PR-4234 Two Rocks Beach Access – Rehabilitation and Revegetation Plan

CPS 8807/1

October 2020

Contents

1. Introduction

The City of Wanneroo (CoW) is proposing to construct a beach access, access road and carpark within the boundaries of Lot 8613 on Deposited Plan 213232; Lot 8989 on Deposited Plan 213232; and Lot 15452 on Deposited Plan 40341, in Two Rocks. The project, the Two Rocks Beach Access (the TRBA), will be located in an area of 3.69 hectares of coastal vegetation that is situated in foreshore reserve, south of the Two Rocks Marina and bound by the Indian Ocean to the west and Two Rocks Road to the east (Figure 1 – delineated in red).

CoW submitted a Native Vegetation Clearing Permit (NVCP) application to clear 3.69 hectares of coastal vegetation to the Department of Water and Environmental Regulation (DWER) for assessment (CPS 8807/1) on 13 February 2020. The NVCP application explicated that the proposed clearing area comprises of priority flora *Leucopogon maritimus* (Priority 1), *Beyeria cinerea subsp. cinerea* (Priority 3) and *Stylidium maritimum* (Priority 3), two priority ecological communities, Bush Forever area 397 and conservation significant fauna Quenda (*Isoodon fusciventer*) (Priority 4) and Black-striped Snake (*Neelaps calonotos*) (Priority 3).

DWER carried out a preliminary assessment of the application and on the 15 September 2020 identified that:

- Due to the presence of the above mentioned sensitive receptors, evidence of additional efforts to avoid and/or mitigate the need for clearing are required to be provided; and
- That the area proposed to be cleared is entirely within Bush Forever area (BFA) 397 and that an offset package would need to be provided within Bush Forever 397, in accordance with the WA Environmental Offsets Policy (DWER, 2011) and Appendix 4 of State Planning Policy 2.8 (WAPC, 2010).

As requested, further information was provided from the CoW to DWER on the 7th October, 8th October and 14th October 2020, outlining the actions proposed to avoid and/or mitigate the impacts to the sensitive receptors; and an updated clearing plan clarifying the extent of the proposed clearing and onsite rehabilitation (Figure 2). The extent of the clearing area comprises of 0.95 ha of permanently cleared area including the road surface, carpark and beach access. 2.74 ha will be rehabilitated after the construction of the TRBA facilities.

On the 15th October 2020, the officers from the CoW met with the DWER to further clarify the mitigation and management strategies for the sensitive receptors, in particular the rehabilitation and offset requirements for the TRBA. The following points were clarified:

- Actions required to clearly demarcate and protect priority species close to the construction zone;
- Management measures that will be adopted to restrict access to the adjacent environment;
- The provision of Offsets of 2:1 (1.9 ha) shall be provided. DWER suggested rehabilitating a blowout to the south (Figure 1 – delineated in blue) or any of the tracks nearby;
- A rehabilitation plan, based on what was provided for the Mindarie Dual Use Path, should be provided to DWER by 15 Nov 2020 and include the offset rehabilitation;
- The future vesting and management of the land.

This Two Rocks Beach Access Rehabilitation and Revegetation Plan (the "RRP") has therefore been developed to describe how each of the above will be achieved, as well as the rehabilitation and revegetation of an area of offset, as described below.

Locality of 94 Two Rocks Road & Associated Offset

Populated Places | Environmentally Sensitive Area | Suburbs and Localities | Cadastre Address | State Roads

Local Government Authority | DPIRD Client Property Event | Cadastre | Other Roads

Map Printed from WALGA LGmap on Tue Oct 27 11:47:30 GMT+08:00 2020

Figure 1: Location Plan

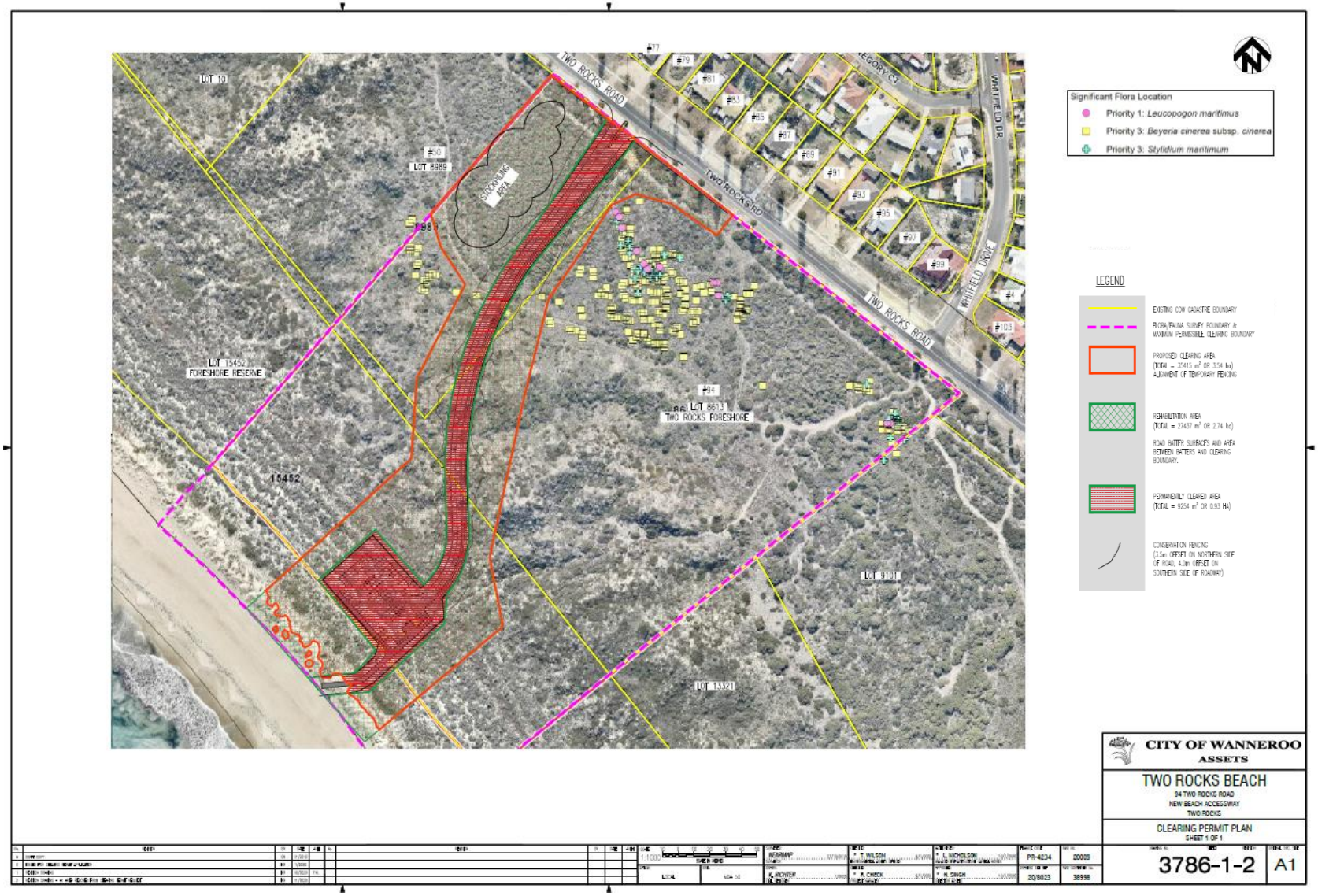

Figure 2: Clearing and Onsite Rehabilitation Plan

As advised by DWER officers on the 15th October 2020; and in accordance with State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (SPP 2.8) (WAPC, 2010); a 2:1 offset ratio is required to counterbalance the removal of 0.95 hectares of native vegetation within Bush Forever site 397. As such, the CoW is proposing the following offsets:

- Revegetation of 2.74 ha of areas disturbed during construction of the TRBA; and
- Rehabilitation and revegetation of 1.9 ha of an area, consisting of a blowout and weed infested area, and located within 100 Spot View, Two Rocks (the "blowout").

On the 29th October 2020, Environmental Officers Danielle Garrett, Tenaha Wilson and Andrew Hawthorne inspected the potential offset site to adequately plan the rehabilitation of the site. During this inspection, it was identified that weed species *Thinopyrum distichium* was the sole species of the frontal dune of this area. Both species at the time were flowering and were distinguishable. This then prompted the City Officers to inspect the frontal dune of the previously surveyed TBRA site. It was then confirmed that the previously identified *Spinifex longifolius* within the frontal dune (Vegetation Type A1) was in fact weed species *Thinopyrum distichium*.

To further verify this, a further site inspection with the TRBA survey botanist (Kelli McCreery) was conducted on the 5th November and it was agreed that the relevant maps and information within the previously provided survey would be updated and be resubmitted to DWER.

On the 11th November, DWER (Matt Gannaway) was advised of the above and that the overall area required for clearing would be reduced due to the presence of the weed species covering the entire frontal dune in this area. It was agreed that the updated maps, shape files and botanical information would therefore be provided to DWER by 30th November 2020 to be included in reassessment of the clearing application.

As a result of the identification of the *Thinopyrum distichium,* a number of adjustments to the clearing permit application were made and displayed in Table 1.

Table 1: Adjusted Clearing Permit Parameters

Clearing permit parameters	Original Application (ha)	Updated application (ha)
TRBA Total proposed clearing	3.6921	3.5415
TRBA Rehabilitation	2.7437	2.7437
TRBA Permanently Cleared	0.9483	0.9254
Required Offset site	1.9	1.86
Planned Offset site	1.9	1.9

On the 12th December, DWER advised the City that:

"Taking into consideration the reduction in the proposed clearing footprint (3.54 hectares) and the proposed rehabilitation area of 2.74 hectares. An offset of 1.86 hectares is required to offset the permanently cleared area of 0.93 hectares."

In addition to the aforementioned, the purpose of the Two Rocks Beach Access Rehabilitation and Revegetation Plan (the "RRP") is to guide the on ground works relating to revegetation of 2.74 ha of areas disturbed during development of the TRBA and to address the impacts to Bush Forever Site 397 by rehabilitating (infill planting and weed management) and revegetating the 1.9 ha of the blowout. This revegetation and rehabilitation plan has

been developed in accordance with ‘A Guide to Preparing Revegetation Plans for Clearing Permits under Part V of the *Environmental Protection Act 1986* (DWER, 2018).

This plan has been developed on behalf of the City of Wanneroo by Tenaha Wilson, who is employed as the Natural Areas Asset Officer at the City of Wanneroo. Tenaha holds a Bachelor of Science in Environmental Management and has experience in developing management plans, clearing permits, vegetation assessment and on ground implementation of revegetation and rehabilitation projects. Correspondence relating to the RRP should be addressed to:

Tenaha Wilson
Locked Bag 1
Wanneroo WA 6946
Tel: 9405 5040
Email: tenaha.wilson@wanneroo.wa.gov.au

The CoW undertake revegetation projects on an annual basis as part of their Capital Works programs and have internal resources providing expertise on completion criteria and onsite revegetation techniques.

2. Existing Environment

2.1 Land Tenure and Zoning

The proposed TRBA is located within three separate land parcels, which all are zoned for Parks and Recreation under the Metropolitan Region Scheme. A summary of land tenure and zoning is provided in Table 2, below.

Table 2: Land tenure and zoning

Lot Number	Land Owner	MRS Zoning	Reserve Purpose
Lot 8613 on Deposited Plan 213232	Crown Land – COW Managed	Parks and Recreation	Public Recreation
Lot 8989 on Deposited Plan 213232	Western Australian Planning Commission	Parks and Recreation, Urban	NA - Freehold
Lot 15452 on Deposited Plan 40341	Crown Land – COW Managed	Parks and Recreation, Waterways	Recreation and Purposes Incidental Thereto

The proposed offset is located within two separate land parcels, which all are zoned for Parks and Recreation under the Metropolitan Region Scheme. A summary of land tenure and zoning is provided in Table 3, below.

Table 3: Land tenure and zoning

Lot Number	Land Owner	MRS Zoning	Reserve Purpose
Lot 13321 on Deposited Plan 21931	Crown Land – COW Managed	Parks and Recreation	Foreshore Management
Lot 15452 on Deposited Plan 40341	Crown land – COW Managed	Parks and Recreation, Waterways	Recreation and Purposes Incidental Thereto

2.2 Vegetation and Flora

2.2.1 Vegetation and Flora of the TRBA

The proposed clearing for the TRBA will initially facilitate the completion of an Unexploded Ordinance (UXO) remediation search; followed by a geotechnical survey to enable final design completion; and finally to facilitate the construction of a beach access and car park. The TRBA construction extent (3.54 ha) lies within 12.68 ha and runs west-east across the Survey Area, as defined in Figure 2.

The City engaged One Tree Botanical to undertake a Level 2 Flora and Vegetation Survey (Appendix A), consistent with the Technical Guide Flora and Vegetation Surveys for Environmental Impact Assessment; Targeted and Detailed Surveys (EPA, 2016). The assessment occurred over two sampling periods, 13 – 16 September and 19 - 21 October 2019.

No Threatened Ecological Communities (TECs) listed under the Western Australian *Biodiversity Conservation Act 2016* or the Federal *Environmental Protection Biodiversity Conservation Act 1999* were recorded in the study area.

McCreery (One Tree Botanical, 2020) found that there were challenges to assessing vegetation in this area due to the lack of a proper regional dataset of quadrat data in the Gibson et al. (1994) dataset from near-coastal and Quindalup Dune areas.

Despite this, assessment was completed against the available information. From this it was noted that two Priority Ecological Communities (PECs), or variants of, occurred in the study area:

- **PEC SWAN 26:** "Northern Spearwood shrublands and woodlands" (FCT24)(Vegetation Type C) and woodlands; and
- **PEC SWAN 21:** "Coastal shrublands on shallow sands, southern Swan Coastal Plain" (FCT29a) (Vegetation Types B1 and D1).

Coastal shrublands on shallow sands, southern Swan Coastal Plain (29a) is the largest represented PEC, with 2.15 ha occurring within the TRBA alignment, of which 0.45 ha occurs within the construction extent. Northern Spearwood shrublands and woodlands (24) also occurs within the TRBA alignment (0.291 ha), of which 0.041 ha occurs within the construction extent.

Six vegetation communities and cleared areas were mapped within the Survey Area (One Tree Botanical, 2020) which forms part of a coastal mosaic, typical of dune systems. The vegetation types included one grassland and five shrublands.

Seven vegetation types were recorded within the study area:

- Low-Lying Primary Dunes on Unconsolidated Sand A1: Incipient Foredune (younger): Uniform regrowth of Grassland **Thinopyrum distichum* (0.137 ha);
- Low-Lying Primary Dunes on Unconsolidated Sand A2: Established Foredune (older): Sparse Shrubland *Olearia axillaris* over Grassland *Spinifex longifolius and *Thinopyrum distichum* (0.243 ha);
- Low-Lying Primary Dunes on Unconsolidated Sand A3: Beach-ridge Plain: Open Shrubland *Olearia axillaris, Rhagodia baccata subsp. baccata and *Pelargonium capitatum* over Sparse Grassland *Spinifex longifolius* and Sparse Vineland *Cassytha flava var. flava* (0.67 ha);
- Tall Secondary Dunes On Unconsolidated Sand B1: Shrubland dominated by *Acacia cyclops, Scaevola crassifolia, Spyridium globulosum, Santalum acuminatum, Myoporum*

insulare, Olearia axillaris, Rhagodia baccata subsp. baccata and *Acanthocarpus preissii,* Sparse Vineland *Hardenbergia comptoniana and Cassytha flava var. flava.* Over Forbland dominated by *Senecio pinnatifolius var. latilobus* (1.18 ha);

- Low Dunes On Semi-Consolidated Sand C1: Species rich low Shrubland dominated by *Melaleuca systena* and species rich Forbland dominated by *Lomandra maritima* and Sparse Sedgeland *Lepidosperma calcicola* and Sparse Rushland *Desmocladus asper* (0.291 ha);
- Low Rises With Limestone Outcropping D1: Closed Shrubland *Melaleuca cardiophylla* with other typical shrubs *Melaleuca huegelii, Acacia xanthina* and *Dodonaea aptera* with Sparse Vineland *Cassytha aurea var. aurea* over Forbland of native and introduced herbs (0.97 ha); and
- Cleared Areas E1: Historically cleared areas; informal walking paths, informal vehicular sand tracks (unused and partially overgrown) (0.182 ha).

Of these, B1 is the most commonly represented vegetation community within the TRBA alignment. Appendix B includes photos of the vegetation types occurring in the TRBA alignment and the offset.

The vegetation type A1 consists entirely of weed species, dominated by **Thinopyrum distichum* (Sea Wheatgrass) on the primary fore dune. From aerial imagery, it appears the species may have either emerged or been planted in the 1990s (Landgate, 2020), when it was commonly used as a rehabilitation species to stabilise dunes (Dixon, 2011). This species will be retained in both the TRBA and offset sites within vegetation type A1 (and where it has proceeded into the A2 vegetation community) to ensure ongoing dune stabilisation, however it will not be replanted as a revegetation species. Infill planting and weed management will occur in a gradual ongoing basis to ensure that the dune stabilisation continues with an eventual overall improved outcome of the diversity of both sites in the A1 and A2 vegetation areas.

Photos and further information for each of the vegetation types in the area proposed to be cleared are provided in Section 5.2.2 of the Flora and Vegetation Survey (Appendix A). Figures 3 and 4 illustrate the vegetation type and vegetation condition of significant flora within the survey area, respectively.

The condition of vegetation mapped within the TRBA alignment ranged from Degraded to Very Good - Excellent, with the majority mapped as Very Good based on the South West Botanical Province (EPA, 2016) and Bush Forever (Keighery, 1994 from Govt. of WA, 2000) vegetation condition scale (Figure 4).

A total of 160 flora species were recorded were recorded from the study area, of which 100 or 63% were natives.

Three Priority Flora species were recorded within the study area:

- *Leucopogon maritimus* (Priority 1);
- *Beyeria cinerea subsp. cinerea* (Priority 3); and
- *Stylidium maritimum* (Priority 3).

Figure 2 illustrates the location of significant flora species within the survey area.

Priority Flora is not common in near coastal areas and three in a single near-coastal vegetation type is unusual. This is an unusually high number for a very small 12.68 hectare near-coastal area. All three species were dominant species within a small area of a single vegetation type (Vegetation Type C - Figure 4) (One Tree Botanical, 2020).

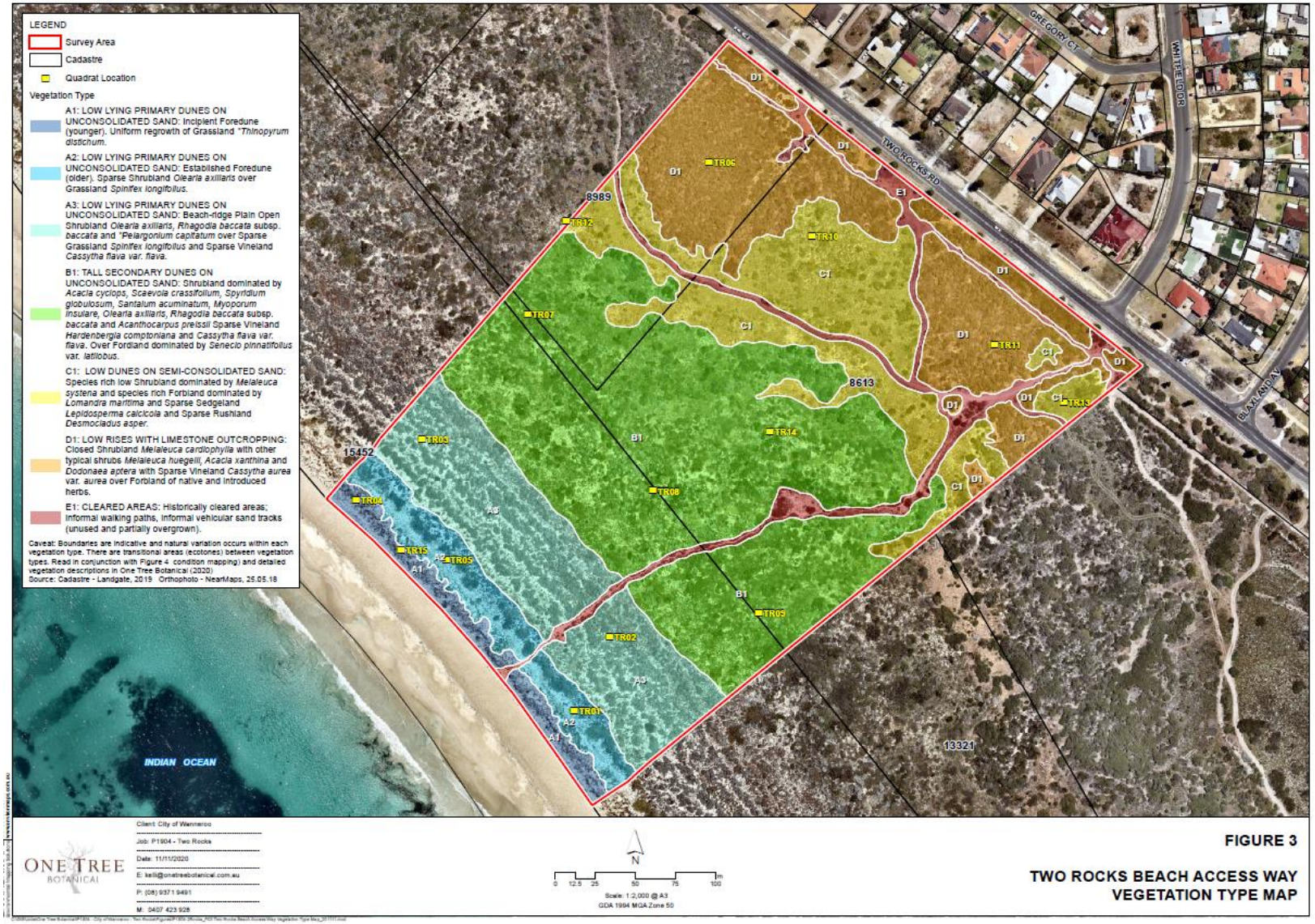

Figure 3: Two Rocks Beach Access Way – Vegetation Type Map (Source: One Tree Botanical (2020))

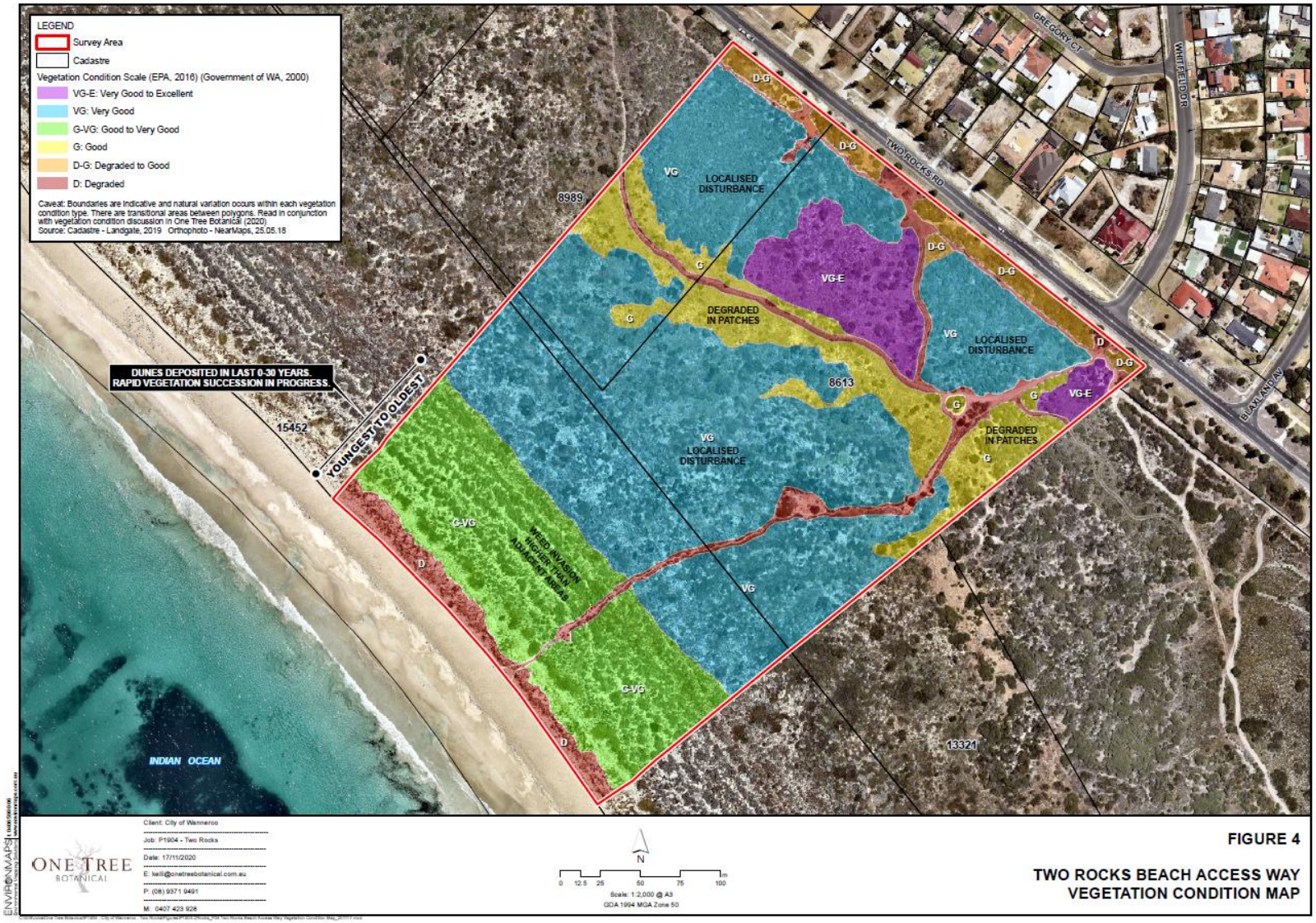

Figure 4: Two Rocks Beach Access Way – Vegetation Condition Map (Source: One Tree Botanical (2020))

2.2.2 Vegetation and Flora of the Offset

The offset site is located approximately 430 m to the south of the TRBA site, is 1.9 ha in size and runs west-east across the Survey Area, as illustrated in Figure 1.

Although the long term goal of the offset site is to conserve and improve the overall condition of the vegetation in this area, the initial stages of the preparation of this site will require the completion of an Unexploded Ordinance (UXO) remediation search and clearing along the along the alignment of the remaining emergency access road; the installation of a heavy duty gate at the entrance to the emergency access road (the "track"); and the fence line (running either side of the emergency track) and other already cleared areas within the offset site (Figure 5).

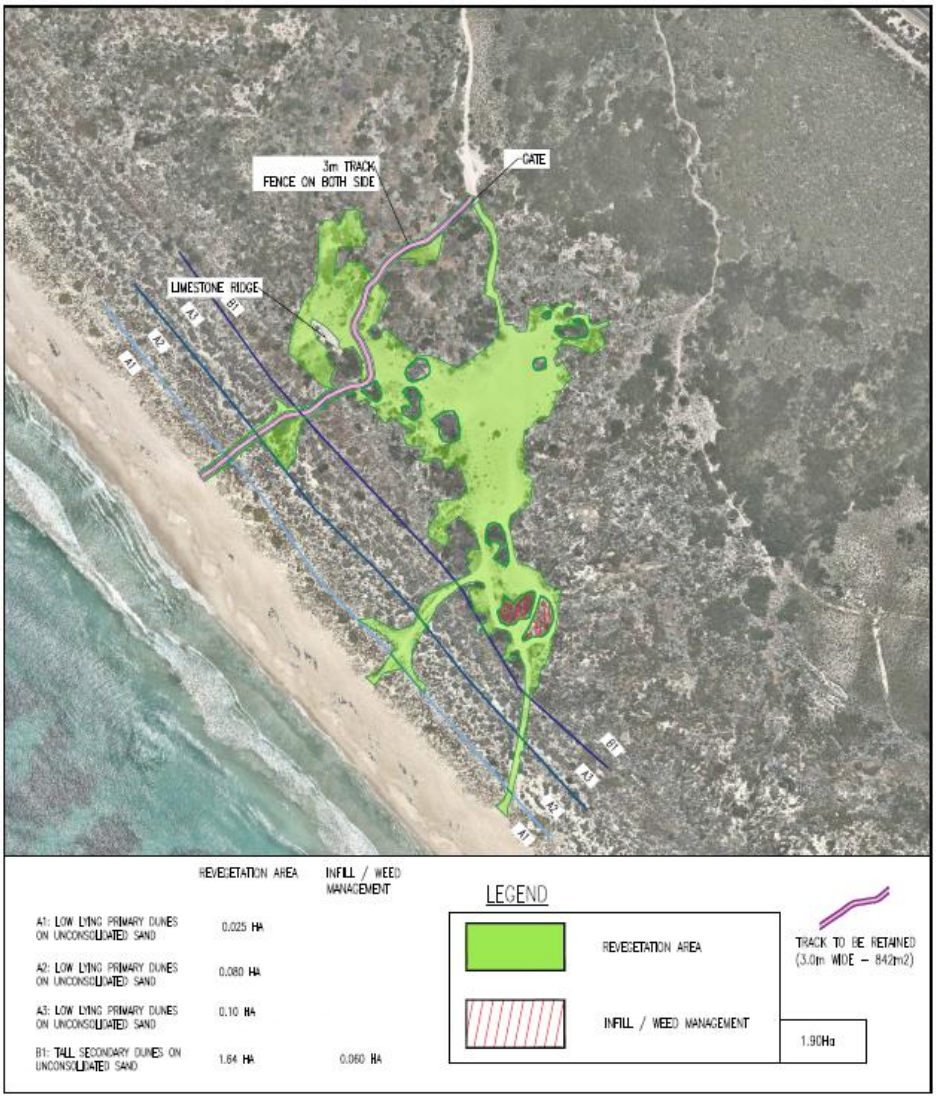

Figure 5: Two Rocks Beach Access Way Offset site – map of Vegetation types, revegetation and rehabilitation areas

The remaining emergency access road will remain as a three metre wide track (842 m^2) to enable emergency vehicles to be able to safely access and leave the site. The heavy duty gate is being installed in a location which has raised road sides with a mixture of limestone and vegetation (Figure 6) which makes it hard for unauthorised vehicles to access the offset

site or attempt to divert around the access gate. All infrastructures relating to the offset site is located on the City's managed land, as described in Table 3.

Figure 6: Location of Entrance gate to emergency access road remaining on site, as per Figure 5**.** Photos taken facing coast ward and land ward.

A separate clearing permit will be submitted for any clearing that is required as a result of the UXO search; and for the gate and fencing of this offset site. The UXO search will ensure that there is no evidence of UXOs, and reduce the risk in areas where digging may need to occur.

Fencing within the offset site will be implemented in accordance with the conservation fencing specifications of the City's Standard Drawings (City of Wanneroo, 2001). The fencing along the emergency access road alignment and the installation of a heavy duty gate at the entrance to the offset site, will minimise disturbance to the offset site from unauthorised vehicle access and direct recreational use (e.g. walking) to already cleared areas, such as the remaining access track. Unauthorised vehicle use is further detailed in Section 4.3.

After completion of the UXO search and the installation of the fencing and heavy duty entrance gate, the rehabilitation of the area will commence. Details of the rehabilitation and revegetation of this area is outlined in Sections 5 – 10.

City officers completed a site inspection and vegetation assessment of the Offset site on the 19 October 2020 and 29 October 2020. The purpose of these site visits were to:

- Complete a vegetation assessment (Appendix C);
- Assess the vegetation types for consistency and comparability against the Detailed Botanical survey completed in 2019 by One Tree Botanical;
- Assess the suitability and use of the proposed offset site for practical implementation of rehabilitation and revegetation techniques; and

- Ensure that the size of the offset site would match that required to offset the permanently cleared areas of the TRBA.

The details of each the above are explained further below.

The initial site visit of the proposed offset site was conducted on the 19 October 2020 (Appendix C) by two experienced CoW Environmental Officers – Danielle Garrett and Tenaha Wilson. The site visit was completed with close comparison to the flora and vegetation composition described in the One Tree Botanical (2020) Flora survey of the TRBA. As a result of this site visit the following observations were made:

- With the exception of a few flora species, the Vegetation Types were comparative to the TRBA survey and could be recognised and applied to the vegetation of the proposed offset site;
- The overall condition of the offset site was in a Good to Degraded Condition, with an increased presence of weed species and dominance. This was expected with the site appearing to be well used by unauthorised vehicles in comparison to less apparent recreation use in the TRBA site;
- The proposed offset site is suitable for the practical implementation of rehabilitation and revegetation techniques; and
- The size of the offset site would match that required to offset the permanently cleared areas of the TRBA, including the potential rehabilitation of the offset site's cleared areas and revegetation of the site's weed infested areas.

The details of this rehabilitation and revegetation are further explained in Sections 5-10 of this document.

A desktop analysis of the site was completed using the WALGA Environmental Planning Tool (EPT) on the 28 October 2020, (WALGA, 2020) to identify any State or Federal listed Threatened flora (TF), Priority Flora (PF), Threatened (TECs) and/or Priority Ecological Communities (PECs) previously known from the study area or surrounds.

No Threatened Ecological Communities (TECs) listed under the Western Australian *Biodiversity Conservation Act 2016* or the Federal *Environmental Protection Biodiversity Conservation Act 1999* were recorded in the study area.

As noted above in the explanation about the vegetation in the TRBA, there were challenges to assessing vegetation in this area due to the lack of a proper regional dataset of quadrat data in the Gibson *et al.* (1994) dataset from near-coastal and Quindalup Dune areas (One Tree Botanical, 2020). Despite this, it is possible due to the similar vegetation composition and close proximity to the study area for the TRBA, that one PEC, or variant of, may occur within the study area:

- **PEC SWAN 21:** "Coastal shrublands on shallow sands, southern Swan Coastal Plain" (FCT29a) (Vegetation Type B1).

Coastal shrublands on shallow sands, southern Swan Coastal Plain (29a) is represented in vegetation Type B1, with potentially 1.64 ha of potential revegetation area and 0.06 ha of infill /weed management area (combined 1.7 ha), occurring within the offset site.

Four vegetation communities and cleared areas were mapped within the offsite site (Appendix C). The area was found to be of similar vegetation composition to that of the Survey Area for the TRBA. The vegetation types included one grassland and three shrublands:

- Low-Lying Primary Dunes on Unconsolidated Sand A1: Incipient Foredune (younger): Grassland **Thinopyrum distichum* (0.025 ha)

- Low-Lying Primary Dunes on Unconsolidated Sand A2: Established Foredune (older): Sparse Shrubland *Olearia axillaris and *Pelargonium capitatum* over Grassland *Spinifex longifolius, Spinifex hirsutus* and **Thinopyrum distichum, with *Cakile maritama* and **Euphorbia paralias* (0.08 ha)
- Low-Lying Primary Dunes on Unconsolidated Sand A3: Beach-ridge Plain: Open Shrubland *Olearia axillaris and *Pelargonium capitatum* over Sparse Grassland *Spinifex longifolius* and Sparse Vineland *Cassytha racemosa, with *Trachyandra divaricata* (0.1 ha)
- Tall Secondary Dunes On Unconsolidated Sand B1: Shrubland dominated by *Acacia cyclops, Scaevola crassifolia, *Pelargonium capitatum, Olearia axillaris, Rhagodia baccata subsp. baccata,* Sparse Vineland *Hardenbergia comptoniana and Cassytha racemosa* over grassland *with Spinifex longifolius,* (1.7 ha)

Of these, B1 is the most commonly represented vegetation community within the offset site. Appendix B includes photos of the vegetation types occurring in the TRBA alignment and the offset. This is similar in composition to that of the TRBA site, except for its shallower soils and exposed limestone. It is for this reason that there was a difference in species composition.

Photos and further information for each of the vegetation types in the offset site area proposed to be cleared are provided in the vegetation assessment of the offset site (Appendix C). Figure 5 illustrates the vegetation type and rehabilitation and revegetation plan for the offset site.

The condition of the vegetation in the offset site is in an overall degraded condition in comparison to the TRBA alignment. Rehabilitation of this site would therefore be a beneficial contribution to the Two Rocks foreshore area to the south of the Marina and assist in the overall continual degradation of this areas' vegetation. The site inspection verified that the offset site ranged from Degraded to Good vegetation condition, based on the South West Botanical Province (EPA, 2016) and Bush Forever (Keighery, 1994 from Govt. of WA, 2000) vegetation condition scale. The main contributing factor to the degraded condition of the site is the use of unauthorised vehicles in the area and the increased invasion of weed species on the site.

A total of 33 flora species were recorded from the offset site, of which 23 or 70% were natives.

No Priority Flora species were recorded within the offset.

2.3 Soil and Landforms

The proposed TRBA and Offset site lies within the Swan Coastal Plain, a series of 20-30 km of dunes arranged in an east to west sequence, with oldest lying in the east (Bassendean Dunes), and the youngest dunes in the west (Quindalup dunes) (Churchward & McArthur, 1980). The offset site lies within the Quindalup dunes (City of Wanneroo, 2020), which are characterised by coastal dunes, consisting of beach sand, sand dunes, coastal dunes, calcareous and siliceous, locally shelly and/or cemented beach rock (AECOM, 2018).

Both sites consist of other typical features of the Quindalup dunes (Dixon, 2011), including:

- A frontal dune system facing the sea and subject to erosion and blowouts (Vegetation Type A1);
- Secondary dunes that are mostly stable with a continuous cover of vegetation (Vegetation Type A2, A3 and B1); and

- Transgressive dunes (extensive blowouts of mobile sand) resulting from episodic events – such as that seen in Vegetation Type B1, C1 and D1).

Historical aerial photography indicates that the beach ridge plain dune system between Two Rocks Marina in the north and The Spot in the south, was only deposited in the last 20-30 years and has rapidly developed vegetative cover following deposition (One Tree Botanical, 2020). Within the TRBA project area approximately 60m of beach ridge plain dune system has been deposited since 2002. This will have resulted from construction of the Two Rocks Marina in 1972, changed coastal processes, causing erosion to the north of the marina and seasonal accretion to the south (Department of Transport, 2018).

The Offset site has been chosen not only because of its similar composition and vegetation to that of the TRBA site, but also because it consists of a larger blowout, approximately 1.8 ha in size, as well as a series of smaller bare and weed infested areas adding up to 1.9 ha in area (Figure 7). The blowout has been exacerbated by historical pedestrian and vehicular activity that has resulted in the loss of vegetation and an overall decrease of ecological value. Rehabilitation, fencing and conservation of this blowout would therefore result in an overall benefit to this area's local environment and prevent further erosion caused by these activities.

Additional information on the land use and unauthorised vehicular access is described further in Sections 3.2 & 4.3, respectively.

Figure 7: The larger Blowout and other areas of disturbance evident in the secondary dunes of the Offset site, vegetation type B

The Offset site also includes an example of the Tamala Limestone landform (Figure 8) within Vegetation Type B1. Gozzard (2007) describes these landforms as discontinuous pockets of limestone that are "cemented coastal sand dunes" and "calcreted surfaces (beach rock), karstic features (sinkholes, caves), raised beaches, and elevated shoreline platforms". Gozzard (2007) noted examples of these in the Two Rocks area. This limestone will not be altered or rehabilitated but rather left as natural feature of the landscape.

Figure 8: Offset site – Tamala Limestone evident in the secondary dunes, vegetation type B1.

2.4 Hydrology

A review of the wetlands of the Swan Coastal Plain feature maps in the WALGA EPT (2020) identified that there are no surface water expressions within the immediate area of the TRBA or Offset site. The closest wetland is Loch McNess, a Conservation Category Wetland located approximately 6 km south east of the sites (WALGA, 2020).

Depth of the ground water ranges from between 19 m below ground level in the east to 3 m in the west (DWER, 2020). The groundwater salinity levels are considered 'marginal' with TDS levels 500 - 1000mg/L (DWER, 2020).

2.5 Fauna

A Basic Fauna Survey of the TRBA (Appendix D) was undertaken by Terrestrial Ecosystems (2020a) on the 29 August 2019. Results of the survey found that the survey area comprises of three main habitat types (Terrestrial Ecosystems, 2020a), including:

- Coastal low heath on sand;
- Mixed open shrubland and heath on sand; and
- Mixed closed shrubland over sand and limestone.

Some of the site was described as being highly disturbed or cleared and provides no habitat value.

Given the similarity in vegetation types, species composition, proximity and landforms of the TRBA and Offset sites, it is unlikely that the Offset site differs in the main habitat types. The site inspections of the Offset site, on the 19 October 2020 and 29 October 2020, confirmed this to be the case (see Appendix B: Site Photos and Comparison of Vegetation Types between TRBA and the Offset). It is therefore assumed that similar conclusions for fauna habitat can be inferred for the Offset site.

All three main habitat types that occurred within the survey area also occur within the TRBA alignment and construction extent. Mixed open shrubland and heath on sand is the most common fauna habitat, with 6.22 ha occurring within the TRBA survey area. The remaining TRBA survey area extent comprises of Mixed closed shrubland over sand and limestone; Coastal low heath on sand and highly disturbed areas with 1.973 ha, 1.915 ha and 0.302 ha, respectively.

A desktop study against the DBCA Schedule/Priority species found that 15 conservation significant fauna species may occur within the area, however Thompson commented that only seven of these may occur within the Study Area, including;

- Quenda (*Isoodon fusciventer*);
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*);
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*);
- Fork-tailed Swift (*Apus pacificus*);
- Osprey (*Pandion haliaetus);*
- Peregrine Falcon (*Falco peregrinus); and*
- Black-striped Snake (*Neelaps calonotos)* (Terrestrial Ecosystems, 2020a).

Only the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) was recorded by Thompson during field observations during the TRBA survey (Terrestrial Ecosystems, 2020a).

During the site inspections conducted by the CoW officers, two species were observed -

- Red-capped Plover (*Charadrius ruficapillus*) – adjacent to the TRBA alignment on the beach; and
- A White-bellied Sea-Eagle (*Haliaeetus leucogaster*), hunting and soaring over the area adjacent to the Offset site.

3. Site History

3.1 Indigenous and European Heritage

A desktop study of the immediate areas of the TRBA alignment and the Offset site indicated no sites of Cultural or Indigenous heritage value.

3.2 Land Use

The suburb of Two Rocks is named after two prominent rocks located offshore from Wreck Point. With the adoption of the state government's Corridor Plan in 1970, extensive plans were made for the residential development of the Yanchep and Two Rocks area. In 1969 The Bond Corporation Pty Ltd purchased 19,600 acres of pastoral property, previously owned by the Wydgee Pastoral Company, and preceded to develop Yanchep Sun City as a satellite city and premier tourist resort in Western Australia (State Heritage Office, 2020).

Residential development was well underway in 1972, followed by a marina in 1973/74 and shopping and recreation centre at Two Rocks. The Two Rocks Marina was developed by

Alan Bond as a training base for Australia's challenge of the America's Cup and to provide facilities for recreational boating and for the local fishing industry. Many of the streets in Two Rocks are named after yachts from America's Cup challengers (State Heritage Office, 2020).

In 1981, following an announcement by the WA government, work began on the construction of Atlantis Marine Park with a $20 million budget over five years. As well as a tourist destination the park was to be used to research marine life. Sun City Pty Ltd was granted a licence by the Department of Fisheries and Wildlife to catch and keep local dolphins. A feature of the park was the 10 metre sculpture of King Neptune designed by local artist Mark Le Buse. The opening of the park was held on 26 December 1981 and by 1982 over one million visitors went through the gates. The park closed in 1990. The King Neptune statue still remains in the locality of Two Rocks near the Two Rocks Shopping Centre (State Heritage Office, 2020).

Prior to the residential development of Two Rocks in 1972, aerial imagery identifies the land in the immediate vicinity of the TRBA alignment and Offset site to be in a more degraded condition than today (Landgate, 2020). Over the years, the disturbance in this local area has actually decreased and the blowout located in the Offset has also decreased in size (Figure 9). This may be due to previous land uses such as pastoral activities and vehicle access being more intense in this area during the 1970s and 1980s. Recent years have meant that access is now more restricted and access to the general public is now not only unauthorised but also more difficult with deterrents such as fencing and large boulders to discourage unauthorised vehicles.

Despite this, the revegetation of the Offset site can only positively contribute to the overall ecological value of this site. More so, the fencing and conservation of this site will further deter and restrict unauthorised vehicles impacting the site.

The survey area of the TRBA was noted to be a relatively intact area of natural vegetation with the following observations (One Tree Botanical, 2020):

- An old vehicle track was present and surrounded by comparatively disturbed vegetation;
- A corridor had been historically cleared for a powerline;
- An informal pedestrian track is present from Two Rocks Road to the beachfront; and
- The beachfront is currently utilised for recreational purposes.

In comparison, the CoW officers noted the following observations at the Offset site:

- The Offset site's vegetation was overall in a more degraded condition than the TRBA site;
- Several vehicle tracks were present and surrounded by disturbed vegetation, with observations of recent vehicle activity;
- The site appeared to have a relatively long history of disturbance by vehicles, which is supported by aerial imagery and historical vehicle tracks in the area;
- The blowout was well established in the Offsite site, which is supported by historical aerial imagery;
- The site includes a higher incidence of exposed limestone, and therefore is naturally void of vegetation;
- The site appears to have an increased intensity of weed coverage, which is unsurprising, considering the increased amount of recreational use of the Offset site;
- Areas of the foredune appear to have been either planted or seed has been dispersed with the weed species Sea Wheatgrass **Thinopyrum distichum.* This native South African species was once used widely in stabilising dunes along the Perth coast and is now a widespread weed of frontal dunes that competes with *Spinifex* species (Dixon, 2011). Aerial imagery indicates that either planting or dispersion may have occurred in the 1990s, where there is a substantial increase in vegetation cover in this area (Landgate, 2020);

- Several informal pedestrian tracks are present from Two Rocks Road to the beachfront, with the observation of a pedestrian using these tracks during the site inspections; and
- The beachfront is currently utilised for recreational purposes, with several persons observed to be using the area during the site inspections.

Both the survey area and Offset site is a part of a much larger Unexploded Ordinance (UXO) Area: Yanchep Two Rocks Artillery Range (ID: 1035) (Department of Defence, 2020). After WWII the broader area was used by Armed Forces for target practice. As the area is known for its military history, the CoW has committed to conducting UXO searches as part of the TRBA and Offset project to ensure that the potential risk of UXO is eliminated. A UXO search will be conducted in all areas of the potential construction site for the TRBA and in the immediate vicinity of the installation of the conservation fencing of the boundary and access track of the Offset site.

Figure 9: Historical aerial imagery of the TRBA and Offset sites on 7 June 1977 and 10 February 2020 (Landgate 2020).

4. Potential Impacts

Threats that have the potential to impact on the TRBA and offset project include:

- Loss of priority flora species;
- Death or injury of fauna;
- Feral animals;
- Weeds;
- Rubbish;
- Unauthorised access;
- Fire; and
- Pathogens and disease.

Details of these threats are discussed below, with suggested mitigation actions, responsibilities and compliance criteria provided with the schedule, in Tables 8 & 9.

4.1 Loss of Priority FloraSpecies

As mentioned in Section 2.2.1 and illustrated in Figure 2, three Priority Flora species were recorded within the study area:

- *Leucopogon maritimus* (Priority 1);
- *Beyeria cinerea subsp. cinerea* (Priority 3); and
- *Stylidium maritimum* (Priority 3).

This number of priority species in one vegetation type (Vegetation Type C1) and within a small near-coastal area is uncommon and therefore significant (One Tree Botanical, 2020). As per discussions with DWER (15th October 2020), it is imperative that any impacts to these species are minimised.

To ensure that the impact to these species was minimised, the original alignment of the path was moved to ensure that the minimum number of species would be impacted. This has now been reduced to four individual plants of *Beyeria cinerea subsp. cinerea* (Priority 3). These four individual plants will now be salvaged during the UXO search and utilised in the revegetation of the TRBA.

In addition to this, the remaining Priority species will be identified and clearly demarcated, prior to any work commencing in the area, i.e. UXO search and construction. The preservation and importance of these species will be communicated in awareness sessions to all key personnel involved in the project. The individual species will be checked for intact demarcation and photographed to ensure they are not impacted. This will occur at the following stages of the project:

- Prior to the UXO search;
- Prior to construction; and
- After construction and revegetation of the battered surfaces.

All records of these checks will be maintained and is scheduled into the project Schedule, as per Tables 8 & 9.

4.2 Fauna Management

As mentioned in Section 2.4, several conservation species occur within the TRBA survey area (Appendix D) (Terrestrial Ecosystems 2020a), including;

- Quenda (*Isoodon fusciventer*);
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*);
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*);
- Fork-tailed Swift (*Apus pacificus*);
- Osprey (*Pandion haliaetus);*
- Peregrine Falcon (*Falco peregrinus); and*
- Black-striped Snake (*Neelaps calonotos).*

The City will ensure the potential impacts of fauna are managed through the following measures:

- Awareness sessions - The conservation and importance of fauna species will be communicated to all key personnel involved in the project and as part of the induction process, including speed limits to reduce the risk of fauna fatality;

- The importance of the allowing fauna to safely move on during construction and clearing will be communicated. Where species are unable to safely move on, a qualified wildlife handler will be called to relocate the species; and
- A wildlife carer will be immediately called to remove and rehabilitate any injured fauna and reported to the Project Manager within 24 hours of the event occurring.

4.3 Feral Animals

Although the Matters of National Environmental Significance (MNES) database search identifies previous records of the Chuditch (*Dasyurus geoffroii*), Woylie (*Bettongi penicillata*) and Western Ringtail Possums (*Pseudocheirus occidentalis*) in the study area, these species are no longer present due to destruction of habitat and predation by feral animals, such as foxes and cats (Terrestrial Ecosystems, 2020). Feral animals compete with native animals for food and habitat, and have a dramatic effect on fragile ecosystems (Jones & Parish, 2008).

A high abundance of rabbits and medium abundance of foxes and cats were noted in the fauna survey (Terrestrial Ecosystems, 2020a). Whilst foxes and cats predate small mammals, the rabbit competes with native fauna for food and destroys natural habitat. This can be particularly devastating when trying to establish new vegetation. To mitigate the potential impacts of feral animals, the TRBA project will be included in the City's feral animal control program.

4.4 Weeds

Weed species were identified as part of the TRBA Flora survey (One Tree Botanical, 2020). One Tree Botanical (2020) observed 60 weed species, which mainly occurred adjacent to the existing tracks and disturbed area (Vegetation Type E1). Table 4 summarises these species and their priority for management according to the level of invasiveness and spread as environmental weeds under the Western Australian Environmental Weed Strategy (WAEWS) (Department of Conservation and Land Management, 1999). Species recorded in the Offset Site are indicated in red font.

Nine weed species were rated high, with 30 species recorded as a Moderate rating.

Table 4: Introduced species and priority for management recorded within the TRBA Study Area (One Tree Terrestrial, 2020). Note: Species recorded in the Offset Site are indicated in red font.

Species	Common name	Priority for Management
**Brassica tournefortii*	Mediterranean Turnip	High
**Bromus diandrus*	*Great Brome*	*High*
**Eragrostis curvula*	*African Love Grass*	*High*
**Euphorbia terracina*	*Geraldton Carnation Weed*	*High*
**Hyparrhenia hirta*	*Tambookie Grass*	*High*
**Lagurus ovatus*	*Hare's Tail Grass*	*High*
**Lupinus cosentinii*	*Blue Lupin*	*High*
**Pelargonium capitatum*	*Rose Pelargonium*	*High*
**Romulea rosea*	*Guildford Grass*	*High*
**Aira cupaniana*	*Silvery Hair Grass*	*Moderate*
**Arctotheca calendula*	*Cape Weed*	*Moderate*
**Arctotheca populifolia*	*Dune Arctotheca*	*Moderate*
**Avena barbata*	*Wild Oats*	*Moderate*
**Bellardia trixago*	*Bellardia*	*Moderate*
**Briza maxima*	*Blowfly Grass*	*Moderate*
**Briza minor*	*Shivery Grass*	*Moderate*
**Cakile maritima*	*Sea Rocket*	*Moderate*
**Crassula glomerata*	*stonecrops*	*Moderate*
**Cuscuta planiflora*	*Dodder*	*Moderate*
**Cynodon dactylon*	*Couch Grass*	*Moderate*
**Dischisma arenarium*	-	*Moderate*
**Ehrharta brevifolia var. cuspidata*		*Moderate*
**Ehrharta longiflora*	*Annual Veldt Grass*	*Moderate*
**Euphorbia paralias*	*Sea Spurge*	*Moderate*
**Euphorbia peplus*	*Petty Spurge*	*Moderate*
**Galium murale*	*Small Goosegrass*	*Moderate*
**Gladiolus caryophyllaceus*	*Pink Gladiolus*	*Moderate*
**Heliophila pusilla*	-	*Moderate*
**Hypochaeris glabra*	*Flatweed*	*Moderate*
**Lysimachia arvensis*	*Pimpernel*	*Moderate*
**Melilotus indicus*	*Indian Sweet-clover*	*Moderate*
**Parentucellia latifolia*	*Common Bartsia*	*Moderate*
**Rostraria cristata*	*Mediterranean Hairgrass*	*Moderate*
**Schinus terebinthifolia*	*Japanese Pepper Tree*	*Moderate*
**Sonchus oleraceus*	*Common Sowthistle*	*Moderate*
**Tetragonia decumbens*	*Sea Spinach*	*Moderate*
**Thinopyrum distichium*	*Sea Wheatgrass*	*Moderate*
**Trifolium campestre var. campestre*	*Hop Clover*	*Moderate*
**Vulpia myuros forma megaleura*	*Rat's Tail Fescue*	*Moderate*

There are no Declared Pest species recorded from the WA Organism List (WAOL) under the *Biosecurity and Agriculture Management Act* 2007 or Weeds of National Significance (WONS) in the TRBA study area or the Offset site.

Eight weed species were identified as part of the Offset site inspection in October 2020. These species mainly occurred adjacent to the existing tracks and disturbed areas as well as the fore dune area where **Thinopyrum distichum* appears to have been either intentionally planted or has naturally dispersed to both the fore dunes of the TRBA and Offset sites (Vegetation Type A1). This is quite an invasive species and competes with species of *Spinifex*, however removal of the species would have a negative outcome for the stabilisation of the fore dunes and therefore will be retained. In degraded areas, infill planting with native species will occur, to compete with the weed species and further stabilise the dune.

4.5 Rubbish

Dumping of waste is a common occurrence throughout bushland reserves and parks in residential areas in the CoW. The dumping of lawn clippings and garden waste can lead to weed infestation and plant disease. Evidence of rubbish dumping, including a car battery, a pallet, garden chairs and miscellaneous boating equipment was observed in the Offset site during the site visits (Figure 10). There was no record of rubbish dumping during either the flora or fauna surveys (One Tree Botanical, 2020;Terrestrial Ecosystems, 2020a).

Figure 10: Dumped waste within the Offset site

4.6 Unauthorised Access

Evidence of the use of unauthorised vehicles was evident in this area with observations of several car tracks on a site visit on the 19 October 2020 (Figure 11 a - b). The presence of vehicles was also visible in an aerial image (Figure 10b) on the WALGA Environmental Planning Tool (2020).

The City is aware that this is a high use recreational area and that a fire track will need to remain in the area for safety reasons. The site is said to be a popular recreational fishing spot due to the presence of Mulloway (*Argyrosomus japonicus*). To ensure that there is minimal risk of damage to the offset rehabilitation, an already established informal track will be retained. This may reduce the risk of deliberate vandalism to the fencing and rehabilitation site by unauthorised vehicles in the future and will need to be considered as part of the potential ongoing maintenance costs to preserve the quality of the fencing and rehabilitation at this offset site.

a) Vehicle tracks observed in the 19 October 2020

b) Aerial imagery demonstrating unauthorised vehicle access (Source: WALGA EPT Oct 2020)

Figure 11 a and b: Evidence of vehicles in Two Rocks Beach Access Way Offset site.

Aerial imagery indicates that there has been an ongoing issue with 4WD tracks from as early as 1970 (Landgate, 2020). This may have also resulted from the pastoral land use activity that occurred in these areas in the 1970-80s. This would have exacerbated the erosion to the pre-existing blowouts and damage to the vegetation around these tracks, which is evident in historical aerial imagery and appeared to be an increasing footprint in vehicle tracks and degraded areas until approximately 1990. The overall condition of the TRBA and offsets sites appears to have actually improved since this time, evident by aerial imagery (Landgate, 2020), where the vehicle tracks and large degraded areas in the area appear to have commenced restoration, either naturally or through rehabilitation efforts.

Development of surrounding areas in recent years has meant that access is now more restricted. Access to the general public is not only unauthorised but also harder to access, with deterrents such as fencing and large boulders to discourage unauthorised vehicles.

The City of Wanneroo and the adjacent developers have historically mitigated unauthorised vehicles in the foreshore areas through various mechanisms such as fencing, CCTV surveillance, blocking of paths with large rocks, signage and public communications relating to the potential impacts and fines that may be imposed for offenders.

4.7 Fire

Fire has the potential to alter the structure, density and composition of natural areas (WALGA, 2004). Fire rarely occurs in the primary coastal dunes due to the higher water content, salt coated debris and bare sanded areas that lack sufficient combustible dry matter and surface litter to act as an ignition source (Dixon, 2011). Fire is therefore not likely to

occur in most of the A1 - A3 vegetation types of the TRBA and offset site; as well as the blowout and cleared areas within the offset site.

Fire history was assessed as part of the flora survey and was observed in each of the quadrats, with the vegetation displaying signs of fire occurring in excess of ten years (One Tree Botanical, 2020). Fire in the adjacent area of both the TRBA and offset had occurred approximately five years ago (Figure 12), according to the DFES historical data accessed from the CoW's Intramaps, (CoW Intramaps, 2020).

Figure 12: Historical fire adjacent to the Two Rocks Beach Access and Offset site.

4.8 Phytophthora

Phytophthora is a plant pathogen that presents a significant threat to the health of ecosystems on the Swan Coastal Plain, affecting more than 40% of the native plant species and half of the endangered species in the south-west of Western Australia. There are several species of *Phytophthora*, but *Phytophthora cinnamomi* is the most widespread and destructive (DBCA, 2020). Dieback is a symptom of a *Phytophthora sp.* infection, killing vegetation because it prohibits the plants' ability to take up the water and nutrients. Dieback can be spread through various vectors, including; soil, footwear, vehicles, machinery and equipment. It can devastate bushland by removing particular plants and changing the nature of the landscape, possibly driving rare species toward extinction (DBCA, 2020).

A common myth is that *Phytophthora* does not occur in coastal areas due to suppression by calcareous materials, such as limestone, due to its high pH. Whist this is true for *Phytophthora cinnamomi*, it is not the case for other species of *Phytophthora,* such as *Phytophthora multivora* and one or more of the currently undescribed *Phytophthora* species (Scott *et al*., 2009). *Phytophthora multivora* is widely distributed, has a wide host range and is associated with deaths of tuart and other species on calcareous soils (Conservation Commission of WA, 2010). A lot more research is needed for this and other species of *Phytophthora* however it is no longer accepted that the use of limestone, or the presence of limestone in a natural landscape, prohibits the pathogen and thus normal dieback processes should be applied including checking limestone bases for the pathogen and ensuring that all standard dieback management practices are adhered to.

Potential dieback was not indicated in the 2019 biological surveys for the TRBA (One Tree Botanical, 2020, Terrestrial Ecosystems, 2020a) however, a formal dieback assessment has not been undertaken. Potential exists for *Phytophthora sp.* and other potential pathogens (such as *Armillaria luteobubalina*) to be introduced as part of the construction process, but standard dieback and vehicle hygiene measures are considered appropriate to mitigate this risk. No significant impact is anticipated related to dieback from the TRBA project, either directly or indirectly.

5. Revegetation Commitments

Vision: The revegetation and rehabilitation will ensure that disturbed areas cleared during development of the TRBA and offset are revegetated and rehabilitated to ensure the conservation values of the Two Rocks foreshore are protected and managed.

Objectives: The main goals of the revegetation plan include;

- Revegetate disturbed areas with local provenance species;
- Protect the environmental values surrounding the alignment of the Two Rocks foreshore area and improve these values in the Offset site; and
- Manage high priority weed infestations within the revegetation area and Offset site.

6. Reference Site Floristic Data

Reference site floristic data from quadrats sampled within the TRBA alignment (One Tree Botanical, 2020), the Offset site vegetation assessment (Appendix C) and opportunistic observations have been used to establish the appropriate targets and completion criteria for each vegetation community type for both sites.

The northern and southern batters on either side of the TRBA construction extent will be revegetated with six different types of vegetation units, as represented in Table 5, identified in the Biological Report (One Tree Botanical, 2020) and shown in Figures 3 and 13. Quadrats were selected as reference sites within each vegetation community, to represent the floristic composition within these different vegetation types. These reference sites will be used as a baseline to assess the future success of the revegetation. The relevant reference sites for each vegetation site and areas of both the northern and southern batters are identified in Table 5 and illustrated in Figure 13.

The offset site will be revegetated with four different types of vegetation units (A1, A2, A3 and B1), as illustrated in Figure 5. The respective areas of each of the vegetation types are also represented in Table 5.

Table 5: Vegetation Type Reference Sites

Vegetation Type	Relevant Reference Sites within TRBA	Revegetation Area North Batter in TRBA (ha)	Revegetation Area South Batter in TRBA (ha)	Revegetation Area in Offset site (ha)
A1	TR04, TR15	0.086	0.045	0.025
A2	TR01, TR05	0.18	0.044	0.08
A3	TR02, TR03	0.152	0.157	0.1
B1	TR07, TR08, TR09, TR14	0.461	0.459	1.64
C1	TR12, TR10, TR13	0.175	0.119	-
D1	TR06, TR11	0.550	0.310	-

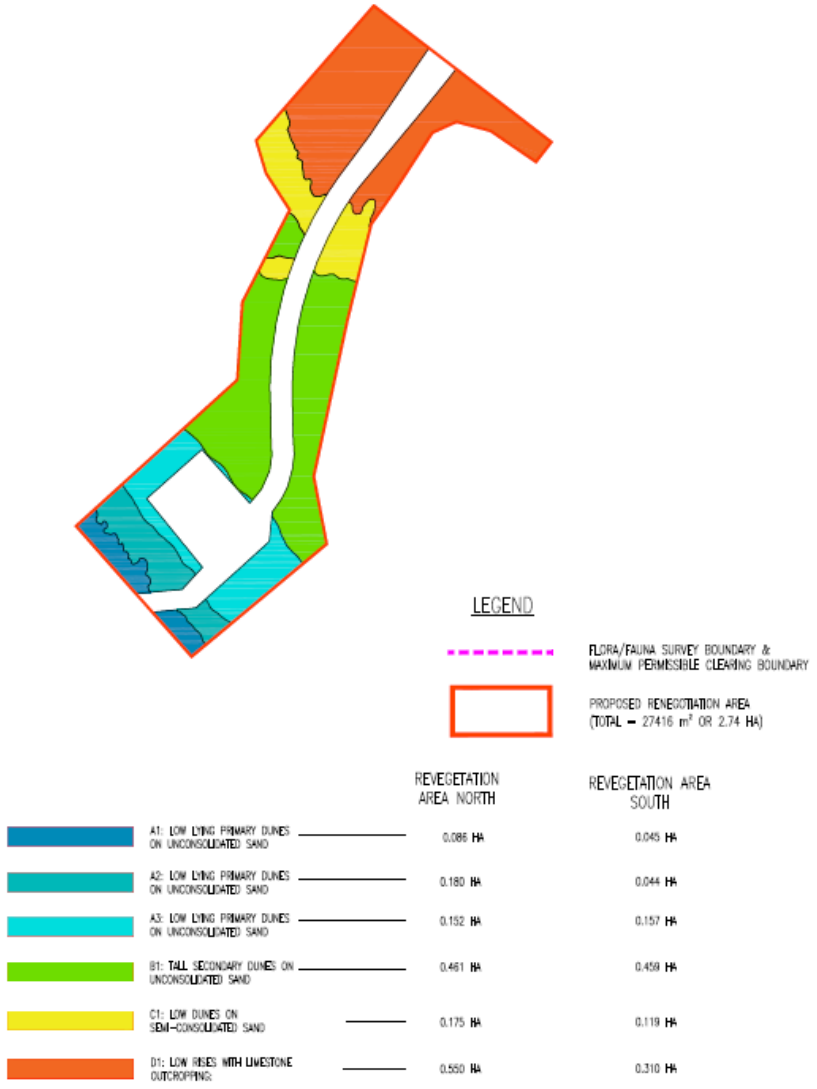

Figure 13: Rehabilitation area categorised by Vegetation types for the Northern and Southern batters, the Two Rocks Beach Access

Individual species lists have been developed for each of the rehabilitation areas in the TRBA and offset sites in order to align with each of the different vegetation types and the assessment of the vegetation for the offset site (Appendix C). Whilst every effort has been made to replicate the species composition, the ratios vary slightly due to the practical challenges involved in recreating these vegetation types (i.e. ability to collect and/or propagate a species). The resulting revegetation species lists have therefore been slightly modified to ensure improved on-ground outcomes. These modifications are summarised for both sites in Table 6.

Table 6: Explanation of modifications to species lists to ensure improved rehabilitation outcomes

Reason for modification	Effected Vegetation Type TRBA	Effected Vegetation Type Offset
A dominant species in this vegetation type is a weed (*Thinopyrum distichium*). Replicating this species in the rehabilitation would not be a good ecological outcome, so the species has been omitted from the rehabilitation list. Removal of the species may result in erosion to the front dune and therefore will be left in place and other *Spinifex* sp. planted in bare areas adjacent. All other weed species (60 in total) will be managed rather than removed from both sites as the removal of these species may exacerbate erosion of the dunes.	A1 A2	A1 A2
Orchid species (five in total) have been removed as they are too difficult to collect and propagate: *Caladenia latifolia* *Cyrtostylis huegelii* *Eriochilus d. subsp. dilatatus* *Leptoceras menziesii* *Microtis m. subsp. media*	A3 B1 C1 D1	A3 B1
Grass species (annual and perennial) have been removed from the species list as they regenerate well through the seed bank in the topsoil. This has been exemplified by recent revegetation in Hardcastle Park (Hawthorne, 2020): *Austrostipa flavescens* *Poa porphyroclados* *Rytidosperma occidentale* *Spinifex hirsutus* *Spinifex longifolius*	A1 A2 A3 B1 C1 D1	A1 A2 A3 B1
Annual species do not provide a long term benefit to the site and offer little return for the effort: *Daucus glochidiatus* *Hydrocotyle hispidula* *Hydrocotyle pilifera var. glabrata* *Trachymene pilosa* *Hyalosperma cotula* *Leptorhynchos scaber* *Rhodanthe citrina* *Senecio vulgaris* *Isotoma hypocrateriformis* *Silene gallica var. gallica* *Crassula c. var. colorata* *Schoenus clandestinus* *Schenkia australis* *Triglochin isingiana* *Triglochin nana* *Poranthera microphylla* *Parietaria debilis* Moss	A3 B1 C1 D1	A3 B1
Opportunistic species have not been included as they are only minor species and not representative of the existing baseline data (i.e. quadrats): *Millotia myosotidifolia* *Podotheca gnaphalioides*	ALL	ALL

Allocasuarina l. subsp. lehmanniana *Salsola australis* *Acrotriche cordata* *Tricoryne elatior*		
The following species have not been included as it is too invasive and may outcompete other important establishing species: *Cassytha aurea var. aurea* *Cassytha flava* *Cassytha glabella forma. casuarinae* *Cassytha r. forma. racemosa*	C1	-
The following species have been included in the species list however it is not guaranteed that they will be able to be planted due to either their known difficulty in propagation and/or seed collection: *Beyeria c. subsp. cinerea* (P3) *Cryptandra mutila* *Drosera macrantha* *Leptomeria preissiana* *Leucopogon insularis* *Leucopogon maritimus* (P1) *Leucopogon parviflorus* *Lysinema pentapetalum* *Pelargonium littorale*	A2 A3 B1 C1 D1	A2 A3 B1
Other minor species have not been included in the species list as it is more important to focus propagation on the more common species. These minor species are likely to regenerate however from the seed bank in the reserved topsoil: *Wurmbea monantha* *Rytidosperma occidentale* *Austrostipa flavescens* *Poa porphyroclados*	B1 C1 D1	B1

7. Targets and Completion Criteria

This revegetation plan will be implemented over a three year period. The targets and completion criteria for the rehabilitation of the TRBA northern and southern batters are outlined in Table 7 and have been developed to meet the objectives of the RRP. Further detail and the timing of these actions are included in the schedule (Tables 8 & 9).

Table 7: Completion criteria, targets and monitoring for areas of revegetation (includes the offset site)

Criterion	Baseline floristic data	Completion targets	Completion criteria	Monitoring
1	Species richness is the average number of species between the reference sites of each vegetation community.	Minimum of 50% of native vegetation species returned based on propagation capacity of species. Therefore revegetation areas shall have a minimum of 50% native species per quadrat, as obtained by the average recorded at the reference sites.	Species richness and number of plants / m^2 in the revegetation areas shall have a minimum of 50% native species per quadrat, as obtained by the average recorded at the reference sites.	The species and number of plants / m^2 in the revegetation areas will be counted in years 2 and 3.
2	% cover of weeds in quadrats of each vegetation community is 2% - 30%	Weeds are mostly absent from the quadrats. Considering external pressures (adjacent areas used for public recreation) a target of ≤10% has been established for the revegetation areas.	The revegetation areas must have % cover of ≤10% weeds. Except for A1 hence this will need a gradual increase in native vegetation and potential for recolonisation	Monitor revegetation areas in years 2 and 3.
3	Survival rate of species to be achieved	If after year 2 and year 3 of planting, a survival rate of 2 plants/m^2 is not achieved, all planted tube stock that have not survived must be replanted within 12 months and monitored for a further 1 year.	The revegetation site needs to ensure a survival rate of no less than 2 plants/m^2 is achieved after three years, and replant any plants within 12 months of dying.	The number of surviving plants in revegetation areas will be counted in years 2 and 3.
4	Rubbish is not present in bushland.	Rubbish is absent from the revegetation sites.	The revegetation site contains minimal rubbish.	Monthly asset inspections
5	Unauthorised access is minimised	Fencing is installed and maintained to prevent unauthorised access to the revegetation site.	Fencing is maintained and there are no visible signs of vandalism and/or unauthorised access to the revegetation site.	Monthly asset inspections
6	Feral animals are mitigated	Potential impacts from introduced animals are monitored and mitigated, where required.	Mitigation measures are implemented if there are visible signs of introduced animals species e.g. rabbits, foxes etc.	Monitor revegetation areas as part of annual reports and as part of monthly asset inspections
7	Priority species are retained	All priority species located immediately outside the construction area are to be retained.	No priority species located immediately outside the construction area are impacted.	The priority species are demarcated before, during and after the UXO search and construction

7.1 Vegetation Establishment

Vegetation establishment in the revegetation area will occur by spreading topsoil, mulch and the planting of tube stock. Technical specifications detailing vegetation establishment techniques are included within Appendix E - Section 3.

There will be no direct seeding as part of this revegetation plan.

With the exception of leaving an access track for future emergency services use, the cleared areas, tracks and blowout will be revegetated.

7.2 Seed Collection, Plant Salvage and Propagation

Local provenance species will be sourced from the project site and other reserves suitable for supplying the seed quantities required to meet completion criteria. To ensure sustainable collection practices, seed will be sourced from the following reserves:

- Tamala Park, Mindarie & Burns Beach, CoW and City of Joondalup (CoJ);
- Longbeach Reserve, Quinns Rocks, CoW;
- Claytons Beach reserve, Mindarie, CoW;
- Burns Beach Reserve, Burns Beach, CoJ;
- Mindarie Foreshore, Mindarie, CoW;
- Quinns Rocks Foreshore, Quinns Rocks, CoW; and
- Yanchep Foreshore, Yanchep, CoW.

The timing of seed collection is detailed in the rehabilitation schedule for each site (Table 8 – TRBA and Table 9 – Offset site). The City of Wanneroo has engaged a contractor (certified by the Revegetation Industry Association of Western Australia (RIAWA)) to undertake seed collection, plant salvage and propagation works. Seed collection and plant propagation will be carried out in accordance with the specifications outlined in Sections 1 and 2 of Appendix E.

Species' lists for seed collection and propagation, in the first three years after construction, are provided in Table 10. The species lists have been developed using data collected from the biological survey and prior experience in developing and implementing revegetation projects.

A contractor (certified by the Revegetation Industry Association of Western Australia (RIAWA)) will be engaged to salvage plants that are not able to be propagated commercially and would be cleared as part of the project.

It is intended that the four individual species of Priority 3 *Beyeria cinerea subsp. cinerea* will be salvaged from the approved clearing areas prior to clearing vegetation and taken to the nursery for storage and replanting. The salvaged plants will be planted in the revegetation area in Year 2 & 3.

Table 8: Rehabilitation Schedule – TRBA Site

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MAMJJASO NDJFMAMJ
SITE PREPARATION	Demarcation of priority species before UXO	Conserve priority species	Competent personnel identify and demarcate Priority species, using botanical report and GPS reference as a guide.	SAM EOs	Records of each species demarcated against GPS reference points - before UXO, before construction and after construction															#		#					#																																					
	Environmental conditions included in contracts	Ensure environmental conditions of licence are understood and complied with - including the GPS locations of the clearing boundary	Include conditions of CPS in contracts	PM, UXO and construction /contractor	CPS licence Shapefiles									#	#	#	#	#	#	#																																										
	On site inductions for contactors and key stakeholders	Ensure potential impacts to flora and fauna are mitigated and that CPS conditions are complied with	As a condition of site entry, TRBA contractors and key stakeholders must complete environmental awareness for the clearing permit conditions that interact with their roles	SAMEOs PM, UXO and construction /contractor	CPS licence Training records Contracts															#	#	#	#	#																																						
	Dieback & Pathogen Mitigation	Dieback could be introduced or spread from the construction extent, which could result in a significant threat to the vegetation.	The scope of works and associated technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases into, or from, the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and leaving site.	UXO, Construction, seed and weed management contractors	Records verifying the requirements of pathogen and weed management, as required in the scope of works and technical specifications.															#	#	#	#	#																																						
	Demarcate vegetation areas	To ensure no one breaches the approved clearing area and the mulch/vegetation is stockpiled in corresponding vegetation areas	Survey to demarcate the clearing and vegetation areas prior to UXO and construction with appropriate flagging and survey posts	PM, Contractors and Survey	Photographic evidence of demarcation of clearing footprint and mulch stockpiles. Surveyed area and shapefiles provided of total cleared area after completed works.																																																										
	UXO search - TRBA and offset site	To eliminate UXO risk	Mulch from UXO - remains in construction area for amalgamating into topsoil layer.	PM and UXO contractor	Shapefiles photos before and after UXO															late	#	#																																										
	Salvaging of priority species	Some species are not able to propagate commercially and are priority species which can be salvaged.	UXO to liaise with the SAMEOs before they approach Priority species area so that the four	PM Revegetation/ contractor	Receipts from contractor, photos of salvaged plants															late	#	#																																										

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MAMJJASO NDJFMAMJ
			individuals can be salvaged and used in rehabilitation.																																																												
	Weed management	Carry out weed management to target prominent weeds before construction commences.	Targeted weed spraying	PM Revegetation/ contractor	Weed contractor invoices																																																								
	Initial Rubbish Removal	Waste should be lawfully removed and disturbance and handling of topsoil minimised during the construction and rehabilitation processes. Increased handling of topsoil could lead to an incremental loss of topsoil and reduced potential seed source for rehabilitation.	An inspection of the construction extent will be completed prior to the commenceme nt of construction to ensure that all waste is identified, hand-picked and removed.	PM Construction contractor	Waste removal receipts and applicable controlled waste documentatio n														#																																													
	Seed Collection	Seed will be collected from the relevant vegetation communities to ensure completion criteria is achieved (species richness)	Local provenance species will be sourced from Two Rocks and other reserves suitable for supplying the seed quantities required to meet completion criteria	PM and seed contractor	Seed collection and storage receipts																																																										
CONSTRUCTION	Demarcation of clearing area and vegetation types	Ensure compliance with the permitted clearing area and ensure the relevant materials are placed back onto the batters in the areas, and vegetation types, from which they were sourced.	The construction extent and each of the vegetation types that transect within the construction extent will be demarcated before clearing commences, as outlined in the tender document. E.g. TRBA colour coding, after UXO search	PM construction /contractor	Photographic evidence of demarcation of clearing footprint and topsoil stockpiles. Surveyed area and shapefiles provided of total cleared area after completed works.																#	#	#	#																																							
	Installation of fencing and gates	Stop unauthorised access and ensure that clearing area is not exceeded. Fencing will protect the revegetation areas and adjacent bushland	Installation of deterrent (e.g. large boulders after UXO search and fencing) and before construction) along construction extent, in accordance with Appendix 2, Section 3.	PM construction /contractor	Photos of deterrents and fencing.																#	#	#	#	#	#	#																																		
	Collect Mulch	Mulch will create a cover for the revegetation batters, is a useful method for collecting seed stock from the vegetation, and a sustainable	Vegetation will be trimmed and grubbed from each of the corresponding vegetation types and chipped into mulch, through the use of a	PM construction /contractor	Mulch placed into respective vegetation types - marked out by flagging or signs. Photos of vegetation chipper being used and																#	#	#	#																																							

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MAMJJASO NDJFMAMJ
		method for disposing of the vegetation.	vegetation chipping device. The mulch will be stockpiled for use in the revegetation of the batters.		mulch stockpiles.																																																									
	Collect Topsoil	Topsoil is a valuable seed source and required for the revegetation of the batters.	After vegetation removal, the top 75 mm of the topsoil will be removed and stockpiled for later use in the revegetation of the batters. The relevant mulch will be placed on top of the respective top soil stockpiles.	PM construction /contractor	Topsoil placed into respective vegetation types - marked out by flagging or signs. Photos of topsoil stockpiles.																#	#	#	#																																							
	Construction	To ensure that the construction of the TRBA is built in compliance with the clearing permit.	Prior to vegetation establishment, site preparation and protection activities will be undertaken in accordance with specifications outlined in Appendix E, Section 3. Specifications of the revegetation plan are built into the scope of work for the construction contractor.	PM construction /contractor	TRBA Construction Scope of works																#	#	#	#																																							
			Ensure compliance with the conditions of the clearing permit and scope of work.	PM construction /contractor	Onsite inspections and evidence required as part of construction tender and scope of works.																#	#	#	#																																							
	Plant propagation	Ensure species of the relevant vegetation communities are available for future planning and that the completion criteria are achieved.	Propagation of species from collected seed to enable the required vegetation to be planted to meet the completion criteria.	Revegetation contractor	Invoices, photos and records of propagation																	#	#	#	#	#	#	#	#				#	#	#	#	#	#	#	#					#	#	#	#	#	#	#	#					#	#	#	#	#	## #
VEGETATION ESTABLISHMENT	Spread Topsoil	Topsoil is a valuable seed source and required for the revegetation of the batters.	The topsoil will be spread onto the revegetation areas, in the corresponding vegetation types, along the northern and southern batters to a depth of 75 mm.	PM construction /contractor	Topsoil placed onto respective batters in the relevant vegetation types - marked out by flagging or signs. Photos of topsoil on batters.																#	#																																									
	Spread Mulch	Mulch will create a cover for the revegetation batters and is a useful method for collecting seed stock from the vegetation, preventing erosion on the	Mulch will be returned to the batters once the topsoil has first been spread and prior to the planting of tube stock.	PM construction /contractor	Mulch placed onto respective batters in the relevant vegetation types - marked out by flagging or signs. Photos of mulch on																#	#																																										

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021) J A S O N D	Year 1 (2021/2022) J F M A M J J A S O N D	Year 2 (2022/2023) J F M A M J J A S O N D	Year 3 (2023/2024) J F M A M J J A S O N D	Year 4 (2024/2025) J F M A M J J A S O N D	Year 5 (2025/2026) J F M A M J
		batters and a sustainable method for disposing of the vegetation.			batters.						
	Install coir matt installation	Stabilise and prepare surface batters for planting	Matting will be installed using City contractor and specifications	PM/Construction contractor	Suitable Matting placed on respective batters						
	Planting of tube stock and salvaged plants	Planting of tube stock and salvaged plants will assist in stabilising the batters and assist in achieving the completion criteria.	Tube stock and salvaged plants will be established to meet the specified completion criteria, and in accordance with Appendix 2.	Revegetation contractor	Photos of planted revegetation sites	#	#	#	#	#	#
	Dieback Mitigation	Disease (such as dieback) could potentially be introduced or spread from this project area. The introduction of disease could result in a significant threat to the vegetation.	The TRBA scope of works and associated technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases in to or from the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and leaving site.	Construction, seed and weed management Contractors	Records shall be kept by the contractor verifying the requirements of pathogen and weed management, as required in the scope of works and technical specifications.	#	#	#	#	#	#
	Watering	Watering the revegetation will be required to assist in the establishment of the plants.	As specified in Appendix 2	Revegetation contractor	Contractor invoices	#					
MONITORING	Weed management	To manage the potential recruitment of weeds over the rehabilitation maintenance period.	Monitor the emergence of weeds as part of the annual revegetation monitoring program.	Botanical Consultant	Weed monitoring results included in the annual monitoring report.			xx xx xx	xx xx xx	xx xx xx	xx
	Maintenance of rubbish, fencing, signage and gates	Ensure measures are effective in managing potential impacts to the revegetation site and completion criteria are achieved.	Monthly rubbish and maintenance inspection and pickup	PM/ Contractor	Contractor invoices Photos						
	Dieback Mitigation	Dieback could potentially be introduced to or spread from, this project area. The introduction of disease could result in a significant threat to the vegetation.	The scope of works and technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases in to or from the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and	Construction, seed and weed management Contractors	Records shall be kept by the contractor verifying the requirements of pathogen and weed management						

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MAMJJASO NDJFMAMJ
			leaving site.																																																											
	Monitoring of unauthorised vehicles	Unauthorised vehicles cause damage and destruction of vegetation and exacerbate erosion of landscapes.	The activity of unauthorised vehicles will continue to be monitored throughout this project, with relevant actions implemented, as required.	PM/ Contractors	Evidence of implemented actions by relevant party e.g. Photos	As required																																																										
	Monitoring of revegetation site	To ensure that the revegetation site is complying with the completion criteria	Monitoring of the vegetation site each September to monitor compliance with the completion criteria and develop contingency for criteria not being achieved - needs to be done before replanting but also as per EPA guidelines	Botanical Consultant	Revegetation monitoring results included in the annual monitoring report.																											xx	x x	x x						x				xx	x x	x x						xx				xx	x x	x x				
MAINTENANCE	Weed management	To manage the potential recruitment of weeds over the rehabilitation maintenance period.	Implement a weed management program (in accordance with specifications outlined in Appendix E, Section 3) throughout the year to effectively manage the emergence and spread of weeds.	Weed Management contractor	Weed contractor invoices																									* *		**						* *	* *	**		* *		**						* *	* *	**										
	Watering	Where criteria listed in Table 7 are identified as 'at risk' of meeting targets, contingency measures such as remedial planting and watering will be implemented.	Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E, Section 3.	PM and revegetation contractor	Contractor invoices																																																											
	Plant infill and propagation	Assessment against the rehabilitation success monitoring reports and the Planting of tube stock and salvaged plants will assist in stabilising the batters and assist in achieving the completion criteria.	Tube stock and salvaged plants will be established to meet the specified completion criteria, and in accordance with Appendix 2 and assessment against the monitoring reports.	PM/Revegetation contractor	Photos of planted revegetation sites																																																											
	Remedial planting	Where criteria listed in Table 7 are identified as 'at risk' of meeting targets, contingency measures such as remedial planting and watering will be implemented.	Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E, Section 3.	PM and revegetation contractor	Contractor invoices Photos																																																											

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M A M J J A S O N D J F M A M J
	Inspection of fencing and revegetation areas	Ensure measures are effective in managing potential impacts to the revegetation site and completion criteria are achieved.	Where criteria listed in Table 7 are identified as 'at risk' of meeting targets, contingency measures such as remedial planting and watering will be implemented. Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E, Section 3.	PM and contractors	Contractor invoices Photos																																																						
REPORTING	Compliance report to DWER	Ensure the clearing permit conditions are complied with and that the revegetation is achieving the completion criteria.	Requirements of clearing permit are monitored and reported in an approved DWER format	PM Revegetation contractor	DWER receive reports as required under Clearing Permit																							#														#														#										

Legend

*	Contingency - dependant on results of monitoring
**	Dependant on rainfall
#	Dependant on approvals

SAMEO = Strategic Asset Management Environmental Officer (City of Wanneroo)

PM = Project Manager (City of Wanneroo)

Table 9: Rehabilitation Schedule – Offset Site

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MA M J J A S O N D J F M A M J
SITE PREPERATION	Vegetation assessment and CPS application for fencing and gate	Ensure that all relevant approvals are acquired for the offset site	CPS application	SAMEOs	CPS licence									#																																										
	Environmental conditions included in contracts	Ensure environmental conditions of licence are understood and complied with - including the GPS locations of the clearing boundary	Include conditions of CPS in contracts	PM construction /contractor	CPS licence Shapefiles										#	#	#	#	#	#																																				
	Dieback & Pathogen Mitigation	Dieback could be introduced or spread from the construction extent, which could result in a significant threat to the vegetation.	The scope of works and associated technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases in to or from the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and leaving site.	UXO, Construction, seed and weed management contractors	Records verifying the requirements of pathogen and weed management, as required in the scope of works and technical specifications.															#	#	#	#	#																																		
	Demarcate vegetation areas	To ensure no one breaches the approved clearing area and the mulch/vegetation is stockpiled in corresponding vegetation areas	Survey to demarcate the clearing and vegetation areas prior to UXO and construction with appropriate flagging and survey posts	PM, Contractors and Survey	Photographic evidence of demarcation of clearing footprint and mulch stockpiles. Surveyed area and shapefiles provided of total cleared area after completed works.																																																					
	UXO search - TRBA and offset site	To eliminate UXO risk	Mulch from UXO - remains in construction area for amalgamating into topsoil layer.	PM and UXO contractor	Shapefiles photos before and after UXO																																																				
	Initial Rubbish Removal	Waste should be lawfully removed and disturbance and handling of topsoil minimised during the construction and rehabilitation processes. Increased handling of topsoil could lead to an incremental loss of topsoil	An inspection of the construction extent will be completed prior to the commencement of construction to ensure that all waste is identified, hand-picked and removed.	PM Revegetation/ contractor	Waste removal receipts and applicable controlled waste documentation														#																																							

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MA M J J A S O N D J F M A M J
		and reduced potential seed source for rehabilitation.																																																												
	Seed Collection	Seed will be collected from the relevant vegetation communities to ensure completion criteria is achieved (species richness)	Local provenance species will be sourced from Two Rocks and other reserves suitable for supplying the seed quantities required to meet completion criteria	PM and seed contractor	Seed collection and storage receipts																																																										
VEGETATION ESTABLISHMENT	Demarcation of vegetation types	Ensure compliance with the approved rehab plan and planted in the relevant vegetation types.	Each of the vegetation types that transect within the offset will be demarcated before rev commences, as outlined in the tender document. E.g. TRBA colour coding, after UXO search	PM Revegetation/ contractor	Photographic evidence of completed works.																#	#	#	#																																								
	Installation of fencing and gates	Stop unauthorised access. Fencing will protect the revegetation areas and adjacent bushland	Installation of deterrent e.g. large boulders after UXO search and fencing) before construction) along construction extent, in accordance with Appendix 2, Section 3.	PM Revegetation/ contractor	Photos of deterrents and fencing.																#	#	#	#	#	#	#																																						
	Revegetation	To ensure that the rehab of the offset is built in compliance with the approved RRP	Prior to vegetation establishment, site preparation and protection activities will be undertaken in accordance with specifications outlined in Appendix E, Section 3. Specifications of the revegetation plan are built into the scope of work for the rehab contractor.	PM Revegetation/ contractor	TRBA Construction Scope of works																#	#	#	#																																								
			Ensure compliance with the conditions of the approved RRP and scope of work	PM Revegetation/ contractor	Onsite inspections and evidence required as part of scope of works.																#	#	#	#																																								
	Plant propagation	Ensure species of the relevant vegetation communities are available for future planning and that the	Propagation of species from collected seed to enable the required vegetation to	Revegetation contractor	Invoices, photos and records of propagation																														#	#	#	#	#	#	#	#					#	#	#	#	#	#	#	#					#	#	#	#	#	# # # # # # # # # # #

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MAMJJASONDJFMAMJ
		completion criteria are achieved.	be planted to meet the completion criteria.																																																											
	Planting of tube stock and salvaged plants	Planting of tube stock and salvaged plants will assist in stabilising the batters and assist in achieving the completion criteria.	Tube stock and salvaged plants will be established to meet the specified completion criteria, and in accordance with Appendix 2.	Revegetation contractor	Photos of planted revegetation sites																																				#												#									# #
	Dieback Mitigation	Disease (such as dieback) could potentially be introduced or spread in this project area. The introduction of disease could result in a significant threat to the vegetation.	The TRBA scope of works and associated technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases in to or from the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and leaving site.	Construction, seed and weed management Contractors	Records shall be kept by the contractor verifying the requirements of pathogen and weed management, as required in the scope of works and technical specifications.																																				#												#									# #
	Watering	Watering the revegetation will not be possible on this site due to its proximity																																																										
MONITORING	Weed management	To manage the potential recruitment of weeds over the rehabilitation maintenance period.	Monitor the emergence of weeds as part of the annual revegetation monitoring program.	Botanical Consultant	Weed monitoring results included in the annual monitoring report.																														**	**	**							**				**	**	**							**				**	**	**				** ** ** ** **
	Monitoring of revegetation site	To ensure that the revegetation site is complying with the completion criteria	Monitoring of the vegetation site each September to monitor compliance with the completion criteria and develop contingency for criteria not being achieved - needs to be done before replanting but also as per EPA guidelines	Botanical Consultant	Revegetation monitoring results included in the annual monitoring report.																																											**	**	**							**				**	**	**				** ** ** ** **
MAINTENANCE	Weed management	To manage the potential recruitment of weeds over the rehabilitation maintenance period.	Implement a weed management program (in accordance with specifications outlined in Appendix E, Section 3) throughout the year to effectively manage the emergence and spread of weeds.	Weed Management contractor	Weed contractor invoices																													**		**						**	**	**		**		**						**	**	**											

Stage	Action	Purpose	How	Responsibility	Compliance Criteria	Year 0 (2020/2021)						Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)					Year 5 (2025/2026)
						J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	MAMJJASONDJFMAMJ
	Plant infill and propagation	Assessment against the rehabilitation success monitoring reports and the Planting of tube stock and salvaged plants will assist in stabilising the batters and assist in achieving the completion criteria.	Tube stock and salvaged plants will be established to meet the specified completion criteria, and in accordance with Appendix 2 and assessment against the monitoring reports.	PM/Revegetation contractor	Photos of planted revegetation sites																																															
	Remedial planting	Where criteria listed in Table 7 are identified as 'at risk' of meeting targets, contingency measures such as remedial planting and watering will be implemented.	Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E, Section 3.	CoW and revegetation contractor	Contractor invoices Photos																																														
	Inspection of fencing and revegetation areas	Ensure measures are effective in managing potential impacts to the revegetation site and completion criteria are achieved.	Where criteria listed in Table 7 are identified as 'at risk' of meeting targets, contingency measures such as remedial planting and watering will be implemented. Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E, Section 3.	CoW	Contractor invoices Photos																																														
	Maintenance of rubbish, fencing, signage and gates	Ensure measures are effective in managing potential impacts to the revegetation site and completion criteria are achieved.	Monthly rubbish and maintenance inspection and pickup - BIMONTHLY	CoW	Contractor invoices Photos																																														
ONGOING	Dieback Mitigation	Dieback could potentially be introduced to. or spread from, this project area. The introduction of disease could result in a significant threat to the vegetation.	The scope of works and technical specification includes the requirement to not introduce or spread any declared pests, weeds or diseases in to or from the project area, as a result of the work performed by the contractor. This includes the cleaning of machinery prior to entering and leaving site.	Construction, seed and weed management Contractors	Records shall be kept by the contractor verifying the requirements of pathogen and weed management																																														

Stage	Action	Purpose	How	Responsibility	Compliance Criteria
	Monitoring of unauthorised vehicles	Unauthorised vehicles cause damage and destruction of vegetation and exacerbate erosion of landscapes.	The activity of unauthorised vehicles will continue to be monitored throughout this project, with relevant actions implemented, as required.	Monitor project area – PM & Reveg Contractor	Evidence of implemented actions by relevant party e.g. Photos
REPORTING	Compliance report to DWER	Ensure the clearing permit conditions are complied with and that the revegetation is achieving the completion criteria.	Requirements of clearing permit are monitored and reported in an approved DWER format	CoW	DWER receive reports as required under Clearing Permit

Action	Year 0 (2020/2021)												Year 1 (2021/2022)												Year 2 (2022/2023)												Year 3 (2023/2024)												Year 4 (2024/2025)								Year 5 (2025/2026)
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	MA M J J A S O N D J F M A M J
Monitoring of unauthorised vehicles	As required																																																								
Compliance report to DWER																							#												#												#										

Legend

*	Contingency - dependant on results of monitoring
**	Dependant on rainfall
#	Dependant on approvals

Table 10: Rehabilitation Species List

SPECIES	PLANTS REQUIRING PROPAGATION											
	Two Rocks Beach Access Site							Offset Site				
	A1	A2	A3	B1	C1	D1	Total	A1	A2	A3	B1	Total
Acacia cyclops			500 200 100	2000 800 400	100 100 100		2600 1100 600				2650 2100 2100 100	2650 2100 2100 100
Acacia l. var. lasiocarpa					500 500 300		500 500 300				50 50 20	50 50 20
Acacia rostellifera					50 50 50		50 50 50				1500	1500
Acacia xanthina					100 100 100	1000 800 400	1100 900 500					
Acanthocarpus preissii				1500 1500	500 500 500	2100 1200 300	3200 3200 800				1500 1000 250 100	1500 1000 250 100
Allocasuarina l. subsp. lehmanniana						800 250 100	800 250 100					
Atriplex isatidea	1500 200 100						1500 200 100		50 20			50 20
Carex thecata						200 100 100	200 100 100					
Carpobrotus virescens			1200 500 200	700 300 100			1900 800 300			100 50	2500 2000 1000 100	2600 2050 1000 100
Clematis linearifolia					50 50 50		50 50 50					
Conostylis candicans subsp. calcicola				500 500	50 50		550 550					

SPECIES	PLANTS REQUIRING PROPAGATION											
	Two Rocks Beach Access Site							Offset Site				
	A1	A2	A3	B1	C1	D1	Total	A1	A2	A3	B1	Total
				200	50		250					
Conostylis c. subsp. candicans					50 50 50		50 50 50				100 100 40 100	100 100 40 100
Cryptandra mutila					50 50 50		50 50 50					
Dianella revoluta var. divaricata					100 50 50	300 300 100	400 350 150					
Dodonaea aptera					150 200 100	300 300 400	450 500 500					
Eremophila glabra subsp. albicans					50 50 50		50 50 50					
Exocarpos sparteus				100 200 100			100 200 100					
Ficinia nodosa				1300 800 400			1300 800 400	30			3000 2000 1500 200	3030 2000 1500 200
Gastrolobium nervosum					200 200 200		200 200 200					
Gompholobium tomentosum				50	50 50		50 50 50					
Guichenotia ledifolia					200	200 200	200 200 200					
Hardenbergia comptoniana				200 300 100	50 50 50		250 350 150				1000 500 200 200	1000 500 200 200

SPECIES	PLANTS REQUIRING PROPAGATION											
	Two Rocks Beach Access Site							Offset Site				
	A1	A2	A3	B1	C1	D1	Total	A1	A2	A3	B1	Total
Hemiandra glabra				300 300 300	50 50 50		350 350 350				500 200 100 100	500 200 100 100
Kennedia prostrata					50 50 50	500 250 250	550 300 300					
Lepidosperma gladiatum						1200 1000 800	1200 1000 800				2000 1550 1000 500	2000 1550 1000 500
Leptomeria preissiana			100 100 50	100 100 50	100 100 50	50 50 50	350 350 200				300 200 100 50	300 200 100 50
Leucophyta brownii										60 30	1500 1500 1000 200	1560 1530 1000 200
Leucopogon insularis					50 50 50	200 200 200	250 250 250					
Leucopogon parviflorus					50 50 50	200 200 200	250 250 250					
Lomandra maritima					1500 1000 500	2000 2500 1000	3500 3500 1500				1200 600 600 300	1200 600 600 300
Melaleuca cardiophylla						2200 1100 800	2200 1100 800					
Melaleuca h. subsp. huegelii						1000 100 100	1000 100 100				250 250 120 120	250 250 120 120
Melaleuca systena					800 600	1200 1200	2000 1800				50 50	50 50

SPECIES	PLANTS REQUIRING PROPAGATION											
	Two Rocks Beach Access Site							Offset Site				
	A1	A2	A3	B1	C1	D1	Total	A1	A2	A3	B1	Total
					400	800	1200				20 70	20 70
Myoporum insulare			300 1000 500	750 1500 750		500 250 250	1500 2750 1500				1050 1050 550 250	1050 1050 550 250
Olax benthamiana					100 100 100		100 100 100					
Olearia axillaris		3300 300 200	7250 500 300	2250 750 400	200 50 50	500 100 500	13500 1700 1000	20	50 20 50	150 50 50	5300 2800 2000 500	5520 2870 2250 500
Opercularia vaginata					200 100 200		200 100 200					
Phyllanthus calycinus					100 100 100		100 100 100					
Pimelea ferruginea					100 100 100		100 100 100				550 550 120 120	550 550 120 120
*Pithocarpa cordata**			700 100 50	800 200 100		80 50 50	1580 350 200					
Rhagodia b. subsp. baccata		1000 100 100	2200 100 100	2000 500 250		700 200 100	5900 900 550				1550 1550 1050 250	1550 1550 1050 250
*Santalum acuminatum^*				300 100 50		300 100 50	600 200 100					
Scaevola crassifolia		1300 200 200		5800 1600 1000			7100 1800 1200	50			5400 3300 2650 500	5450 3300 2650 500

SPECIES	PLANTS REQUIRING PROPAGATION											
	Two Rocks Beach Access Site							Offset Site				
	A1	A2	A3	B1	C1	D1	Total	A1	A2	A3	B1	Total
Scaevola t. subsp. Thesioides					200 100 200		200 100 200					
Senecio pinnatifolius var. latilobus			100 100 50	400 200 100	100 50 50		600 350 200					
Spinifex hirsutus	700 500 200						700 500 200		100 50 50	150 50 50		250 100 100
Spinifex longifolius	7800 500	10300 750	13100 750	2500 200			25650 2200	300 200 100	300 200 100	500 300 200	3000 3000 2000 500	4100 3700 2400 500
Spyridium globulosum				2000 1500 800	300 150 100	1000 750 400	3300 2400 1300				1100 1050 1050 250	1100 1050 1050 250
Templetonia retusa					200 100 200	300 300 300	500 400 400				50 50 20 20	50 50 20 20
Thomasia triphylla						100 100 100	100 100 100					
Threlkeldia diffusa				1000 200 200			1000 200 200				1000 1000 500 500	1000 1000 500 500
Tricoryne elatior						100 100 100	100 100 100					
Trymalium l. var. ledifolium						200 200 200	200 200 200					
Westringia dampieri					100 50 50	250 200 200	350 250 250					

Note - 2021-22 2022-23 2023-24 2024-25

***Unsure of propagation success, numbers are an estimate only**

7.3 Topsoil and Mulch

The construction extent of the TRBA, fencing alignment for the offset site and each of the vegetation types that transect within these (in accordance with Figures 3 & 5) will be demarcated before the UXO search and clearing commences. This will enable the contractor to stockpile any mulch and topsoil material from each vegetation types in the marked corresponding area. This process assists with the relevant materials being placed back onto the batters in the areas, and vegetation types, from which they were sourced. Due to the lack of tall canopy and the overall height of the vegetation types within both sites, it is not anticipated that considerable mulch will be recovered.

Vegetation will be trimmed and grubbed from each of the corresponding vegetation types and chipped into mulch, through the use of a vegetation chipping device. As described above, the mulch will be stockpiled and returned to the batters once the topsoil has first been spread (see Schedule – Tables 8 & 9). The mulch will be spread over the revegetation area prior to planting.

The timing of topsoil and mulch spreading is provided in the schedule (Tables 8 & 9). After vegetation removal has occurred within the TRBA construction area, the top 75 mm of the topsoil will then be removed and stockpiled in accordance with the above described practices. The topsoil will be spread onto the revegetation areas, in the corresponding vegetation types, along the southern and northern batters to a depth of 75 mm.

Whilst it is acknowledged that the topsoil may retain a source of weeds, it is not practical to remove the weed infested topsoil as the loss of native seed resource will be a far greater loss. It is more practical to establish a weed management program to target the prominent weed species and reduce the amount of weed seed source that may be stored in the topsoil. After the establishment of plants, a targeted weed program will take place to manage the potential recruitment of weeds over the rehabilitation maintenance period.

7.4 Site Preparation and Protection

Prior to vegetation establishment, site preparation and protection activities will be undertaken in accordance with specifications outlined in Appendix E. Weed treatment for the species listed in Table 4 will be undertaken in the revegetation area. A single rail conservation fence (Appendix E) will be installed along the TRBA and offset site access road to protect the revegetation areas and adjacent bushland. The timing of site preparation activities are provided in the schedule (Tables 8 & 9).

7.5 Maintenance

Maintenance activities will be undertaken following vegetation establishment and site protection activities to ensure measures are effective in managing the disturbances and threats at the revegetation site (Tables 8 & 9) and criteria are on target for meeting completion criteria (Table 7). Post planting weed control will be undertaken in accordance with specifications outlined in Appendix E. Where criteria listed in Table 7 are identified as ‘at risk’ of meeting targets, contingency measures such as remedial planting and watering will be implemented. Maintenance activities will be undertaken where required over the three year period as outlined in Appendix E.

8. Schedule and Budget

A preliminary schedule (Tables 8 & 9) has been developed for site preparation, vegetation establishment, monitoring, maintenance and reporting for the revegetation area. The City of Wanneroo is responsible for implementing the construction and site preparation actions and will resource the revegetation and maintenance of the TRBA and offset sites, utilising technical expertise from existing personnel and contractors. Timing of some actions may be dependent on project approval and schedules (i.e. spreading of topsoil). The schedule will be revised in accordance with project approvals and construction schedules.

A cost estimate for the revegetation and maintenance of the construction extent is provided in Tables 11 & 12. When preparing the cost estimate, some assumptions have been made which include;

- Increase of CPI of 2.5% pa;
- Topsoil and mulch to be supplied free of charge, costs to spread only; and
- That funding will be available to commence seed collection in FY 2022 with revegetation activities following in subsequent financial years.

Table 11: Budget and Costings - TRBA

Actions	Year 1 (21/22)	Year 2 (22/23)	Year 3 (23/24)	Year 4 (24/25)	Year 5 (25/26)	Total
Weed management	$ 18,754.88	$32,821.04	$32,821.04	$32,821.04	$32,821.04	$ 150,039.04
Coir Mesh matting (m2)	$ 158,340.00		$ 4,060.00	$ 4,060.00	$ 4,060.00	$ 170,520.00
Seed collection	$ 62,287.83	$ 26,834.76	$ 14,260.90	$ -	$ -	$ 103,383.49
Salvage of plants	$ 5,947.00	$ -	$ -	$ -	$ -	$ 5,947.00
Plant supply	$ 66,487.00	$ 73,107.50	$ 58,487.50	$ 34,112.00	$ -	$ 232,194.00
Collection and propagation of difficult species	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 40,000.00
Planting of tube stock and salvaged plants	$ 70,490.00	$76,212.50	$64,487.50	$ 38,500.00	$ -	$ 249,690.00
Watering tubestock (6 applications)	$ -	$ 84,588.00	$91,455.00	$77,385.00	$46,200.00	$ 253,428.00
Monitoring of revegetation site	$ -	$ 25,000.00		$ 25,000.00	$ 25,000.00	$ 75,000.00
Maintenance of rubbish	$ 2,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 18,000.00
Maintenance of fencing, signage and gates	$ 1,470.00	$ 1,470.00	$ 1,470.00	$ 1,470.00	$ 1,470.00	$ 7,350.00
Feral Animal Control	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 30,000.00
Traffic control - all activities	$ 8,537.13	$ 27,824.72	$ 29,089.48	$ 24,030.44	$ 18,339.02	$ 107,820.79
Total	$ 410,313.84	$ 367,858.52	$ 316,131.42	$ 257,378.48	$ 147,890.06	$ 1,335,551.53

Table 12: Budget and Costings – Offset Site

Actions	Year 1 (21/22)	Year 2 (22/23)	Year 3 (23/24)	Year 4 (24/25)	Year 5 (25/26)	Total
Weed management	$ 32,821.04	$ 32,821.04	$ 32,821.04	$ 32,821.04	$ 32,821.04	$ 164,105.20
Fencing and Gate Installation TS01-4-2, restricted access gate option 2, bollard fencing.	$ 21,310.00	$ -	$ -	$ -	$ -	$ 21,310.00
Coir Mesh matting (m2)	$ 98,203.28	$ -	$ 2,436.00	$ 2,436.00	$ 8,120.00	$ 111,195.28
Seed collection	$ 15,122.24	$ 12,496.19	$ 9,175.63	$ 3,906.24	$ -	$ 40,700.31
Plant supply	$ -	$ 61,871.50	$ 45,732.90	$ 31,695.60	$ 8,601.30	$ 147,901.30
Planting of tube stock and salvaged plants	$ -	$ 65,555.00	$47,897.50	$ 32,795.00	$ 8,802.50	$ 155,050.00
Monitoring of revegetation site	$ -	$ 25,000.00	$ -	$ 25,000.00	$ 25,000.00	$ 75,000.00
Maintenance of rubbish	$ 1,600.00	$ 1,600.00	$ 1,600.00	$ 1,600.00	$ 1,600.00	$ 8,000.00
Maintenance of fencing, signage and gates	$ 2,950.00	$ 2,950.00	$ 2,950.00	$ 2,950.00	$ 2,950.00	$ 14,750.00
Feral Animal Control	$ 3,000.00	$ 3,000.00	$ 3,000.00	$ 3,000.00	$ 3,000.00	$ 15,000.00
Total						$ 738,012.09

9. Monitoring and Analysis

Monitoring will be undertaken as outlined in Table 8 & 9 to ensure the criteria are on target and will inform contingency measures where required. An environmental specialist experienced in surveying and analysing flora and vegetation on the Swan Coastal Plain will be engaged to undertake monitoring. The specialist will be required to collect flora and vegetation data for analysis of species richness, number of surviving plants, weed coverage, presence of declared weeds and other potential impacts, as described in Section 4. A report shall be prepared in accordance with Appendix C of '*A Guide to Preparing Revegetation Plans for Clearing Permits'* and provided to DWER as required by the clearing permit conditions *(*DWER, 2018).

Personnel will undertake an inspection of the revegetation site (asset inspection) every month to ensure site protection measures (i.e. fencing) are providing the relevant functions to the revegetation site and identify any issues that require maintenance. Actions to rectify issues within the revegetation site will be implemented in a timely manner by raising work orders and/or engaging a contractor.

Timing for monitoring and reporting are outlined in the project schedule provided in Tables 8 & 9.

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11. Appendices

Appendix A: Flora and Vegetation Survey – Two Rocks Beach Access

Appendix B: Site Photos and Comparison of Vegetation Types between TRBA and the Offset

1. Vegetation Type A1: Young fore dune with Grassland of *Thinopyrum distichum*

a) TRBA

b) Offset

2. Vegetation Type A2: Established foredune with Sparse Shrubland *Olearia axillaris* over Grassland *Spinifex longifolius and Thinopyrum distichum*.

a) TRBA

b) Offset

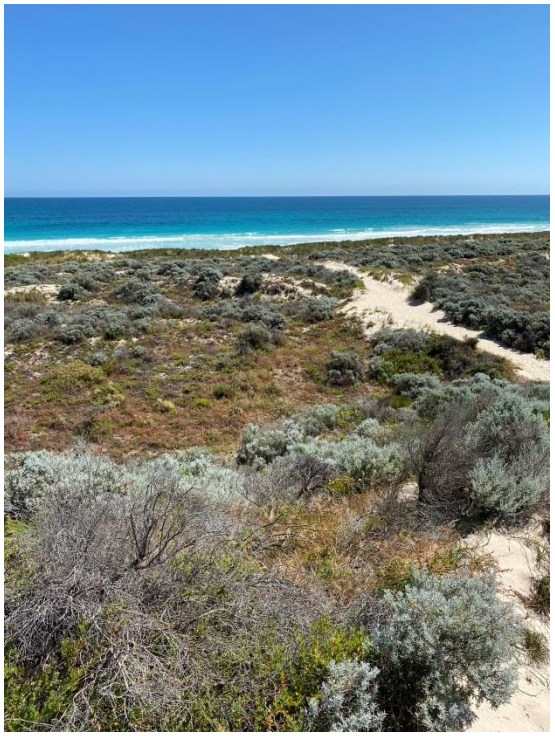
3. Vegetation Type A3: Beach ridge plain with Open Shrubland *Olearia axillaris* and **Pelargonium capitatum* over Sparse Grassland *Spinifex longifolius*.

b) TRBA

b) Offset

4. Vegetation Types A1-A3: Overview showing series of low dunes that constitute a beach ridge plain.

c) TRBA



b) Offset

5. Vegetation Type B1: Secondary Dune with Shrubland dominated by *Acacia cyclops, Scaevola crassifolium, Spyridium globulosum, Santalum acuminatum, Myoporum insulare, Olearia axillaris, Rhagodia baccata subsp. baccata and Acanthocarpus preissii*

d) TRBA

b) Offset

Appendix C: Vegetation Assessment of Offset Site

Appendix D: Vertebrate Fauna Survey – Two Rocks Beach Access, Two Rocks (Terrestrial Ecosystems, 2020)

Appendix E: Technical Specifications (City of Wanneroo, 2020)