sowthistle	
	**Sonchus oleraceus*		Common Sowthistle	
	**Urospermum picroides*		False Hawkbit	
	**Ursinia anthemoides*		Ursinia	
BRASSICACEAE	**Brassica tournefortii*		Mediterranean Turnip	
	**Cakile maritima*		Sea Rocket	
	**Diplotaxis muralis*		Wall Rocket	
	**Heliophila pusilla*			
	**Raphanus raphanistrum*		Wild Radish	
CAMPANULACEAE	*Isotoma hypocrateriformis*		Woodbridge Poison	
	Lobelia tenuior		Slender Lobelia	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
CAPRIFOLIACEAE	**Centranthus ruber*		Red Valerian	
CARYOPHYLLACEAE	**Cerastium glomeratum*		Mouse Ear Chickweed	
	**Minuartia mediterranea*			
	**Petrorhagia dubia*		Velvet Pink	
	**Polycarpon tetraphyllum*		Fourleaf Allseed	
	**Silene gallica*		French Catchfly	
	**Spergularia diandra*		Lesser Sand Spurry	
	**Stellaria media*		Chickweed	
CASUARINACEAE	*Allocasuarina fraseriana*		Sheoak	
	Allocasuarina humilis		Dwarf Sheoak	
	Allocasuarina lehmanniana subsp. *lehmanniana*		Dune Sheoak	
CHENOPODIACEAE	*Atriplex isatidea*		Coast Saltbush	
	**Enchylaena tomentosa var. tomentosa*		Barrier Saltbush	
	Rhagodia baccata subsp. *baccata*		Berry Saltbush	
	Rhagodia baccata subsp. *dioica*			
	Salsola australis	*Salsola kali, Salsola tragus*		
	Threlkeldia diffusa		Coast Bonefruit	
CONVOLVULACEAE	*Cuscuta australis*		Australian Dodder	
CRASSULACEAE	*Crassula colorata*		Dense Stonecrop	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Crassula exserta		Stonecrop	
	**Crassula glomerata*		Stonecrop	
DILLENIACEAE	*Hibbertia hypericoides*		Yellow Buttercups	
	Hibbertia racemosa		Stalked Guinea Flower	
DROSERACEAE	*Drosera erythrorhiza*		Red Ink Sundew	
	Drosera macrantha		Bridal Rainbow	
	Drosera menziesii subsp. penicillaris		Menzies' Rainbow	
ERICACEAE	*Acrotriche cordata*		Coast Ground Berry	
	Astroloma pallidum		Kick Bush	
	Conostephium pendulum		Pearl Flower	
	Conostephium preissii			
	Leucopogon parviflorus		Coast Beard Heath	
	Leucopogon propinquus		Beard Heath	
	Lysinema ciliatum		Curry Flower	
EUPHORBIACEAE	**Euphorbia peplus*		Petty Spurge	
	**Euphorbia terracina*		Geraldton Carnation Weed	
	Monotaxis grandiflora		Diamond of the Desert	
	Ricinocarpos glaucus		Wedding Bush	
	**Ricinus communis*		Castor Oil Plant	
FABACEAE	*Acacia cochlearis*		Rigid Wattle	
	Acacia cyclops		Coastal Wattle	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Acacia huegelii			
	Acacia lasiocarpa		Panjang	
	Acacia lasiocarpa var. *lasiocarpa*		Dune Moses	
	Acacia pulchella		Prickly Moses	
	Acacia rostellifera		Summer-scented Wattle	
	Acacia saligna		Orange Wattle	
	Acacia stenoptera		Narrow Winged Wattle	
	Acacia truncata			
	Acacia willdenowiana		White Grass Wattle	
	Acacia xanthina		White-stemmed Wattle	
	Bossiaea eriocarpa		Common Brown Pea	
	Daviesia triflora		Bacon & Eggs	
	Gastrolobium capitatum	*Nemcia capitata*, *Oxylobium capitatum*		
	Gastrolobium nervosum	*Nemcia reticulata*, *Oxylobium reticulatum*		
	Gompholobium tomentosum		Hairy Yellow Pea	
	Gompholobium aristatum		Yellow Pea	
	Hardenbergia comptoniana		Native Wisteria	
	Hovea pungens		Devil's Pins	
	Hovea trisperma var. *trisperma*		Common Hovea	
	Isotropis cuneifolia		Granny's Bonnets	
	Jacksonia calcicola			
	Jacksonia furcellata		Grey Stinkwood	
	Jacksonia sericea		Waldjumi	Priority 4
	Jacksonia sternbergiana		Stinkwood	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Kennedia prostrata		Scarlet Runner	
	**Lupinus angustifolius*		Narrowleaf Lupin	
	**Lupinus cosentinii*		Sandplain Lupin	
	**Medicago polymorpha*		Burr Medic	
	**Retama raetam*		White Weeping Broom	
	Templetonia retusa		Cockies Tongues	
	**Trifolium angustifolium*		Narrowleaf Clover	
	**Trifolium arvense* var. *arvense*		Haresfoot Clover	
	**Trifolium campestre*		Hop Clover	
	**Trifolium cernuum*		Drooping Flower Moses	
	**Trifolium dubium*		Suckling Clover	
	**Vicia sativa*		Common Vetch	
FRANKENIACEAE	*Frankenia pauciflora*		Seaheath	
GERANIACEAE	**Erodium cicutarium*		Common Storksbill	
	**Pelargonium capitatum*		Rose Pelargonium	
	Pelargonium littorale			
GOODENIACEAE	*Dampiera linearis*		Common Dampiera	
	Lechenaultia floribunda			
	Lechenaultia linarioides		Yellow Leschenaultia	
	Scaevola anchusifolia	*Scaevola holosericea*	Fanflower	
	Scaevola canescens		Grey Scaevola	
	Scaevola crassifolia		Thick-leaved Fan-flower	
	Scaevola nitida		Shining Fanflower	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Scaevola repens var. *repens*		Fanflower	
	Scaevola thesioides			
GYROSTEMONACEAE	*Gyrostemon ramulosus*		Corkybark	
	Tersonia cyathiflora		Button Creeper	
LAMIACEAE	*Hemiandra linearis*		Speckled Snakebush	
	Hemiandra pungens		Snakebush	
	Westringia dampieri			
LAURACEAE	*Cassytha flava*		Dodder Laurel	
	Cassytha glabella		Tangled Dodder Laurel	
	Cassytha racemosa		Dodder Laurel	
LOGANIACEAE	*Logania vaginalis*		White Spray	
MALVACEAE	**Brachychiton populneus*		Kurrajong	
	Thomasia cognata			
	Thomasia triphylla			
MORACEAE	**Ficus carica*		Common Fig	
MYRTACEAE	**Agonis flexuosa*		Peppermint tree	
	Calothamnus quadrifidus		One-sided Bottlebrush	
	**Chamelaucium uncinatum*		Geraldton Wax	
	Corymbia calophylla	*Eucalyptus calophylla*	Marri	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Eucalyptus gomphocephala		Tuart	
	Eucalyptus marginata		Jarrah	
	**Leptospermum laevigatum*		Victorian/Coast Tea Tree	
	Melaleuca huegelii subsp. *huegelii*		Chenille Honeymyrtle	
	Melaleuca lanceolata		Rottnest Teatree	
	Melaleuca systena	*Melaleuca acerosa*	Coastal Honeymyrtle	
NYCTAGINACEAE	**Boerhavia coccinea*		Tar Vine	
OLACACEAE	*Olax benthamiana*			
ONAGRACEAE	**Oenothera drummondii*		Beach Evening Primrose	
OROBANCHACEAE	**Orobanche minor*		Lesser Broomrape	
OXALIDACEAE	**Oxalis pes-caprae*		Sour Sop	
PHYLLANTHACEAE	*Phyllanthus calycinus*		False Boronia	
	Poranthera microphylla		Small Poranthera	
PLANTAGINACEAE	**Kickxia spuria*			
PORTULACACEAE	*Calandrinia brevipedata*		Short-stalked Purslane	
	Calandrinia corrigioloides		Parakeelya/Strap Purslane	
	Calandrinia granulifera		Parakeelya/Pygmy Purslane	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
PRIMULACEAE	**Lysimachia arvensis*	*Anagallis arvensis*	Pimpernel	
PROTEACEAE	*Banksia attenuata*		Slender Banksia	
	Banksia dallanneyi	*Dryandra lindleyana*	Couch Honeypot	
	Banksia grandis		Bull Banksia	
	Banksia menziesii		Menzies Banksia	
	Banksia prionotes		Acorn Banksia	
	Banksia sessilis	*Dryandra sessilis*	Parrot Bush	
	Grevillea crithmifolia			
	Grevillea preissii subsp. *preissii*		Limestone Spider-net Grevillea	
	Grevillea vestita			
	Hakea lissocarpha		Honey Bush	
	Hakea prostrata		Harsh Hakea	
	Persoonia saccata		Snottygobble	
	Petrophile linearis		Pixie Mops	
	Petrophile macrostachya			
	Petrophile axillaris			
	Stirlingia latifolia		Blueboy	
	Synaphea spinulosa			
RHAMNACEAE	*Cryptandra mutila*			
	Spyridium globulosum	Trymalium albicans	Basket Bush	
	Stenanthemum tridentatum	*Spyridium tridentatum*		
	Trymalium ledifolium			
RANUNCULACEAE	*Clematis linearifolia*	*Clematis microphylla*	Slender Clematis	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Clematis pubescens		Common Clematis	
RUBIACEAE	**Galium murale*		Small Goosegrass	
	Opercularia hispidula		Silky-haired stinkweed	
	Opercularia vaginata		Dog Weed	
SANTALACEAE	*Exocarpos sparteus*		Broom Ballart	
	Santalum acuminatum		Quandong	
SAPINDACEAE	*Diplopeltis huegelii*			
SCROPHULARIACEAE	**Dischisma arenarium*			
	Eremophila glabra		Tar Bush	
	Myoporum insulare		Blueberry Tree	
SOLANACEAE	*Anthocercis ilicifolia*			
	Anthocercis littorea		Yellow Tailflower	
	**Solanum nigrum*		Black Berry Nightshade	
STYLIDACEAE	*Stylidium brunonianum*		Pink Fountain Triggerplant	
	Stylidium calcaratum		Book Triggerplant	
	Stylidium junceum		Reed Triggerplant	
	Stylidium repens		Matted Triggerplant	
	Stylidium rigidulum	*Stylidium macrocarpum*		
THYMELAEACEAE	*Pimelea argentea*		Silvery Leaved Pimelea	

Family	Genus and Species	Previous Name	Common Name	Conservation Code
	Pimelea calcicola			
	Pimelea rosea subsp. *rosea*		Rose Banjine	
	Pimelea sulphurea		Yellow Banjine	
TROPAEOLACEAE	**Tropaeolum majus*		Garden Nasturtium	
URTICACEAE	*Parietaria debilis*		Pellitory	
VIOLACEAE	*Hybanthus calycinus*		Wild Violet	

Appendix 3: Flora Quadrat Data

Key to flora abundance ratings

Abbreviation	Abundance estimate (across the site)
Ab	Abundant
C	Common
Un	Uncommon
R	Rare

Quadrat No.: 1
Survey Date: 23/1/2014
Personnel: Sharon Hynes, Alex Devine
GPS Coordinates: 382,841.86; 6,473,242.96 GDA 94, Zone: 50
Vegetation Type: Open Eucalypt, *Corymbia* and *Banksia* Woodland
Soil: Brown sand
Aspect and slope: SE, gentle
Litter(% cover & depth): 10%, 1.2 cm
Condition: Very Good

Native Species	Abund	Native Species	Abund
Acacia pulchella	C	*Phyllanthus calycinus*	C
Acanthocarpus preissii	C	*Pithocarpa cordata*	C
Banksia grandis	C	*Thysanotus sparteus*	Un
Bossiaea eriocarpa	C	*Xanthorrhoea preissii*	Ab
Burchardia congesta	C		
Conostylis aculeata	C		
Corymbia calophylla	Ab		
Corynotheca micrantha	C		
Desmocladus flexuosus	C		
Dichopogon capillipes	C		
Eucalyptus marginata	C	**Invasive Species**	**Abund**
Gompholobium tomentosum	C	**Ehrharta calycina*	Ab
Haemodorum paniculatum	C	**Gladiolus caryophyllaceus*	C
Hardenbergia comptoniana	C	**Pelargonium capitatum*	C
Hibbertia hypericoides	C	**Ursinia anthemoides*	Un
Jacksonia sternbergiana	C		
Kennedia prostrata	C		
Lepidosperma squamatum	C		
Leucopogon propinquus	C		
Macrozamia reidlei	C		
Mesomelaena pseudostygia	Ab		

Quadrat No.:	2
Survey Date:	3/02/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,170.59; 6,471,650.4 GDA 94, Zone: 50
Vegetation Type:	*Olearia axillaris* Open Heathland
Soil:	White sand
Aspect and slope:	W, gentle
Litter(%cover & depth):	5%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Carpobrotus virescens	C	**Ammophila arenaria*	C
Ficinia nodosa	Ab	**Bromus diandrus*	C
Olearia axillaris	Ab	**Lagurus ovatus*	Un
Rhagodia baccata	C	**Lolium rigidum*	Un
Scaevola crassifolia	Ab	**Pelargonium capitatum*	C
Spinifex longifolius	C	**Tetragonia decumbens*	C
Threlkeldia diffusa	C	**Trachyandra divaricata*	C

Quadrat No.:	3
Survey Date:	3/02/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,035.13; 6,472,346.27 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodland over *Acacia rostellifera* Shrubland
Soil:	Grey sand
Aspect and slope:	SE, gentle
Litter (%cover & depth):	8%, 5 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Avena barbata*	C
Acanthocarpus preissii	C	**Bromus diandrus*	Ab
Austrostipa flavescens	C	**Ehrharta longiflora*	Ab
Calothamnus quadrifidus	C	**Euphorbia terracina*	C
Clematis linearifolia	Ab		
Eucalyptus gomphocephala	C		
Euphorbia terracina	C		
Hardenbergia comptoniana	C		
Melaleuca systena	C		
Lepidosperma gladiatum	C		
Rhagodia baccata	C		
Spyridium globulosum	Ab		

Quadrat No.:	4
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,727.1; 6,472,151.3 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodland over *Lepidosperma gladiatum* Sedgeland
Soil:	Grey sand
Aspect and slope:	S, gentle
Litter (%cover & depth):	25%, 2 cm
Condition:	Excellent

Native Species	Abund	Invasive Species	Abund
Acacia lasiocarpa	C	**Avena barbata*	C
Acanthocarpus preissii	C	**Bromus diandrus*	C
Calothamnus quadrifidus	C	**Euphorbia terracina*	C
Eucalyptus gomphocephala	C	**Lagurus ovatus*	Ab
Hardenbergia comptoniana	C	**Pelargonium capitatum*	Ab
Lepidosperma gladiatum	Ab	**Trachyandra divaricata*	C
Olearia axillaris	C		
Pithocarpa cordata	C		
Rhagodia baccata	C		
Spyridium globulosum	Un		

Quadrat No.:	5
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,813.9; 6,472,518.9 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodlands
Soil:	Grey sand
Aspect and slope:	SW, gentle
Litter (%cover & depth):	30%, 1 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia lasiocarpa	Ab	**Avena barbata*	C
Acanthocarpus preissii	Ab	**Bromus diandrus*	C
Austrostipa flavescens	C	**Euphorbia terracina*	C
Banksia sessilis	Un	**Lagurus ovatus*	Ab
Calothamnus quadrifidus	Ab	**Lolium rigidum*	C
Eucalyptus gomphocephala	C	**Pelargonium capitatum*	Ab
Grevillea crithmifolia	C		
Hardenbergia comptoniana	C		
Lechenaultia linarioides	C		
Leucopogon propinquus	Un		
Lomandra maritima	C		
Melaleuca systena	Ab		
Pithocarpa cordata	C		
Rhagodia baccata	C		

Quadrat No.:	6
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	384,044.6; 6,472,447.6 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodland over *Lepidosperma gladiatum* Sedgeland
Soil:	Grey sand
Aspect and slope:	SE, gentle
Litter (%cover & depth):	15%, 3 cm
Condition:	Excellent

Native Species	Abund	Invasive Species	Abund
Austrostipa flavescens	C	**Avena barbata*	Un
Eucalyptus gomphocephala	C	**Bromus diandrus*	C
Hardenbergia comptoniana	C	**Euphorbia terracina*	Un
Lepidosperma gladiatum	Ab	**Lagurus ovatus*	C
Olearia axillaris	C	**Pelargonium capitatum*	C
Pithocarpa cordata	C		
Rhagodia baccata	C		
Spyridium globulosum	C		

Quadrat No.:	7
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	384,090.9; 6,472,487.5 GDA 94, Zone: 50
Vegetation Type:	*Eucalyptus* Woodland
Soil:	Grey sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	30%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia pulchella	C	**Avena barbata*	C
Allocasuarina fraseriana	C	**Briza maxima*	C
Austrostipa flavescens	C	**Ehrharta calycina*	Ab
Banksia prionotes	C	**Pelargonium capitatum*	C
Conostylis aculeata	C	**Romulea rosea*	C
Eucalyptus gomphocephala	C		
Eucalyptus marginata	C		
Gompholobium tomentosum	C		
Hardenbergia comptoniana	C		
Jacksonia calcicola	C		
Jacksonia sternbergiana	C		
Macrozamia reidlei	C		
Mesomelaena pseudostygia	C		
Xanthorrhoea preissii	Ab		

Quadrat No.:	8
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	384,153.6; 6,472,464.9 GDA 94, Zone: 50
Vegetation Type:	*Eucalyptus* Woodland
Soil:	Grey sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	40%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia pulchella	C	**Avena barbata*	C
Acanthocarpus preissii	Un	**Ehrharta calycina*	Ab
Allocasuarina fraseriana	C	**Pelargonium capitatum*	C
Austrostipa flavescens	C	**Trachyandra divaricata*	C
Banksia attenuata	C		
Banksia prionotes	C		
Eucalyptus gomphocephala	C		
Eucalyptus marginata	C		
Exocarpos sparteus	Un		
Hakea lissocarpha	Un		
Mesomelaena pseudostygia	C		
Xanthorrhoea preissii	C		

Quadrat No.:	9
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,911.8; 6,472,689.3 GDA 94, Zone: 50
Vegetation Type:	Open Shrubland of *Allocasuarina lehmanniana* subsp. *lehmanniana*
Soil:	Yellow/white sand
Aspect and slope:	N, gentle
Litter (%cover & depth):	30%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acanthocarpus preissii	C	**Avena barbata*	Un
Allocasuarina lehmanniana subsp. lehmanniana	Ab	**Bromus diandrus*	C
Austrostipa flavescens	C	**Ehrharta calycina*	Ab
Callitris preissii (planted)	Un	**Euphorbia terracina*	C
Grevillea crithmifolia	Ab	**Pelargonium capitatum*	Ab
Gyrostemon ramulosus	C	**Trachyandra divaricata*	C
Hardenbergia comptoniana	C		
Melaleuca systena	Ab		
Schoenus grandiflorus	C		

Quadrat No.:	10
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,368.7; 6,472,821.2 GDA 94, Zone: 50
Vegetation Type:	Open Shrubland of *Allocasuarina lehmanniana* subsp. *lehmanniana*
Soil:	Grey sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	30%, 1 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia lasiocarpa	C	**Bromus diandrus*	C
Acanthocarpus preissii	C	**Ehrharta calycina*	Ab
Allocasuarina lehmanniana subsp. lehmanniana	Ab	**Euphorbia terracina*	C
Austrostipa flavescens	C	**Lagurus ovatus*	C
Calothamnus quadrifidus	C	**Lolium rigidum*	Un
Grevillea crithmifolia	Ab		
Melaleuca systena	Ab		
Schoenus grandiflorus	C		

Quadrat No.:	11
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,820.5; 6,472,286.4 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodlands
Soil:	Grey sand
Aspect and slope:	SW, gentle
Litter (%cover & depth):	30%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia lasiocarpa	Ab	**Avena barbata*	C
Acanthocarpus preissii	Ab	**Euphorbia terracina*	Ab
Austrostipa flavescens	C	**Lagurus ovatus*	Ab
Banksia sessilis	Un	**Lolium rigidum*	C
Calothamnus quadrifidus	Ab	**Pelargonium capitatum*	Ab
Conostylis aculeata	C	**Trachyandra divaricata*	C
Eucalyptus gomphocephala	C		
Hardenbergia comptoniana	C		
Hemiandra pungens	C		
Lechenaultia linarioides	C		
Lomandra maritima	C		
Melaleuca systena	Ab		
Pithocarpa cordata	C		
Schoenus grandiflorus	C		

Quadrat No.:	12
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,127.4; 6,471,831.5 GDA 94, Zone: 50
Vegetation Type:	*Olearia axillaris* Open Heathland
Soil:	White sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	5%, 0.5 cm
Condition:	Very Good

Native Species	**Abund**	**Invasive Species**	**Abund**
Carpobrotus virescens	C	**Lolium rigidum*	C
Ficinia nodosa	C	**Oenothera drummondii*	C
Leucophyta brownii	C	**Pelargonium capitatum*	C
Olearia axillaris	Ab	**Sonchus* sp.	Un
Scaevola crassifolia	C	**Tetragonia decumbens*	Ab
Spinifex hirsutus	C	**Trachyandra divaricata*	Ab
Threlkeldia diffusa	C		

Quadrat No.:	13
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,129.6; 6,471,681.9 GDA 94, Zone: 50
Vegetation Type:	Marram Grass (*Ammophila arenaria*) Grassland
Soil:	White sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	15%, 0.5 cm
Condition:	Degraded

Native Species	Abund	Invasive Species	Abund
Olearia axillaris	Un	**Ammophila arenaria*	Ab
Spinifex hirsutus	Un	**Euphorbia paralias*	C
		**Pelargonium capitatum*	Un
		**Tetragonia decumbens*	Un
		**Trachyandra divaricata*	Un

Quadrat No.:	14
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,213.8; 6,471,646.1 GDA 94, Zone: 50
Vegetation Type:	Mixed Open Heathland
Soil:	White sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	15%, 1 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Bromus diandrus*	Ab
Acanthocarpus preissii	C	**Lagurus ovatus*	C
Ficinia nodosa	C	**Leptospermum laevigatum*	Un
Lepidosperma gladiatum	C	**Lolium rigidum*	C
Myoporum insulare	C	**Oenothera drummondii*	C
Olearia axillaris	C	**Pelargonium capitatum*	Ab
Rhagodia baccata	C	**Trachyandra divaricata*	Ab
Scaevola crassifolia	C		
Spinifex longifolius	C		
Threlkeldia diffusa	Un		

Quadrat No.:	15
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,335.2; 6,471,196.0 GDA 94, Zone: 50
Vegetation Type:	Mixed Open Heathland
Soil:	White sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	15%, 1 cm
Condition:	Very Good

Native Species	**Abund**	**Invasive Species**	**Abund**
Acacia rostellifera	C	**Avena barbata*	Un
Acanthocarpus preissii	C	**Bromus diandrus*	C
Conostylis aculeata	C	**Lagurus ovatus*	C
Hardenbergia comptoniana	Un	**Lolium rigidum*	C
Lepidosperma gladiatum	C	**Oenothera drummondii*	C
Olearia axillaris	C	**Pelargonium capitatum*	C
Rhagodia baccata	C	**Tetragonia decumbens*	Un
Scaevola crassifolia	C	**Trachyandra divaricata*	C
Spinifex hirsutus	Un		
Spinifex longifolius	C		

Quadrat No.:	16
Survey Date:	13/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,194.6; 6,471,302.8 GDA 94, Zone: 50
Vegetation Type:	Marram Grass (*Ammophila arenaria*) Grassland
Soil:	White sand
Aspect and slope:	W, steep
Litter (%cover & depth):	10%, 1 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Olearia axillaris	Un	**Ammophila arenaria*	Ab
Spinifex hirsutus	Un	**Euphorbia paralias*	Un
		**Pelargonium capitatum*	Un

Quadrat No.:	17
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,254.6; 6,472,351.8 GDA 94, Zone: 50
Vegetation Type:	Mixed Coastal Shrubland
Soil:	Grey/brown sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	15%, 1.5 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Avena barbata*	
Acanthocarpus preissii	C	**Brassica tournefortii*	
Austrostipa flavescens	C	**Bromus diandrus*	
Lepidosperma gladiatum	C	**Ehrharta calycina*	
Leucopogon propinquus	C	**Euphorbia terracina*	
Lomandra maritima	C	**Pelargonium capitatum*	
Melaleuca systena	Ab		
Myoporum insulare	C		
Santalum acuminatum	C		
Schoenus grandiflorus	C		
Spyridium globulosum	Ab		
Threlkeldia diffusa	C		

Quadrat No.:	18
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,966.50; 6,472,670.10 GDA 94, Zone: 50
Vegetation Type:	*Acacia rostellifera* Tall Open Shrubland
Soil:	White sand
Aspect and slope:	S, gentle
Litter (%cover & depth):	40%, 3 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Bromus diandrus*	C
Austrostipa flavescens	C	**Ehrharta calycina*	C
Clematis linearifolia	Ab	**Ehrharta longiflora*	C
Eucalyptus gomphocephala	Un	**Euphorbia terracina*	Ab
Grevillea crithmifolia	C	**Lolium rigidum*	C
Hardenbergia comptoniana	C	**Sonchus asper*	Un
Lomandra maritima	C		
Schoenus grandiflorus	C		
Spyridium globulosum	Ab		

Quadrat No.:	19
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,552.1; 6,471,998.2 GDA 94, Zone: 50
Vegetation Type:	Open Woodland of *Eucalyptus gomphocephala* and *Callitris preissii*
Soil:	Grey sand
Aspect and slope:	N, gentle
Litter (%cover & depth):	60%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia cyclops	C	**Avena barbata*	C
Acanthocarpus preissii	C	**Briza maxima*	Un
Callitris preissii	Ab	**Lagurus ovatus*	Ab
Eucalyptus gomphocephala	Ab	**Poa* sp.	Un
Hardenbergia comptoniana	C		
Leucopogon propinquus	C		
Lomandra maritima	C		
Olearia axillaris	Un		
Rhagodia baccata	C		
Scaevola crassifolia	C		
Spyridium globulosum	C		

Quadrat No.:	20
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,489.7; 6,471,956.5 GDA 94, Zone: 50
Vegetation Type:	*Callitris preissii* Open Woodland
Soil:	White sand
Aspect and slope:	W, steep
Litter (%cover & depth):	50%, 0.5 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acanthocarpus preissii	C	**Brassica tournefortii*	Un
Callitris preissii	Ab	**Hordeum leporinum*	Un
Gastrolobium capitatum	C	**Lagurus ovatus*	Ab
Hardenbergia comptoniana	C		
Lepidosperma gladiatum	C		
Rhagodia baccata	C		
Santalum acuminatum	C		
Scaevola crassifolia	C		
Spyridium globulosum	C		

Quadrat No.:	21
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,354.4; 6,472,162.5 GDA 94, Zone: 50
Vegetation Type:	Mixed Coastal Shrubland
Soil:	Grey/brown sand
Aspect and slope:	N, gentle
Litter (%cover & depth):	40%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Avena barbata*	Un
Acanthocarpus preissii	C	**Brassica tournefortii*	Un
Hardenbergia comptoniana	C	**Bromus diandrus*	C
Lepidosperma gladiatum	C	**Ehrharta calycina*	C
Rhagodia baccata	C	**Euphorbia terracina*	C
Santalum acuminatum	C	**Pelargonium capitatum*	C
Spyridium globulosum	Ab		

Quadrat No.:	22
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,362.20; 6,471,814.10 GDA 94, Zone: 50
Vegetation Type:	*Callitris preissii* Open Woodland
Soil:	White/grey sand
Aspect and slope:	SW, gentle
Litter (%cover & depth):	40%, 1 cm
Condition:	Very Good

Native Species	**Abund**	**Invasive Species**	**Abund**
Acacia cyclops	C	**Avena barbata*	C
Callitris preissii	Ab	**Lagurus ovatus*	Ab
Hardenbergia comptoniana	C	**Lolium rigidum*	C
Hibbertia racemosa	C		
Leucopogon propinquus	C		
Melaleuca systena	C		
Rhagodia baccata	C		
Santalum acuminatum	C		
Scaevola crassifolia	C		
Spyridium globulosum	C		

Quadrat No.:	23
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,594.4; 6,472,325.3 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus gomphocephala* Woodland over *Acacia rostellifera* Shrubland
Soil:	Grey sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	30%, 1.5 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Avena barbata*	Un
Acanthocarpus preissii	C	**Bromus diandrus*	C
Austrostipa flavescens	C	**Ehrharta longiflora*	C
Calothamnus quadrifidus	C	**Euphorbia terracina*	C
Clematis linearifolia	C		
Eucalyptus gomphocephala	C		
Hardenbergia comptoniana	C		
Leucopogon propinquus	C		
Spyridium globulosum	Ab		

Quadrat No.:	24
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	383,019.7; 6,472,487.2 GDA 94, Zone: 50
Vegetation Type:	*Acacia rostellifera* Tall Open Shrubland
Soil:	Grey sand
Aspect and slope:	SW, gentle
Litter (%cover & depth):	30%, 2 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia rostellifera	Ab	**Avena barbata*	C
Austrostipa elegantissima	C	**Bromus diandrus*	C
Acanthocarpus preissii	C	**Ehrharta longiflora*	C
Austrostipa flavescens	C	**Euphorbia terracina*	C
Clematis linearifolia	C	**Lagurus ovatus*	C
Lepidosperma gladiatum	C	**Pelargonium capitatum*	C
Melaleuca systena	C		
Spyridium globulosum	Ab		

Quadrat No.:	25
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,880.6; 6,472,977.0 GDA 94, Zone: 50
Vegetation Type:	*Melaleuca huegelii* and *Santalum acuminatum* Shrubland
Soil:	Orange sand over brown sand
Aspect and slope:	E, gentle
Litter (%cover & depth):	15%, 1 cm
Condition:	Very Good

Native Species	**Abund**	**Invasive Species**	**Abund**
Acacia pulchella	Ab	**Avena barbata*	Un
Allocasuarina humilis	C	**Ehrharta longiflora*	Un
Banksia sessilis	C	**Euphorbia terracina*	Un
Calothamnus quadrifidus	C	**Gladiolus caryophyllaceus*	C
Desmocladus flexuosa	C	**Pelargonium capitatum*	Un
Grevillea preissii	C	**Petrorhagia dubia*	C
Lechenaultia linarioides	C	**Trifolium angustifolium*	C
Lomandra maritima	C	**Ursinia anthemoides*	C
Melaleuca huegelii	Ab		
Santalum acuminatum	Ab		
Templetonia retusa	C		
Tricoryne elatior	C		
Xanthorrhoea preissii	C		

Quadrat No.:	26
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,874.6; 6,472,917.0 GDA 94, Zone: 50
Vegetation Type:	*Melaleuca huegelii* and *Santalum acuminatum* Shrubland
Soil:	Orange sand over brown sand
Aspect and slope:	W, gentle
Litter (%cover & depth):	5%, 1 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia pulchella	Ab	**Ehrharta longiflora*	C
Banksia dallanneyi	C	**Gladiolus caryophyllaceus*	Ab
Conostylis aculeata	C	**Ursinia anthemoides*	C
Gompholobium tomentosum	C		
Grevillea preissii	C		
Hibbertia hypericoides	C		
Lomandra maritima	C		
Melaleuca huegelii	C		
Santalum acuminatum	Ab		
Scaevola repens	Un		
Templetonia retusa	C		
Xanthorrhoea preissii	Ab		

Quadrat No.:	27
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,955.7; 6,473,029.5 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus* and *Banksia* Woodland
Soil:	Brown sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	7%, 3 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia pulchella	C	**Avena barbata*	C
Allocasuarina humilis	Ab	**Briza maxima*	Un
Banksia attenuata	Ab	**Ehrharta longiflora*	C
Banksia menziesii	Ab	**Gladiolus caryophyllaceus*	C
Corynotheca micrantha	C	**Pelargonium capitatum*	C
Desmocladus flexuosa	C	**Ursinia anthemoides*	C
Eucalyptus gomphocephala	C		
Gompholobium tomentosum	C		
Haemodorum spicatum	C		
Hakea lissocarpha	Un		
Hibbertia hypericoides	C		
Macrozamia reidlei	C		
Mesomelaena pseudostygia	C		
Xanthorrhoea preissii	C		

Quadrat No.:	28
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,966.7; 6,472,958.1 GDA 94, Zone: 50
Vegetation Type:	Open *Eucalyptus* and *Banksia* Woodland
Soil:	Light brown sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	30%, 2 cm
Condition:	Very Good

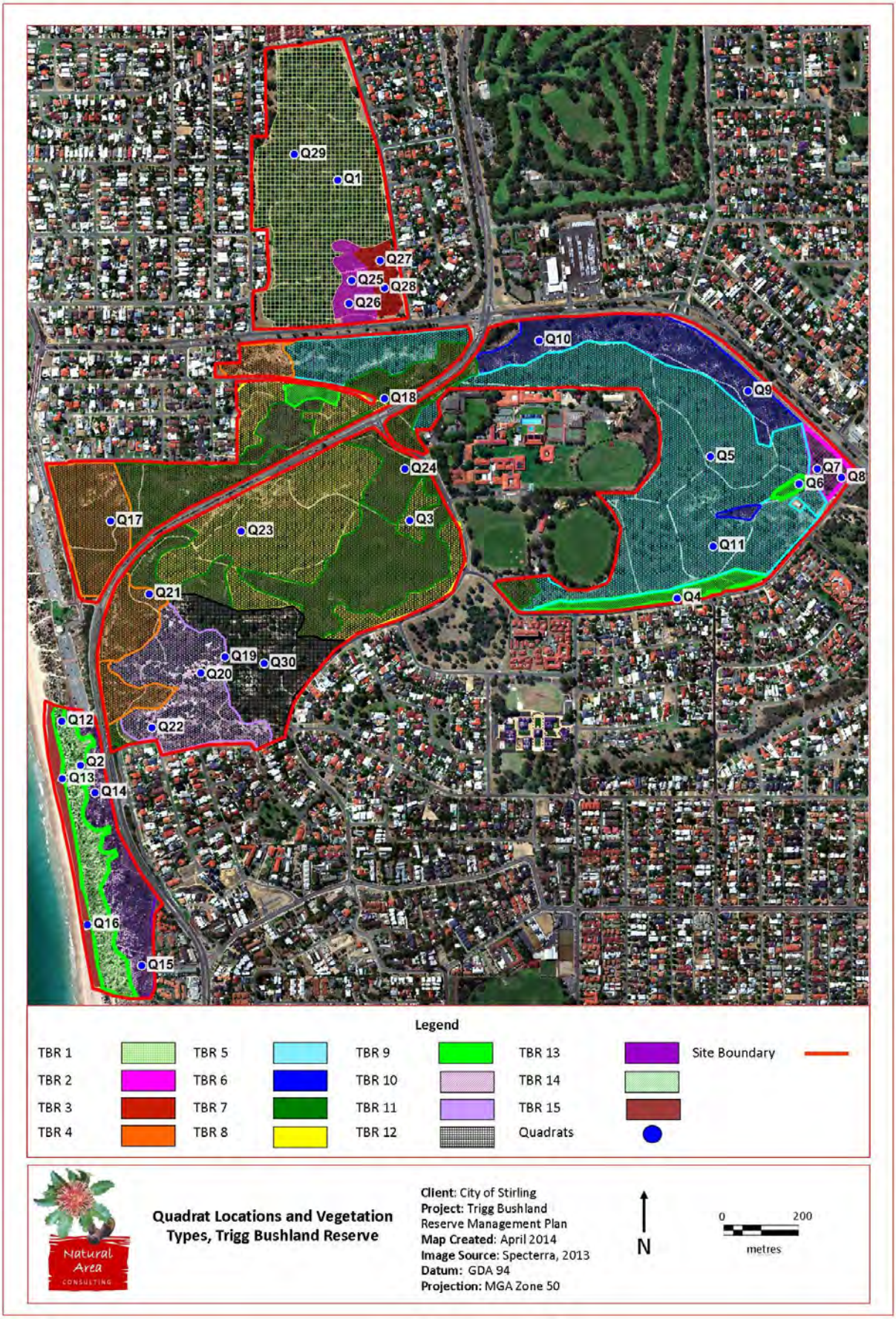
Native Species	Abund	Invasive Species	Abund
Acacia pulchella	C	**Ehrharta longiflora*	C
Allocasuarina humilis	Ab	**Gladiolus caryophyllaceus*	C
Banksia attenuata	Ab	**Pelargonium capitatum*	C
Banksia menziesii	Ab	**Sonchus asper*	Un
Burchardia congesta	C		
Calothamnus quadrifidus	C		
Dianella revoluta	C		
Gompholobium tomentosum	C		
Hakea prostrata	Un		
Mesomelaena pseudostygia	C		
Petrophile macrostachya	Un		
Santalum acuminatum	Un		
Xanthorrhoea preissii	C		

Quadrat No.:	29
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,732.30; 6,473,304.90 GDA 94, Zone: 50
Vegetation Type:	Open Eucalypt, *Corymbia* and *Banksia* Woodland
Soil:	Grey sand
Aspect and slope:	NW, gentle
Litter (%cover & depth):	40%, 2 cm
Condition:	Very Good

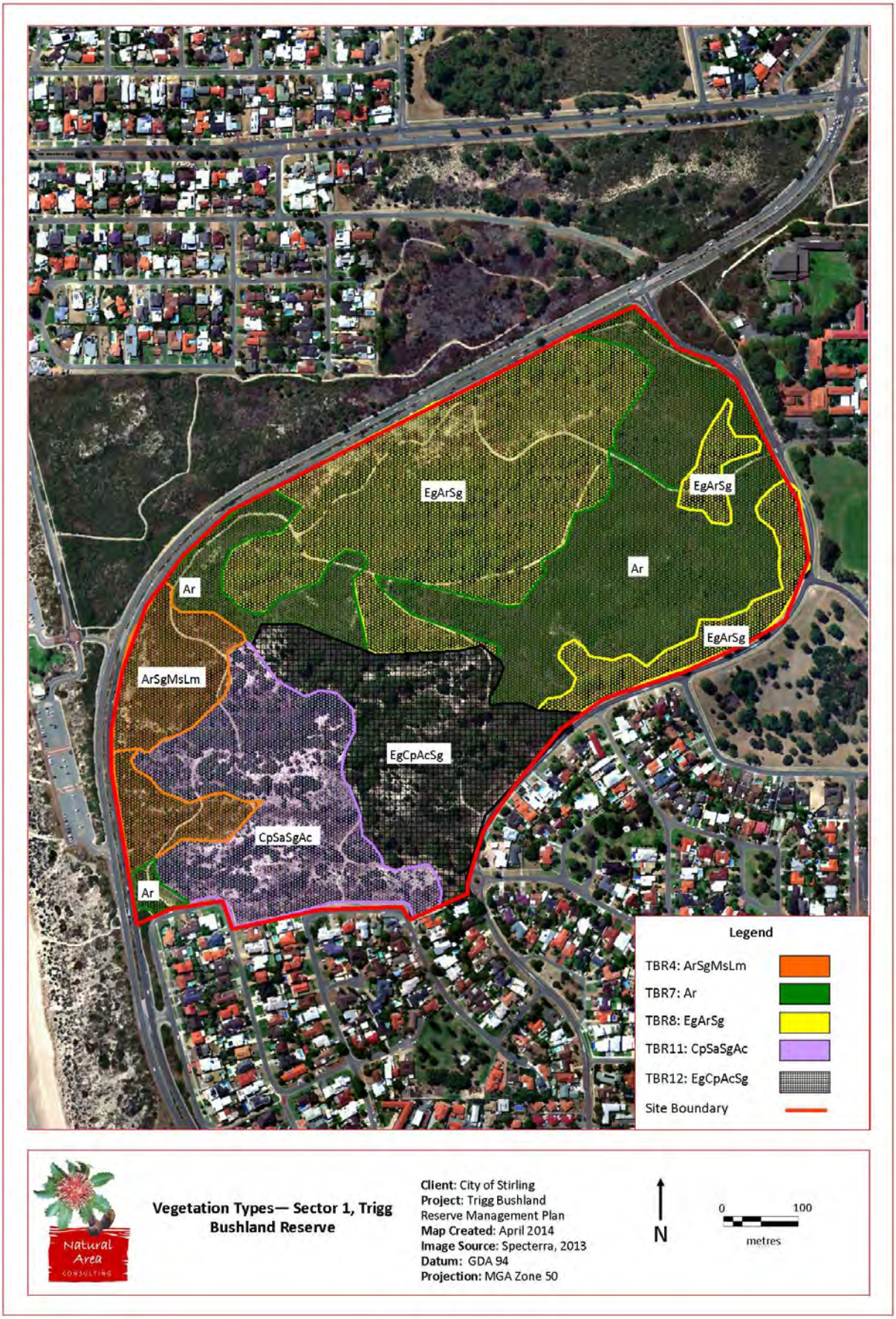
Native Species	Abund	Invasive Species	Abund
Acacia pulchella	C	**Avena barbata*	C
Banksia attenuata	C	**Briza maxima*	C
Banksia grandis	C	**Ehrharta longiflora*	C
Banksia menziesii	C	**Gladiolus caryophyllaceus*	C
Corymbia calophylla	Ab	**Pelargonium capitatum*	C
Corynotheca micrantha	C		
Eucalyptus gomphocephala	C		
Eucalyptus marginata	C		
Gompholobium tomentosum	C		
Hardenbergia comptoniana	C		
Hibbertia hypericoides	C		
Macrozamia reidlei	C		
Mesomelaena pseudostygia	C		
Phyllanthus calycinus	C		
Pithocarpa cordata	C		
Xanthorrhoea preissii	Ab		

Quadrat No.:	30
Survey Date:	14/03/2014
Personnel:	Sharon Hynes, Alex Devine
GPS Coordinates:	382,617.80; 6,472,041.30 GDA 94, Zone: 50
Vegetation Type:	Open Woodland of *Eucalyptus gomphocephala* and *Callitris preissii*
Soil:	Grey sand
Aspect and slope:	N, gentle
Litter (%cover & depth):	40%, 1.5 cm
Condition:	Very Good

Native Species	Abund	Invasive Species	Abund
Acacia cyclops	C	**Avena barbata*	C
Acanthocarpus preissii	C	**Lagurus ovatus*	Ab
Callitris preissii	Ab		
Eucalyptus gomphocephala	Ab		
Hardenbergia comptoniana	C		
Lomandra maritima	C		
Olearia axillaris	C		
Rhagodia baccata	C		
Scaevola crassifolia	C		
Spyridium globulosum	C		


Q29
Q1
Q27
Q25
Q28
Q26
Q10
Q18
Q9
Q5
Q24
Q7
Q8
Q6
Q17
Q23
Q3
Q11
Q21
Q4
Q19
Q30
Q20
Q12
Q22
Q2
Q13
Q14
Q16
Q15
Legend
TBR 1
TBR 2
TBR 3
TBR 4
TBR 5
TBR 6
TBR 7
TBR 8
TBR 9
TBR 10
TBR 11
TBR 12
TBR 13
TBR 14
TBR 15
Quadrats
Site Boundary
Natural Area CONSULTING
Quadrat Locations and Vegetation Types, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50
N
0
200
metres

Appendix 4: Vegetation Types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EgArSg
Ar
Ar
EgArSg
ArSgMsLm
EgCpAcSg
CpSaSgAc
Ar
Legend
TBR4: ArSgMsLm
TBR7: Ar
TBR8: EgArSg
TBR11: CpSaSgAc
TBR12: EgCpAcSg
Site Boundary
Natural Area CONSULTING
Vegetation Types— Sector 1, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50
N
0
100
metres

Vegetation Types— Sector 2, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50

N

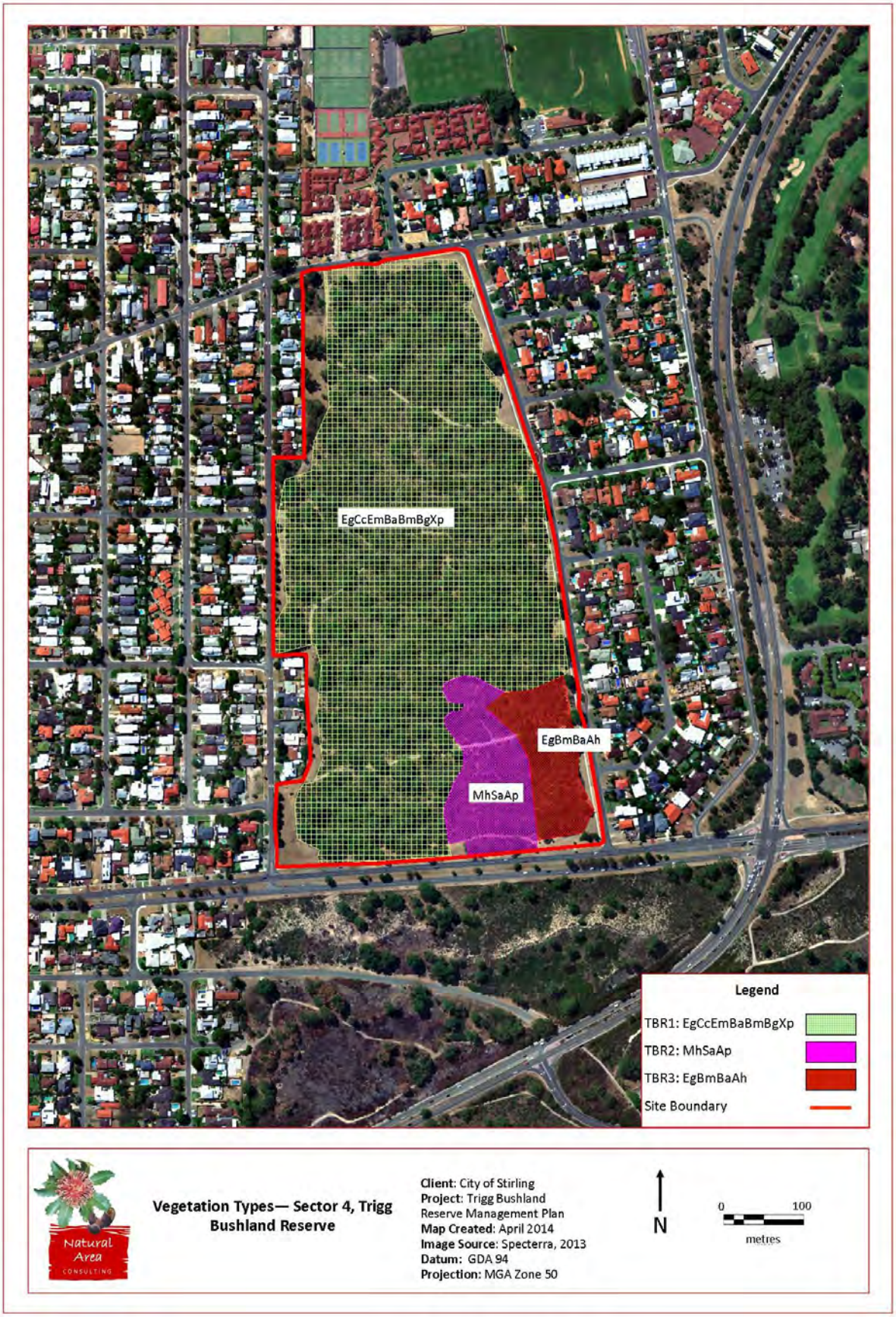
0 100
metres

Vegetation Types— Sector 3, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50

N

0 100
metres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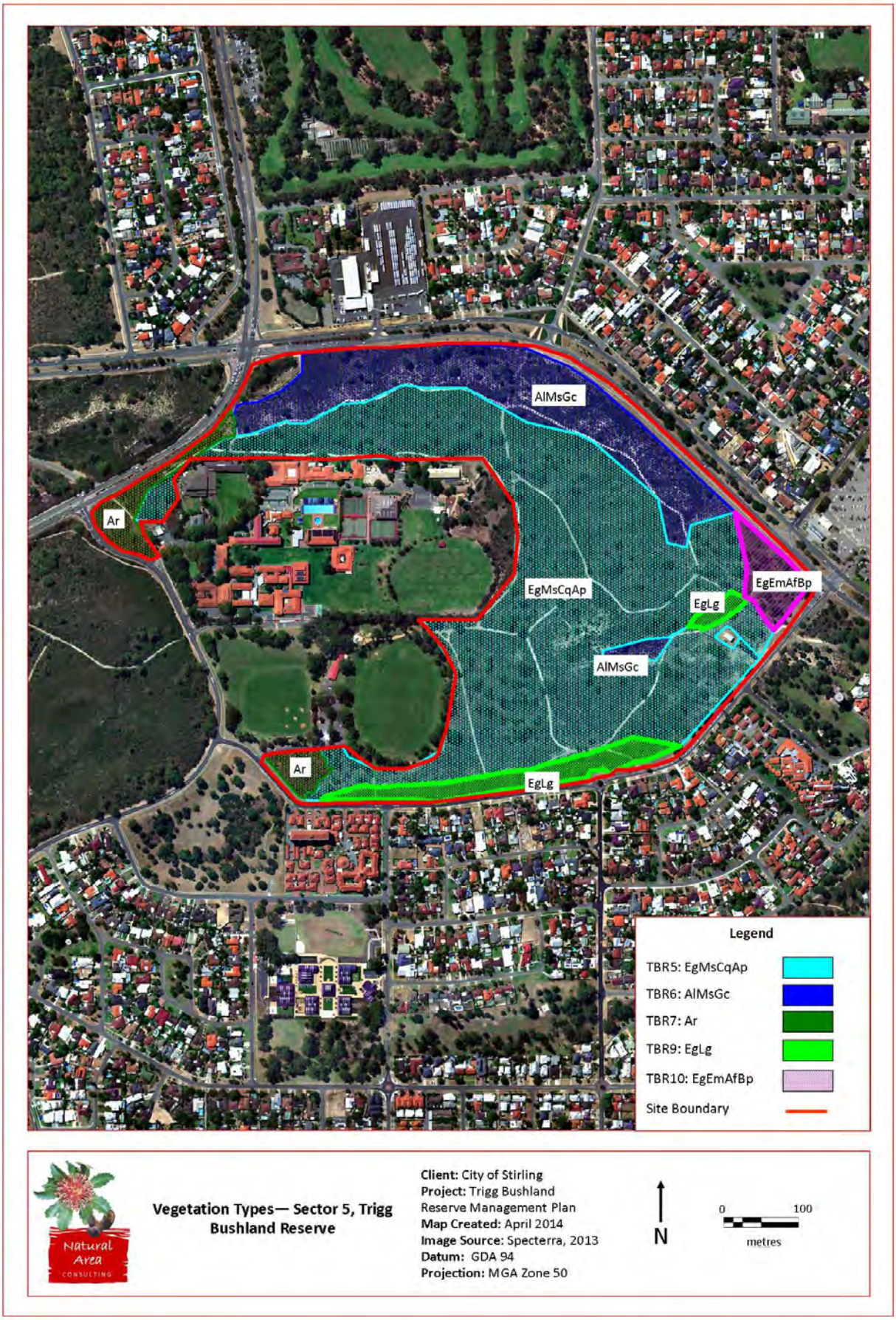
EgBmBaAh
MhSaAp
Legend
TBR1: EgCcEmBaBmBgXp
TBR2: MhSaAp
TBR3: EgBmBaAh
Site Boundary
Natural Area CONSULTING
Vegetation Types— Sector 4, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50
N
0
100
metres


AlMsGc
Ar
EgMsCqAp
EgEmAfBp
EgLg
AlMsGc
Ar
EgLg
Legend
TBR5: EgMsCqAp
TBR6: AlMsGc
TBR7: Ar
TBR9: EgLg
TBR10: EgEmAfBp
Site Boundary
Natural Area CONSULTING
Vegetation Types— Sector 5, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50
N
0
100
metres

Vegetation Types— Sector 6, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA 94
Projection: MGA Zone 50

N

0 100
metres

Appendix 5: Conservation Codes

Western Australia – Flora and Fauna

Abbreviation	Name	Description
T	Threatened	Flora or fauna that is rare or likely to become extinct (Schedule 1 of the *Wildlife Conservation Act* 1950) Taxa that have been adequately searched for and deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X	Presumed Extinct	Flora or fauna that is presumed to be extinct in the wild (Schedule 2 of the *Wildlife Conservation Act* 1950) Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	International Agreement	Birds protected under international agreement (Schedule 3 of the *Wildlife Conservation Act* 1950) Birds that are subject to an agreement between governments of Australia and other countries relating to the protection of migratory birds and birds in danger of extinction
S	Specially Protected	Other specially protected fauna (Schedule 4 of the *Wildlife Conservation Act* 1950) Fauna that is in need of special protection, otherwise than for the reasons listed in other schedules of the *Wildlife Conservation Act* 1950.
Schedule 1 species that are ranked by the DEC according to their level of threat using IUCN Red List criteria		
CR	Critically endangered	Species considered to be facing an extremely high risk of extinction within the wild
EN	Endangered	Species considered to be facing a very high risk of extinction within the wild
VU	Vulnerable	Species considered to be facing a high risk of extinction in the wild
Taxa that have not been adequately surveyed for listing under Schedule 1 or 2 of the Wildlife Protection Act are added to the Priority Lists under priorities 1, 2 or 3, according to the priority for further survey and evaluation of their conservation status.		
1	Priority One	Poorly known taxa Taxa which are known from one or a few collections or sight records (generally <5), on all lands not managed for conservation, such as road verges, urban areas, farmland, active mineral lease and under threat of habitat destruction or degradation. Taxa may be included if

Abbreviation	Name	Description
		they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2	Priority Two	Poorly known taxa Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, such as national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves and similar. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes
3	Priority Three	Poorly known taxa Taxa that are known collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4	Priority Four	Rare or near threatened and other taxa in need of monitoring Rare: Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Near threatened: Taxa that are considered to have been adequately surveyed and that to not qualify for Conservation Dependent, but that are close to qualifying for vulnerable. Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Priority Five	Conservation Dependent Taxa Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

Source: (Department of Parks and Wildlife, 2014)

Commonwealth Conservation Codes

Category	Description
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium term

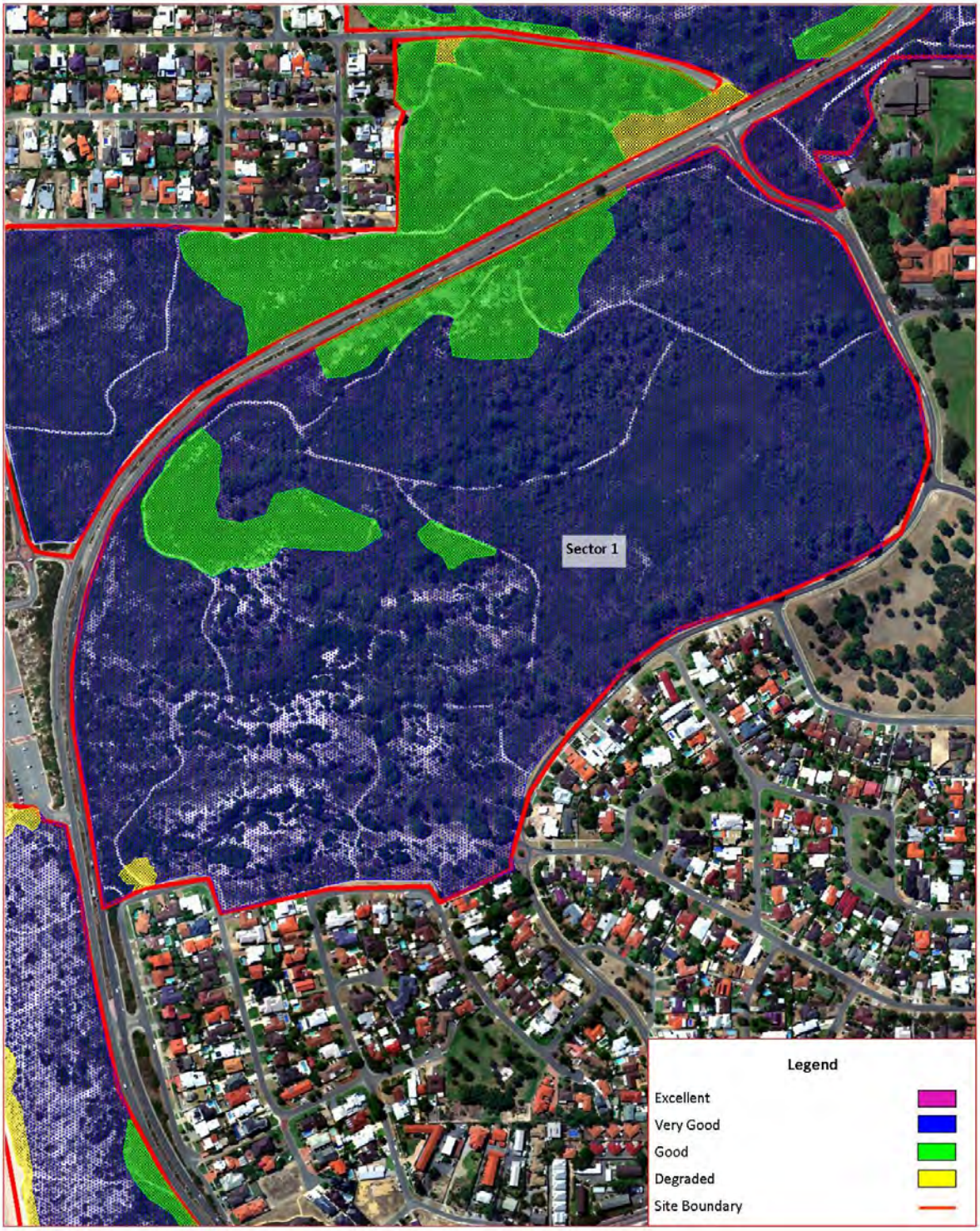
(Source: Department of Sustainability, Environment, Water, Population and Communities, 2012)

Appendix 6: Vegetation Condition Rating Scale

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

(Government of Western Australia, 2000)

Appendix 7: Vegetation Condition

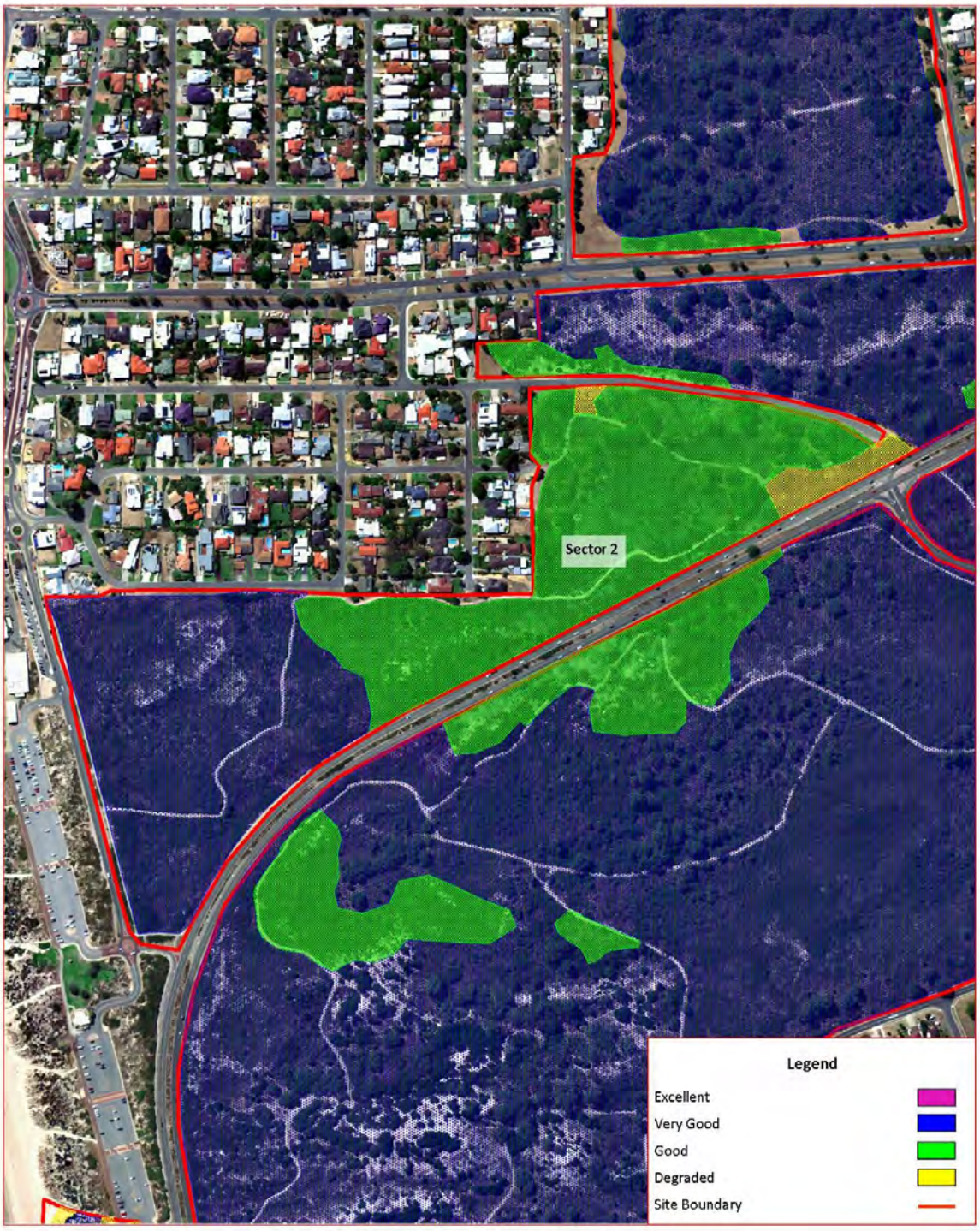


Vegetation Condition – Sector 1, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres



Natural Area CONSULTING

Vegetation Condition – Sector 2, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres

Vegetation Condition – Sector 3, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres

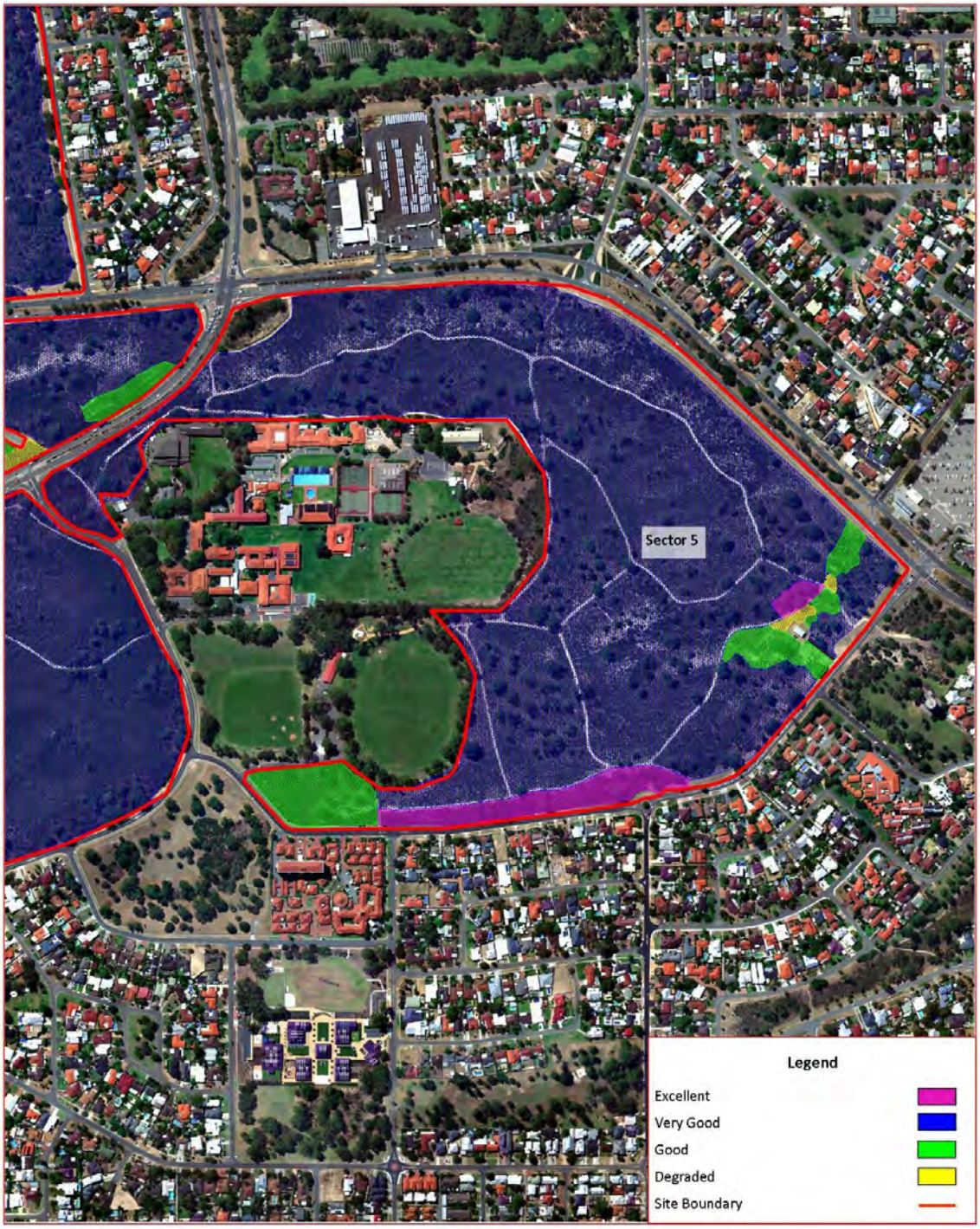
Natural Area CONSULTING

Vegetation Condition— Sector 4, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres



Natural Area CONSULTING

Vegetation Condition— Sector 5, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 200
metres

Vegetation Condition— Sector 6, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Image Date: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres

Appendix 8: Fauna Species List

Genus and Species	Common Name	Conservation Code	EPBC Status
Amphibian			
Crinia glauerti	Clicking Frog		
Heleioporus eyrei	Moaning Frog		
Limnodynastes dorsalis	Western Banjo Frog		
Litoria moorei	Motorbike Frog		
Myobatrachus gouldi	Turtle Frog		
Bird			
Acanthiza apicalis	Broad-tailed Thornbill, Inland Thornbill		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill		
Acanthiza inornata	Western Thornbill		
Acanthorhynchus superciliosus	Western Spinebill		
Accipiter cirrocephalus	Collared Sparrowhawk		
Accipiter fasciatus	Brown Goshawk		
Acridotheres tristis	Common Myna		
Aegotheles cristatus subsp. cristatus	Australian Owlet-nightjar		
Anas platyrhynchos	Mallard		
Anas superciliosa	Pacific Black Duck		
Anous tenuirostris melanops	Australian Lesser Noddy		Vulnerable, IA
Anthochaera chrysoptera	Little Wattlebird		
Anthochaera carunculata	Red Wattlebird		
Anthus novaeseelandiae	Richard's Pipit		
Apus pacificus	Fork-tailed Swift		Threatened, IA
Aquila morphnoides	Little Eagle		
Ardea alba	Great Egret		IA
Ardea ibis	Cattle Egret		IA
Artamus cinereus	Black-faced Woodswallow		
Artamus cyanopterus	Dusky Woodswallow		
Cacatua roseicapilla	Galah		
Cacatua sanguinea westralensis	Little Corella	I	
Cacatua tenuirostris	Long-billed Corella	I	
Cacomantis flabelliformis	Fan-tailed Cuckoo		
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	T	Vulnerable
Calyptorhynchus latirostris	Carnaby's Cockatoo	T	Endangered
Carduelis carduelis	European Goldfinch		
Catharacta skua	Great Skua		IA
Charadrius melanops	Black-fronted Dotterel		
Cheramoeca leucosternus	White-backed Swallow		
Chrysococcyx basalis	Horsfield's Bronze Cuckoo		

Genus and Species	Common Name	Conservation Code	EPBC Status
Colluricincla harmonica subsp. rufiventris	Grey Shrike-thrush		
**Columba livia*	Rock Pigeon, Rock Dove		
Coracina novaehollandiae subsp. novaehollandiae	Black-faced Cuckoo-shrike		
Corvus coronoides	Australian Raven		
Cracticus tibicen	Australian Magpie		
Cracticus torquatus	Grey Butcherbird		
Cuculus pallidus	Pallid Cuckoo		
Dacelo novaeguineae	Laughing Kookaburra	I	
Daphoenositta chrysoptera subsp. pileata	Varied Sittella		
Dicaeum hirundinaceum	Mistletoe Bird		
Diomedea carteri	Indian Yellow-nosed Albatross	T	Vulnerable, IA
Diomedea cauta	Shy Albatross	T	Vulnerable, IA
Diomedea epomophora epomophora	Southern Royal Albatross		Vulnerable, IA
Diomedea epomophora sanfordi	Northern Royal Albatross		Endangered, IA
Diomedea exulans (sensu lato)	Wandering Albatross		Vulnerable, IA
Diomedea exulans amsterdamensis	Amsterdam Albastross		Endangered, IA
Diomedea exulans exulans	Tristan Albatross		Endangered, IA
Diomedea melanophris	Black-browed Albatross	T	Vulnerable, IA
Diomedea melanophris subsp. impavida	Campbell Albatross		Vulnerable, IA
Elanus axillaris	Black-shouldered Kite		
Eopsaltria australis subsp. griseogularis	Western Yellow Robin		
Epthianura albifrons	White-fronted Chat		
Falco berigora	Brown Falcon		
Falco cenchroides	Australian Kestrel, Nankeen Kestrel		
Falco longipennis	Australian Hobby		
Gerygone fusca	Western Gerygone		
Glossopsitta porphyrocephala	Purple-crowned Lorikeet		
Grallina cyanoleuca	Magpie-Lark		
Haliaeetus leucogaster	White-bellied Sea-Eagle		Cwlth Land
Haliastur sphenurus	Whistling Kite		
Halobaena caerulea	Blue Petrel		Vulnerable, IA
Hirundo neoxena	Welcome Swallow		
Hirundo nigricans subsp. neglecta	Tree Martin		
Lalage sueurii	White-winged Triller		

Genus and Species	Common Name	Conservation Code	EPBC Status
Larus pacificus	Pacific Gull		Cwlth Land
Lichenostomus virescens	Singing Honeyeater		
Lichmera indistincta	Brown Honeyeater		
Macronectes giganteus	Southern Giant-Petrel		Endangered, IA
Macronectes halli	Northern Giant-Petrel		Vulnerable, IA
Malurus lamberti	Variegated Fairy-wren		
Malurus leucopterus	White-winged Fairy-wren		
Malurus splendens	Splendid Fairy-wren		
Melithreptus brevirostris subsp. leucogenys	Brown-headed Honeyeater		
Merops ornatus	Rainbow Bee-eater		IA
Neophema elegans	Elegant Parrot		
Neophema petrophila	Rock Parrot		
Ninox novaeseelandiae	Southern Boobook		
Pachycephala pectoralis subsp. fuliginosa	Golden Whistler		
Pachycephala rufiventris	Rufous Whistler		
Pandion haliaetus	Osprey		Cwlth Land
Pardalotus punctatus	Spotted Pardalote		
Pardalotus striatus	Striated Pardalote		
Pardalotus striatus subsp. westraliensis	Striated Pardalote		
**Passer domesticus*	House Sparrow		
**Passer montanus*	Eurasian Tree Sparrow		
Petroica cucullata	Hooded Robin		
Petroica goodenovii	Red-capped Robin		
Petroica multicolor subsp. campbelli	Scarlet Robin		
Phaps chalcoptera	Common Bronzewing		
Phylidonyris melanops	Tawny-crowned Honeyeater		
Phylidonyris nigra	White-cheeked Honeyeater		
Phylidonyris novaehollandiae	New Holland Honeyeater		
Platycercus icterotis	Western Rosella		
Platycercus spurius	Red-capped Parakeet		
Platycercus zonarius	Twenty-eight Parrot, Australian Ringneck		
Podargus strigoides	Tawny Frogmouth		
Pterodroma mollis	Soft-plumaged Petrel		Vulnerable, IA
Puffinus assimilis	Little Shearwater		IA
Puffinus carneipes	Flesh-footed Shearwater		IA

Genus and Species	Common Name	Conservation Code	EPBC Status
Rhipidura fuliginosa subsp. *preissi*	Grey Fantail		
Rhipidura leucophrys subsp. leucophrys	Willie Wagtail		
Rostratula australis	Australian Painted Snipe		Endangered
Sericornis frontalis	White-browed Scrub-wren		
Smicrornis brevirostris	Weebill		
Sterna anaethetus	Bridled Tern		IA
Sterna caspia	Caspian Tern		IA
Sterna dougallii	Roseate Tern		IA
Sterna nereis	Australian Fairy Tern		Vulnerable
Strepera versicolor	Grey Currawong		Vulnerable
Streptopelia chinensis	Spotted Turtle-Dove		
Streptopelia senegalensis	Laughing Turtle-Dove		
**Sturnus vulgaris*	Common Starling		
Tadorna tadornoides	Australian Shelduck, Mountain Duck		
Thalassarche cauta steadi	White-capped Albatross		Vulnerable, IA
Threskiornis molucca	Australian White Ibis		Vulnerable
Threskiornis spinicollis	Straw-necked Ibis		
Todiramphus sanctus	Sacred Kingfisher		
Trichoglossus haematodus	Rainbow Lorikeet		
Tyto alba	Barn Owl		
Vanellus tricolor	Banded Plover, Banded Lapwing		
Zosterops lateralis	Grey-breasted White-eye, Silvereye		
Reptiles			
Aprasia repens	Sand-plain Worm Lizard		
Brachyurophis fasciolata subsp. fasciolata			
Brachyurophis semifasciata	Southern Shovel-nosed Snake		
Brachyurophis semifasciata			
Christinus marmoratus	Marbled Gecko		
Cryptoblepharis buccanani	Buchanan's Snake-eyed Skink		
Cryptoblepharis plagiocephalus	Australian Snake-eyed Skink		
Ctenophorus adelaidensis	Western Heath Dragon		
Ctenotus australis	West Coast Long-tailed Ctenotus		
Ctenotus fallens	West Coast Ctenotus		
Ctenotus ora	Coastal Plains Skink	P1	
Cyclodomorphus celatus	Western Slender Blue-tongue		
Delma fraseri	Fraser's Scalyfoot		
Diplodactylus alboguttatus	White-spotted Gecko		
Echiopsis curta	Bardick Snake		

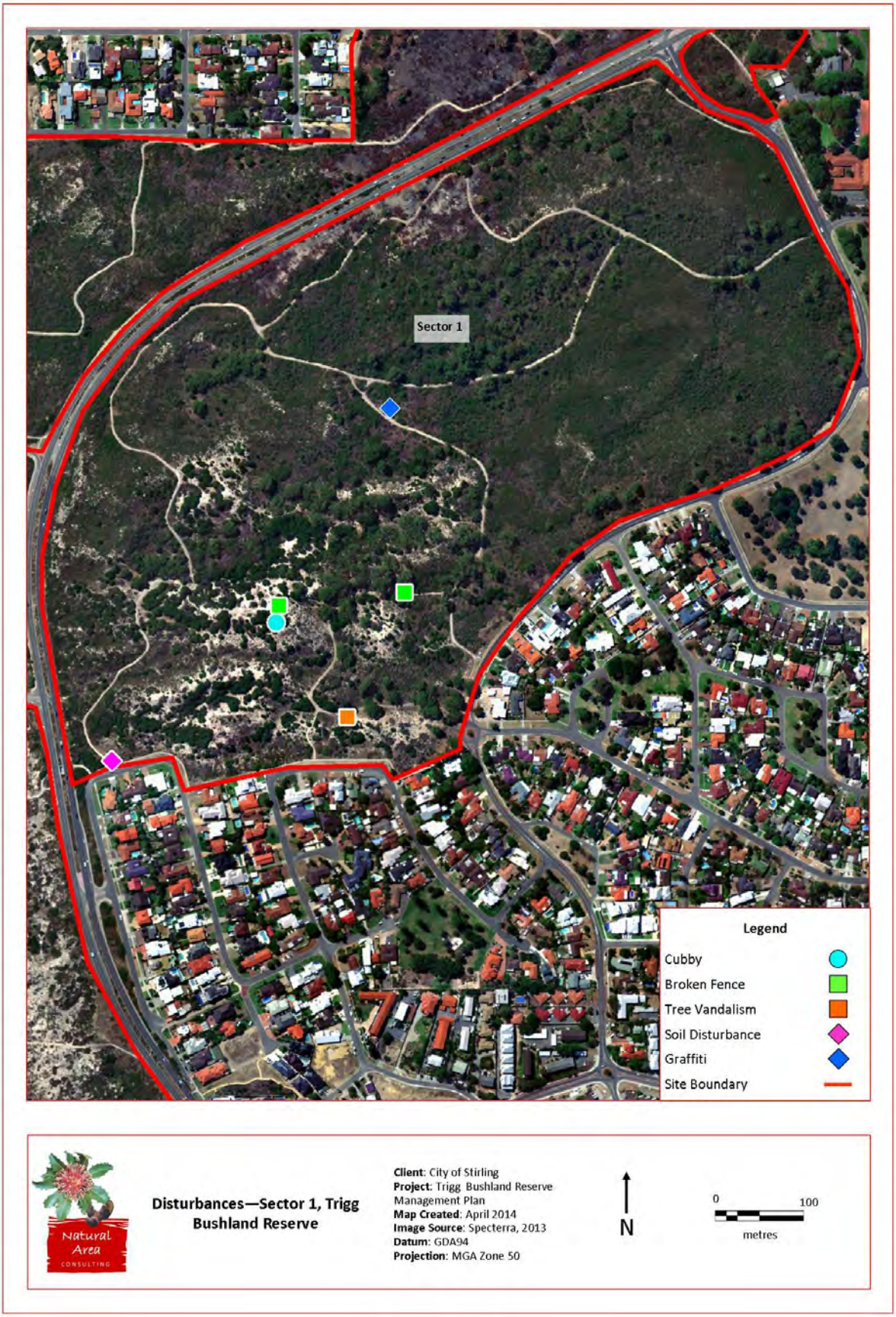
Genus and Species	Common Name	Conservation Code	EPBC Status
Egernia napoleonis	Napoleon Skink		
Hemiergis quadrilineata	Two-toed Earless Skink		
Lerista elegans	Elegant Slider		
Lerista lineata	Lined Lerista		
Lerista lineopunctulata	Dotted-line Robust Slider		
Lerista praepedita	West Coast Worm-slider		
Lialis burtonis	Burton's Snake-lizard		
Menetia greyii	Common Dwarf Skink		
Morethia lineoocellata	Line-eyed Morethia		
Morethia obscura	Shrubland Morethia Skink		
Neelaps bimaculatus	Black-naped Burrowing Snake		
Neelaps calonotos	Black-striped Burrowing Snake		
Notechis coronatus	Crowned Snake		
Notechis scutatus subsp. occidentalis	Tiger Snake		
Parasuta gouldii	Gould's Hooded Snake		
Pletholax gracilis subsp. gracilis	Slender Slider		
Pogona minor	Dwarf Bearded Dragon		
Pseudonaja affinis	Dugite		
Pygopus lepidopodus	Southern Scaly-foot, Common Scaly-foot		
Ramphotyphlops australis	Southern Blind Snake		
Simoselaps bertholdi	Jan's Banded Snake		
Strophurus spinigerus	Soft Spiny-tailed Gecko		
Tiliqua occipitalis	Western Blue-tongued Lizard		
Tiliqua rugosa	Shingleback Lizard, Bobtail		
Varanus gouldii	Sand Monitor		
Varanus tristis	Black-headed Monitor		
Mammal			
**Canis lupus familiaris*	Domestic Dog	I	
Cercartetus concinnus	Western Pygmy Possum		
Chalinolobus gouldii	Gould's Wattled Bat		
Chalinolobus morio	Chocolate Wattled Bat		
**Felis catus*	Cat	I	
Isoodon obesulus fusciventer	Southern Brown Bandicoot, Quenda	P5	
Mormopterus planiceps	Little Mastiff-bat		
**Mus musculus*	House Mouse	I	
Nyctophilus geoffroyi	Lesser Long-eared Bat		
Nyctophilus gouldi	Gould's Long-eared Bat		
Nyctophilus major major	Western Long-eared Bat		
**Oryctolagus cuniculus*	Rabbit	I	

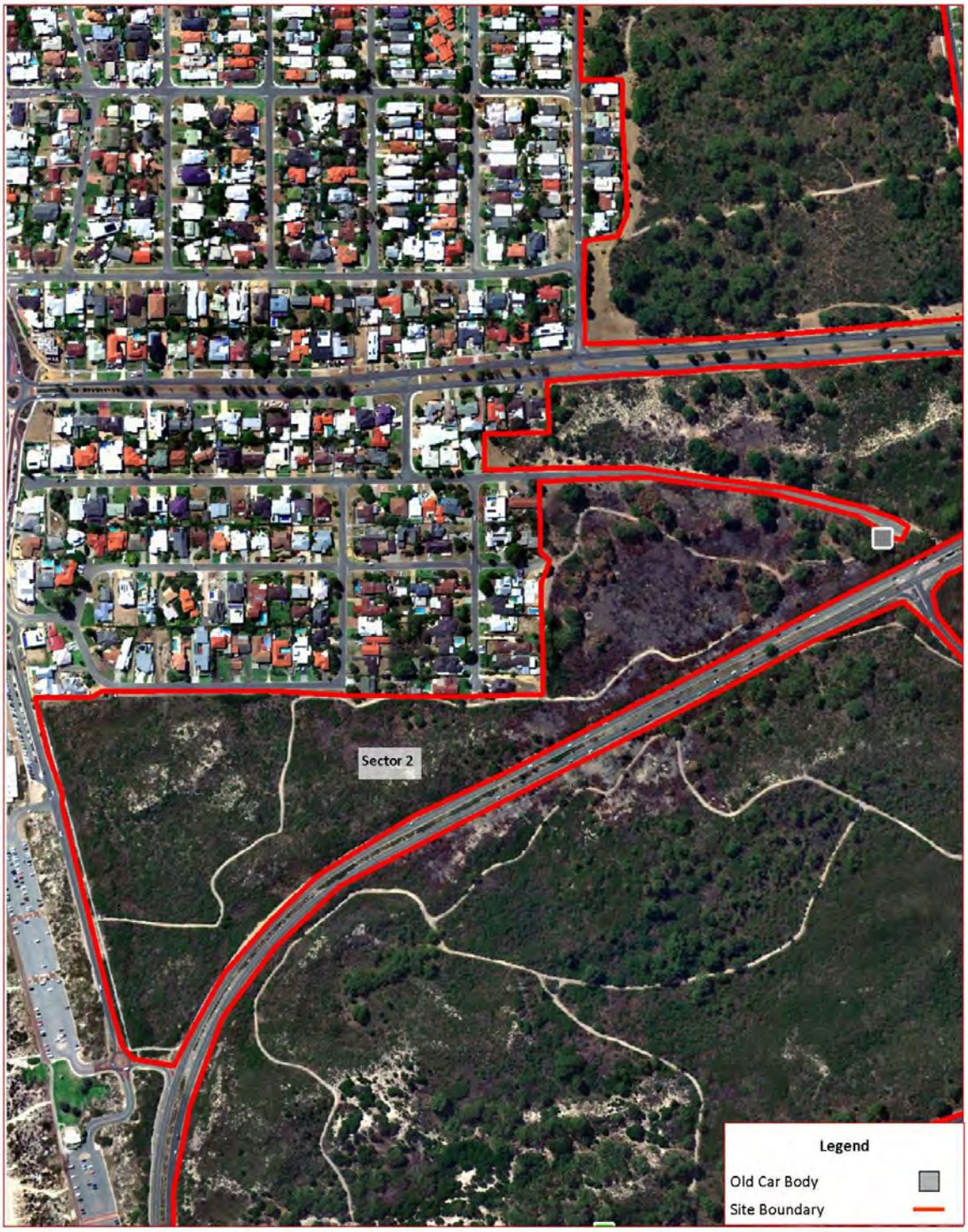
Genus and Species	Common Name	Conservation Code	EPBC Status
**Rattus norvegicus*	Brown Rat		
**Rattus rattus*	Black Rat		
Tachyglossus aculeatus	Short-beaked Echidna		
Tadarida australis	White-striped Mastiff-bat		
Tarsipes rostratus	Honey Possum		
Trichosurus vulpecula	Common Brushtail Possum		
**Vulpes vulpes*	Red Fox	I	

Legend

* Introduced species
Species possibly occurring in Trigg Bushland Reserve according to EPBC report
Species Expected to occur within Trigg Bushland Reserve
Species known to occur within Trigg Bushland Reserve

Appendix 9: Disturbances





Disturbances—Sector 2, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

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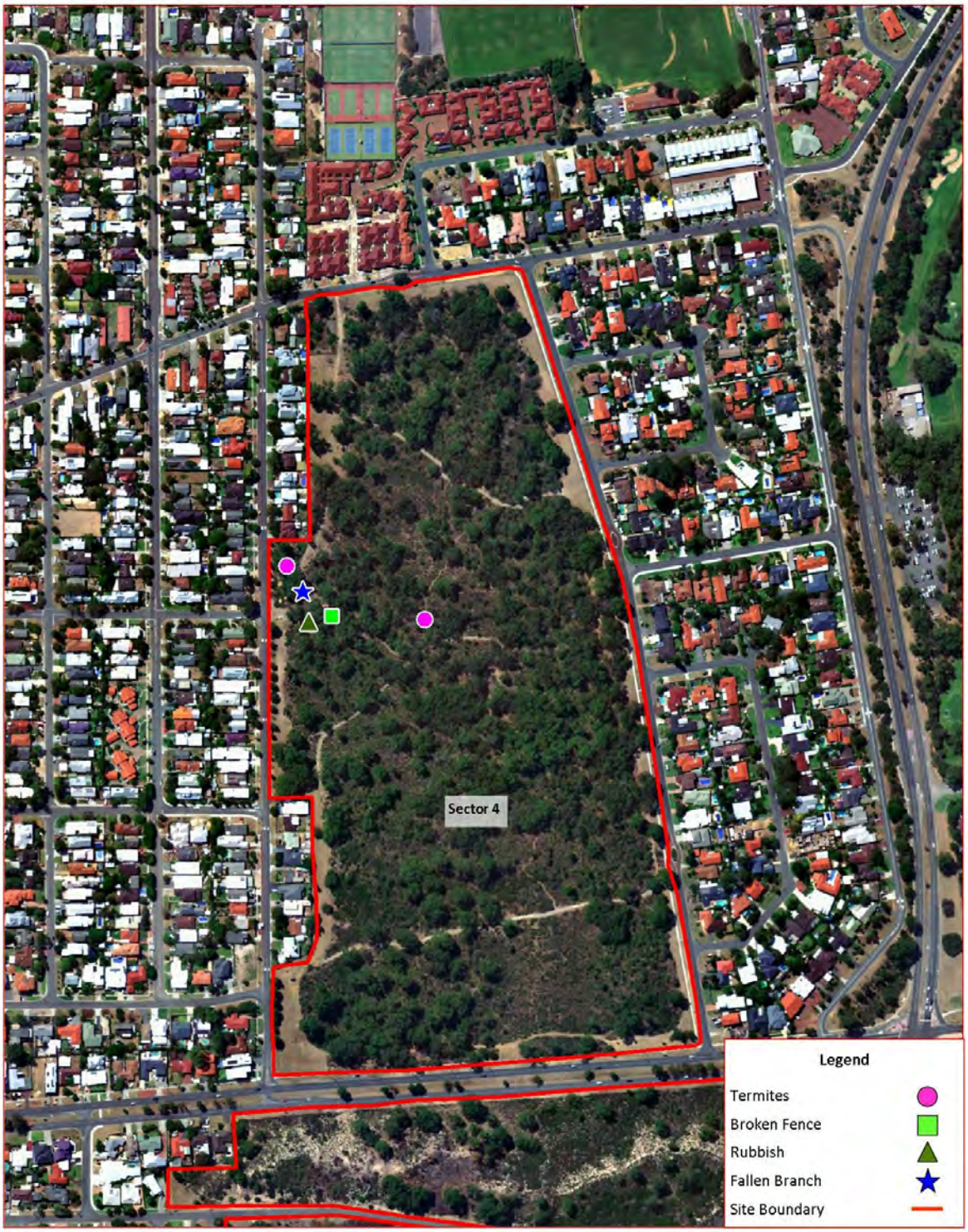
metres



Disturbances—Sector 4, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

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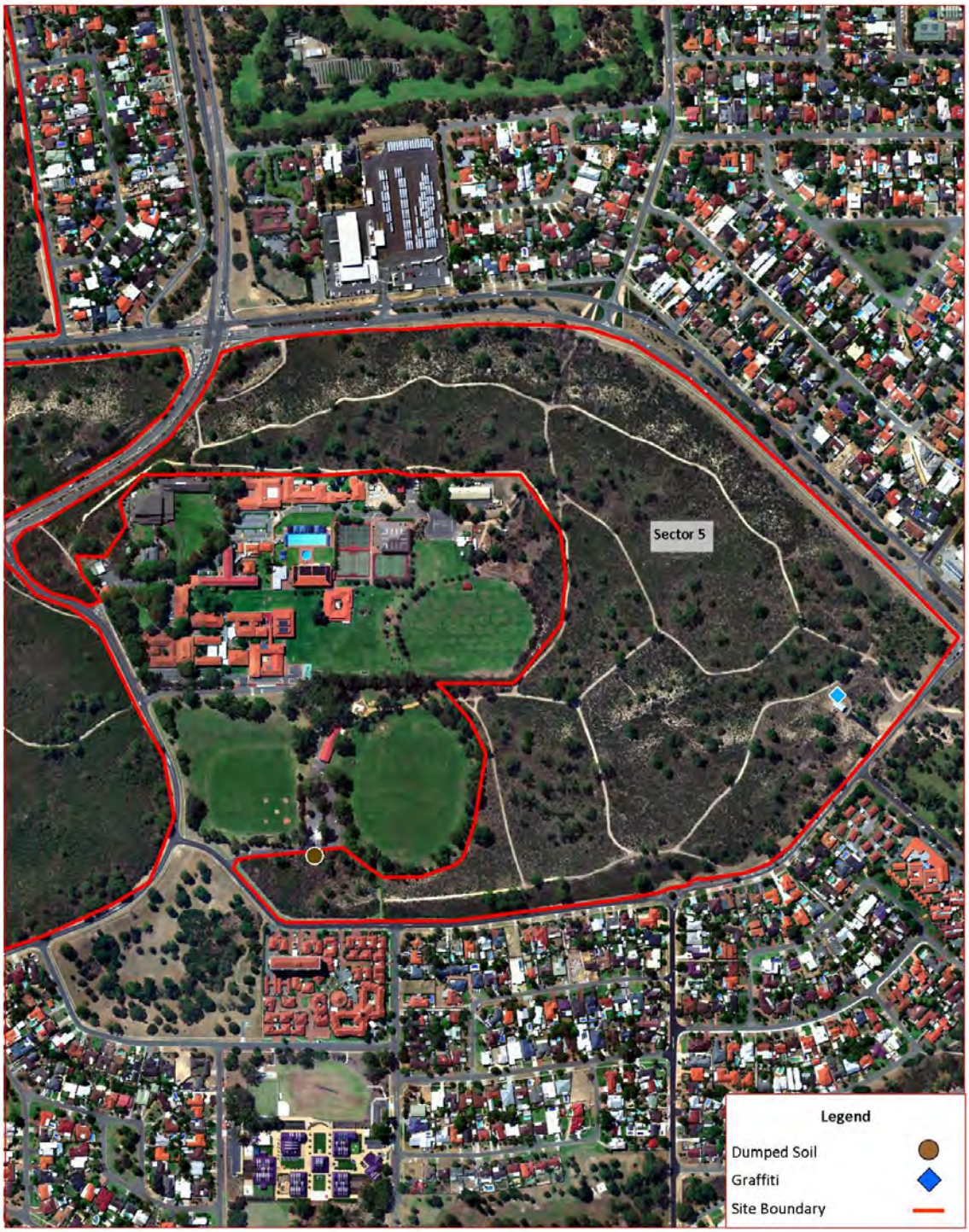
metres



Natural Area CONSULTING

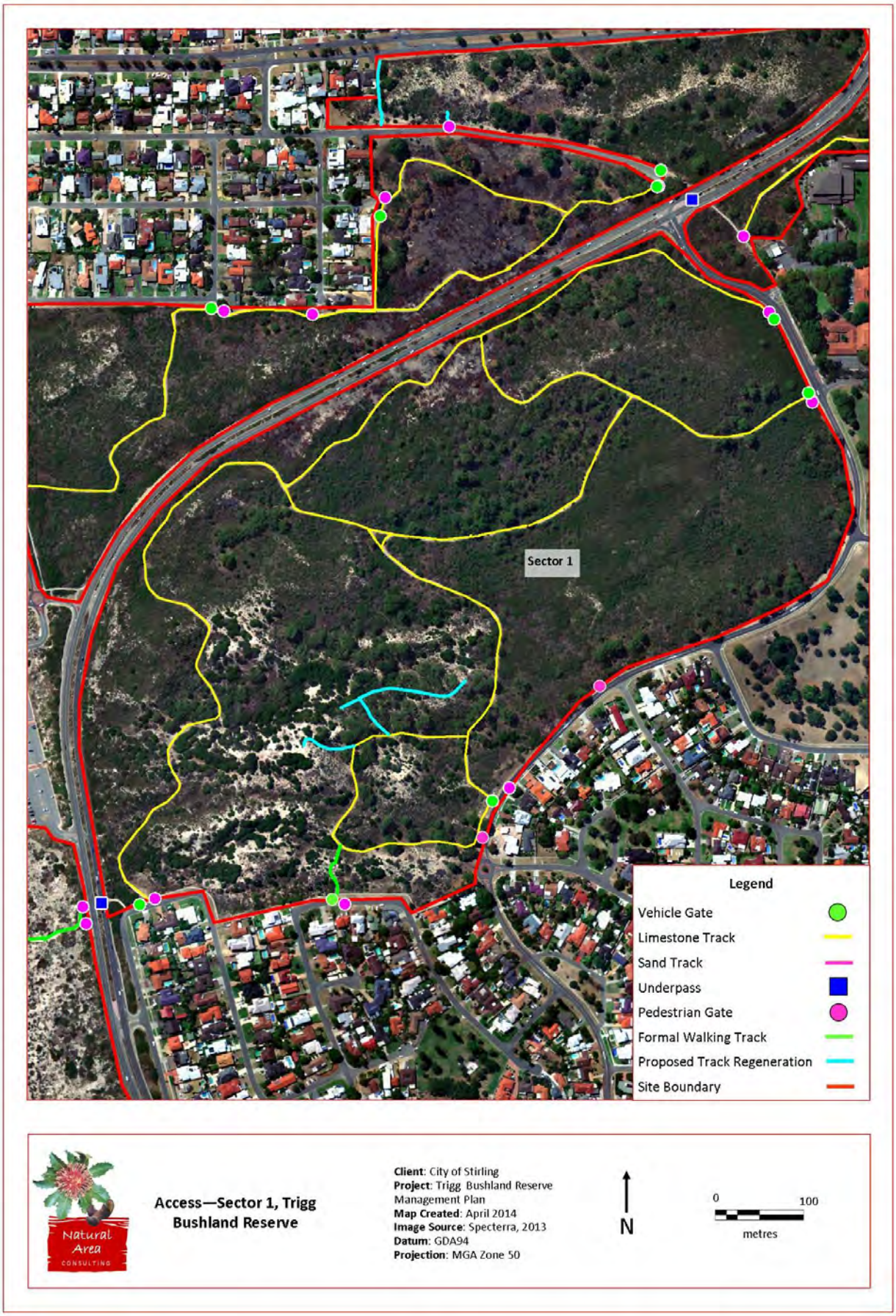
Disturbances—Sector 5, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres

Appendix 10: Access


Sector 1
Legend
Vehicle Gate
Limestone Track
Sand Track
Underpass
Pedestrian Gate
Formal Walking Track
Proposed Track Regeneration
Site Boundary
Natural Area CONSULTING
Access—Sector 1, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50
N
0
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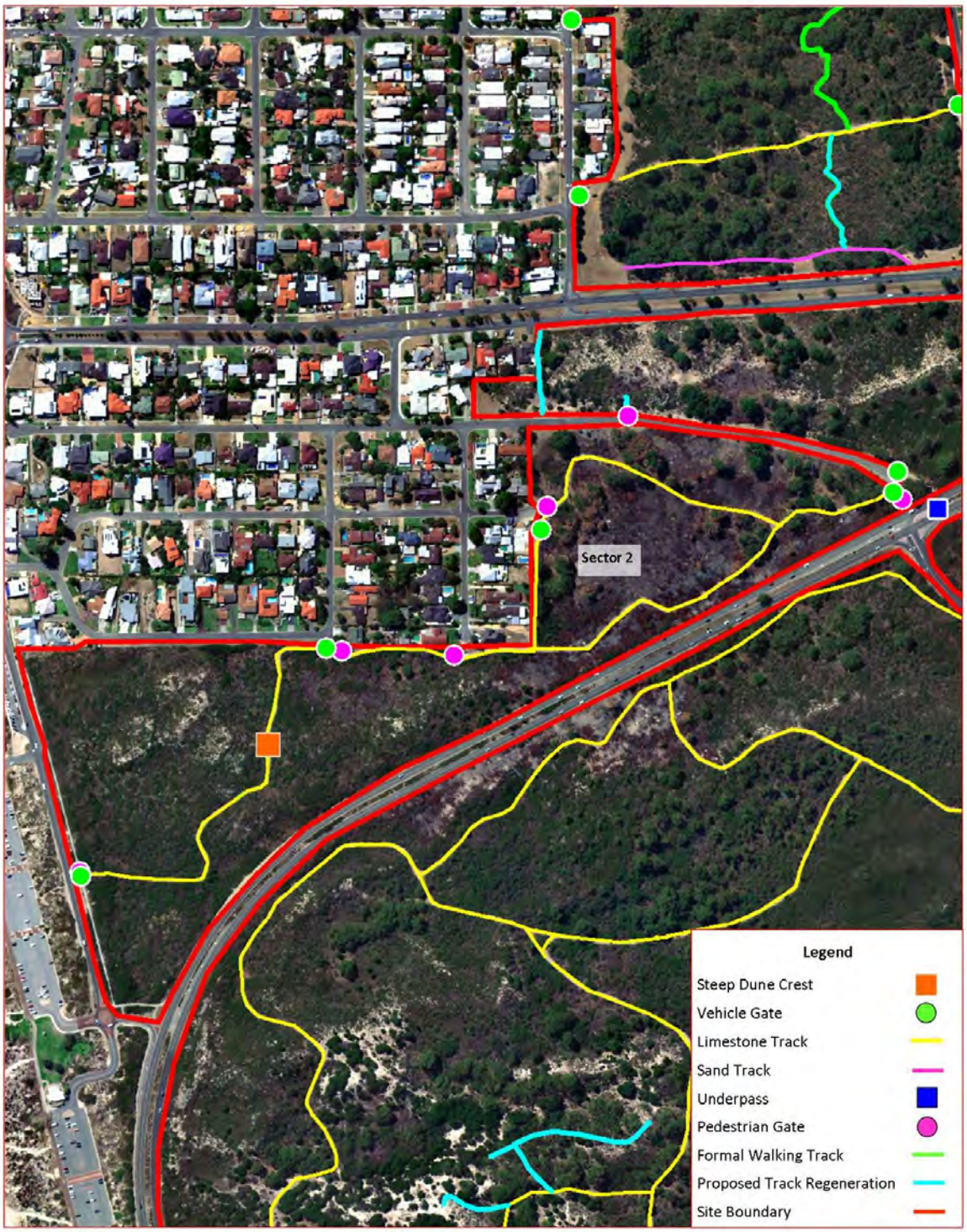
metres



Natural Area CONSULTING

Access—Sector 2, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

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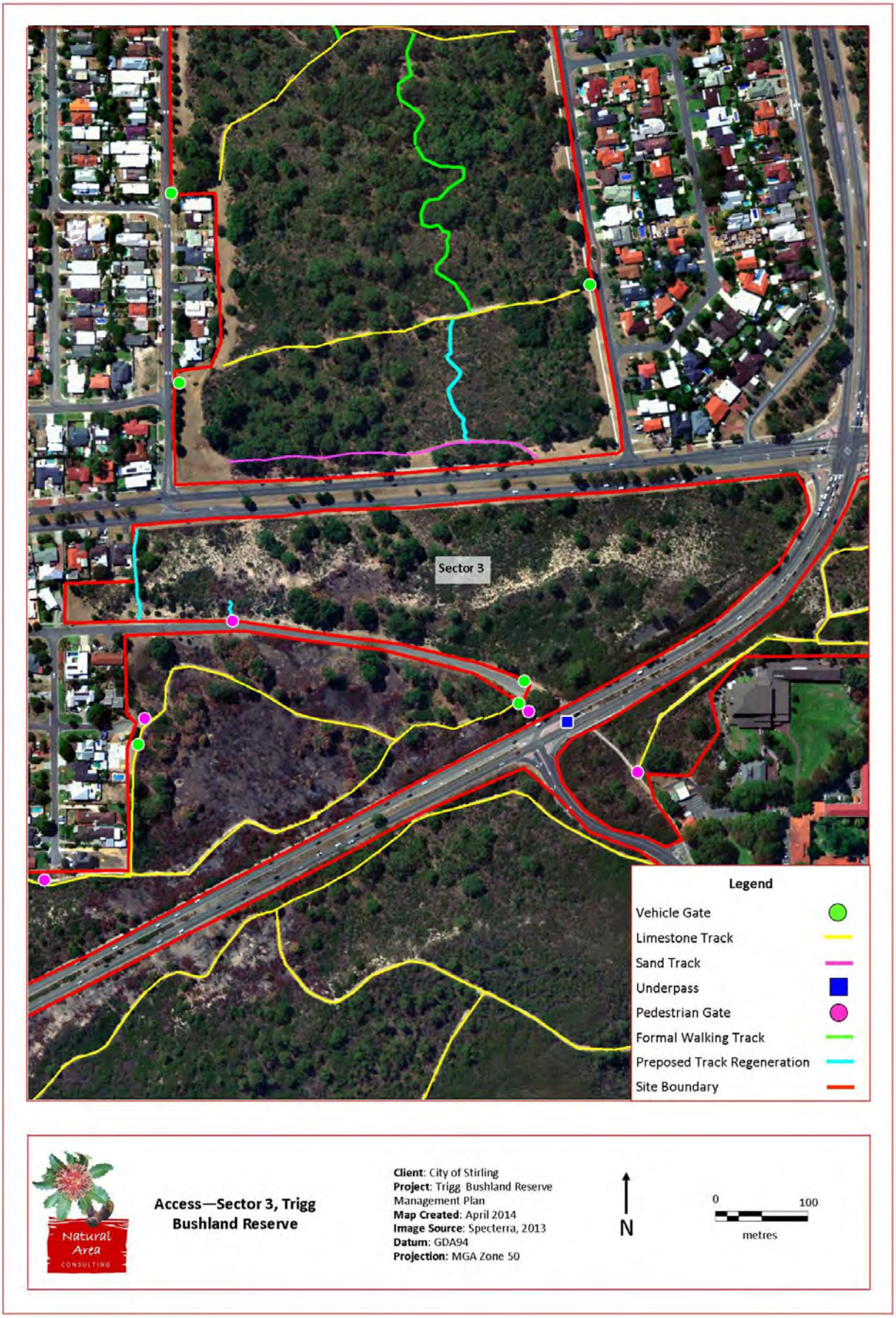
0 100
metres


Sector 3
Legend
Vehicle Gate
Limestone Track
Sand Track
Underpass
Pedestrian Gate
Formal Walking Track
Preposed Track Regeneration
Site Boundary
Natural Area CONSULTING
Access—Sector 3, Trigg Bushland Reserve
Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50
N
0
100
metres

Natural Area CONSULTING

Access—Sector 4, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

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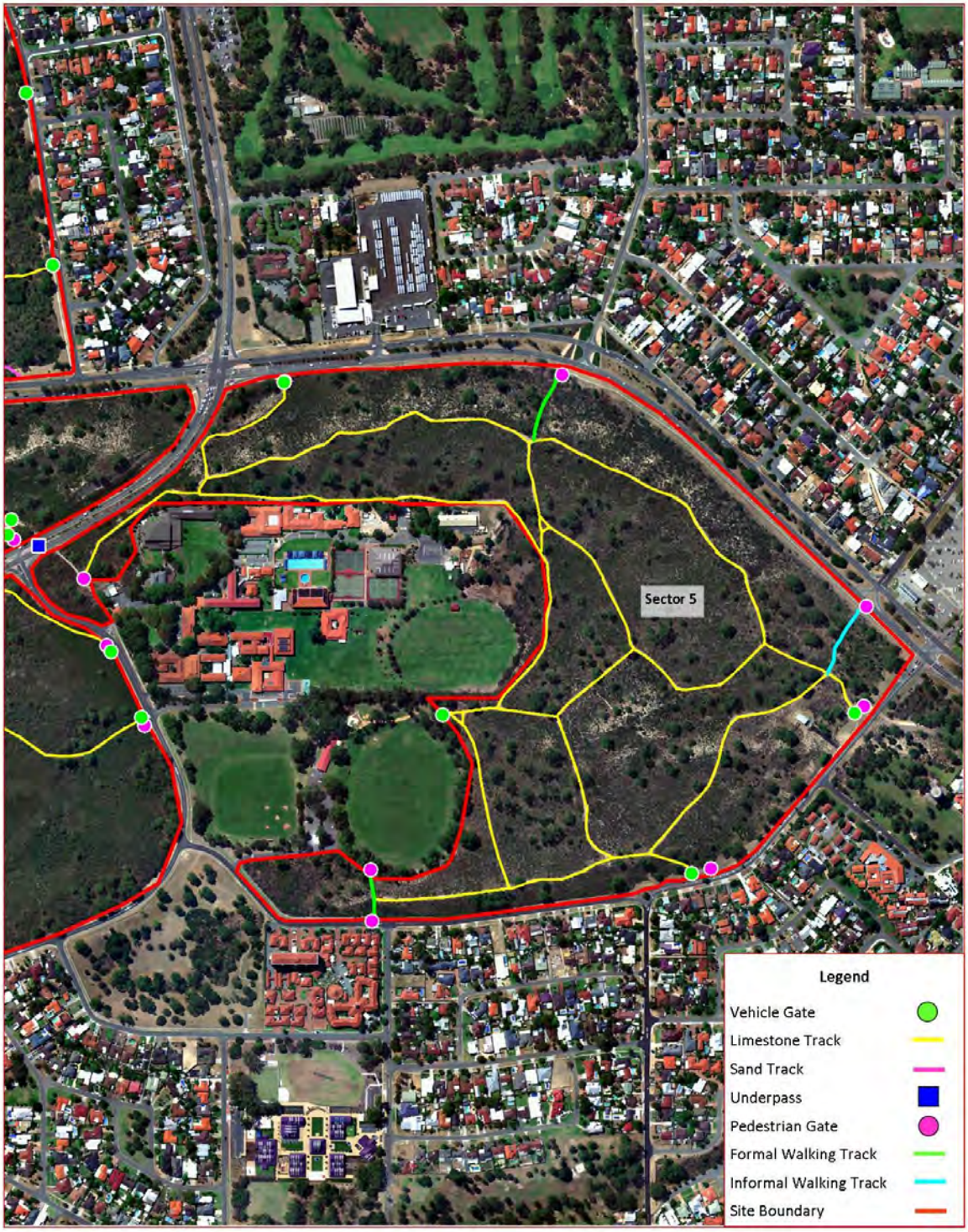
metres



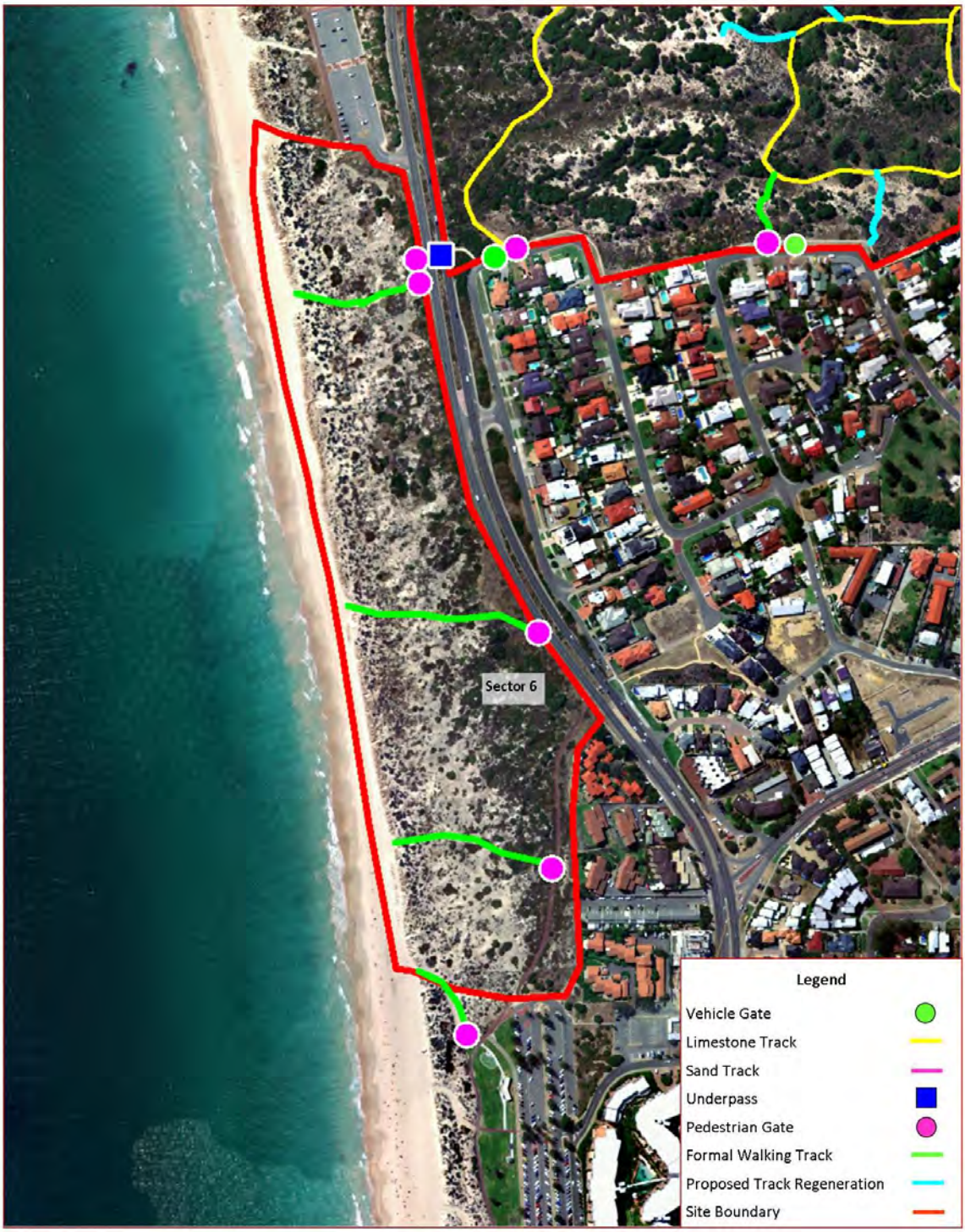
Natural Area CONSULTING

Access—Sector 5, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres



Access—Sector 6, Trigg Bushland Reserve

Client: City of Stirling
Project: Trigg Bushland Reserve Management Plan
Map Created: April 2014
Image Source: Specterra, 2013
Datum: GDA94
Projection: MGA Zone 50

N

0 100
metres

Appendix 11: Audit of Public Submissions

Trigg Bushland Reserve - Public Comments 2014

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
1	Dog walking	I would like to register my objection to the proposed change to the rules regarding dog access to bushland areas. One of the best aspects of CoS is the enlightened policy of all open spaces being dog friendly/off leash areas with the onus being on the owners to ensure reasonable control. We believe this policy contributes to the overall health of the local community due to the known benefits of dog ownership and their exercise needs.	The City of Stirling will allow dogs to be walked off the lead in Trigg Bushland if the community ensures: 1. Dogs are kept under control as defined in the *Dog Act 1976* (WA) and City of Stirling Dog Local Laws, dogs are walked on the tracks and are not allowed within the bushland; 2. excrement must be picked up and placed in bins. The Dog Act stipulates that: a person must be able to control a dog, and be capable of attaching a leash, harness or other restraint if required, and that the leash (or similar) must be no longer than 2 m in length. Thus, for a dog to be considered under control, it must respond immediately to owner commands and be close enough to have a leash attached quickly, if the situation requires it, and is capable of being controlled by whomever is holding the dog. The City of Stirling will review the situation within the Duart-Arnott sector at the end of 2016 after implementation.	Section 2.5.4 of the Management Plan adjusted, with additional recommendations included. Additional information includes a summary of outcomes of the invertebrate study carried out at a dog and non-dog beach within the City of Stirling.
1	Dog walking	Dogs exercising off leash generally sticking to the paths and close to their owners.	As per no. 1 above	As per no. 1 above
1	Dog walking	Contrary to the suggestion that on leash exercise is satisfactory, this is just not the case to adequately satisfy a dog's physical and/or emotional well-being. For many dogs additional activities to ensure they are content by the time they return home and therefore less likely to cause nuisance by barking.	As per no. 1 above	As per no. 1 above
1	Education	We trust that in this instance an educative rather than restrictive approach will be taken by the CoS.	Education of dog and cat owners is seen as complementary to other management measures, and has been provided for in the management plan	As per no. 1 above
1	Weed management	Many good strategies were set out, particularly with respect to the timely management of weeds following instances of bushfire. For instance, following the recent fire in the sector behind Spence St, early treatment to eliminate weed species would have significantly enhanced the success of the subsequent substantial native flora germination. Similarly, improved control of feral animals (particularly rabbits) and garden plants is to be commended.	When possible to do so, the City of Stirling undertakes weed control after fire to prevent weeds. Recommendation 12.3 in Section 2.4.11 supports this practice.	No changes to the plan
2	Dog walking	In regards to the report recommendations that dog exercise is restricted within the bushland area, yet the report notes that dog exercise is one of the predominant uses of the bushland in the mornings and I would agree that the vast majority of the users are walking their dogs. Any rules to restrict this use would be very disappointing and based on my experience would lessen the use of the area.	As per no. 1 above	As per no. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
3	Cyclists	Suggest creating greater obstacles for the bike (albeit prams may have to be folded to gain access) and, in one glaring example on Jeanes Road, reinstate some impediment for bike entry.	The section on Trail and Motorbikes in Section 3.1.4 includes the recommendation that chicanes or other forms of access that limit the ease of access to bikes is installed	No changes to the plan
3	Signage	Existing signs say “no bicycles, no motor bikes” and these directions are flouted due to the ready access points around the perimeter of the Reserve. Damage caused by vehicles in way of erosion, cause difficult walking conditions. The speed of some cyclists is not only frightening but can be dangerous for pedestrians. Extend arson warning signage (typical of the Sector 4 area)	Adherence to conditions of entry are difficult to enforce and responsibility for monitoring and encouraging compliance rests with rangers; however, it is difficult to monitor.	No changes to the plan
4	General comments about the plan	Plan should have a specified period. Strategies should be based on a risk assessment so important issues are dealt with first. Should rank key natural assets and threats. Management actions should be based on reducing the level of threat to assets. Ongoing monitoring of condition over time. Annual cost of management actions recorded. Recommendations should be prioritised. Recommendations state who will be responsible for actions and by when. Wording so recommendations can be managed long-term	No period has been specified by the City of Stirling, with future review(s) being triggered by changed conditions, knowledge or other requirements. This plan updates the 1991 plan. Priorities are highlighted in Table 12 Implementation Priorities in Section 6.0	No changes to the plan
4	Strategic issues – Purposes of urban bushland reserves: Ecological & social purpose	There is no clearly stated community owned vision for the Trigg Bushland Reserve. The primary purpose of WA Nature Reserves is solely ecological, that is, for biodiversity conservation. WA National Parks have joint ecological and social purposes, that is, the purposes attempt to strike a balance between nature conservation and human use, with the former having primacy. We believe that, in a highly urbanised society like WA, the purpose of these types of reserves should be for the psychological and physical well-being of the community via interaction with the natural environment. Thus, in operational terms, the purpose of the TBR should be to promote and encourage the legitimate public uses the community see as consistent with their well being and consistent with the natural assets necessary for these social purposes. In this scenario, the community's social needs have primacy provided the major natural assets are protected. Simplify objectives, make them achievable	Changes made to Section 1.6. The aim is manage the Reserve in accordance with the management orders detailed in Section 1.2, which is conservation, dune protection, education and passive recreation, with a few of the reserves having additional purposes such as parking and water supply. The hierarchy of the management orders mean that conservation is the primary aim, but also allows for other uses/purposes. The various values of Trigg Bushland do promote the psychological and physical well-being of the community through its interaction (use) of the site for a range of activities.	Section 1.6 adjusted.
4	Walking in bushland	It is unreasonable to reduce the real social benefits people and dogs get from walking and exercising their dogs freely by requiring dogs to be on leashes in order to obtain potentially minor ecological benefits.	As per no. 1 above	As per no. 1 above
5	Dog walking	As I am moving into Jeanes Road with small children in a couple of weeks, I very much agree with the return of the 'dogs on lead' policy for Trigg Bushland. It's our responsibility to look after what remains of the natural flora and fauna, dog excrement and them running loose does not help.	As per no. 1 above	As per no. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
6	Dogs off leash	Request not supporting recommendations 16.1 and 16.2 in regards to walking dogs off leash. Draft plan does not justify banning dogs off leash in Trigg bushland, evidence suggests bushland is in very good condition. No evidence of trampling of native orchids or of disturbances from dogs in bushland area. No evidence to suggest dogs affecting native wildlife. No evidence to suggest dog poo is a problem in Trigg bushland. Supports the placement of more dog litter bags.	As per no. 1 above	As per no. 1 above
7	Phytophthora	10.3 (Foot) Foot wash against 'Phytophthora'. How can efficient application to people visiting the area be enforced?	It is recognised that the use of such stations can be difficult to enforce, and will be one of the factors for consideration by the City. This is a common strategy that is used to assist with management, and it is expected that the majority will adhere to the requirement for use if the City chooses to proceed with their installation. NIASA accredited nurseries use such footbaths and are designed in a manner that maximises use prior to entry. They are also being used successfully at other reserves and national parks within Western Australia and other States.	No changes to the plan
7	Division of bushland	The area involved is strongly divided into 4 sections, with very busy traffic on main roads dividing the sections. My suggestion is that the City of Stirling consider dividing up management of the Trigg Bushland into 4 areas with a central management to steer and co-ordinates activity. This will have the areas individually assessed for their status, their ecological attractions and reversibility, which should attract more public interest.	A holistic management approach has been adopted that recognises the site as a whole, whilst also recognising issues specific to each sector.	No changes to the plan
8	Maintenance	Log & chain path near St Mary's needs some repair.	Noted.	No changes to the plan
8	Signage	Re 5.3.12 Rubbish – we would like to see the signs prohibiting the dumping of rubbish be renewed on the fence adjacent to our house, the Elliott Rd cul-de-sac and other fences surrounding the reserve. A neighbour has been observed dumping building rubble in the reserve & occasionally mattresses/furniture dumped at end of the cul-de-sac.	Specific signs relating to the dumping of rubbish do not usually work in reducing the dumping of waste as the offenders are already aware that they are committing an illegal act. Illegal waste dumping can be reported to council officers so that clean up can be organised.	No changes to the plan
8	Tracks	Proposed track regeneration from Karrinyup Rd (near intersection with Arnott St) to Elliott Rd is used daily. It might be better to formalise track & provide screening to adjacent house because people seem determined to use track (having cut fence along Karrinyup Rd could re-locate 'gate to nowhere' at end of 'cul-de-sac' to entry to this path on Elliott Rd.	Agreed. Map changed, access gate also recommended	Paragraph 4 of Section 3.2 adjusted, recommendation to retain this track included (25.3), and others renumbered, Figure 26 adjusted
8	Weeds	Drainage into Tuart Trees rear corner of Karrinyup & Arnott Rd seems to be encouraging spread of weeds, especially Freesias. Weeds appear to be spreading and new species appearing (Caltrop) (in grassy area next to 39 Elliott Rd)	Drainage and weeds have been addressed within Section 2.2 the management plan.	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
9	Dog Faeces	I regularly, 3 or 4 times a week, walk or jog on the paths. I enjoy taking in the natural setting, native plants and wildlife but the amount of dog poo on the paths has noticeably increased over the last 5 years.	Noted, refer No 1 above	As per no. 1 above
9	Dogs	There are plenty of options for exercising dogs in the area. The local open space areas by Jeanes/Elliot, Duke/Deanmore, Jackson Ave, Prisk Elliot are all used for dogs, as well as the dedicated dog beach and the ovals beside St Mary's.	Noted, refer No 1 above	As per no. 1 above
9	Dogs in bushland	I strongly recommend as part of this plan to have no dogs in the bushland.	Noted. See comments for No. 1 above.	As per no. 1 above
9	Uncontrolled dogs	I have been harassed by uncontrolled dogs and on two occasions been bitten on my shorts.	Noted. The City of Stirling Responsible Dog Ownership pamphlet indicates that dogs are not under effective control if they: chase or disturb any person or wildlife, act in a threatening or aggressive manner, cause damage to flora, enter a lake or water channel. The responsibility for ensuring this happens is with the dog owner. In the event of a dog attack, report it to the City Rangers via the Customer Contact Centre.	As per no. 1 above
10	Dogs	Never seen a serious dog fight or evidence of native species being killed. What a load of rubbish to suggest that dogs off leash accompanied by their owners cause havoc and degradation. Most owners diligent about picking up dog poo. Cats are another matter.	As per no. 1 above	As per no. 1 above
10	Poles & wire fencing	We have lived opposite 'our bush' for over 20 years in Trigg and walk regularly through its special paths, usually twice a day and thus have an intimate knowledge of its exceptional beauty. Along with us our children and grandchildren who regularly accompany us and are also learning to appreciate the many aspects of the flora and bird life that change almost daily with the seasons. The biggest blight committed on the bush is the unsightly pole and wire fence, cutting off access to residents wishing to enjoy nature. No wonder someone resorted to cutting it until a single way through was designed to be possible. It is a pity that fences prevent us from properly enjoying the experience. We hope that there will be no more fences.	No additional fencing is planned within Trigg Bushland by the City of Stirling	No changes to the plan
10	Signs	To the plethora of signs with no educational or informative value erected that do nothing but attract graffiti.	Informative and educational signs have been allowed for within the management plan with the intention that it will assist in educating the majority. Graffiti is an ongoing management issue, and will occur whether or not signs are present.	No changes to the plan
11	Dogs on leash	P76. Dogs on leash. I have been exercising dogs off leash in areas adjoining surf club & St Mary's for years. At no stage have I observed my or any other dogs running through the bush. They run on paths & let off steam. Be careful trying to change this status quo.	As per no. 1 above.	As per no. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
11	Ongoing maintenance	Sector 2 NE corner near Jeanes Rd intersection – drain needs amending as rubbish oil etc goes into bush.	Drainage and associated issues are discussed in Section 2.2 of the management plan	No changes to the plan
12	Anti-social behaviour	Teenagers riding motorbikes in the bushland, making camp sites with camp fires, taking drugs and leaving needles. This is not acceptable and needs to be addressed with fencing, turnstiles, regular monitoring, CCTV etc.	There are no plans for additional fencing within Trigg Bushland. Entry points will be subject to review. Regular monitoring is carried out by parks personnel. CCTV is not planned by the City of Stirling.	No changes to the plan
12	Dog Faeces	The dune ridge behind St Mary's Anglican School smells of dog poo all along the ridge, it absolutely reeks on a warm day. There are poo bags available, but we didn't see people using them, and because their dogs are not under control, they don't notice or simply look the other way.	As per no. 1 above	As per no. 1 above
12	Dogs on leads	With long leads, there really isn't any reason why a well mannered dog can't go for an unrestricted walk and still be on leash. It is really only badly mannered dogs that will find this to be a restriction.	Note that the *Dog Act 1976* (WA) indicates that the maximum dog leash length is 2 m.	No changes to the plan
12	Fire	We do not believe in burning the bush, but do believe in reducing weeds, taking out cubby's and other structures which often have camp fires and smoking associated with them. Any reduction in the frequency of fire is vital for the safety of residents and integrity of the bushland. It does not recover when it is burnt frequently.	Noted. The majority of fires in natural areas are often deliberately lit, making it difficult to control the frequency of occurrence.	No changes to the plan
12	Uncontrolled dogs	Uncontrolled dogs come up to you in Trigg Bushland and will not leave you alone, even a friendly dog can harm you, With friendly dogs jumping on us, tripping us, and so on, so the issue is really one of control. . We have been jumped on may times and the risk of a fall is scary when you are older. We completely agree with the recommendation that Trigg Bushland be returned to its pre-1996 designation as a dogs on leash area.	As per no. 1 above. Note that it was discovered that the pre-1996 designation as a dog on leash area was not correct and all reference to this has subsequently been removed from the plan.	As per no. 1 above
13	Track naming	Track naming system great to improve safety in the bushland. Another bee hive not mapped. Turnstile entrance off Karrinyup Rd near Jeans Rd CNR. Old log & hive.	Noted.	No changes to the plan
14	Dog Faeces	I see dogs not on leads as I walk through the bush, it is possible for the dogs to leave their faeces anywhere.	Noted. See also comments for No. 1 above.	As per no. 1 above
14	Dog walking	I would like to support the recommendation that Trigg Bushland be returned to its pre 1996 designation as a "dogs on lead" area.	Note that it was discovered that the pre-1996 designation as a dog on leash area was not correct and all reference to this has subsequently been removed from the plan. See also comments for No. 1 above.	As per no. 1 above
15	Dogs walking	Dogs can also disturb the local fauna.	Noted. See also comments for No. 1 above.	As per no. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
16		I have two dogs which I regularly walk in Sector 5. I have them off leash, they stay on the limestone paths. I clean up their poo. Some do not & I would like them to be punished. I would prefer dogs to be off lead, but controlled & kept to paths so as to not damage wildlife, bushland etc. The rubbish bin has been removed from Jeanes Road, near Duke St. I think if this was to be replaced, this might improve the dog mess situation. It is a wonderful space to enjoy nature and I want to continue to enjoy it with my dogs. Great work.	As per no. 1 above. There is an existing bin and poo-pouch dispenser near the corner of Duke Street and Jeanes Road, and an additional one has been recommended for the entry near Jeanes Road, as shown in Figure 21 of the Management Plan	No changes to the plan
17	Cats	Report does not say that there are currently any issues with cats so why do we need education and more signs. Sure that no person intentionally takes cats into the bush	Cats are known hunters of wildlife including lizards, frogs and small mammals. The issue is with those cats allowed to roam from home in an uncontrolled manner, as described in the *Cat Act 2011.*	No changes to the plan
17	Condition of bushland	The management plan states that "the majority of bush is in good or very good condition". This being so I do not see the need to restrict dogs to being on a lead only.	The condition rating scale is a qualitative one that considers the presence of native vegetation and degradation processes such as weeds and disturbance. In the case of Trigg Bushland, the size of the reserve contributes to its overall good or very good condition, with those areas where people walk dogs in poorer condition than less accessible areas. In addition, the rating scale represents conditions at a particular time and does not consider future risks or threats. See comments for No. 1 above relating to dogs off leash	As per no. 1 above
17	Dog owners	I have seen only responsible dog owners, keeping to the paths and clearing up after their pets. Owners who do not clean up after their dogs are always not going to do so, whether the dogs are on a lead or not. It is the usual case of a few spoiling things for the majority, and the majority being penalised.	As per no. 1 above	As per no. 1 above
17	Signage	Unfortunately there is always an element of people in society who despite rules and regulations are always going to do the wrong thing, trample through the bush, build illegal structures, dump rubbish. No amount of signage will change this mentality.	Agreed, signage will assist with education of the majority	No changes to the plan
18	Access tracks	I walk from Karrinyup to Moline house every day and there is nowhere to sit down on the walk trails. Suggest rest area on steep section, as some needed to rest along the way. Overall, good job	This issue has been noted by the City of Stirling and will be given consideration. Any additional seating will consider the conservation values of the bushland.	Section 3.1.2 of the Management Plan includes a recommendation that additional seating is considered.
19	Bushland use	Encourage people to use the bush to keep community strong and support retention of the bushland. Encourage kids to get involve and take ownership of areas	This could best be done through developing programs through schools. This should be a task for the environmental community liaison officer or alternative if the City has one. Section 3.3.4 discusses the potential opportunities for strengthening and developing new partnerships with educational and research organisations.	No changes to the plan
19	Dog faeces	Dog bin, most western end of Southern Track at Duart Arnott.	It is uncertain what the issue with the bin is. The presence of bin in this location has been highlighted in Figure 21 of the Management Plan.	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
19	Dogs	Don't change the dog off leash policy. I have been walking in section 4, but all 1-5 to a lower extent, twice daily since 1976. I live in Haysum St. I am on my 4th dog. I have never seen a dog attack any fauna, they tend to only roam 1-2m off the main tracks, they stay close to their owners. with dog manage the dogs behaviour, in 40 years walking through sector 4, I can't remember an incident where a major conflict between dogs occurred. Dogs on leads tend to be more aggressive, maybe because the owners know the dog is aggressive.	As per no. 1 above	As per no. 1 above
19	Dogs	Don't regulate the life out of our community. I meet more people in my community through my daily dog walk/run than contact in my street.	As per no. 1 above	As per no. 1 above
20	Cyclists	I feel all cyclists should have bells so they can warn unsuspecting pedestrians of their approach. Children on bicycles are more likely to cause damage to the bushland that the dogs.	Not within the scope of an EMP. Could be integrated into any signs that are installed in the future but should not form part of this plan.	No changes to the plan
20	Dog walking	I have been walking dogs in the area for 20 years, I had no concerns for my safety when I met dogs that were not on leads. I feel that paths are wide enough to enable dogs to walk without damaging the bushland. A dog that is exercised sufficiently is a better adjusted dog than one confined to a small back yard, only taken on a sedate walk on a lead. This is more likely to lead to an increased number of complaints about dogs barking. I prefer to take my dogs in the bushland rather than walking on West Coast Drive as it is very busy. It is not relaxing.	As per no. 1 above	As per no. 1 above
20	Dog walking	The majority of dog owners are responsible in that they keep unruly dogs on leads. The majority of dog owners who walk in this part of the Trigg bush are environmentally aware.	As per no. 1 above	As per no. 1 above
20	Dog walking	If unable to allow dogs to run off lead in the bushland we will have to take them to Charles Riley Oval. I would not like my daughter or son falling into dog faeces that has not been cleared up when they are playing sport on the oval.	As above. Note that the responsibility of dog owners to remove faecal matter from any reserve, and the non-removal is listed as an offence under the *Dog Act 1976*.	As per no. 1 above
21	Dog walking	Objecting to dogs being out on leash but agree that dogs should stay on designated tracks and paths. Agrees with education on bushland conservation and suggests rangers to police such matters. Educate dog owners about importance of bushland conservation and the importance of bush wacking with their dogs	As per no. 1 above. Education has been allowed for within the Management Plan. City Rangers have the responsibility for monitoring compliance with the local dog laws, and this ongoing responsibility is highlighted in the recommendations.	As per no. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
22	Dog walking	I have looked at the plan and appreciate all the work the environmentalist do however the bushland is for the residents to enjoy it if the Shire keep on regulating how the public can walk their animals than I do not agree with this new proposal. It is a waste of time and taxpayers money to keep on having rules that do not inflict damage caused problems to the wildlife and fauna of the area. I have a pleasurable walk through the area and have done so for a very long time, you cause angst when you want to bring in rubbish rules.	As No 1 above.	As per no. 1 above
23	Dog walking	Of the measures proposed the one that concerns me is to introduce dogs on lead requirements. Of all causes of damage listed in the plan, damage by dogs seems to be very minor in fact I can't think of any damage that my dogs cause. They sniff around, they don't damage flora and we pick up their waste like most owners. I know from my own dogs and those of friends that they very rarely go off the main paths anyway. Our dogs like to walk with us and we like to give them a bit of freedom to roam. There are few places left that allow dogs off lead, please don't make them fewer.	As per no. 1 above	As per no. 1 above
24	Condition of bushland	I have thought the reserve to be rather neglected, which is concerning given the high diversity of native species present and that there are few large remnants of native vegetation remaining within the Perth urban area.	Noted. The intent of the management plan is to provide for ongoing management to retain the bushland in perpetuity.	No changes to the plan
24	Dog walking	While not a dog owner, I can understand that many dog walkers enjoy giving their dogs an off lead walk in the area that is safe from traffic. Many dogs I observe are well behaved, but others run riot off the paths and into the bush. I support the recommendation that the reserve is returned to it's designation as a dog on lead area, or alternatively that there is a small designated area that dogs can be off the lead.	As per no. 1 above	As per no. 1 above
24	Education	I think the council will have to ensure enforcement of the rule together with education as it is likely to be unpopular with pet owners.	Noted. This has been included within the Management Plan	As per no. 1 above
24	Weed treatment	Of all threats to the bushland, I believe that encroachment by weeds has the most potential to seriously degrade the reserves value. I suggest inclusion of a recommendation that requires council to develop a formal weed management action plan for the reserve.	Noted. Suggestions regarding weed assessment and management have been provided in Sections 2.4.6, 2.4.7 and 2.4.8 of the management plan.	No changes to the plan
25	Barriers	We strongly support the recommendation to build barriers on both sides of West Coast Highway, subject to final design. We believe more emphasis should be put on the management of vehicles and foot traffic along West Coast Highway in this report.	Noted. The management of vehicles and foot traffic along West Coast Highway is the responsibility of Main Roads WA, rather than the City of Stirling.	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
25	Tracks	While we agree that 'goat tracks' in sector 1 and 5 should be closed and rehabilitated, we believe that this recommendation should be made for all similar tracks in BFS308. It should not be limited to any sector. Where goat tracks have been semi-formalised, specifically the 'Nature Appreciation Trail' in sector 4, there has been further degradation of the bushland.	Tracks in all sectors were considered when suggesting those to be retained and those to be closed and rehabilitated	No changes to the plan
25	Cats	Cats are a major contributor to fauna loss and although education is recommended regarding the Fauna Protected Buffer Zone, there should be further recommendations regarding monitoring and enforcement.	The management of cats has been allowed for within the management plan, which includes education of owners and cat trapping as required.	Recommendation 16.7 has been added to reflect the responsibility of Rangers to enforce dog and cat laws.
25	Classification	Classification of the quality of the bush in BFS308 is not always consistent with our experience. Clearly areas which have previously been assessed as 'pristine' in the Bush Forever literature (in the south Trigg Reserve) have not been investigated, these areas are dense and virtually inaccessible and are not likely to have changed significantly since originally assessed. They appear to have been overlooked in this survey. The classification of bushland is a very important issue with potential ramifications for decision making in decades to come.	The vegetation condition rating scale is qualitative, and there is always the possibility of variation in assessment outcomes depending on the assessor. Condition also changes over time, and the Bush Forever assessment was some 14+ years ago. The entire site was considered when undertaking the assessment.	No changes to the plan
25	Climate change	Suggest a comment that it would be useful to emphasise where priority should lie given the unknowns about the long-term effects of climate change	While there are a number of unknowns associated with climate change, the aim of the management is the current timeframe. It is expected that any changes to knowledge, practices or the current situation associated with climate change will be addressed in future reviews to the document	No changes to the plan
25	Dog Faeces	There has been some discussion that dog faeces is high enough in soil nutrients to harm certain plant species such as orchids.	Noted, with some information provided by the City of Stirling has been included within the Management Plan.	As per no. 1 above
25	Dogs	Recommendations regarding wildlife could be stronger given the presence of protected/threatened species. Simply making the recommendation to keep dogs on a lead is not sufficient. Fence off areas as per other areas.	A combined approach to the management of dogs has been suggested, which includes dogs on leashes in nominated areas, enforcement of laws, and education. Note that a negative aspect of fencing to protect fauna is that it can isolate populations, and thus counterproductive to protection.	No changes to the plan
25	Education	Education is often used as a catch-all cure for problems, but who is to do it, how will they achieve it and how effective will it be are key issues which are not mentioned.	Education is seen as providing information or the 'why' something needs to be done a particular way, rather than implementing a number of 'don'ts'. It is seen as being complementary to other management strategies rather than being a standalone strategy, and will assist with informing many. As the Land Manager, the City of Stirling has the major role in education, and this will be achieved through signage and the provision of other information. It is also something that the Friends of Trigg Bushland can contribute to with their regular activities and the website. Increased partnerships and research opportunities will also contribute to the wider education process. All of these have been highlighted within the Management Plan.	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
25	Facilities	Agree with the recommendation that no further facilities be provided in Bush Forever Site 308 in the area being used primarily for walking and dog exercise. However, problems associated with the dual use path, the lookout, beach car park and surf lifesaving club should be specifically referenced and the need to ensure that population pressure from increased beach used does not affect the bushland. This should include the parts of Bush Forever Site 308 that are to the East and West of the beach car parks and surf club. There should also be some consideration given to appropriate treatment of the lookout.	The car park and surf lifesaving club are outside the area of consideration within the plan. A general comment about any further development and potential impacts has been added to the plan. Recommendations relating to the lookout have been added.	Paragraph added to Section 4.1, along with recommendations 30.1 and 30.2. Additional consideration has been given to the lookout in paragraph 1 of Section 3.1.2, and recommendations 18.5 and 18.6 added.
25	Fencing	The recommendation for no further fencing within Bush Forever Site 308 is not supported, and it is believed that there should be specific recommendations to reduce the 'off track 'traffic in Sector 4 as it is believed to be under-fenced in comparison to other parts of Bush Forever Site 308. The constant widening of intersections between 'goat tracks' and the main paths should be addressed, if not by fencing then by bollarded or other means. To recommend no action whatsoever is in our view inappropriate particularly since Sector four is in a two-year trial with further fencing to be put into place depending upon the results. To pre-empt this trial is potentially disastrous for bushland protection. The old fencing in Sector 4 is considered to be effective as it is visually unobtrusive and set back into the bush and has been doing its job. In other bushland reserves, areas have been fenced with wide wire mesh to provide additional protection for particular species from dogs.	No further fencing is planned or required within Trigg Bushland.	No changes to the plan.
25	Fire	The report should recommend historical fire mapping and innovative fire management techniques. As 85% of fires are caused by man, there need to be specific recommendations to mitigate bushfires ecologically (weed reduction) and socially (education, citizen watch) as well as provide specific plans for bushland recovery when a bushfire does occur. It is pleasing to note that the MP recommends post fire flora and fauna surveys and specialised post fire weed control and recognise the extreme changes on flora that can result from too frequent fires. There are new and innovative methods of reducing the number of bushfires which include social activities as well as ecological management techniques. This needs to be researched and included as part of the plan.	The management plan includes consolidated maps of fires dating back to 1993, as provided by the City of Stirling. Weed management, including weed control after fire has been provided for within the management plan (Section 2.4.11, recommendation 12.3), and is carried out by the City of Stirling where possible to do so.	No changes to the plan
25	General comments about the plan	Typographical corrections highlighted	Changes made where appropriate to do so. Note that fungi survey has been retained, as it relates to a survey of fungi (plural) species	Various minor changes

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
25	Management plan scope	The management plan should encompass both the Trigg Bushland Reserve and all of the adjacent land which comprises Bush Forever Site 308. Figure 1 assessment boundary does not include all of the Bush Forever site 308. The management plan should specifically note that there are significant portions of non--bushland within this area, but that Bush Forever covers all significant native vegetation within the boundaries of the site, even if on private land. This means that the fore dunes at Trigg Beach and the secondary dunes alongside the existing access road to Trigg Beach car parks are covered by Bush Forever legislation, as also are significant trees within Millington Reserve. We strongly recommend that this report be amended to include all of Bush Forever Site 308 in its scope.	The site boundary has been set by the City of Stirling.	No changes to the plan
25	Other	We applaud the City of Stirling and in particular the Natural Areas Management staff and their contractors for the hard work and diligent consideration evident in what is a well presented and illustrated, very clear and generally concise Draft Management Plan for Trigg Bushland, and for the exemplary way that the consultation process has been conducted.	Noted.	No changes to the plan
25	Pressure on bushland	The recommendations and management strategies are considered to be limited in scope to what is likely to be achieved within current budget constraints. We believe that the management plan should be aspirational and include best practice strategies, with issues that could be included or expanded on: The burgeoning pressure on urban bushland due to population growth, urban infill, and the effects of climate change and reduced groundwater. These can be expected as the major threats to urban bushland over the next ten years and should be included in the management plan.	There are advantages and disadvantages in relation to having an aspirational management plan. Advantages include aiming for the best outcomes, regardless of other potential constraints, but which can lead to aspirational goals not being achievable. As an A-Class Reserve, changes to boundaries would require a lengthy approval process. As the areas surrounding the Reserve are largely urbanised, pressures from increased population are likely to limited. As the management will have a life according site conditions, changing knowledge, and similar, the effects of climate change and reduced groundwater will be picked up and addressed in future review processes.	No changes to the plan
25	Purpose of reserves	The legal stature of the COS as Manager, and the legal details of the reserves comprising Bush Forever Site 308 need to be corrected and formalised as a matter of urgency. In particular, the designated purpose of each reserve must be amended as a priority from 'recreation' to (at a minimum) 'passive recreation'. We also agree that the section of bushland on Elliot Rd should be included in BFS38, we have enquired but can find no relevant reason why it was not included initially.	Noted. It is not known why this section was not included as part of the Bush Forever site initially.	No changes to the plan
25	Reduce fragmentation	Recommendations should be expanded to further reduce current fragmentation by removing informal tracks and restricting access where appropriate, while monitoring bushland for additional areas which may need to be restricted in the future.	Ongoing monitoring for new, informal tracks has been included within the management plan. At present, no further fencing or restricting of access is planned by the City of Stirling.	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
25	Threatened ecological communities	We believe that the Callitris preissii TEC be investigated and for further management practices to be put into effect as a matter of priority as it is extremely fire sensitive	Noted.	No changes to the plan
25	Weed mapping	Weed mapping has been included in the report, but should be given a priority and should include a soil analysis to identify seed banks, weeds as well as native species. Only certain areas have been mapped for weeds in recent years, which has allowed the explosive growth of certain weeds in areas which have not been surveyed. Earlier reports included in the management plan to ascertain increase/decrease in weeds	Weed mapping has been provided for, with the inclusion of a density rating to assist with appropriate prioritisation of future weed control activities. The mapping of weed density will allow an assessment of change in weeds over time and along with the overall effectiveness of weed control activities implemented within the Reserve. Soil analysis is unlikely to alter current and recommended management strategies.	No changes to the plan
26	Dog walking	Strongly objects to the proposal to require dogs to be on a leash at all times in bush areas and sees no need or evidence justifying changing the existing arrangement. Dogs of course need to appropriately exercised including running/fetching balls if they are to be well balanced. The people they use the bush the dog exercise are typically responsible. For example the availability of 'poo bags' has been very successful and in my observation had a very high compliance rate. If there are any issues then education if really needed should address. Prohibiting properly exercising a dog in not appropriate, the recommendation to require dogs on leash at all times in the bush is impractical, unfair and strongly opposed.	As per no. 1 above. Education of dog and cat owners has been provided for in the management plan.	As per no. 1 above
26	Other animals	has lived in the area since the 60s, prior to recent subdivision, kangaroos disappeared by mid 70s and all other animals from my recollections have not decreased since the 1996 policy, still in similar numbers to the 70s.	Noted	No changes to the plan
26	Rubbish removal	Supports proactive rubbish removal strategies being implemented post bushfires and prior to weed emergence. The recent bushfire behind Spence Street was a missed opportunity with significant rubbish being exposed making it easy to collect and dispose of. This should be targeted at the most available opportunity.	Noted	No changes to the plan
26	Weed control	Supports proactive weed control on a similar basis above subject to limitations associated with spraying. There was no evidence of proactive weed control post fire which were ideal conditions for both bush seed germination and weed germination.	Where possible, weed control after fire is undertaken by the City of Stirling. Recommendation 12.3 in Section 2.4.11 supports this position.	No changes to the plan
26	Weeds	Procedures are needed to ensure where material is, for example, being imported and machinery used for track repair that seed are not also imported. Such seeds can be latent from many years and consequently a longitudinal control program is necessary.	City of Stirling has procedures in place, and these are communicated to contractors as required	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
27	Dog walking	I oppose the recommendations to exclude Trigg Bushland Reserve from the City's list of designated dog exercise areas. The vast majority of residents are dog owners. The vast majority of dog owners are responsible users. Almost all dog owner uses of the bushland have their dog "off leash". Is primarily enjoyed by responsible dog owners exercising their animals off leash, if this facility is removed the usage of the bushland will reduce dramatically with no ecological benefit.	As per no. 1 above	As per no. 1 above
27	Dog walking	Effective dog socialisation has far reaching benefits. Socialising of canines is not recommended or practical when the animals are tethered and under strict physical control from their owners. Dogs will have less opportunity to develop good socialisation skills, this will lead to undesirable behaviours such as barking. Leashed canines tend to socialise poorly together.	As per no. 1 above	As per no. 1 above
27	Dog walking	Clarko Reserve is not a designated dog exercise area and is primarily used by non-dog owners. Charles Riley Reserve is often utilised for sporting activities and is not always suitable to exercise dogs. Star Swamp has been removed from the designated dog exercise area list, with dogs now required to be leashed. Some dog owners have stopped exercising their dogs at Star Swamp due to the change. The only other designated area is the Benion Beach which is not suitable all year round due to extreme weather conditions. Many of the people that I meet within that the Trigg Bushland feel that the proposal to restricted dogs from free exercise is absurd. The threat or damage potential of unleased animals is overstated in the Management Plan and cannot be corroborated by evidence of degradation due to the designation of the reserve as an open exercise area since 1996.	Clarko Reserve is not on the list of dog exclusion areas. The Dogs Local Law indicates that sporting ovals can be used for dog exercise, when it is not being used for sporting events	As per no. 1 above
27	Residents	Socialising of local residents, development of neighbourly cooperation and community spirit, is a hugely underestimated benefit of the current dog exercise area.	Noted	No changes to the plan.
27	Rubbish	Rubbish in stormwater drain ingress points. I regularly collect rubbish from the reserve when exercising my dog. Some is unavoidable , however more regular effort by council (or Water Corp) to collect rubbish that flows into the reserve from stormwater drains at the Duart Rd, Arnott St and Karrinyup Rd ingress points would be advantageous.	Drainage and weeds have been addressed in Section 2.2 of the management plan.	No changes to the plan.

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
28	Dog Faeces	Dogs don't stop going to the toilet when they are put on a lead. I walk in the Trigg Reserve every day. I cannot remember the last time I stepped in or smelt dog faeces. In winter it is washed away and in summer it is eaten by dung beetles. Potentially fence of environmentally sensitive areas.	The *Dog Act 1976* (WA) indicates it is an offence for an owner of a dog not to remove its excrement from a public place, and this is also included in the City of Stirling Dogs Local Law. Unfortunately, when many dogs defecate, the smell can be become unpleasant, and there have been numerous instances of people stepping in dog faeces within the reserve. When the faecal matter is washed away, it can result in impacts to local flora and fauna species. A study undertaken within the City of Stirling comparing invertebrate species diversity in a dog exercise area and a dog exclusion area found the number of diversity of beetles was different between the two sites, with those in the dog exercise area dominated by dung beetles. Water quality testing in lakes has shown the concentration of E. coli significantly increases, and thus there is an increased potential for disease in these areas.	As No 1 above.
28	Dog walking	I have lived in Trigg for 26 years and my wife and I strongly disagree with this recommendation (not permitting dogs off a lead). The plan takes a very simplistic assessment of why dogs should not be allowed off leashes and I don't think CoS can make that decision based on such poor information. Believe positives outweigh the negatives. The materiality of the impact of dogs needs to be considered- not been taken into account in the plan	As No 1 above.	As No 1 above.
28	Dog walking off lead	It encourages people to use the reserves more frequently. Increased use makes the reserve safer. It prevents overcrowding of dog beaches. Dogs get a more wholesome workout which means they are less irritable and less likely to bark. Enforcement of this will be very difficult as most people will walk their dogs early morning or late night. Provides a valuable community asset. No evidence of trampling flora or disturbing fauna and will interfere with the enjoyment of the reserve for people. Valuable community asset, helps home values	As No 1 above.	As No 1 above.

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
28	Dogs	Rebuttal of justifications for having dogs on leashes: Dogs have the potential to harass, damage or kill any fauna species within an area. While the statement is true it can also be said about adults and children or cats or pet budgies. No evidence was provided to support that any damage has occurred by dogs. The real question should be our dogs having a material impact on fauna and an understanding of what an acceptable loss of form would be – it is clear that this work has not been undertaken. I do not think that the City of Stirling could make statements about keeping dogs on leashes reduces impacts to flora and fauna within the reserve without evidence. Trampling flora; no evidence has been provided to support this assertion, and whether it is obvious that dogs do have the potential to do this. Of course, people also can trample flora. Interference of enjoyment of reserve for other people: Not preventing dogs to roam off of leashes will also interfere with other people's enjoyment of the reserve I for that matter would be extremely annoyed if I have to keep my dog on a lead in the reserve. You can never keep everyone happy so this is a completely ridiculous consideration. If you could demonstrate, for example, that the majority of people using the reserve over a period of months do not want dogs to be off the leash then this would be a relevant consideration. As far as I can see I do not believe such a survey has been undertaken.	As No 1 above.	As No 1 above.
28	Education	Education should be undertaken to educate people to the potential impacts dogs can have off the lead. Potentially fence off particular sensitive areas of the reserves to be dog free.	Agreed - education has been provided for within the management plan	No changes to the plan.
29	Exec summary	Non native trees- the word derelict cottage, all non native trees in the Trigg Bushland should be removed. Weed treatment strategy- Wholistic replace holistic. Fire- include spraying as soon as possible after fire to destroy germinating seeds. Protect tree hollows for parrots when lopping burnt trees. Introduced fauna- include cats.	The removal on non-native trees has been allowed for within the management plan. Paragraph 3 and recommendation 12.3 of Section 2.4.11 includes the provision for weed control after fire. Note that the City of Stirling has indicated that the cottage is a local heritage site, hence the descriptor used. Adjustments have been made to the section on introduced fauna and the associated recommendation with the removal of the words rabbits and foxes	Paragraph 1 of both Sections 2.4.6 and 2.4.8 has been adjusted to include an indication that weeds include grasses, bulbs, trees and herbs. Recommendation 14.1 reworded to indicate that the City of Stirling will undertake feral animal control in accordance with its current practices and procedures.
29	2.1.3 Topography	Description of Sector 6 should be West Coast Highway, not West Coast Drive.	Adjusted	West Coast Drive changed to West Coast Highway
29	2.5.2	Include cats and feral bees in recommendation for control of feral animals	Section 2.5.2 includes cats and feral bees as fauna to be controlled	Recommendation 14.1 has been reworded through the removal of (rabbits and foxes), and indicates that control of '...feral fauna species and undertake controls…' to indicate that all feral fauna of concern should be controlled.

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
29	3.1.2 Facilities	3.1.2 Include recommendation to improve the path and lookout in Sector 6 to make it accessible for prams and wheelchairs. Seating should be provided in the lookout area and it should be generally tidied up to make it more attractive to users, passers-by and tourists to enhance the ocean view over the natural dunes. Interpretive signs could be installed with e.g. distances to notable points of interest such as Rottnest Island (which is visible across the reserve), Fremantle and Hillarys Marina.	Adjusted	Additional text included in paragraph 1, and recommendations 18.5 and 18.6 added.
29	3.1.3 Signs	This section should contain acknowledgement of the signs that were installed with the assistance of the Friends of Trigg Bushland for the purposes of the centenary of Federation in 2001. These interpretive signs contain descriptions of flora in the vicinity enabling identification to occur by users by the reserve. They were located specifically to take advantage of outlook, views and notable vegetation and sites of historical significance such as cottage ruins. These signs provide a model for installation in other sectors of the reserve.	Adjusted	Sentence added to paragraph 1 of Section 3.1.3
29	3.3.3 Friends of Trigg bushland Inc	The Friends of Trigg Bushland Inc group was formed at a public meeting in 1990. It would be helpful to provide the website address to enable public and interested individuals to make contact with the friends group	Added. The website is also included in the reference list at the end of the management plan	Sentence 1 of Section 3.3.3 adjusted to include Friends of Trigg Bushland website.
29	5.1 Protection mechanisms	this should include a description of the protections for Class A reserves under the Land Administration Act. The table should include the Land Administration Act Class A reserves protections	Agreed	Table 11 updated to include the Land Administration Act. Information also included in new paragraph 1 of Section 1.4 Reserve Significance.
29	5.3.11 Heritage trail	there is already a heritage trail walk as described in the brochure the Scarborough trigg heritage walk which was printed in 2001 to celebrate the centenary of federation. The walk track and the interpretive signs were funded by a Commonwealth grant and the signs still exist within the reserve. Acknowledgement of this should be included in the management plan for historical purposes and the aim should be to extend the existing walk track to other sections of the reserve. Signs exist at the cottage ruins in the southern part of the reserve. A worthy goal would be cleaning up the cottage ruins site. The sign has a reproduction of the sketch of the original cottage that was built on occupied by the stop filled family from the 1930s to the 1950s when it was burnt by arsonists. A long term plan could be building a reproduction of the cottage for use as a rest point containing educational displays of flora and fauna. This would need to be very sensitively done and in consultation with the Friends group.	Information relating to the heritage trail adjusted. Section 1.4.1 Heritage added to address comments regarding the derelict cottage.	Paragraph 3 of Section 3.1.3 adjusted to indicate additions to the existing trial network within and external to the reserve. Wording of Recommendation 19.3 adjusted. Sentence 1 of Section 5.3.11 adjusted. Section 1.4.1 added, along with recommendation 2.2

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
29	Cats	Feral and domesticated cats are the largest single threat to native wildlife in our urban reserves and should be high priority for control within the Trigg Bushland Reserve. I support the education of the public especially in streets surrounding the bushland, about the reserve being a cat exclusion zone and why. Signs to that effect would be a positive move. I support compulsory cat enclosures in adjacent houses where cats are kept as pets.	The control of cats through implementation of the *Cat Act 201*1 (WA) has been allowed for within Section 2.5.4 of the management plan	Recommendation 16.7 has been added to reflect the responsibility of Rangers to enforce dog and cat laws.
29	Dog Faeces	Dog faeces are often deposited on and off tracks attracting flies and other vermin.	Noted, refer No 1 above	As per no. 1 above
29	Dog walking	I strongly support the return of the policy of dogs on leashes . Any walker in the bushland will encounter on most tracks dogs off leashes running ahead of their owners into the bush. Not everyone feels safe with unleashed dogs, myself included, having been a victim of dog attack, dogs can frighten walkers especially children. They should be leashed at all times to protect flora, fauna and users of the bushland.	Refer No. 1 above	As per no. 1 above
29	Fire	Include spraying as soon as possible after a fire to destroy the germinating weed seeds. Protect tree hollows for parrots when lopping burnt trees.	This is discussed in Section 2.4.11 and provided for in Recommendation 12.3	No changes to the Plan
29	Plan review	A number of review suggestions (spelling, grammar)	Adjusted where appropriate to do so. Note that holistic is more commonly used in the environmental field rather than wholistic, with both variations acceptable. The use of holistic has been retained within the management plan.	Various
29	Reserve and Management Authority	This significance of the Trigg Bushland Reserve is Recognised through its classification as A Class Reserve In addition to being a Bush Forever site. This land classification under the Land Administration Act 1997 Should be referred to throughout the management plan. This is a significant omission. This it should be stated in section 1.2 and support from recommendation 1.3 for the future protection of the environmental values of these sections of Trigg Bushland Reserve.	It was felt the best place to include this information is primarily in Section 1.4 and Table 11 in Section 5.1, with a few other references to the Class A designation in the Executive Summary and other locations within Section 1	Primarily Section 1.4 with the addition of a new paragraph 1, and inclusion of Land Administration Act in Table 11 in Section 5.1.
29	Reserve Significance (Section 1.4)	This should include that the Reserve has the highest protection available under the Land Administration Act 1997. It is a Class A Reserve - this classification occurred in 1989 (the previous) Class C reserve numbers were revoked and were amalgamated to make one Class A Reserve	Agreed	New paragraph 1 added to Section 1.4

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
29	Soil seed bank	Work carried out by Dr Judy Fisher indicates that it is important to know what is in the soil seed bank as well is the surrounding vegetation in bushland reserves. One of her findings indicates that post fire most introduced seeds sit in the leaf litter, while most of native seed is under the soil. This means that spraying soon after a fire will destroy much of the germinating weed seed. Findings also included a number of species within the seed bank in the study area were not identified within surrounding vegetation. On this basis it is considered equally important to have knowledge of what is contained in the soil seed bank as it is of the vegetation above. For this reason the management plan should include recommendations on soil seed bank surveys.	The work of Dr Fisher is acknowledged, along with the opinion that knowing what is in the seed bank is important. Investigations relating to the seed bank are considered aspirational, and unlikely to alter the management strategies currently carried out by the City or those suggested in this Management Plan. Both native and non-native species present within the seed bank will grow when their preferred conditions for germination are met, be it after fire or other disturbance. The importance of weed control after fire has been discussed in Section 2.4.11 and highlighted in Recommendation 12.3.	No changes to the plan.
30	Dogs on leashes	Because there may be conflicting interests in any community. (e.g. dogs, conservation, recreation) can considerations be given to having different purposes for different reserves (e.g. dogs can be off leads at Sector 2 which need to be on leads in Sector 4). Trigg is an area where people have always valued these open spaces and I think it is important that not many rules are put in place.	As per No. 1 above	As per No. 1 above
30	Dog beaches	Dog beaches are crowded in daylight hours outside of regular working hours	Noted.	No changes to the plan.
30	Dog walking	I object to Recommendation 16 to have Trigg Bushland removed from the list of the city's designated dog exercise areas. The Trigg Bushland is extremely important as an urban parkland to encourage residents to enjoy the bush. This plan will significantly reduce the local communities enjoyment of the bushland. Would like to retain the current level of recreational use, at least in sector 4, popular for off leash dog walking. People can comply with different activities being allowed in different sections particular if there is sound reasons given and communicated to the users. When council introduces greater restrictions in an urban recreational parkland, a real and significant need should be demonstrated but your report does not provide satisfactory evidence. For example, there does not seem to be any specific recreational use surveys conducted for the bushland upon which to base decisions. Space there does not seem to be any specific biodiversity impact studies done to demonstrate increasing degradation caused by dogs? The overall health of the bushland is reported to be high to very high. The plan will significantly reduce the local communities enjoyment of the bushland.	Noted. The community includes dog-walkers and non-dog walkers. See also comment for No. 1 above	As per No. 1 above

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
30	Dog walking	The vast majority, easily over 90% of the recreational users, are dog owners who enjoy letting their dogs off leash when walking on paths through the bush. There are no dogs roaming through the bushland, they stay close to their owners, on designated pathways. Restricting to only having dogs on leashes in my opinion will significantly reduce use by owners. Please delay restricting dog owners enjoyment of Sector 4 until evidence can be shown for the need to do so, as the impact in the restriction will be immediate loss of enjoyment of an important urban park.	As per no. 1 above	As per No. 1 above
30	Dog walking	The local sports grounds are rightfully and fully utilised by sports clubs, very restrictive to find times to exercise dogs in between games and practice sessions.	Noted.	As per No. 1 above
31	Condition of bushland	The bush has never looked better in my opinion with this year's fauna and flora looking magnificent. We love the area and are careful to preserve its beauty, let us enjoy and use the area freely as we do not cause damage.	Unfortunately, the term 'freely' will be interpreted in many ways that could result in damage to the bushland. The aim of the management plan is to ensure the ongoing protection of the bushland well into the future, where residents can continue to enjoy its natural and other values with a minimum of impact.	No changes to the plan
31	Dog walking	Since 1992 I have loved and utilised the bush. I have used this with my dogs over the years and I love the fact that they and I can have a decent walk with them off lead. It is my observation that most of the people using this space are dog owners like me and gives themselves and dogs a bit of freedom, With monitoring of damage to the Bush, cars, other people and other dogs.	As per no. 1 above	As per no. 1 above
32	Access tracks	Limestone pathway in the Trigg Bushland @ Eliot Road to St Marys underpass degraded + needing resurface.	General comment on track inspections included	Paragraph 3 added to Section 5.3.8 Access as part of Section 5.3 Management Strategies
32	Fire break	The firebreak has degenerated and this part of the bushland needs attending to.	It is uncertain which area is being discussed, so it is not possible to comment specifically on the location. The City of Stirling will maintain access paths and firebreaks on an ongoing basis	No changes to the plan
32	Ongoing maintenance	West Coast Hwy. Median strip when through Trigg Bushland "beautification" of median strip did not happen.	Noted, however, the median strip is outside the scope of the management plan.	No changes to the plan
32	Ongoing maintenance	53 King Albert Rd, Trigg. Melaleuca (Paperbark tree) requires pruning and; cul-de-sac weeds need whipper snipping.	Noted.	No changes to the plan
32	Ongoing maintenance	'52 King Albert Rd, Trigg (New House) – remove basketball hoop on verge.	Noted.	No changes to the plan
32	Sand on pathways	The log steps alongside St Mary's dribble sand all over the pathway, it is messy, there must be a better way to contain the sand.	Noted	No changes to the plan

No	Subject Matter	Comment Received	Response	Adjustments to Management Plan
32	Weeds	Would it not be better to do the weeds before they seed as it makes the weed problem worse.	Weed control programs consider the optimum time for successful treatment, including, treatment prior to seed production. However, some plants have the ability to produce viable seed after treatment has taken place.	No changes to the plan

City of Stirling

Trigg Bushland Reserve Management Plan Addendum

Callitris preissii Woodland Threatened Ecological Community Management Recommendations

V1.1 – 21 June 2018

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City of Stirling

Trigg Bushland Reserve *Callitris preissii* Woodland Threatened Ecological Community Management Recommendations

V1 – 21 June 2018

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1.0 Introduction

Natural Area Consulting Management Services was contracted to prepare an addendum for the Trigg Bushland Management Plan to provide recommendations on the threatened ecological community (TEC) SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain (SCP30a). The Trigg Bushland Management Plan was prepared by Natural Area in 2015 and included recommendations relating to the need for further investigation and assessment of SCP30a.

Investigations by the Department of Biodiversity, Conservation and Attractions (previously the Department of Parks and Wildlife) and Natural Area confirmed the presence of SCP30a within the foredune vegetation at Trigg Beach (Sector 6) and within Sector 1 (Elliott Road – West Coast (South) Sector). A follow-up survey by Natural Area in December 2017 assessed the extent of the condition of the locations where *Callitris preissii* is found within Trigg Bushland, with outcomes informing recommendations for ongoing management and which are provided in this document. While the main *Callitris preissii* populations are located within Sectors 1 and 6, individuals may also occur in other sectors.

1.1 Location

Trigg Bushland Reserve is a Class A reserve located approximately 11 km north west of the Perth central business district (CBD) in the City of Stirling. It comprises an area of approximately 170 ha within the suburbs of Karrinyup and Trigg (Figure 1).

Figure 1: Site Location - Trigg Bushland Reserve

1.2 Legislative Protection

Threatened ecological communities are presumed to be or at risk of being destroyed (Department of Parks and Wildlife, 2017), and are protected under State and/or Commonwealth legislation. The ecological community *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain (SCP30a) is listed as vulnerable under the *Wildlife Conservation Act 1950* (WA) due its vulnerability to threatening processes such as fire and fragmentation (Department of Parks and Wildlife, 2016); it is not listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

The Interim Recovery Plan for SCP30a prepared by the Department of Parks and Wildlife (2014) outlines the various threatening processes and management strategies for successful preservation of this community, with success criteria including:

- an increase in the number of populations either managed for conservation or with conservation included in the purpose
- representative areas of the community across its geographical range with condition maintained or improved
- 90% or more of the areal extent of occurrences maintained at the same vegetation condition rank or improved.

Consequently, the criteria for failure are:

- decline in the vegetation condition rank of 10% or more of the area of the community
- failure to achieve an increase in the area managed for conservation.

The Trigg Bushland populations are recognised as populations by the Department of Parks and Wildlife (2014) and include conservation as a management purpose. They are also considered to be in very good condition and representative of the community within its geographical range. Over time, management of the communities will be measured against these criteria.

1.3 Consultation

During the preparation of this addendum, the City of Stirling consulted with community groups that have an interest in Trigg Bushland:

- Friends of Trigg Bushland
- Stirling Natural Environment Coastcare
- Beach Not Bitumen.

Comments and responses are provided in Appendix 1.

2.0 Extent and Condition

A statistical analysis was carried out using the Plymouth Routines in Multivariate Ecological Research (PRIMER) 7 software to assess the extent of the SCP30a within Trigg Bushland, with areas in Sectors 1, 5 and 6 reviewed (Table 1, Figures 2, 3). The SCP30a patches in Sectors 1 and 6 represent a significant occurrence of this threatened ecological community at its northern-most extent as it is one of the larger areas that is in Very Good condition.

Table 1: Extent of SCP30a within Trigg Bushland

Sector	Vegetation Type	Area (ha)
1	*Callitris preissii* Open Woodland	7.9
1	*Eucalyptus gomphocephala* and *Callitris preissii* Open Woodland	7.5
5	Planted *Callitris preissii* Open Woodland	N/A
6	*Callitris preissii* Open Woodland	0.9
	Total	16.3

Callitris preissii Open Woodland
Sector 1, long unburnt

Eucalyptus gomphocephala and *Callitris preissii* Open Woodland, Sector 1, burnt Dec 1998

Callitris preissii in Sector 6

Figure 2: *Callitris preissii* Woodlands within Trigg Bushland

2.1 Sector 1 Extent

Four quadrats within the *Callitris preissii* Open Woodland and *Eucalyptus gomphocephala* and *Callitris preissii* Open Woodland in Sector 1 assessed during preparation of the 2015 Management Plan were used as the basis of the statistical analysis (Table 1; Figures 2 and 3). To determine if these areas have a species composition consistent with SCP30a, data from the nominated quadrats were amalgamated with data from Gibson *et al.* 1994, transformed into presence/absence matrices and inputted into the Plymouth Routines in Multivariate Ecological Research (PRIMER) 7 software. A resemblance matrix was created that shows the similarities between quadrats. For each quadrat located within potential SCP30a, the five most similar quadrats from Gibson *et al.* dataset were used to determine the most similar vegetation community (Table 2).

Table 2: Gibson *et al.* comparison – most similar quadrats, Sector 1

Trigg Quadrats	Most similar quadrats from Gibson *et al.* 1994				
Q19	TRIG-2	PEPGRV-2	BURN-1	CHIDPT-1	WOODP-2
Similarity (%)	39.0	30.8	29.1	24.5	23.3
Comm. Type	**29a**	**30a**	**29a**	**24**	**30a**
Q20	PEPGRV-2	TRIG-2	WOODP-1	LESCH-3	GARDEN-4
Similarity (%)	27.8	26.3	24.0	20.0	19.4
Comm. Type	**30a**	**29a**	**30a**	**30b**	**30a**
Q22	TRIG-2	WOODP-1	PEPGRV-2	BURN-1	GARDEN-4
Similarity (%)	25.6	23.1	21.6	18.9	18.8
Comm. Type	**29a**	**30a**	**30a**	**29a**	**30a**
Q30	TRIG-2	PEPGRV-2	BURN-1	WOODP-2	PB-4
Similarity (%)	36.8	33.3	30.8	25.0	23.8
Comm. Type	**29a**	**30a**	**29a**	**30a**	**29b**

The four quadrats located within the sector had high similarities to both SCP29a, Coastal Shrubland on Shallow Sands and SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain community types. An assessment of the typical and common species outlined in the Gibson *et al.* dataset were compared to the 2014 survey quadrats and confirmed that the species abundance and composition was most similar to SCP30a, thus confirming these areas as the threatened ecological community.

2.2 Sector 6 Extent

Callitris preissii trees located along the foreshore in Sector 6 were considered to be SCP30a by the Department of Parks and Wildlife, as noted in their recovery plan (2014). The assessment carried out by Natural Area in December 2017 reviewed the number of individuals of *C. preissii* present within the Sector and considered the potential habitat area that could potentially become SCP30a.

The assessment confirmed the presence of 13 individuals within Sector 6 which were identified as remnant trees (Figure 2). While they were sparsely located within the area, they had a cover over 2% required to classify a vegetation type, as outlined by Bush Forever Volume 2 (Government of Western Australia, 2000). In total, approximately 0.93 hectares of potential SCP30a was identified in Sector 6 (Figure 2; Table 1). As there is no minimum patch size outlined for SCP30a, the presence of the *Callitris preissii* and other

associated flora species confirm that this area is a location where the TEC is present and thus is protected under the *Wildlife Conservation Act 1950* (WA).

2.3 Sector 5 Extent

The area in Sector 5 was researched by Keighery (2012) and identified as a historically planted mixture of *C. preissii* and *C. verrucosa* that are not considered to be representative of the TEC and are not protected under the *Wildlife Conservation Act 1950* (WA).

2.4 Vegetation Condition

The condition of an area of vegetation contributes to its resilience and ability to resist impacts associated with threatening processes, with areas in good or better condition better able to resist impacts such as weed invasion and grazing from pest animal species. Vegetation condition within Trigg Bushland was assessed by Natural Area during preparation fo the 2015 Management Plan, with the locations where Callitris preissii were recorded in Sectors 1, 5 and 6 all determined to be in Very Good condition using the rating scale attributed to Keighery in Bush Forever Volume 2 (Government of Western Australia, 2000). The condition was reviewed in the 2017 assessment of SCP30a, with each sector remaining at Very Good.

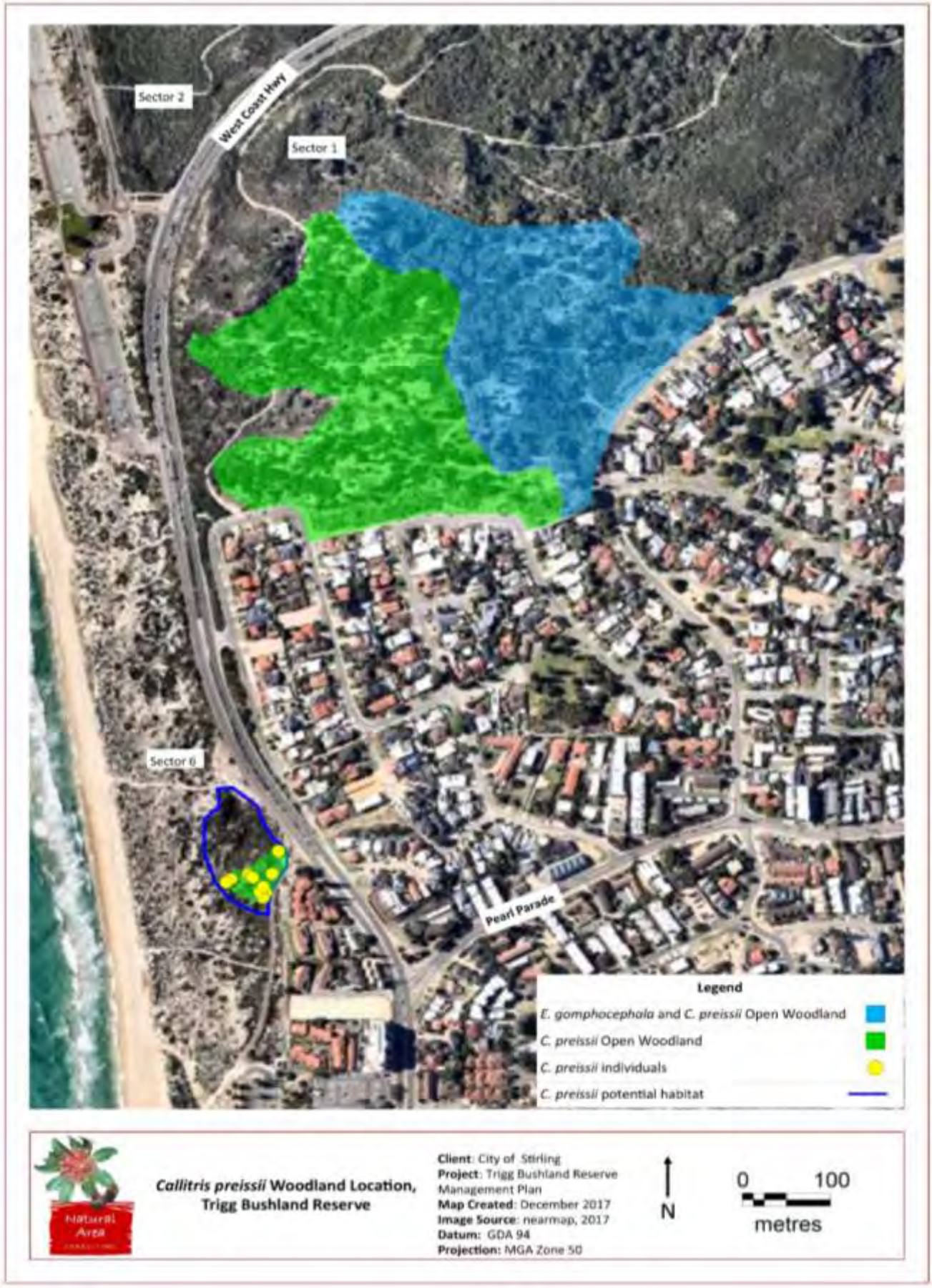

Figure 3: SCP30a extent within Trigg Reserve

3.0 Threatened Ecological Community Management

Processes and activities that threaten the continued presence of the TEC include:

- fire, particularly frequent fire
- grazing
- weed invasion
- habitat fragmentation
- uncontrolled access
- outbreeding with the planted area of *C. preissii*
- altered hydrology.

In order to protect the areas designated as the threatened ecological community, a number of management recommendations are provided.

3.1 Buffer Area

Buffers around areas of significance provide an area that minimises impacts from external sources occurring in the broader area and is recommended around the TEC areas. As Main Roads WA owns the verge and median strip on West Coast Highway, the City will work with them to undertake rehabilitation within the buffer.

Recommendation

It is recommended that a buffer of at least 50 metres around the SCP30a areas is established. It is noted that a buffer cannot be established in all locations due to existing development, such as the area to the south-east in Sector 6 and areas to the south and south-east in Sector 1 (Figure 3). It is expected that management actions associated with maintaining the TEC will also occur in the buffer area.

3.2 Monitoring

To determine that the overall success criteria outlined in the Interim Recover Plan are being achieved in the Trigg Bushland locations, it is recommended that:

- a monitoring program be established in conjunction with monthly maintenance that the City of Stirling undertake in bushland areas
- photo points are established throughout established SCP30a areas encompassing various elevation, vegetation types, vegetation conditions and the buffer area (Table 3)
- if revegetation occurs within Sector 6, three 5 m x 5 m quadrats and an additional two photo points are established to monitor success in this area

Table 3: Photo point number and location

Sector	Vegetation Type	Photo points
1	*Callitris preissii* Open Woodland	3
1	*Eucalyptus gomphocephala* and *Callitris preissii* Open Woodland	3
6	*Callitris preissii* Open Woodland	3
6	*Callitris preissii* Open Woodland (revegetation area)	5
	Total	14

3.3 Rehabilitation

The areas of SCP30a in Sector 1 are in Very Good condition and are of a large enough size to be resilient to most changes; rehabilitation of the existing extent is not necessary. A distinct change in vegetation type was noted towards the top of the dune in the north and the dune swale in the west during the 2014 survey, which can be seen in aerial imagery (Figure 3). The adjacent vegetation type consisted of *Acacia rostellifera* shrubland in the north and mixed coastal heath in the west, and there was no evidence of potential SCP30a habitat outside of its current range.

The smaller area in Sector 6 is a distinct population over 450 m from the population in Sector 1. There was likely a historical connection with the population in Sector 1 which has been cleared for development purposes. The 13 individuals present in Sector 6 are spread out over two foredunes (approximately 100 m x 100 m) and, at present, are susceptible to a range of threats due to the small population size.

Recommendations:
Infilling of *Callitris preissii* and associated SCP30a species between the 13 individuals in Sector 6 is recommended as it will help create a continuous vegetation community. Additionally, planting could occur in the area north of the population to extend the range of the community, with conditions assessed during the 2017 survey considered suitable for the community type (refer to the potential habitat area in Figure 3). It is recommended that plants used for revegetation are propagated from provenance seed, ideally collected from the individuals remaining in Sector 6, or alternatively from Sector 1. The mitigation of threatening processes will be required prior to and during any rehabilitation works.

3.4 Fire

Inappropriate fire regimes are a significant threatening process to SCP30a communities. *Callitris preissii* are fire sensitive, which means they tend to die rather than regenerate after fire (Keighery *et al.,* 1997). This species does not require fire for seed germination, and thus exist in long unburnt areas (Keighery *et al.,* 1997).

The record of fires within Trigg Bushland is limited with ten recorded in the period 1993 to mid-2014. A fire in December 1998 burnt approximately 50% of the *Eucalyptus gomphocephala* and *C. preissii* Open Woodland area in Sector 1, where seedlings have regenerated from the seedbank present at the site (Figure 2), and this area remains in Very Good condition. All other areas have limited records of fire, and based on the size of existing *Callitris preissii*, they are estimated to be long unburnt (50+ years). All the fires recorded have been unplanned and, based on the level of public access and use, it is expected unplanned fires will occur in the future. A no-burn regime at Garden Island has been successful in retaining a good condition of SCP30a (Department of Parks and Wildlife 2014), although the impact of this fire regime on associated species is unknown. Due to the frequency of unplanned burns in Trigg Bushland, the proximity to residential property and the sensitivity of a significant proportion of species in the community, it is recommended that no prescribed burns are undertaken in the SCP30a at Trigg Bushland.

3.5 Weeds

The TEC is particularly susceptible to weed invasion following disturbance, which may be due to its naturally low understorey abundance and diversity (Department of Parks and Wildlife, 2014). The Interim Recovery Plan indicates that a weed control program necessary to maintain or improve the current condition of the

community in the long-term. Three weed species were common in the quadrats surveyed in 2014, namely Wimmera Ryegrass (*Lolium rigidum*), Bearded Oat (*Avena barbata*) and Hare's Tail Grass (*Lagurus ovatus*), grasses were noted during the 2017 survey. Invasive grass species will rapidly increase the fire fuel load and fire intensity in bushland environments (Department of Environment Regulation, 2015). As fire is the main threatening process to SCP30a, it is important to control weeds, and grassy weeds in particular. Additionally, more weeds may have become established within the TEC areas since the 2014 survey, with garden escapees noted on the periphery of Trigg Bushland during the 2017 survey.

Recommendations:
It is recommended that weed mapping is undertaken within the SCP30a and buffer areas to assess weed invasion and inform a comprehensive weed control program. In the short term, the implementation of a winter grass control program will enable the control the high grass abundance noted. As a geophyte, Black Flag has the potential to resprout from corms, so the City will investigate methods and costings for control and consult further with relevant groups.

3.6 Habitat Fragmentation and Uncontrolled Access

The area of SCP30a in Sector 6 is currently fenced, surrounded by dense vegetation and on very steep dunes, with no evidence of uncontrolled access (Figure 4). Due to the small size of this population, fragmentation may significantly alter the condition and extent of this area of TEC.

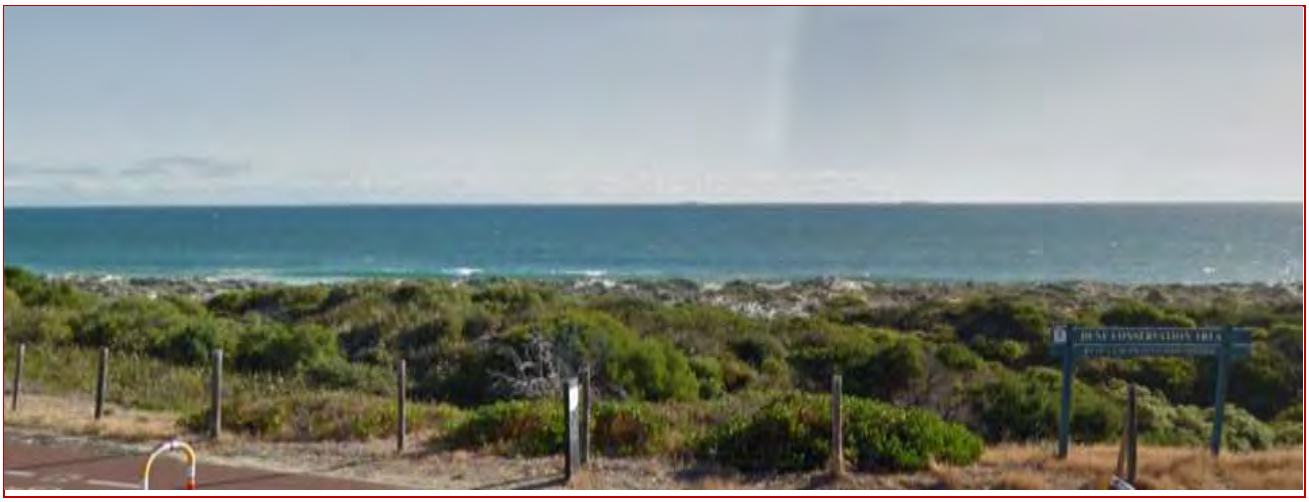

Figure 4: Sector 6: Fenced SCP30a area with steep dunes and dense vegetation

The area of SCP30a in Sector 1 has formalised pathways through several areas, and there is evidence of uncontrolled access through informal pathways (Figure 5). Due to the sparse understory typical of *C. preissii* Woodlands it will be difficult to prevent the creation of new informal pathways if current tracks are blocked. Current tracks are not leading to significant erosion, litter or weed spread, but are fragmenting the habitat further. This fragmentation does not appear to have a significant impact on the *C. preissii* Woodland at present, but if new tracks are created may have an impact on the condition of the TEC.

Figure 5: Sector 1: Formal (right) and informal (left) pathways

Recommendations:

It is recommended that:

- the planning and installation of amenities into Trigg Bushland, including paths, benches and signage avoid all SCP30a areas
- no areas of SCP30a are cleared, including the area of potential habitat identified in Sector 6
- the creation of natural barriers to prevent additional informal tracks being formed in Sector 1, such as through the installation large limestone rocks or logs, is considered.

3.7 Grazing

Grazing, such as by rabbits, is known to have an impact on SCP30a, particularly post fire with predation of seedlings reducing overall recruitment (Winn, 2007). In addition to active predation of native species, soil disturbance and the addition of nutrients through dung to the community can encourage weed establishment (Keighery *et al.* 1997). Evidence of rabbits were noted within Trigg Bushland in both the 2014 and 2017 surveys, including within the SCP30a areas. Grazing was assessed during the 2017 survey and considered to be having an insignificant impact with regards to soil disturbance and addition of nutrients. However, rabbit predation may change over time and have a negative impact on community restoration efforts or regeneration post fire.

Recommendations:

It is recommended that:

- rabbit control is undertaken within the TEC as a matter or priority when required
- strategies to exclude rabbits from access to SCP30a in the event of a fire or restoration effort be undertaken, through the installation of tree guards (in the event of planting) or exclusion fencing (in the event of fire).

3.8 *Callitris preissii* in Sector 5

The area of *Callitris preissii* in Sector 5 was researched by Keighery (2012) and identified as a historically planted mixture of *C. preissii* and *C. verrucosa.* The genetic distinctness of the remnant populations of SCP30a within Trigg Bushland are threatened by outbreeding and potential hybridisation with this population.

Recommendation:
To ensure the remnant populations of SCP30a in Sectors 1 and 6 remain genetically distinct it is recommended that these individuals are removed using a staged approach.

3.9 Altered Hydrology

It is noted that SCP30a has been identified as likely to be a groundwater dependent ecosystem (Department Parks and Wildlife, 2014). Groundwater extraction activities or developments that affect groundwater level may influence the health of the community. As the locations of these patches are coastal, salinity may also have an influence on their continued existence. These factors are not able to be controlled by the City of Stirling, thus no recommendations for management are provided.

4.0 Summary of Recommendations

A summary of the recommendation made throughout the addendum is provided below, along with assigned priorities. The implementation of these recommendations will ensure that the extent and condition of the Threatened Ecological Community *Callitris preissii forests* and woodlands (SCP30a) within Trigg Bushland Reserve is improved.

Aspect	Recommendation	Priority
Maintenance	Establish a 50 m buffer in which monitoring, and mitigation of threats should occur	High
Maintenance	Establish approximately nine photo monitoring points throughout SCP30a, encompassing different vegetation types, vegetation conditions and elevations.	High
Rehabilitation	Infill planting of SCP30a in Sector 6 (Trigg Foreshore) with provenance seed, ideally from Sector 6	Medium
Maintenance	Establishment of approximately three 5 m x 5 m monitoring quadrats for the rehabilitation area (and 5 photo monitoring points)	As needed (High)
Weeds	Grass weed control program within SCP30a and buffer area	High
Weeds	Comprehensive weed mapping and treatment strategy	Medium
Weeds	Investigate control options and costings for Black Flag	Medium
Grazing	Rabbit control	As needed (Medium)
Grazing	Protection of infill plantings with tree guards	As needed (High)
Grazing	Protections of seedlings post fire with exclusion fencing	High
Sector 5	Remove *Callitris preissii* individuals on a staged basis over time	Medium

5.0 References

Department of Parks and Wildlife, (2017), *Conservation Codes for Western Australian Flora and Fauna*, accessed May 2018 via: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/conservation_code_definitions.pdf.

Department of Parks and Wildlife, (2016), *List of Threatened Ecological Communities (TECs) Endorsed by the Western Australian Minister for Environment*, accessed May 2018 via: https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_october_2016.pdf.

Department of Parks and Wildlife, (2014), *Callitris preissii (or Melaleuca lanceolata) Forests and Woodlands Interim Recovery Plan No. 340.* Accessed March 2018 via: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/IRP340_Callitris_preissii_forest_and_woodlands_SCP30a_2014.pdf.

Department of Environment Regulation, (2015), *A Guide to Burning Under the Native Vegetation Clearing Provisions*, Department of Environmental Regulations, Perth, Western Australia. Accessed April 2018 via: https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Guidelines/3fire_guideline_native_veg.pdf

Environment Protection Biodiversity and Conservation Act 1999 (Cwlth)

Gibson, N., Keighery, B., Keighery, G., Burbidge, A., Lyons, M., (1994), *A Floristic Survey of the Southern Swan Coastal Plain*, Department of Conservation and Land Management and the Conservation Council of Western Australia, Perth, Western Australia.

Keighery, B., Gibson, N., Keighery, G., (1997), *The Regional Significance of the Flora and Vegetation of Garden Island,* paper presented at Environment and Energy Conference; Submarine Training and Support Centre Auditorium, HMAS Stirling, Garden Island 14-15 April 1997 in Department of Parks and Wildlife, (2014), *Callitris preissii (or Melaleuca lanceolata) Forests and Woodlands Interim Recovery Plan No. 340.* Accessed March 2018 via: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/IRP340_Callitris_preissii_forest_and_woodlands_SCP30a_2014.pdf.

Keighery, G., (2012), *Status of Callitris in Star Swamp, Trigg Dunes and Jeanes Prisk Reserve, Karrinyup, City of Stirling*. Department of Environment and Conservation.

Wildlife Conservation Act 1950 (WA)

Winn, K.O., (2007), *Developing a strategy for Woodland Restoration. An Integrated Approach to Woodland Restoration Strategy Development on Rottnest Island, Western Australia*. PhD thesis presented at the University of Western Australia, Perth, 2007 in Department of Parks and Wildlife, (2014), *Callitris preissii (or Melaleuca lanceolata) Forests and Woodlands Interim Recovery Plan No. 340.* Accessed March 2018 via: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/IRP340_Callitris_preissii_forest_and_woodlands_SCP30a_2014.pdf.

Appendix 1: Audit of Consultation Outcomes

No	Name	Subject Matter	Comment Received	City of Stirling Response	Adjustments to Management Plan
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Addendum	There are no major issues with the Management Plan Addendum. In particular, the Friends of Trigg Bushland would like to comment on the following recommendations made in the Plan:	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Buffer Zone	▪ The recommendation to provide a 50m buffer zone between the new population in Zone 6 and man-made structures is fully supported.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Photo points for monitoring	▪ The creation of photo points for monitoring the new population is fully supported, and the Friends of Trigg Bushland would be willing to assist with implementation of this recommendation.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Additional planting	▪ The Friends of Trigg Bushland would be interested in further consultation with experts before committing to further planting and infilling, and would be willing to assist in gathering this advice.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Burning	▪ The recommendation that no burning occur in any of these areas is fully supported.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Weed mapping	▪ Weed mapping is fully supported, as long as it does not cause any delay in removing annual weeds which could cause a fire hazard. The Friends would be willing to assist in weeding this area, which is quite fragile.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Tracks	▪ The recommendation that no new tracks or fragmentation occur in this area is fully supported.	Noted	No change
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Text	Page 7 - Relevant text: population. Comment: populations (plural)	Noted	Adjusted
1	Friends of Trigg Bushland - Nina McLaren, Secretary	Text	Page 4 - Relevant text: plant. Comment: planted (tense)	Noted	Adjusted
2	Beach Not Bitumen - Anthony James, Spokesperson	Addendum	Thank you for the opportunity to comment on the draft addendum to the Trigg Bushland Management Plan to protect the TEC in the South Trigg Beach Reserve. We have perused the addendum and consulted with the Friends of Trigg Bushland who facilitated the identification of the TEC. We are pleased to advise that we support the inclusion of the addendum as drafted into the Trigg Bushland Management Plan. We would also like to take the opportunity to congratulate the City of Stirling on taking steps to protect this important stand of Rottnest Pine and the surrounding dune vegetation and landforms for future generations.	Noted	No change
3	Friends of Trigg Bushland - Robyn Murphy, Convener	Addendum	The Friends of Trigg Beach appreciates the opportunity to review the draft addendum to the Trigg Bushland Management Plan to protect the Threatened Ecological Community of *Callitris preissii* woodland in the South Trigg Beach Reserve. After consulting with the Friends of Trigg Bushland who initiated the TEC, we are pleased to endorse the draft and its attachment to the Trigg Bushland Management	Noted	No change

No	Name	Subject Matter	Comment Received	City of Stirling Response	Adjustments to Management Plan
			Plan. The protection of the coastal reserve and the TEC within its boundaries is integral to the conservation of the Quindalup dunes complex that forms Trigg Beach and its surrounds, and its inclusion in the Management Plan provides guidance for maintaining its integrity into the future. Thank you for the opportunity to make comment.		
4	Stirling Natural Environment Coastcare - Walter Kolb, Works Coordinator	Black Flag	Should be excavated to 400 mm and removed from site before renewal of fence. This area has previously been cleared of all vegetation and sprayed out yearly. The area is permanently marked and contained. If Black flag is not removed, corms will wash down the slope and infest swale areas.	Noted. The presence of Black Flag should be noted during the recommended weed mapping works, and an appropriate treatment regime determined.	New recommendation added: City to investigate methods and associated costings for the control of Black Flag and consult further with relevant groups.
4	Stirling Natural Environment Coastcare - Walter Kolb, Works Coordinator	Weed reinfestation	To prevent weeds from re-infesting the TEC area the strips of land between: ▪ the dual use footpath and fence ▪ the footpath to road adjacent to the TEC should be sprayed out and maintained ▪ the land between the housing and the footpath should be weeded and re-vegetated.	Noted. These recommendations are consistent with the intent of information provided in the addendum, particularly Sections 3.1 and 3.3. They will be considered when the various recommendations are implemented.	No change
4	Stirling Natural Environment Coastcare - Walter Kolb, Works Coordinator	Median strip	The median strip of West Coast Highway should be weeded and planted up with native vegetation, especially targeting *Euphorbia terracina*	Noted. Recommendation consistent with Sections 3.1 and 3.3 of the addendum	No change
4	Stirling Natural Environment Coastcare - Walter Kolb, Works Coordinator	Weeding	Weeding of all weeds should continue so as to enhance the area. NB: This area currently includes sites of native Pellitory and disturbance should be avoided especially during the growing season.	Noted	No change
4	Stirling Natural Environment Coastcare - Walter Kolb, Works Coordinator	Fencing	When Planning to replace existing fencing keep in mind that the dual use footpath should possibly be widened in the future	Noted	No change