

Foreshore Works Revegetation Plan

Burns Beach Foreshore Reserve Stage 3

Project No: EP15-020(15)

**Prepared for Peet Funds Management Limited
September 2021**



Foreshore Works Revegetation Plan

Burns Beach Foreshore Reserve Stage 3



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Foreshore Works Revegetation Plan

Burns Beach Foreshore Reserve Stage 3



Executive Summary

This *Foreshore Works Revegetation Plan* (FWRP) outlines the restoration approach for stage 3 of the Burns Beach foreshore reserve (referred to as ‘the site’ and shown in **Figure 1**).

A summary of restoration tasks within the site is provided in **Table E1** below. Some preliminary works will commence in 2021 dependent on the timing of earthworks. However, formal implementation of the FWRP will commence at the time tubestock are installed (May – June 2022). The tasks outlined in this FWRP will then be implemented for a minimum of two years up until hand over to the City of Joondalup. Handover will only occur once objectives have been met and will be subject to the satisfaction of the City of Joondalup.

Table E1: Schedule of implementation for the restoration of the site

| Year | Timeframe | Specific Task |
|------------------------|---|--|
| 2021/2022 (Year 0+) | During earthworks associated with batters and construction of built infrastructure in the site | Translocate plant and topsoil material |
| | Following completion of earthworks associated with batters and construction of built infrastructure in the site | Apply landform stabilisation measures |
| | | Install fencing and signage |
| | December 2021 | Order tubestock |
| 2022/2023 (Year 1) | Following first rains in late autumn/winter (May or June 2022) | Undertake weed control |
| | | Plant tubestock |
| | Spring (September – November 2022) | Undertake weed control |
| | February 2023 | Undertake monitoring |
| | | Evaluate revegetation success and confirm whether objectives have been met |
| | Undertake contingency actions (if required) | |
| 2023/2024 (Year 2) | Following first rains in late autumn/winter (May – July 2023) | Undertake weed control (if required) |
| | | Plant tubestock (supplementary, if required) |
| | Spring (September – November 2023) | Undertake weed control (if required) |
| | February (2024) | Undertake monitoring |
| | | Evaluate revegetation success and confirm whether objectives have been met |
| | | Undertake contingency actions (if required) |
| | (May or June 2024) | Report outcomes to City of Joondalup. Handover site, or parts of the site, where objectives have been met, to satisfaction of the City of Joondalup. |
| 2024/2025 (Year 2+) | TBC | Undertake contingency actions (if required) |

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Appendix A

Foreshore Restoration Monitoring (Emerge Associates 2021)

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Abbreviation Tables

Table A1: Abbreviations – Organisations

| Organisations | |
|---------------|--|
| City | City of Joondalup |
| DPLH | Department of Planning, Lands and Heritage |
| Peet | Peet Funds Management Limited |
| WAPC | Western Australian Planning Commission |

Table A2: Abbreviations – General terms

| General terms | |
|---------------|---------------------------------------|
| FMP | Foreshore management plan |
| FMPBB | Foreshore management plan Burns Beach |
| FWRP | Foreshore Works Revegetation Plan |
| PSP | Principal Shared Pathway |

Table A3: Planning

| General terms | |
|---------------|----------------------------|
| MRS | Metropolitan Region Scheme |
| SPP | State Planning Policy |

Table A4: Abbreviations – units of measurement

| Units of measurement | |
|----------------------|--------------|
| ha | Hectare |
| m | Metre |
| mm | Millimetre |
| m ² | Square metre |
| Km | Kilometre |

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1 Introduction

1.1 Project background

The Burns Beach Estate is a residential development located approximately 30 kilometres (km) north-west of the Perth Central Business District, within the locality of Burns Beach in the City of Joondalup (the City). Peet Funds Management Limited (Peet) have been managing the development of the Burns Beach Estate since 2006.

As part of this development, works were conditioned to occur in the adjacent coastal foreshore reserve (WAPC Ref: 160617). These works included the rehabilitation of coastal vegetation and construction of formal access routes as outlined in the *Foreshore Management Plan Burns Beach* (FMPBB) endorsed by the City of Joondalup and the Department of Planning and Infrastructure in March 2006 (Cardno BSD 2006).

Subsequently, the southern and central portions of the Burns Beach Estate have been constructed and adjacent portions of the coastal foreshore reserve have been handed over to the City of Joondalup (referred to as stage 1 and stage 2 of the foreshore works).

Peet now intend to progress the subdivision of the final northern portion of the Burns Beach Estate and associated third and final stage of coastal foreshore works (referred to as stage 3).

1.2 Site boundary

Stage 3 of coastal foreshore works will occur within the northern portion of the Burns Beach foreshore reserve as shown in **Figure 1** (herein referred to as the 'site').

The site is approximately 9.52 hectares (ha) in size and is bound by the yet to be constructed PSP to the east, the Indian Ocean to the west, parks and recreation reserved land to the north and the stage 2 foreshore reserve to the south.

1.3 Purpose of the document

This *Foreshore Works Revegetation Plan* (FWRP) outlines restoration works that will be completed within the site, consistent with and as an update to the FMPBB (Cardno BSD 2006) and in accordance with planning and approval requirements outlined above (refer **Section 2.1**). The FWRP should therefore be read in conjunction with the FMPBB to provide context for the overarching principals.

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2 Background

2.1 Planning context

Subdivision approval for development adjacent to the southern portion of the site where stages 2 and 3 intersect has been received from the Western Australian Planning Commission (WAPC) (WAPC Ref: 156568). Subdivision approval has also been received for the remainder of Burns Beach Estate adjacent to the site (WAPC Ref: 160429). Conditions 11 and 14 of the relevant subdivision approvals requires that *'Prior to the commencement of subdivision works the Burns Beach Foreshore Management Plan is to be revised and updated to ensure the protection and management of the sites environmental assets with satisfactory arrangements being made for the implementation of the approved plan'*.

This FWRP responds to the requirement to revise and update the FMPBB, as it provides site-specific management measures to ensure the overarching environmental outcomes specified in the FMPBB are achieved (WAPC Ref: 160617).

Several separate planning guidance documents have published subsequent to the preparation of the original FMPBB that require consideration:

- *State Planning Policy 2.6 State Coastal Planning Policy (SPP 2.6)* (WAPC 2013)
- *State Coastal Planning Policy Guidelines* (DPLH 2020)
- *Joondalup Coastal Hazard Assessment* (M P Rogers & Associates 2016).

The preparation of SPP 2.6 and associated Guidelines and the *Joondalup Coastal Hazard Assessment* resulted in the re-evaluation of the foreshore reserve adjacent to the Burns Beach Estate compared to that which is shown in the FMPBB and associated foreshore setbacks. This change is reflected in the updated site boundary shown in **Figure 1**. In addition to the updated site boundary, the extent of built infrastructure within the site has been reduced since the preparation of the original FMPBB, in order to reduce the extent of the environmental impacts within the foreshore reserve.

The foreshore reserve is part of Bush Forever site 322 (DPI 2016). The *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region (Government of WA 2000). *Bush Forever* sites are considered as part of the planning and environmental approvals process for land development. Bush Forever site 322 has previously been considered when approvals were granted for development of the Burns Beach Estate and stage 3 foreshore works.

The foreshore reserve is also mapped as part of an environmentally sensitive area associated with Bush Forever site 322. An environmentally sensitive area indicates that exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply. The clearing associated with the Burns Beach Estate has been granted subdivision approval under the *Planning and Development Act 2005* and therefore a Schedule 6 exemption under *Environmental Protection Act 1986* does apply.

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The foreshore reserve is located within an area mapped as having 'slight potential' to contain unexploded ordnance (UXO) (DoD 2021). In accordance with Department of Fire and Emergency Services (DFES) advice, where the UXO mapping category is slight, there is no requirement to assess or search the site for UXO (DFES 2021).

2.2 Existing environment

Detailed information regarding the environmental context of the site is provided in the FMPBB (Cardno BSD 2006), with factors relevant to the site and the restoration works provided below.

2.2.1 Climate

It is critical that restoration works respond to climatic conditions to ensure that actions such as planting and weed control are undertaken at appropriate times. Based on the seasonal patterns present in the local area, the best time to establish plants in the site is late autumn to early winter to coincide with seasonal rainfall. Similarly, weed control will need to respond to seasonal rainfall and treatment may be required in autumn prior to planting and in spring after planting has been completed.

2.2.2 Geomorphology

The site is composed of dunes of the Quindalup complex which are comprised of relatively infertile calcareous sands (Gozzard 1982).

Coastal dunes are dynamic environments that are continually reshaped by erosion and depositional processes. The combination of wave and wind act to create parabolic dunes which are ostensibly mobile until stabilised by vegetation. Removal of vegetation can lead to erosion and the creation of blow outs. The restoration works within the site must ensure landforms are stabilised effectively to allow vegetation to establish and secure dunes in the longer term.

2.2.3 Vegetation

Cardno BSD (2006) identified four plant communities within the Burns Beach foreshore reserve as described in **Table 1**. Areas of bare sand that do not support a native vegetation community also occur in the foreshore reserve.

Table 1: Plant communities identified within the site (from Cardno BSD 2006)

| Plant community | Description |
|-----------------|---|
| OaSc | <i>Olearia axillaris/Scaevola crassifolia</i> low to open heath. This vegetation unit occurs widely throughout the foreshore reserve. |
| SgOa | <i>Spyridium globulosum/Olearia axillaris</i> open to closed heath. This vegetation unit occurs widely throughout the foreshore reserve. |
| LgSc | <i>Lepidosperma gladiatum/Scaevola crassifolia</i> open to closed heath. This vegetation unit occurs in the depressions behind the primary and secondary dune formations. |
| MsLm | <i>Melaleuca systena/Lomandra maritima</i> low shrubland to low open heath. This vegetation unit occurs on the higher areas, on the west side of the reserve. <i>Lomandra maritima</i> occurs in a larger block to the north of the site. |

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The vegetation condition of plant communities previously recorded within the foreshore reserve ranged from 'completely degraded' to 'excellent' (Cardno BSD 2006). Updated plant community and vegetation condition mapping for the site is provided in **Figure 2**.

Generally, vegetation in the site contains a low proportion of weed species. Some weed species previously recorded as being dominant in the foreshore reserve include **Pelargonium capitatum*, **Tetragonia decumbens* and **Trachyandra divaricata* (Cardno BSD 2006)¹.

2.2.4 Previous works

Landscape works have previously been undertaken within stage 1 of the foreshore reserve. These works were undertaken between December 2006 and January 2008 and involved the construction of the southern extent of the PSP, and the construction of a boardwalk to provide beach access. An area of public open space (Beachside Park) was developed adjacent to the stage 1 boundary during the same period.

Restoration works have previously been undertaken within the stage 1 and 2 portions of the foreshore reserve. No specific monitoring objectives for restoration were specified in the FMPBB to provide context for the success of restoration works.

The outcomes of restoration within stage 1 and 2 foreshore reserve were evaluated in March 2021, with the findings provided in detail in **Appendix A**.

¹ Asterisk '*' denotes species not native to the site (weeds).

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3 Foreshore Works

3.1 Subdivision construction disturbance

The construction of Beachside Drive and adjacent principal shared pathway (PSP) will require the construction of batters within the foreshore reserve. The FMPBB proposed batter slopes that were steeper than the standard 1:3 to reduce the horizontal extent of batter intrusion into the foreshore reserve (Cardno BSD 2006). Consequently batter slopes of 1:2 up to 1:1 were constructed within earlier stages of the foreshore reserve (Cardno BSD 2006).

In acknowledgment of the difficulty that steeper slopes pose to restoration, a revised approach will be taken when constructing batter slopes within stage 3 that generally results in a 1:4 gradient overall and where applicable and reasonable batters may be between 1:4 to 1:8. The final footprint of the batters for each segment of the PSP and Beachside Drive will be determined with the City at the time of construction.

In addition to easing batter slopes, treatments such as limestone rock terracing and retaining walls will be considered to minimise batter footprints. limestone rock terracing will involve use of large limestone boulders recovered from the development area and will act as “informal” retaining walls. Retaining walls will otherwise be constructed from limestone blocks consistent with those already in place along the developed portions of the Burns Beach foreshore.

All areas disturbed as part of the construction of Beachside Drive and the PSP are to be regraded to manageable gradients protected from public access and wind erosion and revegetated as part of the revegetation/restoration works. In addition, existing informal tracks within the site are to be revegetated as part of the broader package of revegetation/restoration works.

3.2 Future landscape works

The FMPBB provided a concept plan for the landscape works to be undertaken across the foreshore reserve that included pedestrian and emergency vehicle beach access pathways. When development application is submitted to the City separate landscape plans will be prepared that detail the footprint of landscape works within the foreshore reserve.

The revegetation/restoration works associated with landscape works will be determined separately as part of development approval.

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4 Threats and opportunities

Key threats to restoration of the site have been identified in **Table 2**.

Table 2: Key threats to restoration of the site

| | Description |
|--------------------------------|---|
| 1. Plant pathogens (dieback) | Soil borne water moulds <i>Phytophthora</i> spp. (dieback) or other pathogens (<i>Pythium</i> spp.) may occur in the surrounding area. Dieback kills susceptible plants by attacking their root system which inhibits uptake of water and nutrients (DPaW 2015). A large range of native species are susceptible to dieback which is spread through movement of soil and mud, especially by vehicles and footwear. There is no practical large-scale cure for dieback and therefore containment is the primary option available for management. While dieback is not expected to be a critical issue for vegetation within the site, good hygiene practices will nonetheless need to be applied at all times to limit the potential for the spread or introduction of dieback and other plant pathogens. |
| 2. Unmanaged access | The movement of people, domesticated animals and/or vehicles over the revegetated area may result in erosion, damage to plants and directly limit revegetation outcomes. Therefore, some restriction to access to the site will be required during restoration and over the long term. |
| 3. Erosion and dust generation | Surface water is likely to drain freely across the site due to the permeable sands present. Therefore, water erosion from surface runoff would occur infrequently, if at all, and only in response to intense events. However, wind erosion and disturbance during batter construction have the potential to impact on revegetation due to ground disturbance and removal of vegetation cover. Although revegetation will stabilise the site and reduce the potential for dust and erosion, management actions will be undertaken prior to establishment of plants and also if evidence of erosion is observed in the site prior to plant maturation. |
| 4. Competition from weeds | Invasive non-native plants (weeds) can degrade native vegetation through competition for space and resources. An increase in weed presence could therefore limit revegetation outcomes. Some weeds are already well established within and adjacent to the site. However, the cover and/or diversity of weeds may be increased during foreshore works through the effects of ground disturbance and by the introduction of new weeds on vehicles or equipment. Good hygiene practices and weed management will be required to limit the introduction of weeds and control weeds within the site. |
| 5. Herbivory | Herbivory can directly limit the outcomes of revegetation by damaging or destroying plants. It is possible that herbivores like rabbits or kangaroos could pose a risk to revegetation of the site. Herbivore management will be required if impacts are recorded, particularly in initial periods when plants are small. |

As the site currently contains bare and eroding areas it offers an opportunity for restoration. The bare areas largely include historically cleared tracks and small blowouts.

Where native vegetation is required to be removed for construction of the northern precinct of the Burns Beach estate (adjacent to the site), or on site during the construction of Beachside Drive and PSP batters, there is an opportunity to recover and reuse materials including brushing, mulch and topsoil as part of restoration works. The ability to reuse these materials will be contingent to some extent on timing of works and ability to store material ready for use.

A groundwater abstraction licence (GWL 176854) has been obtained for the development of the northern precinct, which includes sufficient allocation to provide supplementary water to establishing revegetation areas if required.

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5 Goal and Objectives

Consistent with Cardno BSD (2006), the overarching goal for restoration is to stabilise and revegetate bare parts of the site and restore any areas disturbed by the development interface, with a near continuous and diverse layer of appropriate, local native shrub and herb species.

The appropriate target ecosystem for restoration is a coastal dune system, similar to the heathland plant communities that currently occur within the site. Key native species include shrubs such as *Melaleuca systena*, *Olearia axillaris*, *Scaevola crassifolia* and *Spyridium globulosum* and sedges or rushes such as *Lepidosperma gladiatum* and *Lomandra maritima*. A representative photograph of this community is shown in **Plate 1**.



Plate 1: Target ecosystem comprising low open heath vegetation

The following specific objectives are proposed to guide the restoration and help to demonstrate that the overarching goal has been met:

1. Landforms within restored areas are stable and not actively eroding such that native shrub and herb species can be established².
2. Restored areas have a minimum density of four (4) native plants per metre squared (m²)².
3. Restored areas have a minimum diversity of at least seven (7) appropriate local native species².
4. All native plants established from tubestock are at least one year old³.
5. Weed cover does not exceed 15% of restored areas².

² As measured within systematically located 2 m x 2 m or 5 m x 5 m sample plots, as appropriate.

³ That is one year from time of planting.

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6 Method

Restoration will be undertaken within the site once the construction of the batters required for Beachside Drive and PSP are completed. Restoration is required to stabilise and revegetate cleared or bare areas within the site and limit weed cover so that objectives can be met prior to handover to the City.

6.1 Restoration area

Restoration will occur in the following general locations within the site:

1. Batters associated with the construction of the PSP and Beachside Drive.
2. Bare areas where historic disturbance has occurred (e.g. existing unauthorised vehicle and pedestrian tracks and blowout areas).

These locations have been grouped as a restoration area, as shown in **Figure 3**. The restoration is expected to be further divided into sub areas as required to implement works.

6.2 Communication

Prior to commencing any work, all personnel will be informed of the conservation significance of the foreshore reserve and the potential for impacts to adjacent native vegetation resulting from works within the site.

In particular, it will be communicated that:

- the City considers the site to be of high conservation significance
- the site is part of Bush Forever site 322
- the site is part of an 'environmentally sensitive area'
- ground disturbance activities must be strictly limited to clearing areas associated with batters and access tracks within the site.

In addition, it will be communicated to contractors involved within ground disturbance works (including planting) that the site is mapped as having a 'slight potential' for UXO to occur. Whilst the risk of any UXO being identified within the site is low, should any material suspected of being UXO be encountered during works, contractors are to stop work and contact the police immediately.

Personnel specifically involved in restoration works will be made aware of the management actions outlined below.

6.3 Hygiene

To minimise the potential of pathogens and weeds being spread within the site and to other areas (as per threat '1' outlined in **Table 2**), the following management measures will be undertaken during restoration works:

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- Vehicles, tools, equipment and machinery will be free of all mud, soil and plant material on arrival at the site.
- If vehicles, tools, equipment and machinery are temporarily removed from the site during works they must be free of all mud, soil and plant material on return.
- Topsoil from weed infested parts of the site will be removed or buried at depth and not re-used in the site.
- Topsoil from relatively weed free areas may be stockpiled for later reuse in the site as required.
- Vegetation material such as shrub branches could be stockpiled for later reuse in the site as brushing.
- Imported fill or mulch material will be certified free of dieback and environmental weeds.

6.4 Access (to restoration areas)

Access to restoration areas will be restricted to limit the impact that unmanaged and unauthorised access may have on the restoration areas (as per threat '2' outlined in **Table 2**).

To ensure works are not undertaken outside of the batter area, temporary fencing or bunting will be installed on the western boundary of the batter area to delineate the works area prior to commencement of earthworks.

At the completion of works temporary fencing/bunting will be removed and conservation-style fencing will be installed on the eastern boundary of the PSP batters, west of the adjacent PSP (which is shown in **Figure 3**).

Signs detailing dune restoration works will be attached to the conservation-style fencing, adjacent to the PSP. These signs will help to encourage users of the path to 'take an interest in the rehabilitation works and to further understand dune ecology' and 'stay on the designated access paths to avoid impacting on the foreshore reserve restoration' (Cardno BSD 2006).

6.5 Landform stabilisation

Dust and sand drift from the site must be controlled in accordance with the Department of Water and Environmental Regulation guidelines. Measures to both stabilise the site and reduce the potential for dust and erosion will be required after construction of the batters (as per threat '3' outlined in **Table 2**).

Revegetation is an effective measure to stabilise sand dunes and reduce dust in the longer term (refer **Section 6.6**). However, as the coastal sand dune landform present within the site is dynamic, stabilisation may be required in order to provide a suitable planting medium and secure landforms until plants have matured.

In case there is a lag between the completion of landforms and planting, ensuring that the site is stabilised in the interim will be important to the success of restoration works. A range of options for stabilisation are specified below that can be applied as required across the site. A revegetation contractor will be able to advise which option(s) are suitable for the site based on information obtained during a site inspection.

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6.5.1 Brushing

Brushing is an effective and natural method for stabilising slopes and enhancing the outcomes of coastal erosion. If suitable, brushing will be sourced from vegetation cleared within the site. Otherwise, external sources of suitable brushing will be required. Brushing may be laid by hand in a roughly interwoven or interlocked pattern or spread by machine (i.e. coarse mulch). Brushing will be spread over moderate to steep slopes exposed to prevailing winds.

6.5.2 Coir mesh matting

Biodegradable coir (jute) mesh matting is effective in stabilising slopes and may be required for steeper slopes or if sufficient brushing material cannot be sourced. Coir mesh matting (900 grams per square metre (gsm)) will be installed according to manufacturer's/supplier's specification as required. Coir mesh matting, installed with biodegradable fastener pins, was recommended for landform stabilisation in the FMPBB (Cardno BSD 2006).

6.5.3 Mulch and topsoil

Mulch and topsoil (**Section 6.3**) may be re-spread in the site (if it was able to be stockpiled and is available). Mulch may consist of relatively large vegetative material such as branches or brush, as well as down sized material that has been put through a mulcher or chipper. Topsoil typically comprises the first 0.05 to 0.1 m of soil stripped from clearing areas and ideally those areas determined to have a lower weed burden. Areas subject to mulch or topsoil will be covered with at least a light layer (e.g. to a depth of 0.05 to 0.1 m). Once spread, mulch or topsoil material will be tracked into the landform to secure it using suitable machinery. Where additional mulch material is required, it will be weed free, certified pathogen free, native mulch sourced from an accredited supplier.

6.5.4 Sand trap fencing

Sand trap fencing can be an effective method of landform stabilisation, particularly during earthworks. Sand trap fencing typically involves erecting post and wire fencing with shade cloth or similar material that collects wind-borne sand to reduce sand movement, break up slopes and create incipient dunes over time. During construction of the batters in the site, sand trap fencing may be installed at locations susceptible to erosion, such as along the western boundaries of the PSP batters. This style of fencing will stabilise slopes prior to installation of brushing/coir mesh matting/mulch.

6.6 Weed control

Weed control may be required prior to planting to prepare the site and reduce competition between weeds and establishing native plants (as per threat '4' outlined in **Table 2**). Weed control will also likely be required following planting to suppress weeds below the objective of 15% cover and reduce competition with establishing native plants. Weed cover will be reviewed twice a year, and if required, weed control will be undertaken at least twice a year in autumn and spring.

Weed control methods deemed suitable for the site will be determined following an inspection of the site. Appropriate weed control methods may include both manual (hand weeding) and chemical (herbicide) based approaches. Hand weeding can be successful for certain species and when weed

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abundance is relatively low. When weed cover is relatively high a broad-spectrum herbicide formulation may be applied as a spot spray that targets specific weeds. Alternatively, if grass weeds are prevalent a grass selective formulation may be applied to more efficiently suppress weed growth, taking care to avoid off target impact to native plants.

Herbicides will only be applied by a Department of Health licensed pest management technician and in accordance with manufacturer's instructions as provided on product label. A licensed pest management technician will be consulted on what suitable approaches would be based on information obtained during a site inspection.

6.7 Revegetation

Revegetation with native plant species is an effective means of stabilising sand dunes and reducing dust in the longer term (as per threat '3' outlined in **Table 2**). The methods outlined in this section have been informed by the FMPBB (Cardno BSD 2006), examination of aerial photography, a site inspection and knowledge of the local area.

6.7.1 Direct seeding

As per the FMPBB, seed may be collected from within the site prior to earthworks and associated vegetation clearing. This seed will be collected by a licensed seed contractor and used to propagate tubestock to be installed in the site. Alternatively, seed may be available for use in the site that was previously collected within other areas of the Burns Beach foreshore reserve.

Species that may be direct seeded include:

- *Acanthocarpus preissii*
- *Carpobrotus virescens*
- *Conostylis acculeata*
- *Lepidosperma gladiatum*
- *Lomandra maritima*
- *Myoporum insulare*
- *Spinifex longifolius*.

6.7.2 Plant establishment

Planting seedlings as tubestock is a simple and effective method for revegetating the site. In combination with topsoil respreading (refer **Section 6.5.3** and **0**), and direct seeding planting tube stock will result in successful revegetation outcomes, if stabilisation is completed as previously outlined in **Section 4.4** and tubestock are planted in autumn or winter at a sufficient depth and density.

6.7.3 Timing

Tubestock will be planted once the winter rains have started and the ground is sufficiently moist. Planting will be initiated as soon as possible to allow plants the maximum time for establishment before the summer dry period (WAPC 2003). Planting outside of this period is not recommended as survival rates will likely be reduced.

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Topsoil may be stockpiled and respread ahead of winter to ensure that it is in place before seasonal rain stimulates germination of seeds stored in the topsoil. Alternatively, plant and topsoil material may be moved directly in place at any time, but preferably in late autumn prior to the commencement of seasonal winter rain.

6.7.4 Site preparation

The landform within the site adjacent to the PSP, pedestrian paths and emergency access way will be reshaped and battered on completion of civil construction works. Surface preparations within the site, as described in **Section 6.5**, will be installed immediately after completion of earthworks. No other preparation works will be required as the sandy soils within the site will provide a suitable medium for planting native species.

Dependent on the timing of works, weed control may be required prior to planting (refer **Section 6.6**). Note that some native species may arise through the soil seedbank and these will be retained.

6.7.5 Sourcing tubestock

Tubestock will be sourced from a Nursery Industry Accreditation Scheme, Australia (NIASA) accredited nursery and grown from local provenance seed or cuttings with genetic diversity. If seed is not available from within the site or Burns Beach foreshore reserve, seed from similar coastal location in vicinity of site may be available from a revegetation contractor (northern swan coastal plain <20 km from eth site). An order will be placed for tubestock to be grown from seed and/or cuttings well in advance of expected planting date to ensure required species and volumes can be obtained. As much as six months to a year's notice may be required to ensure availability of some species.

The tubestock should be grown as tall as possible to facilitate deep planting as outlined in **Section 4.5.5**. Nursery staff can advise which species can be grown tall enough such that deep planting is appropriate. Before collection, the tubestock will be hardened off and in good condition.

A list of 22 suitable species and recommended tubestock numbers is provided in **Table 3**. This species list is constructed from species recommended to be planted in the FMPBB (Cardno BSD 2006) and observations of vegetation within and adjacent to the site.

Table 3: Tubestock plant list

| Lifeform | Species |
|----------|-------------------------------|
| Herb | <i>Acanthocarpus preissii</i> |
| | <i>Conostylis aculeata</i> |
| | <i>Conostylis candicans</i> |
| | <i>Lomandra maritima</i> |
| Sedge | <i>Lepidosperma gladiatum</i> |

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Table 3: Tubestock plant list (continued)

| Lifeform | Species |
|----------|------------------------------|
| Shrub | <i>Acacia cochlearis</i> |
| | <i>Acacia lasiocarpa</i> |
| | <i>Acacia rostellifera</i> |
| | <i>Exocarpos sparteus</i> |
| | <i>Kennedia prostrata</i> |
| | <i>Melaleuca systema</i> |
| | <i>Myoporum insulare</i> |
| | <i>Olearia axillaris</i> |
| | <i>Phyllanthus calycinus</i> |
| | <i>Rhagodia baccata</i> |
| | <i>Scaevola crassifolia</i> |
| | <i>Spyridium globulosum</i> |

6.7.6 Installing tubestock

Tubestock will be planted over two seasons, if required. Species will be planted in a mixed pattern so that diversity is maintained across the revegetation area.

Tubestock will be installed using a deep planting method. For example, tubestock grown to 300 mm tall can be planted with only 50 - 75 mm of stem showing above the sand surface (WAPC 2003). This positions the roots closer to water supplies and decreases water loss in hot and dry conditions. Deep planting will also help to prevent herbivory from resulting in the death of seedlings, which can easily re-sprout if the top of the plant is removed (as per threat '5' outlined in **Table 2**). The brushing installed (refer **Section 6.5.1**) will provide further physical and herbivory protection for the growing seedlings.

Supplementary planting will be undertaken if the density objective is not achieved after two years (as detailed in **Section 6.10**).

Note tree bags/guards may not be used as they increase installation time, require removal once plants are established and have a detrimental effect on most seedling establishment (Stevens *et al.* 2016). Supplementary watering should not be required if planting is undertaken during the optimal early winter period. Planting will be monitored during summer and supplementary water will be provided if required⁴.

⁴ Note planting will not be undertaken in summer.

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6.7.7 Translocation of plant and topsoil

As clearing will occur to facilitate the construction of the PSP and Beachside Drive, there is the potential for the translocation of plant and topsoil material to enable revegetation within the site. The primary opportunity for utilising translocated plant and topsoil material will be within the historically cleared tracks and blowout. Where insufficient plant material is available, or translocated material does not survive, infill planting with tubestock may be used to ensure the objectives of this FWRP are met.

6.8 Fencing

Conservation-style fencing will be installed adjacent to the pedestrian paths to prevent access to the restoration areas. The specifications of the fencing will follow the current requirements of the City, similar to that adjacent to the existing PSP to the north and south of the site as shown in **Plate 2**.



Plate 2: Fencing adjacent to the existing PSP north of the site

6.9 Monitoring and reporting

6.9.1 Monitoring

Monitoring enables the evaluation of the outcomes of restoration against the objectives detailed in **Table 3**. During inspections the site will be traversed along regularly spaced transects and notes regarding landform stability and erosion will be recorded. Measurement of plant density and species diversity will be undertaken using quadrats or another appropriate sampling method, to allow formal assessment against the objectives. It is recommended that sample units used to obtain these measures are larger than 1 m² to allow an averaged assessment of density (e.g. 2 x 2 m quadrats, 5 m x 5 m quadrats or equivalent sized transects).

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As specified in the FMPBB (Cardno BSD 2006), monitoring will be undertaken once a year in summer. This will provide enough time to organise weed control and order additional plants for infill planting in the following season, if required. Monitoring and reporting will be completed by qualified personnel who are experienced with local flora and vegetation sampling methods. A minimum of three monitoring events will be undertaken, as shown in **Table 5**.

6.9.2 Evaluation Criteria

Recommended evaluation criteria for restoration objectives are presented in **Table 4**.

Table 4: Objectives, evaluation criteria, monitoring methods and timeframes

| Objective | Evaluation Criteria | Method | Timeframe |
|---|--|--|---|
| 1. Ensure that landforms are stable and not eroding. | No active eroding areas occur within the site. | Traverses/transects across the entire site. | 1 st year on completion of planting followed by each year after. |
| 2. Ensure that a minimum of four (4) native plants are established per metre squared (m ²) within all restored areas after two years ¹ . | No areas exist where there are less than two native plants per m ² across the site. | Measure with randomly located sample plots (such as 5 m x 5 m quadrats). | End of year 2. |
| 3. Ensure that a minimum of seven (7) of the native species specified in the planting list are established within the site after two years (see species list specification in Table 3). | No areas exist where there are less than seven native species within each quadrat. | Measure with randomly located sample plots (such as 5 m x 5 m quadrats). | 1 st year on completion of planting followed by each year after. |
| 4. Ensure all native plants established from tubestock are at least one years old. | At least one year has elapsed since the time that tubestock were planted. | Obtained from records | End of year 2, followed by each year after as required. |
| 5. Ensure that weed cover does not exceed 15% when measured in any 5 x 5 m portion of the site after two years. | No areas exist where they cover of weeds is greater than 15%. | Measure with randomly located sample plots (such as 5 m x 5 m quadrats). | End of year 2. |

¹ Established defined as living, healthy and showing signs of growth.

6.9.3 Reporting

A report will be submitted to the City of Joondalup twelve (12) months after the initial planting within the site, followed by annual reports up until completion. The reports will demonstrate performance against the stated goal and objectives (refer **Section 5**).

6.10 Contingency

Contingency actions will only be required if the site is determined to be on a trajectory such that the objectives will not be met (during years 1-2) or if objectives are not met at the end of the two-year FWRP implementation period. Actions may include ordering and installing supplementary tubestock, erosion repair and additional weed control, as described in **Section 6.10.1**.

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If criteria are not met due to unforeseen factors, or over small areas due to issues with implementation, the relevant tasks will be repeated. Note that weed control and tubestock planting can result in variable outcomes due to uncontrollable or unpredictable factors like extreme weather events, vandalism, seasonal variation in rainfall or temperature and differences in landform, soil or biology.

Where it is demonstrated that the prescribed methods have been ineffective, alternative methods that better achieve the desired outcomes may be adopted. In the event that alternative methods are required advice will be sought from a qualified and experienced revegetation contractor and consultation with the City will be completed to confirm the acceptability of any modification to proposed methodology.

Where additional planting is required within the two-year implementation period, these areas of supplementary planting will be monitored and maintained for at least an additional year, so that it can be confirmed that objectives have been met and the City is satisfied with restoration outcomes such that it will take on long term management of the site.

6.10.1 Supplementary tubestock planting

Where it is identified that plant survival is below the objectives (**Section 5**), supplementary planting will be undertaken until the objective density have been achieved. These tubestock will be planted according to methods outlined in **Section 6.7**.

6.10.2 Erosion repair

Where areas of erosion are identified these will be patched with additional coir mesh matting or brushing. Care will be taken not to disturb installed plants when undertaking erosion repair. A qualified and experienced revegetation contractor will be able to advise a suitable approach to erosion repair if required.

6.10.3 Additional weed control

Where it is identified that weed cover is higher than the objective (**Table 4**), additional weed control will be undertaken. Weed control will be undertaken according to methods outlined in **Section 6.6**, or as advised by a licenced pest management technician.

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7 Implementation

The extension of Beachside Drive and the PSP is expected to occur between September and December 2021.

Revegetation will commence the following year in May or June 2022 (start date may be subject to change, and is dependent on the onset of winter rain) and will be completed over the whole site. Some restoration actions may be completed prior to or immediately following the earthworks and civil works associated with the road batters are completed including topsoil respreading, landform stabilisation, fencing, signage and weed control. Once the earthworks program is known, preliminary tasks such as ordering of native plant tubestock and respreading or stockpiling of topsoil material will be completed to ensure sufficient plant stock is available in time for installation in autumn/winter 2022.

Landscape works will be staged to coincide with the progressive subdivision of the northern development precinct. The timing for construction of landscape features will be confirmed with the City through separate development approvals. The detailed design of each feature and associated stabilisation, revegetation requirements will be considered at the time.

This FWRP will be implemented for a minimum of two years from tubestock planting (year 1) and monitored for at least two years (from tubestock planting). Provided the objectives have been met to the satisfaction of the City the site will be handed at the end of year 2, to be managed for conservation in perpetuity.

The tasks that will be completed within the site following construction of Beachside drive batters are summarised below:

- Recover and respread or stockpile topsoil (refer **Section 0**).
- Apply landform stabilisation as required (refer **Section 6.5**).
- Install fencing and signage (refer **Section 6.2**).
- Order tubestock (refer **Section 6.7.5**).
- Submit development applications for landscape elements (refer **Section 3.2**).
- Undertake weed control (refer **Section 6.6**).
- Plant tubestock in late autumn/winter (refer **Section 6.7**).
- Undertake supplementary weed control (as required).
- Construct landscape elements as per specific development approval.
- Monitor site to evaluate performance against objectives (refer **Section 6.9**).
- Undertake contingency actions if required (refer **Section 6.10**).
- Repeat over the two-year implementation period (revegetation across years 1 and 2).
- Report outcomes to City of Joondalup and hand over site once objectives are met after a minimum of two years.

7.1 Program tasks and timeframes

A schedule for implementation within the site is provided as **Table 5**. The timeframe outlined includes preliminary tasks that need to be completed at the time of clearing and earthworks. Implementation then proceeds for a minimum of two years subsequent to tubestock planting.

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Table 5: Schedule for implementation for restoration of the site

| Year | Timeframe | Specific Task |
|------------------------|---|--|
| 2021/2022 (Year 0+) | During earthworks associated with batters and construction of built infrastructure in the site | Translocate plant and topsoil material |
| | Following completion of earthworks associated with batters and construction of built infrastructure in the site | Apply landform stabilisation measures |
| | | Install fencing and signage |
| | December 2021 | Order tubestock |
| 2022/2023 (Year 1) | Following first rains in late autumn/winter (May or June 2022) | Undertake weed control |
| | | Plant tubestock |
| | Spring (September – November 2022) | Undertake weed control |
| | February 2023 | Undertake monitoring |
| | | Evaluate revegetation success and confirm whether objectives have been met |
| | Undertake contingency actions (if required) | |
| 2023/2024 (Year 2) | Following first rains in late autumn/winter (May – July 2023) | Undertake weed control (if required) |
| | | Plant tubestock (supplementary, if required) |
| | Spring (September – November 2023) | Undertake weed control (if required) |
| | February (2024) | Undertake monitoring |
| | | Evaluate revegetation success and confirm whether objectives have been met |
| | | Undertake contingency actions (if required) |
| | (May or June 2024) | Report outcomes to City of Joondalup. Handover site, or parts of the site, where objectives have been met, to satisfaction of the City of Joondalup. |
| 2024/2025 (Year 2+) | TBC | Undertake contingency actions (if required) |

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References

8.1 General references

The references listed below have been considered as part of preparing this document.

Cardno BSD 2006, *Foreshore Management Plan Burns Beach*, V01011--KAF40048, Rev 6a.

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8.2 Online references

Bureau of Meteorology (BOM) 2021, *Climate Averages*, viewed 3 March 2021, <<http://www.bom.gov.au/climate/data/>>.

Department of Fire and Emergency Services (DFES) 2021, *Unexploded Ordnance (UXO) FAQ's*, viewed 12 August 2021, <[https://www.dfes.wa.gov.au/regulationandcompliance/buildingplanassessment/Pages/Unexploded-Ordnance-\(UXO\)-FAQs.aspx](https://www.dfes.wa.gov.au/regulationandcompliance/buildingplanassessment/Pages/Unexploded-Ordnance-(UXO)-FAQs.aspx)>

Department of Defence (DoD) 2021, *Unexploded Ordnance Mapping Application*, viewed 12 August 2021, <<https://www.wherisuxo.org.au/>>

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Figures



Figure 1: Site Location

Figure 2: Sample Locations



Figure 1: Site Location

Project: Burns Beach Foreshore Reserve Monitoring
Burns Beach Foreshore Reserve

Client: Peet Funds Management Limited

Plan Number: EP15-020(13)--F44
Drawn: SCM
Date: 26/03/2021
Checked: SCM
Approved: RAW
Date: 31/03/2021



0 50 100 150
Metres
Scale: 1:6,000@A4
GDA 1994 MGA Zone 50



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
 © Landgate (2020). Nearmap Imagery date: 04/01/2021

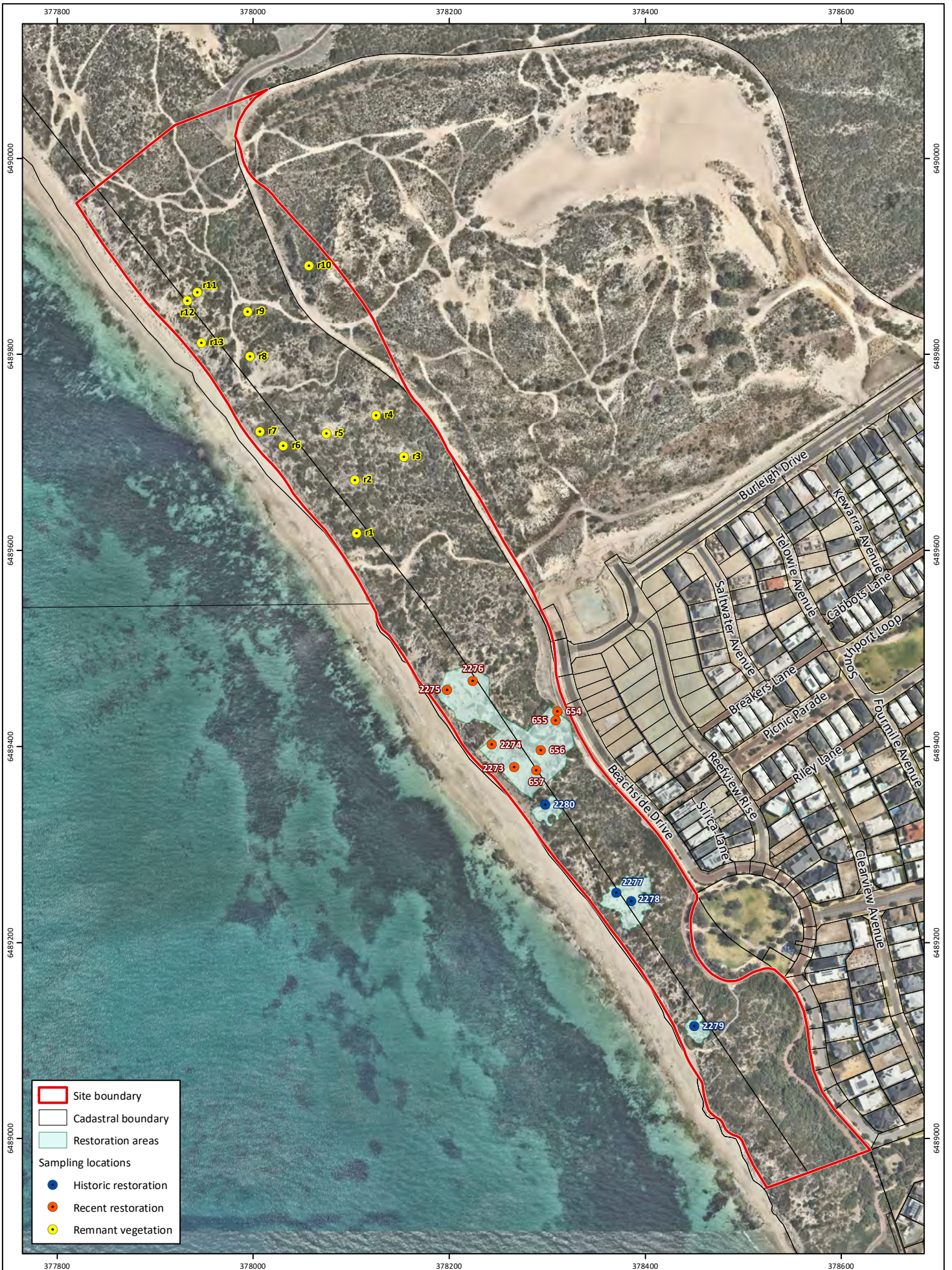


Figure 2: Sampling Locations

Project: Burns Beach Foreshore Reserve Monitoring
Burns Beach Foreshore Reserve

Client: Peet Funds Management Limited

Plan Number: EP15-020(13)-F45
Drawn: SCM
Date: 26/03/2021
Checked: SCM
Approved: RAW
Date: 31/03/2021



0 60 120
 Metres
 Scale: 1:5,000@A4
 GDA 1994 MGA Zone 50



Appendix A: Survey data



| Sample location | Sample ID | Native species cover (%) | Weed cover (%) |
|----------------------|-----------|--------------------------|----------------|
| Recent restoration | 654 | 25 | 0.1 |
| Recent restoration | 655 | 40 | 0.1 |
| Recent restoration | 656 | 40 | 0.1 |
| Recent restoration | 657 | 25 | 0.1 |
| Recent restoration | 2273 | 5 | 1 |
| Recent restoration | 2274 | 15 | 0.1 |
| Recent restoration | 2275 | 25 | 0.1 |
| Recent restoration | 2276 | 5 | 0.1 |
| Historic restoration | 2277 | 15 | 0.1 |
| Historic restoration | 2278 | 10 | 2 |
| Historic restoration | 2279 | 20 | 20 |
| Historic restoration | 2280 | 80 | 1 |
| Remnant vegetation | r1 | 80 | 5 |
| Remnant vegetation | r10 | 80 | 10 |
| Remnant vegetation | r11 | 30 | 15 |
| Remnant vegetation | r12 | 1 | 30 |
| Remnant vegetation | r13 | 30 | 20 |
| Remnant vegetation | r2 | 20 | 30 |
| Remnant vegetation | r3 | 40 | 15 |
| Remnant vegetation | r4 | 50 | 15 |
| Remnant vegetation | r5 | 25 | 5 |
| Remnant vegetation | r6 | 65 | 25 |
| Remnant vegetation | r7 | 98 | 0.1 |
| Remnant vegetation | r8 | 20 | 15 |
| Remnant vegetation | r9 | 80 | 0.1 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|--------------------|-----------|--------------------------|--------|--------------------------------|
| Recent restoration | 654 | Acacia cyclops | Native | 2 |
| Recent restoration | 654 | Acacia rostellifera | Native | 2 |
| Recent restoration | 654 | Acacia xanthina | Native | 1 |
| Recent restoration | 654 | Carpobrotus virescens | Native | 2 |
| Recent restoration | 654 | Lepidosperma gladiatum | Native | 95 |
| Recent restoration | 654 | Myoporum insulare | Native | 1 |
| Recent restoration | 654 | Oenothera drummondii | Weed | 4 |
| Recent restoration | 654 | Olearia axillaris | Native | 2 |
| Recent restoration | 654 | Pelargonium capitatum | Weed | 6 |
| Recent restoration | 654 | Scaevola crassifolia | Native | 3 |
| Recent restoration | 654 | Spinifex longifolius | Native | 22 |
| Recent restoration | 654 | Thinopyrum distichum | Weed | 50 |
| Recent restoration | 655 | Olearia axillaris | Native | 5 |
| Recent restoration | 655 | Acacia cyclops | Native | 1 |
| Recent restoration | 655 | Acacia xanthina | Native | 3 |
| Recent restoration | 655 | Acanthocarpus preissii | Native | 4 |
| Recent restoration | 655 | Atriplex cinerea | Native | 1 |
| Recent restoration | 655 | Carpobrotus virescens | Native | 1 |
| Recent restoration | 655 | Lepidosperma gladiatum | Native | 53 |
| Recent restoration | 655 | Oenothera drummondii | Weed | 5 |
| Recent restoration | 655 | Pelargonium capitatum | Weed | 1 |
| Recent restoration | 655 | Scaevola crassifolia | Native | 5 |
| Recent restoration | 655 | Spinifex longifolius | Native | 21 |
| Recent restoration | 655 | Tetragonia decumbens | Weed | 1 |
| Recent restoration | 655 | Thomasia triphylla | Native | 1 |
| Recent restoration | 655 | Trachyandra divaricata | Weed | 1 |
| Recent restoration | 656 | Acacia rostellifera | Native | 6 |
| Recent restoration | 656 | Acacia cyclops | Native | 1 |
| Recent restoration | 656 | Cakile maritima | Weed | 1 |
| Recent restoration | 656 | Carpobrotus virescens | Native | 6 |
| Recent restoration | 656 | Frankenia pauciflora | Native | 1 |
| Recent restoration | 656 | Lepidosperma gladiatum | Native | 21 |
| Recent restoration | 656 | Olearia axillaris | Native | 4 |
| Recent restoration | 656 | Scaevola crassifolia | Native | 13 |
| Recent restoration | 656 | Spinifex longifolius | Native | 34 |
| Recent restoration | 656 | Trachyandra divaricata | Weed | 1 |
| Recent restoration | 657 | Olearia axillaris | Native | 4 |
| Recent restoration | 657 | Acacia rostellifera | Native | 1 |
| Recent restoration | 657 | Acacia sp. | Native | 1 |
| Recent restoration | 657 | Asteraceae sp. | Weed | 1 |
| Recent restoration | 657 | Carpobrotus virescens | Native | 7 |
| Recent restoration | 657 | Ficinia nodosa | Native | 31 |
| Recent restoration | 657 | Hardenbergia comptoniana | Native | 1 |
| Recent restoration | 657 | Kennedia prostrata | Native | 1 |
| Recent restoration | 657 | Lepidosperma gladiatum | Native | 1 |
| Recent restoration | 657 | Leucophyta brownii | Native | 1 |
| Recent restoration | 657 | Pelargonium capitatum | Weed | 3 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|--------------------|-----------|--------------------------|--------|--------------------------------|
| Recent restoration | 657 | Rhagodia baccata | Native | 1 |
| Recent restoration | 657 | Scaevola crassifolia | Native | 1 |
| Recent restoration | 657 | Spinifex longifolius | Native | 12 |
| Recent restoration | 657 | Thinopyrum distichum | Weed | 4 |
| Recent restoration | 657 | Trachyandra divaricata | Weed | 21 |
| Recent restoration | 2273 | Spinifex longifolius | Native | 29 |
| Recent restoration | 2273 | Cakile maritima | Weed | 70 |
| Recent restoration | 2273 | Carpobrotus virescens | Native | 1 |
| Recent restoration | 2273 | Scaevola crassifolia | Native | 1 |
| Recent restoration | 2273 | Spyridium globulosum | Native | 1 |
| Recent restoration | 2273 | Tetragonia decumbens | Weed | 1 |
| Recent restoration | 2273 | Thinopyrum distichum | Weed | 1 |
| Recent restoration | 2273 | Trachyandra divaricata | Weed | 3 |
| Recent restoration | 2274 | Olearia axillaris | Native | 8 |
| Recent restoration | 2274 | Asteraceae sp. | Weed | 1 |
| Recent restoration | 2274 | Cakile maritima | Weed | 13 |
| Recent restoration | 2274 | Carpobrotus virescens | Native | 2 |
| Recent restoration | 2274 | Ficinia nodosa | Native | 9 |
| Recent restoration | 2274 | Lepidosperma gladiatum | Native | 3 |
| Recent restoration | 2274 | Leucophyta brownii | Native | 2 |
| Recent restoration | 2274 | Pelargonium capitatum | Weed | 12 |
| Recent restoration | 2274 | Scaevola crassifolia | Native | 17 |
| Recent restoration | 2274 | Scaevola crassifolia | Native | 1 |
| Recent restoration | 2274 | Spinifex longifolius | Native | 13 |
| Recent restoration | 2274 | Tetragonia decumbens | Weed | 4 |
| Recent restoration | 2274 | Thinopyrum distichum | Weed | 140 |
| Recent restoration | 2274 | Trachyandra divaricata | Weed | 21 |
| Recent restoration | 2275 | Scaevola crassifolia | Native | 12 |
| Recent restoration | 2275 | Acacia rostellifera | Native | 1 |
| Recent restoration | 2275 | Carpobrotus virescens | Native | 10 |
| Recent restoration | 2275 | Euphorbia paralias | Weed | 4 |
| Recent restoration | 2275 | Ficinia nodosa | Native | 12 |
| Recent restoration | 2275 | Leucophyta brownii | Native | 1 |
| Recent restoration | 2275 | Olearia axillaris | Native | 5 |
| Recent restoration | 2275 | Spinifex longifolius | Native | 27 |
| Recent restoration | 2275 | Thinopyrum distichum | Weed | 22 |
| Recent restoration | 2275 | Trachyandra divaricata | Weed | 17 |
| Recent restoration | 2276 | Carpobrotus virescens | Native | 3 |
| Recent restoration | 2276 | Euphorbia paralias | Weed | 4 |
| Recent restoration | 2276 | Ficinia nodosa | Native | 4 |
| Recent restoration | 2276 | Hardenbergia comptoniana | Native | 1 |
| Recent restoration | 2276 | Leucophyta brownii | Native | 1 |
| Recent restoration | 2276 | Olearia axillaris | Native | 1 |
| Recent restoration | 2276 | Pelargonium capitatum | Weed | 5 |
| Recent restoration | 2276 | Scaevola crassifolia | Native | 5 |
| Recent restoration | 2276 | Spinifex longifolius | Native | 12 |
| Recent restoration | 2276 | Trachyandra divaricata | Weed | 3 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|----------------------|-----------|--------------------------|--------|--------------------------------|
| Historic restoration | 2277 | Kennedia prostrata | Native | 1 |
| Historic restoration | 2277 | Ficinia nodosa | Native | 42 |
| Historic restoration | 2277 | Lepidosperma gladiatum | Native | 3 |
| Historic restoration | 2277 | Leucophyta brownii | Native | 4 |
| Historic restoration | 2277 | Olearia axillaris | Native | 2 |
| Historic restoration | 2277 | Pelargonium capitatum | Weed | 1 |
| Historic restoration | 2277 | Scaevola crassifolia | Native | 5 |
| Historic restoration | 2277 | Spinifex longifolius | Native | 8 |
| Historic restoration | 2278 | Spinifex longifolius | Native | 10 |
| Historic restoration | 2278 | Asteraceae sp. | Weed | 9 |
| Historic restoration | 2278 | Carpobrotus virescens | Native | 3 |
| Historic restoration | 2278 | Euphorbia paralias | Weed | 15 |
| Historic restoration | 2278 | Ficinia nodosa | Native | 35 |
| Historic restoration | 2278 | Hardenbergia comptoniana | Native | 1 |
| Historic restoration | 2278 | Olearia axillaris | Native | 3 |
| Historic restoration | 2278 | Pelargonium capitatum | Weed | 6 |
| Historic restoration | 2278 | Scaevola crassifolia | Native | 1 |
| Historic restoration | 2278 | Thinopyrum distichum | Weed | 2 |
| Historic restoration | 2278 | Trachyandra divaricata | Weed | 3 |
| Historic restoration | 2279 | Leucophyta brownii | Native | 27 |
| Historic restoration | 2279 | Acacia rostellifera | Native | 1 |
| Historic restoration | 2279 | Acanthocarpus preissii | Native | 2 |
| Historic restoration | 2279 | Asteraceae sp. | Weed | 7 |
| Historic restoration | 2279 | Carpobrotus virescens | Native | 11 |
| Historic restoration | 2279 | Euphorbia paralias | Weed | 17 |
| Historic restoration | 2279 | Ficinia nodosa | Native | 2 |
| Historic restoration | 2279 | Pelargonium capitatum | Weed | 82 |
| Historic restoration | 2279 | Spinifex longifolius | Native | 9 |
| Historic restoration | 2279 | Tetragonia decumbens | Weed | 3 |
| Historic restoration | 2279 | Thinopyrum distichum | Weed | 1 |
| Historic restoration | 2279 | Trachyandra divaricata | Weed | 4 |
| Historic restoration | 2280 | Olearia axillaris | Native | 17 |
| Historic restoration | 2280 | Ficinia nodosa | Native | 11 |
| Historic restoration | 2280 | Hardenbergia comptoniana | Native | 2 |
| Historic restoration | 2280 | Leucophyta brownii | Native | 1 |
| Historic restoration | 2280 | Pelargonium capitatum | Weed | 19 |
| Historic restoration | 2280 | Scaevola crassifolia | Native | 5 |
| Historic restoration | 2280 | Spinifex longifolius | Native | 10 |
| Historic restoration | 2280 | Tetragonia decumbens | Weed | 2 |
| Historic restoration | 2280 | Trachyandra divaricata | Weed | 8 |
| Remnant vegetation | r1 | Scaevola crassifolia | Native | 6 |
| Remnant vegetation | r1 | Acanthocarpus preissii | Native | 25 |
| Remnant vegetation | r1 | Carpobrotus virescens | Native | 11 |
| Remnant vegetation | r1 | Lepidosperma gladiatum | Native | 9 |
| Remnant vegetation | r1 | Pelargonium capitatum | Weed | 22 |
| Remnant vegetation | r1 | Olearia axillaris | Native | 2 |
| Remnant vegetation | r1 | Trachyandra divaricata | Weed | 2 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|--------------------|-----------|-----------------------------------|--------|--------------------------------|
| Remnant vegetation | r1 | Hardenbergia comptoniana | Native | 1 |
| Remnant vegetation | r10 | Scaevola crassifolia | Native | 6 |
| Remnant vegetation | r10 | Acanthocarpus preissii | Native | 6 |
| Remnant vegetation | r10 | Melaleuca systema | Native | 9 |
| Remnant vegetation | r10 | Threlkeldia diffusa | Native | 1 |
| Remnant vegetation | r10 | Pelargonium capitatum | Weed | 14 |
| Remnant vegetation | r10 | Lomandra maritima | Native | 5 |
| Remnant vegetation | r10 | Austrostipa sp. | Native | 1 |
| Remnant vegetation | r10 | Acacia cochlearis | Native | 1 |
| Remnant vegetation | r10 | Carpobrotus virescens | Native | 10 |
| Remnant vegetation | r10 | Santalum acuminatum | Native | 1 |
| Remnant vegetation | r10 | Olearia axillaris | Native | 1 |
| Remnant vegetation | r11 | Scaevola crassifolia | Native | 10 |
| Remnant vegetation | r11 | Pelargonium capitatum | Weed | 25 |
| Remnant vegetation | r11 | Acanthocarpus preissii | Native | 12 |
| Remnant vegetation | r11 | Cassytha sp. | Native | 2 |
| Remnant vegetation | r11 | Tetragonia decumbens | Native | 5 |
| Remnant vegetation | r11 | Trachyandra divaricata | Weed | 2 |
| Remnant vegetation | r11 | Melaleuca systema | Native | 2 |
| Remnant vegetation | r12 | Thinopyrum distichum | Weed | 60 |
| Remnant vegetation | r12 | Pelargonium capitatum | Weed | 8 |
| Remnant vegetation | r12 | Tetragonia decumbens | Native | 10 |
| Remnant vegetation | r12 | Trachyandra divaricata | Weed | 10 |
| Remnant vegetation | r12 | Ficinia nodosa | Native | 2 |
| Remnant vegetation | r13 | Scaevola crassifolia | Native | 10 |
| Remnant vegetation | r13 | Pelargonium capitatum | Weed | 5 |
| Remnant vegetation | r13 | Ficinia nodosa | Native | 3 |
| Remnant vegetation | r13 | Thinopyrum distichum | Weed | 40 |
| Remnant vegetation | r13 | Trachyandra divaricata | Weed | 3 |
| Remnant vegetation | r13 | Tetragonia decumbens | Native | 10 |
| Remnant vegetation | r2 | Pelargonium capitatum | Weed | 50 |
| Remnant vegetation | r2 | Cassytha sp. | Native | 5 |
| Remnant vegetation | r2 | Olearia axillaris | Native | 1 |
| Remnant vegetation | r2 | Carpobrotus virescens | Native | 16 |
| Remnant vegetation | r2 | Acanthocarpus preissii | Native | 30 |
| Remnant vegetation | r2 | Conostylis aculeata | Native | 2 |
| Remnant vegetation | r2 | Trachyandra divaricata | Weed | 6 |
| Remnant vegetation | r2 | Hardenbergia comptoniana | Native | 1 |
| Remnant vegetation | r2 | Spyridium globulosum | Native | 1 |
| Remnant vegetation | r2 | Acacia lasiocarpa var. lasiocarpa | Native | 1 |
| Remnant vegetation | r2 | Lagurus ovatus | Weed | 5 |
| Remnant vegetation | r3 | Spinifex longifolius | Native | 10 |
| Remnant vegetation | r3 | Pelargonium capitatum | Weed | 20 |
| Remnant vegetation | r3 | Trachyandra divaricata | Weed | 2 |
| Remnant vegetation | r3 | Acanthocarpus preissii | Native | 10 |
| Remnant vegetation | r3 | Hemiandra pungens | Native | 3 |
| Remnant vegetation | r3 | Carpobrotus virescens | Native | 3 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|--------------------|-----------|--------------------------|--------|--------------------------------|
| Remnant vegetation | r3 | Conostylis aculeata | Native | 6 |
| Remnant vegetation | r3 | Exocarpos sparteus | Native | 1 |
| Remnant vegetation | r3 | Scaevola crassifolia | Native | 3 |
| Remnant vegetation | r4 | Scaevola crassifolia | Native | 4 |
| Remnant vegetation | r4 | Carpobrotus virescens | Native | 5 |
| Remnant vegetation | r4 | Lepidosperma gladiatum | Native | 2 |
| Remnant vegetation | r4 | Pelargonium capitatum | Weed | 28 |
| Remnant vegetation | r4 | Lagurus ovatus | Weed | 5 |
| Remnant vegetation | r4 | Hardenbergia comptoniana | Native | 1 |
| Remnant vegetation | r4 | Trachyandra divaricata | Weed | 23 |
| Remnant vegetation | r4 | Cassytha sp. | Native | 4 |
| Remnant vegetation | r4 | Ficinia nodosa | Native | 3 |
| Remnant vegetation | r4 | Conostylis aculeata | Native | 2 |
| Remnant vegetation | r4 | Acanthocarpus preissii | Native | 2 |
| Remnant vegetation | r4 | Olearia axillaris | Native | 2 |
| Remnant vegetation | r5 | Scaevola crassifolia | Native | 1 |
| Remnant vegetation | r5 | Pelargonium capitatum | Weed | 41 |
| Remnant vegetation | r5 | Ficinia nodosa | Native | 4 |
| Remnant vegetation | r5 | Acanthocarpus preissii | Native | 1 |
| Remnant vegetation | r5 | Olearia axillaris | Native | 1 |
| Remnant vegetation | r5 | Conostylis aculeata | Native | 1 |
| Remnant vegetation | r6 | Scaevola crassifolia | Native | 15 |
| Remnant vegetation | r6 | Myoporum insulare | Native | 13 |
| Remnant vegetation | r6 | Pelargonium capitatum | Weed | 40 |
| Remnant vegetation | r6 | Rhagodia baccata | Native | 3 |
| Remnant vegetation | r6 | Acanthocarpus preissii | Native | 19 |
| Remnant vegetation | r6 | Lepidosperma gladiatum | Native | 6 |
| Remnant vegetation | r6 | Hardenbergia comptoniana | Native | 1 |
| Remnant vegetation | r6 | Olearia axillaris | Native | 1 |
| Remnant vegetation | r7 | Scaevola crassifolia | Native | 30 |
| Remnant vegetation | r7 | Olearia axillaris | Native | 1 |
| Remnant vegetation | r7 | Acanthocarpus preissii | Native | 1 |
| Remnant vegetation | r7 | Lepidosperma gladiatum | Native | 28 |
| Remnant vegetation | r7 | Pelargonium capitatum | Weed | 10 |
| Remnant vegetation | r7 | Tetragonia decumbens | Native | 5 |
| Remnant vegetation | r7 | Trachyandra divaricata | Weed | 2 |
| Remnant vegetation | r7 | Spinifex longifolius | Native | 1 |
| Remnant vegetation | r8 | Trachyandra divaricata | Weed | 150 |
| Remnant vegetation | r8 | Scaevola crassifolia | Native | 15 |
| Remnant vegetation | r8 | Exocarpos sparteus | Native | 1 |
| Remnant vegetation | r8 | Lepidosperma gladiatum | Native | 3 |
| Remnant vegetation | r8 | Pelargonium capitatum | Weed | 35 |
| Remnant vegetation | r8 | Acanthocarpus preissii | Native | 29 |
| Remnant vegetation | r8 | Asteraceae sp. | Weed | 1 |
| Remnant vegetation | r8 | Carpobrotus virescens | Native | 2 |
| Remnant vegetation | r8 | Hemiandra pungens | Native | 1 |
| Remnant vegetation | r8 | Poaceae sp. | Native | 1 |

| Sample location | Sample ID | Species | Origin | No. plants (5 m x 5 m quadrat) |
|--------------------|-----------|--------------------------|--------|--------------------------------|
| Remnant vegetation | r8 | Cassytha sp. | Native | 1 |
| Remnant vegetation | r8 | Hardenbergia comptoniana | Native | 3 |
| Remnant vegetation | r9 | Olearia axillaris | Native | 3 |
| Remnant vegetation | r9 | Leucopogon parviflorus | Native | 1 |
| Remnant vegetation | r9 | Lomandra maritima | Native | 25 |
| Remnant vegetation | r9 | Carpobrotus virescens | Native | 12 |
| Remnant vegetation | r9 | Cassytha sp. | Native | 6 |
| Remnant vegetation | r9 | Desmocladius flexuosus | Native | 100 |
| Remnant vegetation | r9 | Melaleuca systema | Native | 10 |
| Remnant vegetation | r9 | Spyridium globulosum | Native | 3 |
| Remnant vegetation | r9 | Conostylis aculeata | Native | 4 |
| Remnant vegetation | r9 | Threlkeldia diffusa | Native | 1 |
| Remnant vegetation | r9 | Hemiandra pungens | Native | 1 |
| Remnant vegetation | r9 | Pelargonium capitatum | Weed | 2 |
| Remnant vegetation | r9 | Acanthocarpus preissii | Native | 2 |
| Remnant vegetation | r9 | Lagurus ovatus | Weed | 3 |
| Remnant vegetation | r9 | Poa sp. | Native | 1 |

Report Title
Project Title

