

OPEN SPACE MANAGEMENT PLAN

Prepared for:
M38 Industrial Estate

May 2019



ADDRESS: 60 Stapylton Jacobs Well Road, Stapylton
REAL PROPERTY DESCRIPTION: Lot 501 on SP295994
PREPARED FOR: M38 Industrial Estate
DATE PREPARED: MAY 2019

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GDP Document Control

Originating Office:	Yatala	Job Number:	5738
Physical Address:	76 Business Street	Job Name:	KS8 Pty Ltd.
	Yatala	Project Manager:	Brian Gassman
	QLD 4207	Document Title:	Open Space Management
Postal Address:	PO Box 392	Plan	
	BEENLEIGH.Q. 4207	Author:	Kathryn Tibbles
Phone:	+61 7 3807 3333	Client:	KS8 Pty Ltd
Fax:	+61 7 3287 5461	Client Contact:	Daniel Farquhar
Email:	mail@gassman.com.au	Client Reference:	
Web:	www.gassman.com.au		

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No.	Author	Reviewer
1. V1.0	Kathryn Tibbles	Mitchell Gassman

Approval for Issue

Version	Name	Position	Signature	Date
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1 Introduction

1.1 Purpose

This Open Space Management Plan (OSMP) has been prepared for the purposes of maintaining the proposed Open Space dedication area on the subject site.

This OSMP has been prepared in accordance with the City of Gold Coast SC6.11 Land Development Guidelines and SC6.12 City Plan Policy – Landscape Work.

The purpose of this OSMP is to provide the following information in accordance with Condition 25 of the Preliminary Approval 201800656:

- 1 Summary of OSMP inclusions;
- 2 Construction, establishment and ongoing management outcomes;
- 3 Rehabilitation Works; and
- 4 Relocation of the wedge tailed eagle nest.

The broad aim of this OSMP is to provide Council Officers with confidence that the proposed Open Space Park Area will function appropriately in the context of the proposed development (and surrounding environment) whilst simultaneously meeting Council's requirements for the park's ongoing operation.

2 Site Description and Proposal

Site Owners	KS8 Pty Ltd
Location	60 Stapylton Jacobs Well Road, Stapylton
Legal Description	Lot 501 SP295994
Development Application	Staged Industrial Subdivision in accordance with PA 201800656

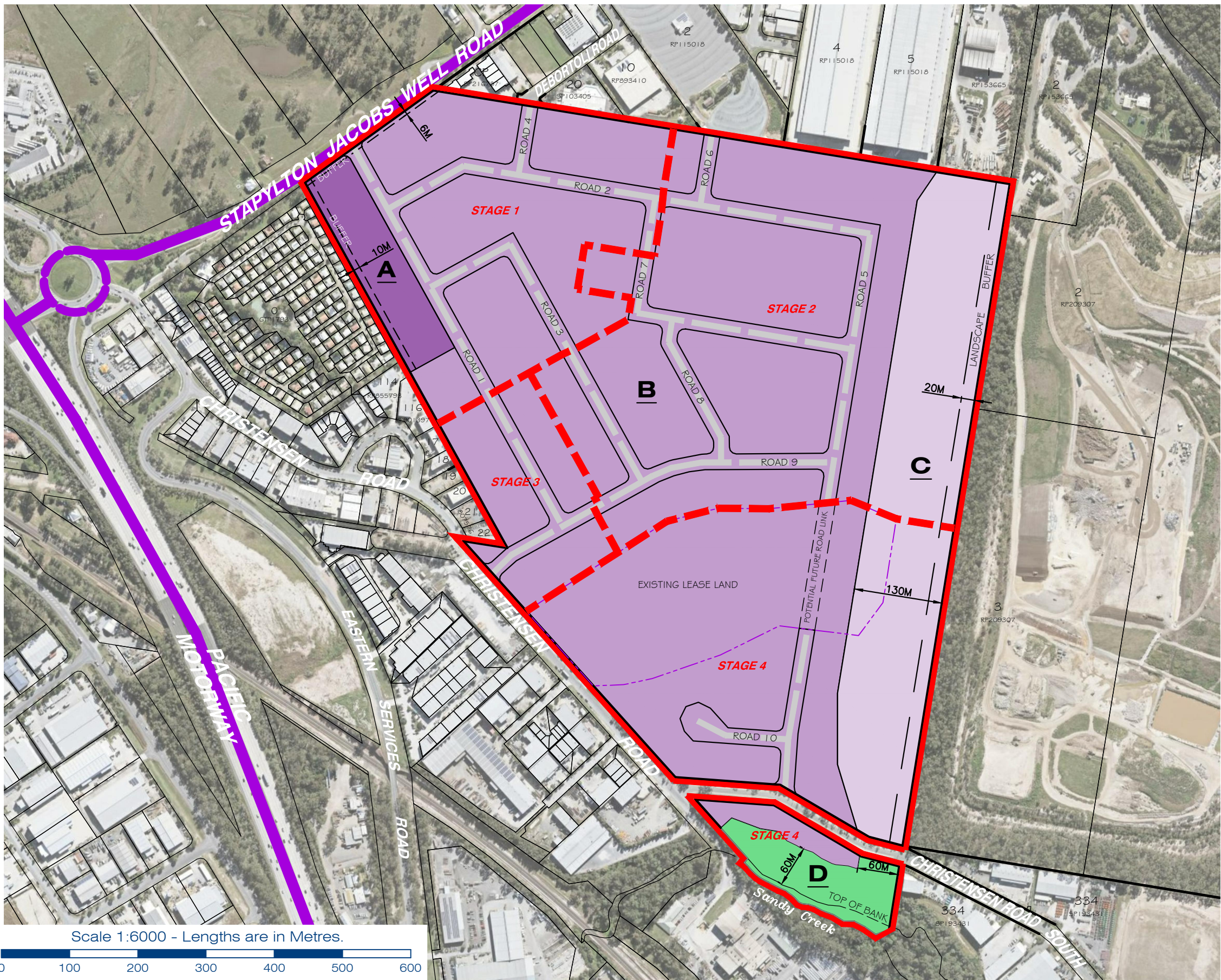
2.1.1 Site Characteristics

The subject site is described as Lot 501 SP295994 and is situated on 60 Stapylton Jacobs Well Road, Stapylton. The site is bordered by Stapylton-Jacob's Well Road in the northwest, industrial development to the north, industrial and housing development to the west, a land fill site to the east, and Sandy Creek to the south.

Approximately half of the area of the combined subject site had been cleared previously and was used for pastoral purposes. The remainder of the property previously contained remnant vegetation, however at the time of writing this Open Space Management Plan, all of the remaining vegetation has been cleared in accordance with Vegetation Clearing OPW approvals, with the exception of the proposed Open Space area, where vegetation is required to be retained.

2.1.2 Proposed Development

The development application that this report supports is for a staged industrial subdivision with road network and stormwater treatment areas. The area proposed to be dedicated as Open Space subject to this report is located to the south of Christensen Road and shown as Precinct D – Open Space on the approved Land Use and Staging Plan shown on the following page.



LEGEND

Site Area: 73.114 Ha

- Limit of Application
- Major State controlled Roads
- Possible future industrial collector road
- Existing lease land extent

A	LOW IMPACT AND SERVICE INDUSTRY	2.41 Ha
B	GENERAL IMPACT BUSINESS & INDUSTRY	56.4311 Ha
C	LIMITED GENERAL IMPACT BUSINESS & INDUSTRY	12.193 Ha
D	OPEN SPACE / RESERVE	1.31 Ha

STAGE	AREA
STAGE 1	16.20Ha
STAGE 2	29.76Ha
STAGE 3	4.81Ha
STAGE 4	22.343Ha

NOTE:

- The landscaped buffer areas shall be established and maintained for the life of the development. No building works are to occur within the landscape buffer areas unless otherwise approved by the Chief Executive Officer;
- Roadworks and land dedication associated with Road 1, Christensen Road, Eastern Service Road and Christensen Road South will be subject to the detailed design for Stage 3 & 4 of the development;
- Lot access on the southern side of Christensen Road South is subject to further evaluation and approval following the detailed design of roadworks in Stage 3 & 4 of the development;

PLANS AND DOCUMENTS referred to in the DEVELOPMENT APPROVAL

Application No: MCU201701550

Dated: 21 November 2018

Development shall comply with the conditions of approval as detailed in the Decision Notice and Council's Planning Scheme, Local Laws and Planning Policies

Scale at A3:	1:6000			
Date:	07-08-18			
Design:	.			
Drawn:	RM			
Checked:	BC			
D	07/08/2018	AMEND ZONE A & ADD ROAD NUMBERING	RM	BC
C	30/05/2018	MINOR UPDATES	RM	BC
B	11/05/2018	POSSIBLE FUTURE COLLECTOR ROADS	RM	BC
A	08/02/2018	ORIGINAL ISSUE	RM/SH	BC
Issue	Date	Description	DRN	CHK

Project: Stapylton-Jacobs Well Road, Stapylton

Client: KS8 Pty Ltd

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M38 INDUSTRIAL ESTATE
Land Use Classification and Staging Plan

Drawing No: 5738 P 001
Revision No: D

2.1.3 Summary of Open Space Areas

The aim of the Open Space area is to protect and restore a 60m buffer to Sandy Creek riparian zone to a functional ecological corridor consistent with expected outcomes under the City Plan for this area. The proposed Open Space area is identified in the Land Use and Stage Plan, and the plans within Appendix 1 and 2. Corridor and fauna connectivity values will be enhanced, and weed incursions minimised. An approach of primarily natural assisted regeneration through weed management will be facilitated to achieve the outcomes required for this area prior to dedication to Council.

A key function off the proposed Open Space area will also be to provide a secure and suitable location for the Wedge Tailed Eagle (*Aquila audax*) nest which has been relocated from the part of the site that has been cleared for the industrial subdivision. The approved Wedge Tailed Eagle Relocation Management Plan, details the specific requirements for the nest relocation and ongoing monitoring, and should be read in conjunction with this Open Space Management Plan.

Access to the proposed Open Space area will be provided directly off Christensen Road South.

2.1.4 Approvals for the Site

At the time of writing this OSMP, the site has an overarching Preliminary Approval (ref 201800656), approved Reconfiguring a Lot (ROL) and Operational Works (OPW) approvals for Stage 1 of the development (ref ROL201800079/OPW201800485/OPW201800486), and an OPW approval for vegetation clearing (ref OPW20181219) over the balance of the site excluding the area to be dedicated as Open Space. Both OPW approvals for Stages 1 and the balance have been acted upon, and vegetation clearing completed.

3 Relevant Development Constraints

The Open Space area has been assessed against possible constraints imposed upon it by Federal Government Departments, State Government Departments, Local Authorities and inherent physical constraints of the site.

3.1.1 Federal Government Constraints

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been enacted to protect the environment, particularly matters of National Environmental Significance. The Australian Government Department of Environment administers the EPBC Act and implements the Act, in part, via the Department's 'Protected Matters' environmental database tool.

The Protected Matters Database generates a report (based on a defined grid search area) that helps determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in or around the subject site. The information provided in the report is indicative only, and corroboration with a ground-truthing investigation is required.

An indication of possible Protected Matters, as they relate to the site and surrounding area, include:

- 1 x Wetland of International Significance;
- 3 x Threatened Ecological Communities (being within the general area);
- 67 x Threatened Species (being within the general area);
- 45 x Migratory Species (being within the general area).

The grid search area was identified as being within the same catchment area as the Moreton Bay RAMSAR Wetland of International Importance, with potential for the occurrence of the following threatened ecological communities;

- Lowland Rainforest of Subtropical Australia
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- White Box – Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

A ground-truthing investigation has determined there are no wetlands of International Significance present on site. An investigation of the potential habitat of the site indicated that the site was not likely to support significant populations of any listed species and did not contain the identified TEC.

It is considered that the site is not significantly or onerously constrained by matters of national significance.

3.1.2 State Government Constraints

Upon assessing the site against Department of Natural Resources and Mines (DNRM) Regional Ecosystem Mapping (to assess the site against the provisions of the *Vegetation Management Act 1999*) it has been noted that the site contains Category B vegetation. The area proposed to be dedicated as Open Space is mapped with remnant Least Concern RE 12.11.5/12.11.24 (85:15), and non regulated Category X vegetation (see **Figure 1**).

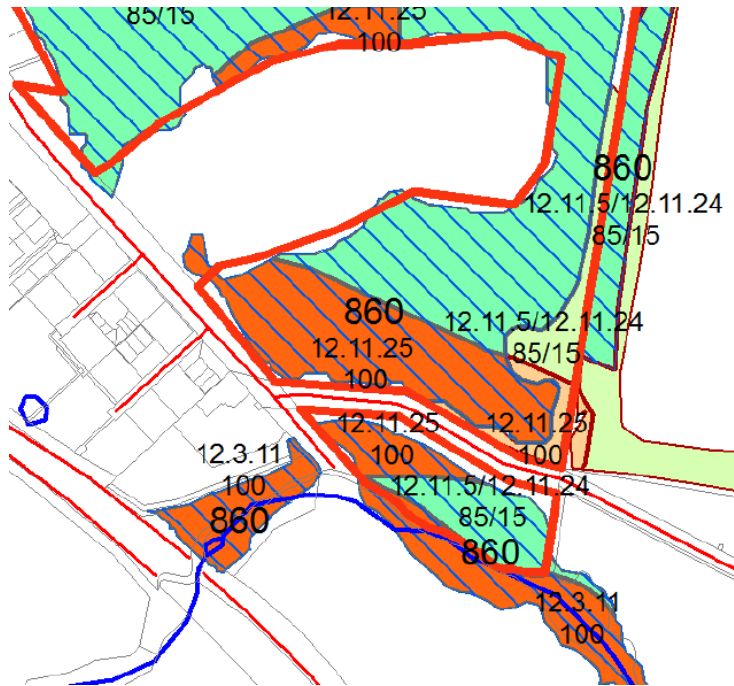


Figure 1: Excerpt of DNRM Vegetation Management Supporting Map

RE 12.11.5 Least Concern

Description:

Corymbia citriodora subsp. *variegata* open forest to woodland, usually including *Eucalyptus siderophloia*/*E. crebra* (sub coastal ranges), *E. propinqua* and *E. acmenoides* or *E. carnea*. Other species that may be present and abundant locally include *Corymbia intermedia*, *C. trachyphloia* subsp. *trachyphloia*, *Eucalyptus tereticornis*, *E. microcorys*, *E. portuensis*, *E. helidonica*, *E. major*, *E. longirostrata*, *E. biturbinata*, *E. moluccana* and *Angophora leiocarpa*. *Lophostemon confertus* often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Occurs on hills and ranges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. (BVG1M: 10b)

RE 12.11.24 Endangered

Description:

Eucalyptus carnea, E. tindaliae, Corymbia intermedia woodland +/- E. crebra or E. siderophloia, Eucalyptus resinifera, Eucalyptus major, E. helidonica, Angophora woodsiana, C. trachyphloia, E. microcorys, Corymbia citriodora subsp. variegata, C. henryi. Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics usually at altitudes <300 metres. (BVG1M: 9g)

Closely associated with the Regional Ecosystem Mapping is the Department of Environment and Science (DES) Referable Wetland Database. A search of the site using the Referable Wetland Mapping Tool indicates that the site is not constrained by natural wetlands deemed significant.

The South East Queensland Koala Conservation State Planning Regulatory Provision (SPRP) and State Planning Policy 2/10: Koala Conservation in South East Queensland (SPP) are made under the *Sustainable Planning Act 2009* (SPA). SPRP trigger maps revealed that the subject site does not fall in a mapped assessable development area of Koala habitat.

3.1.3 Local Government Constraints

The Gold Coast City Plan 2014 has identified the following development constraints over the site:



Bushfire Hazard area

The bushfire Hazard overlay map indicates that the proposed open space area may be affected by medium bushfire risk adjacent to Sandy Creek. The remainder of the site will be entirely cleared of vegetation and will be considered a low bushfire risk. The area proposed to be dedicated as Open Space will be limited to the buffer provided along Sandy Creek – which in itself will reduce the potential bushfire hazard. Development adjacent to the open space area will need to address the Bushfire Hazard Code as part of any future individual Lot MCU or ROL applications.



Environmental Significance - Priority Species

The proposed Open Space area is mapped within the Environmental Significance – priority species overlay. The areas within this overlay are almost wholly contained within the proposed Open Space area.

Environmental Significance - Vegetation Management

The proposed Open Space area is mapped within the Environmental Significance – vegetation management overlay as containing Medium Value Vegetation.

Environmental Significance - Wetlands and Waterways

A waterway areas is mapped along the southern boundary of the proposed open space area within the Environmental Significance – wetlands and waterways overlay. The areas within this overlay mapped on the site are entirely contained within the proposed Open Space area.

3.1.4 Physical Constraints

There are no significant physical constraints to the OSPA.

4 Park Dedication and Design

This section of the OSMP will provide details about the design of the Open Space area, including the rationale as to how the area was determined. In addition to design determinants, this section will also provide comment on the features of the area.

<i>Parkland, Size, Shape and Distribution</i>	The proposed area of public open space begins to the south of Christensen Road South and extends back to the boundary with Sandy Creek. The Open Space area provides a buffer of 60m to Sandy Creek, and an additional area 60m along the road frontage with Christensen Road South. The proposed Open Space area is 1.74 Ha in size.
<i>Function and Connectivity</i>	The Open Space area has several proposed functions including: • Ecological conservation area; • Habitat interactions and rehabilitation potential; • Aesthetic values; and • Natural drainage. The proposed Open Space area has been principally created to conserve the riparian zone of Sandy Creek in order to enhance the ecological values of the area in addition to maintaining the connectivity values of Sandy Creek. The proposed Open Space area will also provide a secure and suitable location for the Wedge Tailed Eagle nest that has been relocated to the Open Space area in accordance with the approved Wedge Tailed Eagle Relocation Management Plan.
<i>Context</i>	The proposed Open Space area has been designed in the context of its position in relation to surrounding vegetation, specifically to encompass areas of remnant vegetation, and the areas adjacent to Sandy Creek.
<i>Environmental Impact/Protection</i>	A significant rationale for the conservation purpose of the Open Space area, is to assist in providing an ecological link through the site via assisted natural regeneration and a small amount of active

	planting. Particular attention needs to be paid to the site's role in any wider ecological corridor. The Open Space area will also provide a secure and suitable site for the relocated Wedge Tailed Eagle nest.
Access location	Provision for access to the proposed Open Space area is available via Christensen Road South (see Appendix 1). Once this OSMP has been approved by council, a public landscape OPW application will be made detailing the specific location of the proposed access gate to the Open Space area.
Community impact	The Open Space area will have a beneficial impact on the local community by improving the riparian zone of Sandy Creek through assisted natural regeneration and a small amount of active planting. It may set the precedent for future approvals and works on adjacent sites in the wider context of establishing an improved ecology of the area associated with Sandy Creek.
Safety	There are no known safety issues associated with the Open Space area. With the relocation of the Wedge Tailed Eagle nest to this area, there may be potential for falling debris from the nest to occur as the nest breaks down or is repaired. Given that the purpose for this area is ecological conservation, it is not expected that members of the public will come in contact with the nest, therefore this risk is considered to be negligible. As detailed in the Relocation Management Plan, appropriate structural monitoring has been detailed for any structures installed as part of the Wedge Tailed Eagle Nest relocation.

4.1 Design Rationale

The location and design of the proposed Open Space area has been formed by elements including topography, the Vegetation Management Map (DNRME) and location of Category B remnant vegetation, Council's Environmental Significance Overlay Map, and the current approvals which exists over the site.

In consideration of the site's developments constraints (identified earlier), the design of the Open Space area has been influenced as follows:

- It creates a habitat corridor through the site and to link adjacent ecologically significant areas;
- It provides a secure and suitable location for the relocated wedge tailed eagle nest;
- Aesthetically pleasing area enhancing landscape features and native vegetation; and
- Provide a green setting for future development and industry.

4.2 Open Space Area Considerations

Possible constraints that have been identified on site have been incorporated in the design of the proposed public open space area. The following section of the OSMP identifies further constraints and provides information on their mitigation.

4.2.1 Environmental, Cultural or Heritage Preservation

Areas of environmental significance have been incorporated into the proposed Open Space area. As a consequence of development, reasonable and practical measures shall be executed where required in order to meet the duty of care requirements under the *Aboriginal Cultural Heritage Act (2003)*.

4.2.2 Environmentally Significant Functions

A portion of the Open Space area to be dedicated is currently functioning as a waterway corridor which provides for fauna connectivity and a buffer to Sandy Creek. These values will be maintained and enhanced through the proposed assisted natural regeneration of the area. The proposed open space area will also provide a suitable and secure site for the relocated Wedge Tailed Eagle nest in accordance with the Relocation Management Plan.

4.2.3 Wedge Tailed Eagle Nest

In accordance with overarching Preliminary Approval MCU201800656, the Wedge Tailed Eagle nest from the main part of the site subject to the development has been removed and relocated to a new location within the propose Open Space area. A new tree pole was sourced from the clearing of the main site, and installed by Brisbane Power Poles within the Open Space area. A 3m deep hole was dug, and then the new tree pole cemented in. The nest was then placed in an artificial cradle structure, and secured on top of the new tree pole. The location of the relocated nest is shown on the plans within Appendix 1 and 2.

In accordance with Preliminary Approval MCU201800656, a Relocation Management Plan was submitted and approved by City of Gold Coast Council. Monitoring of the relocated Wedge Tail Eagle nest and the structural components of the new tree pole and artificial nest cradle will be undertaken in

accordance with the approved Wedge Tailed Eagle Relocation Plan. The approved Wedge Tailed Eagle Relocation Management Plan is included within Appendix 5.

4.2.4 Rehabilitation

The proposed Rehabilitation Management Plan (RMP) for the Open Space area is contained within Section 5 of this Open Space Management Plan, and the location of the proposed rehabilitation treatment zones detailed in Appendix 2. Natural assisted regeneration through weed management is proposed to be the primary rehabilitation treatment to facilitate an improvement to the ecology of the area.

4.2.5 Delineation of Open Space Park Area

Where the edge of the open space area adjoins road reserve (Christensen Road South), the Open Space area will be delineated through the use of bollards. Where the Open Space area adjoins the adjacent industrial development areas coloured marker posts will be used to delineate the boundary at each change of direction. Both of these required delineation treatments will be detailed as part of a public landscape OPW application which will be prepared and submitted following the endorsement of this Open Space Management Plan.

4.2.6 Embellishments and Fencing

As the intent for the Open Space area is principally to facilitate natural processes and conservation, no public facility embellishments or fencing are proposed within the park.

4.2.7 Access

Access for maintenance and fire management will be provided by direct access off Christensen road South as indicatively shown in Appendix 1. A public landscape OPW application will be lodged to detail the specific location of the access gate following councils endorsement of this Open Space Management Plan.

4.2.8 Vegetation removal

No vegetation removal is proposed within the proposed Open Space area. An existing access track was re-established in order to install the Wedge Tailed Eagle nest as part of the relocation process, however a vegetation OPW was not required for this purpose.

4.2.9 Linkages

As discussed previously, ecological linkages will be embellished on the subject site by assisted natural regeneration, with a small area of active planting.

4.2.10 Bushfire Management

The site is mapped as containing Medium Bushfire Hazard vegetation in the City of Gold Coast City Plan. Given the purpose of the proposed Open Space area is for conservation, no building structures are proposed, and the area is connected to limited adjacent hazardous vegetation occurring along the Sandy Creek corridor, it is not considered necessary to include bushfire risk mitigation measures within the Open Space area. Future development adjacent to the Open Space area will be required to address the Bushfire Hazard Overlay Code as part of any future ROL and MCU applications.

4.2.11 Stormwater and Hydraulic Management Provisions

There are no stormwater and hydraulic management provisions proposed within the Open Space area.

4.2.12 Erosion and Sediment Control Plan

Monitoring and maintenance of the construction phase sediment and erosion control measures implemented on the adjacent development site will be in accordance with IECA's Best Practice Guidelines, the City of Gold Coast Council's Schedule 6 City Plan Policy SC6.9.3.2 Design Objectives – SC6.9.3.2.2 Erosion and Sediment Control (Construction Phase), Relevant Healthy Waterways guidelines and documents, and the Urban Stormwater Planning Guideline (Queensland State Government).

4.2.13 Rubbish Removal

There are some piles of rubbish and old concrete material that have previously been disposed in the Open Space area. All rubbish is required to be removed prior to rehabilitation works beginning in accordance with the Rehabilitation Management Plan.

5 Rehabilitation Management Plan

5.1 Purpose

The purpose of the Rehabilitation Management Plan (RMP) is to provide details of the proposed rehabilitation works within the Open Space area to enable the client to adequately plan and undertake works in accordance with councils requirements. It also provides Council with clear expectations of scope of works and a means of ensuring works are completed according to the approved plan.

5.2 Scope

This RMP applies to the parcel of land to be dedicated as public open space identified in Appendix 1 as the Open Space area.

5.3 Aims and Objectives

The Rehabilitation Plan aims to outline details of work and target outcomes that adequately improve the quality of vegetation within the ecological and waterway corridor, and link the site to other areas of environmental values.

The broad objectives of this report are to:

- Comply with current 'best practice' guidelines as well as Council guidelines and policies
- Provide an overview of the sites environmental conditions;
- Ensure the long term environmental integrity and ecological linkages within the site;
- Improve ecological function and fauna opportunities of the site.

5.4 Intended Outcomes

The intended outcomes for successful rehabilitation of the sites dedicated Open Space are:

- Rehabilitation area is free from declared weed species.
- Rehabilitation area demonstrates a reduction in abundance and diversity of weed species currently present on the site.

5.5 Rehabilitation Approaches

There are four generally accepted approaches to rehabilitation as outlined in the *South East Queensland Ecological Restoration Framework*. These are:

- a. Natural regeneration;
- b. Assisted natural regeneration;
- c. Reconstruction; or
- d. Fabrication.

In consideration of the largely vegetated nature of the proposed Open Space area, assisted natural regeneration via processes of weed management will be instituted throughout the majority of the site. A small area of active reconstruction planting is proposed around the area disturbed by machinery as part of the Wedge Tailed Eagle nest relocation. If natural regeneration is not successful within areas of significant weed infestation. Contingency reconstruction planting can be considered to ensure that the weed infestations do not again dominate the rehabilitation areas.

5.6 Site Assessment

The site is located in the northern region of the City of Gold Coast local government area. The vegetation present within the proposed Open Space area is a mix of regrowth and mature vegetation, and riparian vegetation associated with the waterways. There are weed species present throughout the area.

A description of the site constraints and relevant planning instruments is outlined in detail within Section 3 of this document. The following shall describe the vegetation present on site in order to plan how the site is to be effectively rehabilitated.

5.6.1 Native Vegetation

The subject site is mapped as containing 'least concern' RE 12.11.5/12.11.24 across the majority of Open Space area, with RE 12.3.11 in a thin strip directly adjacent to Sandy Creek along the southern boundary of the lot, and RE 12.11.25 in the north west corner of the Open Space area. On ground observations identified the following predominant species;

Canopy Species

Eucalyptus siderophloia, *Corymbia intermedia*, *Angophora leiocarpa*, *Corymbia citriodora* subsp *variegata* and *Eucalyptus pilularis*.

Mid Storey Species

Alphitonia excelsa, *Melaleuca decora*, *Melaleuca linariifolia*, *Allocasuarina litoralis* and *Acacia spp.*

Groundcover / Shrub Layer Species

Gahnia aspera, *Cymbopogon refractus*, *Lomandra hystrix*, *Smilax australis*, *Lomandra longifolia*, *Pteridium esculentum*.

Generally, native vegetation in the Open Space area transitions from Eucalypt and Corymbia open forest across the majority of the area, down to a thin strip of more rainforest and riparian species along Sandy Creek along the southern border of the Open Space area.

Due to the established nature of vegetation currently present, this rehabilitation plan proposes primarily assisted natural regeneration through weed management in most of the Open Space area. However, planting specifications have been provided for a small area that was required to be disturbed to install the relocated Wedge Tailed Eagle nest.

5.6.2 Exotic Vegetation

A number of exotic species were observed as occurring on the subject site. In particular, *Lantana camara* is present throughout the understorey in varying densities. *Passiflora subpeltata* and *Passiflora suberosa* are also frequently found within the area. Specific weed control techniques will be outlined in subsequent sections of this report.

5.7 Herbicide application

Herbicide will be applied by qualified personnel with experience in bush regeneration and native plant species identification. It is recommended that spray operators have undertaken accredited training through a nationally accredited program such as Chemcert. All weed control techniques will be in accordance with the South East Queensland Ecological Restoration Framework Guidelines 2012 (Appendix 3).

Herbicide spraying must only be undertaken or supervised by ACDC accredited operators and must comply with the ACDC Act. This Act also specifies limitations of certain herbicides and applications in Queensland Districts.

Spray operators have a legal responsibility to themselves and the public. Employers and employees have obligations under the Work Place Health and Safety Act to provide a 'Duty of Care'.

In Queensland, the 'off-label' permit allows bush regenerators to apply herbicide on plant species that are not listed on the label under Permit 7485. The off-label permit is administered by the Australian Pesticides and Veterinary Medicines Authority (APVMA). This relates to the ground distribution control of weeds in Non Agricultural Areas, Bushland, Forests and Wetlands.

It is a requirement of this permit, that all persons using the products covered by this off-label permit comply with the details and conditions listed in the permit. In addition, read the herbicide label carefully before use and always use the herbicide in accordance with the label directions. Chemical control of various weeds mentioned in this document will comply with permit 7485.

The operator is responsible to comply with environmental considerations, especially working in riparian areas. It is important to become familiar with the product MSDS, in particular aspects of soil residuality, translocation, break down in water and impact on amphibians (for example, Glyphosate herbicides are chelated with salts which can build up in the soil, changing the Ph and soil conditions). To ameliorate the impact of salt and modified ph, fulvic acid can be used in conjunction with herbicide. As a microbial stimulant fulvic acid increases the plants uptake of the herbicide and reduces soil residues, therefore minimizing environmental harm.

Within 10m of a water body only registered aquatic herbicide "Biactive" glyphosate will be used.

5.8 Weed control methods

All weed control undertaken on the subject site will be undertaken with the following considerations:

- All weed control methods will be in accordance with the South East Queensland Ecological Restoration Framework Guidelines 2012 (Appendix 3).
- Due consideration of the ecologically sensitive nature of the site must be made when selecting the appropriate weed removal and weed control methods.
- Frog friendly Glyphosate will be the primary herbicide used in these weed control works.
- Weed control works must be undertaken in a manner which does not promote erosion and instability of soil, specifically in areas close to the waterway buffers and drainage areas.
- If evidence of excessive spraying or off target damage is observed, additional rehabilitation will be undertaken to ensure that Open Space areas are stable and are not at elevated risks of erosion due to off target damage.
- Dye mixed with chemical is to be used when treating all weeds within the Open Space area
- Weed control is to be undertaken under drip lines of existing native plants in a manner which promotes regeneration and reduces competition for native species and which limits the potential for off target damage.

Weed control methods specific to the target weed species will be followed in accordance with Appendix 3 – Control Techniques and Herbicide Application Rates For Particular Weed Species of the South East Queensland Ecological Restoration Framework prepared on behalf of SEQ Catchments and South East Queensland Local Governments, Brisbane.

5.9 Planting Details

5.9.1 Summary of treatments

The primary rehabilitation management action in the Open Space area is to be weed management in order to support natural regeneration, with a small area of active reconstruction planting proposed around the area used to installed the Wedge Tailed Eagle nest. The planting around this area will be done in a way that maintains an existing 4m wide access track to the relocated Wedge Tailed Eagle nest. Planting techniques and a planting schedule has been provided for the area requiring active planting in the following sections. The planting schedule can also be used to provide contingency planting species for the area subject to assisted natural regeneration if weed management activities do not result in sufficient native regeneration occurring.

Contingency plantings will only be enacted if agreement between the proponent and City of Gold Coast Council is made that natural regeneration has not been effective and direct plantings are required to ensure that rehabilitation in the open space park area is completed to the satisfaction of council.

The two (2) distinct rehabilitation zones are nominated and are individually outlined in the following sections.

5.9.2 Planting techniques

The Rehabilitation Management Plan in Appendix 2 depicts the section of the Open Space area that will require planting, after taking into account existing native vegetation.

Plants are to be supplied in 75mm native tube stock or equivalent, and are to be planted according to Figure 4.1 below.

Plant stock is to be sourced from local nurseries, using local provenance parent material. Stock is to be free of defects and pathogens and should show good root structure and vigour.

A survival rate of at least 90% is to occur within the rehabilitation area for the duration of the 12 month establishment and 12 month maintenance periods. Failure to achieve these targets will require plant replacement.

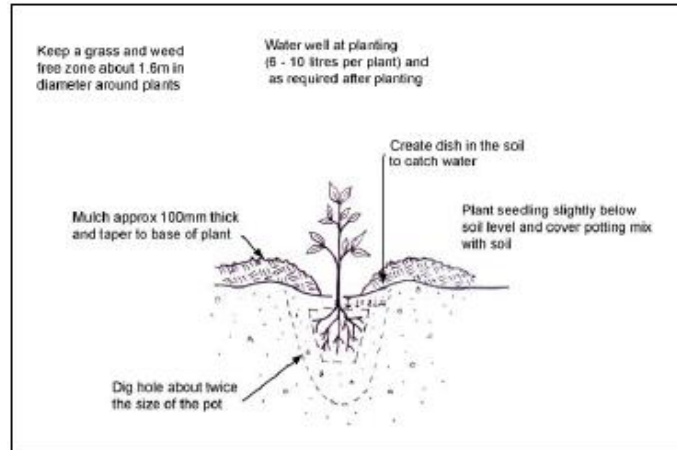


Figure 4.1: Planting Detail

5.9.3 Rehabilitation Zone 1 – Active Planting (435m²)

The location of this 'Rehabilitation Zone 1 - Active Planting' is shown in Appendix 2. This area was disturbed in order to allow the required machinery access to install the relocated Wedge Tailed Eagle nest. The area would contain significant seed bank, and would be expected to regenerate naturally, however some active reconstruction planting is proposed to help this area re-establish more rapidly. A 4m wide access track, which previously existed through the area, is intended to be maintained clear of vegetation, to allow ongoing access to the relocated Wedge Tailed Eagle nest.

The following planting specifications will be implemented within this rehabilitation zone. Planting densities have been specified; however the planting densities required may vary depending on the extent of existing vegetation on the ground, and any natural regeneration that occurs.

The species below have been selected from RE 12.11.5 which is the existing RE type occurring in the area, and from species observed on ground within the rehabilitation zone.

Rehabilitation Zone 1 – Active Planting – 435m²

Type	Botanical Name	Common Name	Pot size
Canopy	<i>Corymbia citriodora</i> subsp. <i>variegata</i>	Spotted Gun	Tube
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	Tube
	<i>Eucalyptus siderophloia</i>	Grey ironbark	Tube

	<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	Tube
	<i>Corymbia intermedia</i>	Pink bloodwood	Tube
	<i>Eucalyptus propinqua</i>	Small Fruited Grey Gum	Tube
	<i>Angophora leiocarpa</i>	Smooth Barked Apple	Tube
Mid-storey	<i>Melaleuca linariifolia</i>	Snow in Summer	Tube
	<i>Lophostemon suaveolens</i>	Swamp box	Tube
	<i>Lophostemon confertus</i>	Brush Box	Tube
	<i>Melaleuca decora</i>	Whitefeather Honeymyrtle	Tube
	<i>Alphitonia excelsa</i>	Red Ash	Tube
	<i>Breynia oblongifolia</i>	Coffee Bush	Tube
	<i>Callistemon viminalis</i>	Red Bottlebrush	Tube
Groundcover	<i>Cymbopogon refractus</i>	Barbwire Grass	Tube
	<i>Dianella caerulea</i>	Blue Flax Lily	Tube
	<i>Lomandra hystrix</i>	Creek matrush	Tube
	<i>Lomandra longifolia</i>	Spiny headed matrush	Tube
	<i>Gahnia aspera</i>	Rough Saw-Sedge	Tube
	<i>Themeda triandra</i>	Kangaroo Grass	Tube

Total area: 435m² (approx)

Density: 1 plant per 2m²

Ratio: 70% canopy, 20% Mid-storey, 10% Shrubs

35x Canopy Species per 100m²

10x Mid-storey Species per 100m²

5x Shrub Species per 100m²

Total = 50 plants per 100m² module

5.9.4 Rehabilitation Zone 2 – Weed Management (16,987 m²)

The location of the 'Rehabilitation Zone 2 - Weed Management' is shown in Appendix 2 and includes most of the proposed Open Space area. This area was observed to contain some areas of weed infestation, particularly of *Lantana camara*. This area extends from the northern boundary of the Open Space area, all the way back to the southern boundary with Sandy Creek. Weed management activities in this area will occur in accordance with Section 5.7 and 5.8 of this report, and Appendix 3.

If, following weed removal, some areas struggle to regenerate, some active planting may be considered as a contingency measure. If required, contingency planting species can be drawn from the planting schedule prescribed for Rehabilitation Zone 1, or as determined by the suitably qualified rehabilitation contractor undertaking the works.

5.9.5 Mulch

Mulch is to be used on all active planting areas within the rehabilitation area. The mulch shall consist of 100mm of weed-free forest mulch spread in a 30cm radius around each plant to ensure that natural regeneration is not impeded.

5.9.6 Watering

All plant stock is to be watered onsite prior to planting and as soon as practical after planting (within several hours). Water is to be sourced locally or is to be recycled non-potable water.

5.10 Staging of Works

The total rehabilitation works should be for a period of 12 months, allowing 6 weeks for adequate preparation of planting areas if required. Rehabilitation works should be staged as follows:

Table 3.1: *Staging of works*

Step	Activity	Timing
1	Locate and delineate the rehabilitation area	Week1
2	Remove all rubbish and foreign debris from rehabilitation area	Week 1
3	Undertake initial weed treatment. Locate, mark out and prepare areas for active planting.	Week 1
4	Undertake follow up weed control	Week 7 – 10
5	Follow up weed control within the rehabilitation areas and maintenance of planting areas if required.	6 weekly cycle: Week 16, 22, 28, 34 - 52
6	Undertake an assessment of the effectiveness of weed control and natural regeneration.	Week 24

5.11 Maintenance

The maintenance period will be for 12 months following the 12 month plant establishment phase and shall consist of:

- Weed Management - Splatter gun, hand weeding and spot spraying in rehabilitation areas.
- Watering of planted plants if required.
- Top up mulch around planted areas if required.
- Replacement planting of individual plants which have died if required.

The performance of maintenance activities will be assessed as part of allocated monitoring inspections.

Table 3.2: *Measurement of health of plantings*

Time scale	Growth and development processes	Key indicator for species health	Maintenance Issues that may arise	Description of maintenance period
0 – 3 Months	Growth rate and establishment	Seedling heights, foliage growth and colour, weed presence.	Weed removal, water requirements, impacts from unforeseen destruction, attrition rates.	At least 90% success in establishing the planted species. Minimal weeding required.
4 – 12 Months	Continued growth and establishment General health Minor habitat use	Increasing height and trunk diameter increasing, Canopy growth and density Weed presence, Canopy closure	Weed removal, possible impacts from past weed invasion measures.	Healthy foliage growth rates and characteristics corresponding with individual species.

5.12 Monitoring and Performance Criteria

The rehabilitation works are to be monitored by routine site inspections by a qualified professional. Refer to Appendix 4 for a sample monitoring inspection form.

The following inspections are recommended:

Table 3.3: *Monitoring Schedule*

Inspection	Timing	Purpose	Evidence	Performance criteria
1	Week 1	Confirm location of rehabilitation area	Site visit	Weed control works have commenced.
2-11	Week 2 – 52 (12 months)	'Establishment' period - Inspection of weed control & natural regeneration. Consider contingency planting where necessary, Replace any dead plants	Inspection form & photographs	<u>Week 12</u> – 15% of woody and declared weeds have died. <u>Week 24</u> – 30% of woody and declared weeds have died. If insufficient natural regeneration observed replacement plants must

Inspection	Timing	Purpose	Evidence	Performance criteria
				be planted. <u>Week 36</u> – 50% of woody and declared weeds have died and natural regeneration or successful reconstruction planting is occurring <u>Week 52</u> – 75% of woody and declared weeds have died and natural regeneration or successful reconstruction planting is occurring.
12+	Week 52 – 104 (12 months)	'On maintenance' period – assess ecological integrity of site; Plant establishment and vigour Effectiveness of weed control activities	Inspection form, photographs & certification to council	Week 104 – 90% + of woody and declared weeds have died and natural regeneration or successful reconstruction planting is occurring.

5.13 Performance Indicators

- All environmental weeds including woody weeds, vines and Declared Class 1 and 2 weeds (pursuant to the Land Protection (Pest and Stock Route Management) Act 2002) must be controlled on all lands proposed for transfer to Council.
- No declared Class 1 or Class 2 weeds are to be present on site at the Off Maintenance inspection.
- Pasture grass weeds and other perennial weed species are managed and impacts are minimised as much as possible.

6 Conclusion

This OSMP has addressed the objectives that are required to achieve a natural asset protected Open Space area pursuant to Council's Open Space guidelines.

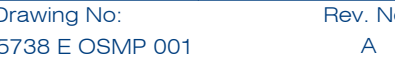
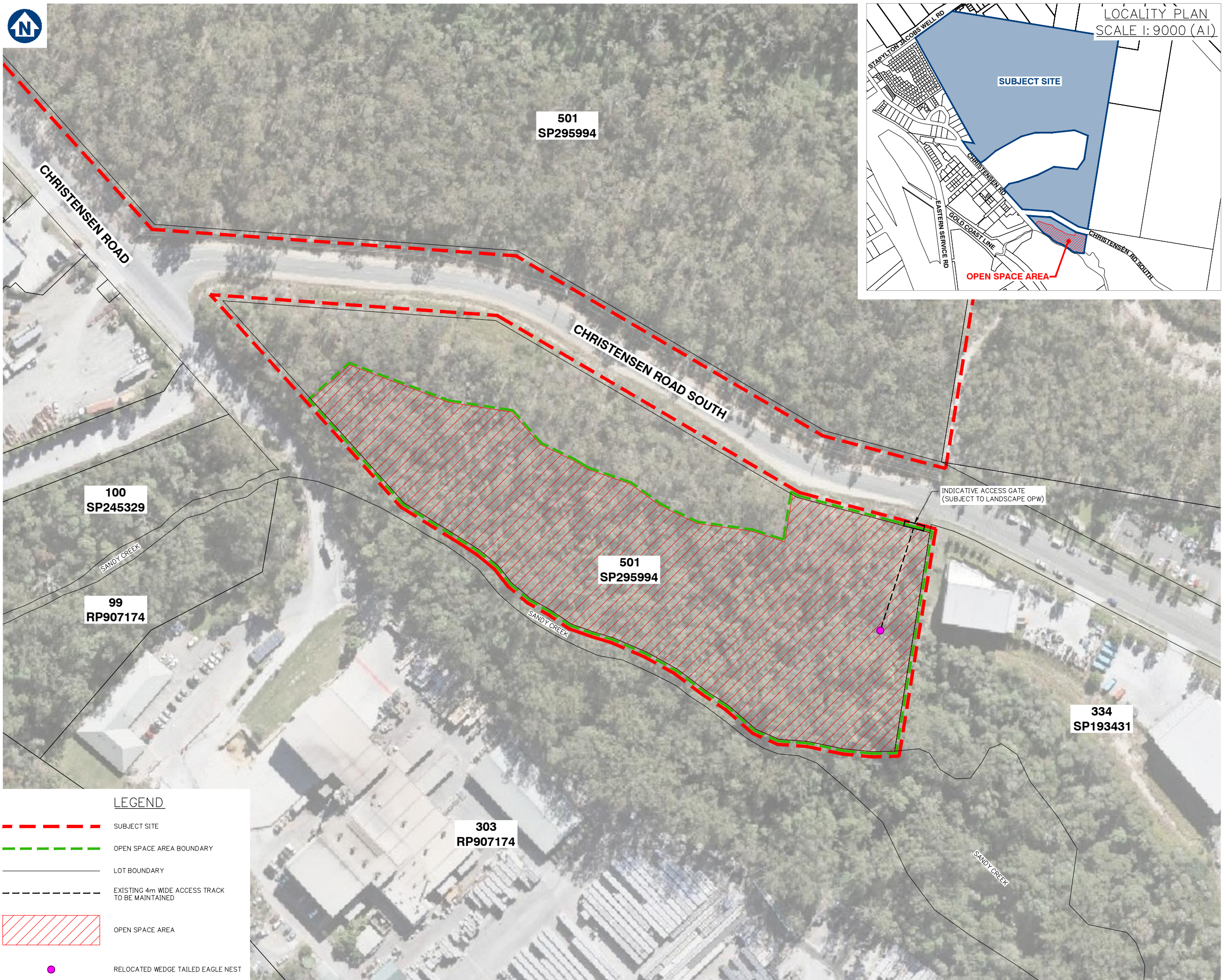
By providing evidence and the rationale behind the creation of the Open Space area, this report provides the various strategies and responses to achieve Council objectives, whilst effectively managing environmentally sensitive areas during the construction and operation of the proposed development.

The creation and spatial dimensions of the Open Space area have been based on overarching development approvals and with reference to the relevant City of Gold Coast open space guidelines.

Due to the environmental context of the Open Space area, rehabilitation will primarily involve weed management to encourage assisted natural regeneration, and subsequently enhanced ecological functioning. Reconstructive planting specifications have also been specified for a small area surrounding the Wedge Tail Eagle nest pole to kick start the regeneration process in this area.

It is considered that the proposed Open Space area adheres to the Council's organisational requirements and produces a broad range of benefits to the local community and the natural environment, through vegetation conservation, habitat conservation, and waterway protection.

APPENDIX 1 – Open Space Management Plan



APPENDIX 2 – Rehabilitation Management Plan



ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GENERAL NOTES

REHABILITATION MANAGEMENT PLAN

A Issue	24-05-2019 Date	ORIGINAL ISSUE Description	JRG DRN	MG CHK

0 15 30 45 60 75

1:750 (FULL SIZE A1)
1:1500 (HALF SIZE A3)

Scale at A1: 1:750

Designed:	KT
Drafted:	JRG
Approved:	MG
RPEQ:	16939
Signed:	
Date:	24-05-2019

Drawing No:	Rev. No:
5738 E OSMP 002	A

APPENDIX 3 – South East Queensland Ecological Restoration Framework Weed Management Techniques

DISCLOSURE

At the time of publication the following chemicals and techniques are registered for use and are commonly utilised. Other chemicals and techniques are used in the ecological restoration industry. Laws and best practice techniques change over time and as such it is best to check with your local government as to the current preferred approach.

Under label or off-label permits 11463 and 9868. Permit 9868 requires that persons who can use the product under the permit are "All persons who are trained in the use and handling of agricultural chemicals and who are performing weed control as part of a bush regeneration/restoration project". Operators are legally obliged to read the label before using any herbicides. If the species you wish to treat is not on the label it will be

necessary to read the off label permit. Always consult the ecological restoration plan for the projects.

Additional useful references include the Weeds of Southern Queensland (Dight et al., 2011) and PUBCRIS (<http://services.apvma.gov.au/PubcrisWebClient/welcome.do>).

HERBICIDE (+ E.G. TRADE NAME)	PRINCIPLE USES	ECOTOXICOLOGY	GROUP	SCHEDULE	UPTAKE AND RESIDUAL AFFECT	
Glyphosate 360gl (Weedmaster® or Roundup Biactive®)	Non- selective weed control	Full Aquatic registration (in most formulations),	M	5	Absorbed through the leaf via spraying and through the cambium when applying techniques such as stem injection and cut, scrape and paint. Extremely short-lived and rapidly immobilised (both in soil and water). Degraded within hours in most environments	
2,4-D 625 gl amine (Amicide 625)	Selective of broad-leaved weeds in native grasses (limited effect on deep rooted dicots, legumes etc.)	Aquatically registered formulations available	I	5	Mainly absorbed through leaves and stems. Fairly immobile and reltively short-lived in the soil. (degraded within days in most environments)	
Fluroxypyr 333gl (Starane advance)	Selective broad-leaf control (particularly effective on undersown legumes weeds)	N (demonstrated toxicity to aquatic organisms)	I	NS	Absorbed through the leaves. Relatively short-lived in the soil though highly persistent in water	
Metsulfuron Methyl (Brush-off, Ally, Associate)®	Selective of broad-leaved weeds but also able to control a variety of monocots when applied at higher rates especially Liliaceae and Commilinaea. Lower rates do affect monocots.	N (demonstrated toxicity to aquatic organisms)	B (potential resistance rotate with other herbicides)	NS	Mainly leaf absorbed. May persist for 3-6 months in the soil profile.	
Metsulfuron + Glyphosate	Non-selective weed control and used with particular weeds or combination of weeds.	N (demonstrated toxicity to aquatic organisms)	MB (potential resistance rotate with other herbicides)	5	Mainly leaf absorbed, may persist for 3-6 months in the soil profile.	
2,2-DPA	Grass (monocot) selective herbicide suitable for targeting dense weedy grass infestations amongst desirable native vegetation.	Yes (limited)	J	NS	Leaf and root absorbed	
*Aquatic reg indicates that formulations of this herbicide may carry and aquatice registration, some formulations do not and individuals should check PUBCRIS prior to assuming they have an aquatically regitered formulation. Addition of non-aquatically re...						
Gly	Glyphosate	eg. Weedmaster Duo®, Roundup Biactive®				
MM	Metsulfuron methyl	eg. Brushhoff ®, Brushkiller®, Associate®				
S	Surfactant	eg. LI700®, Prosil®, Pulse®				
A	Spray Adjuvant	eg. Agral®, Protec®, Codacide®,				
D	Colour Marking Dye	eg. Herbi (red or blue) Liquid Dye®				

COMMON NAME	SCIENTIFIC NAME	APPLICATION METHOD	CHEMICAL	RATE	ADJUVANT	SURFACTANT	COMMENTS
TREES							
Chinese Celtis	<i>Celtis sinensis</i>	Stem Inject	Glyphosate	1:1.5 Gly:water			
		Cut, Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Basal Bark (saplings)	Fluroxypyr	210ml:10L diesel			
		spot-spray	Glyphosate	200ml:10L water + A + D			
			Glyphosate + Metsulfuron Methyl	200mL Gly + 1.5g MM in 10L water + S + A			
Camphor Laurel	<i>Cinnamomum camphora</i>	Stem Inject	Glyphosate	1:1.5 Gly:water			
		Cut, Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Basal Bark (saplings)	Fluroxypyr	210ml:10L diesel			
		Spot spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + S + D			
			Glyphosate	200ml:10L water + A + D			
Cadaghi	<i>Corymbia torelliana</i>	Cut, Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Stem Inject	Glyphosate	1:1.5 Gly:water			
		Basal Bark (saplings)	Fluroxypyr	210ml:10L diesel			
		Spot spray	Glyphosate	100ml Gly: 10L water + A + D			
Loquat	<i>Eriobotrya japonica</i>	Basal Bark(sapling)	Fluroxypyr	210ml:10L diesel			
		Spot spray	Glyphosate	200ml Gly:10L water +			
		Cut Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Stem Inject	Glyphosate	1:1.5 Gly:water			
Cockscomb Coral Tree and Coral Tree	<i>Erythrina crista-galli</i> and <i>E. x sykesii</i>	Spot spray	Glyphosate	200ml Gly:10L water + S+ A			
		Basal Bark (sapling)	Fluroxypyr	210ml/10L diesel			
		Cut Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Stem Inject	Glyphosate	1:1.5 Gly:water			
Brazilian cherry	<i>Eugenia uniflora</i>	Cut Scrape and Paint	Glyphosate	neat (undiluted)			
		Stem Inject	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
		Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + S + D			
Golden Rain Tree	<i>Koelreuteria elegans;</i> <i>paniculata</i>	Cut Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Stem Inject	Glyphosate	1:1.5 Gly:water			
		Basal Bark (sapling)	Fluroxypyr	210ml:10L diesel			
		Spot spray	Glyphosate	100ml Gly:10L water + A + D			
Privet (Large and Small leaved)	<i>Ligustrum lucidum</i> and <i>L.sinense</i>	Spot Spray	Glyphosate	200ml Gly:10L water + S+ D			
			Metsulfuron methyl	1.5g MM:10L water + A + D			
			Fluroxypyr	30ml:10L water +			
		Cut Scrape and Paint	Glyphosate	1:1.5 Gly:water			
		Stem Inject	Glyphosate	1:1.5 Gly:water			
		Basal Bark (sapling)	Fluroxypyr	210ml:10L diesel			

Mulberry	<i>Morus spp.</i>	Spot Spray	Glyphosate	200ml Gly:10L water + S + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
		Basal Bark (Juvenile)	Fluroxypyr	210ml:10L diesel			
Canary Island Date Palm	<i>Phoenix canariensis</i>	Spot Spray	Glyphosate	200ml Gly:10L water + S + D			
		Stem Inject	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
Guava	<i>Psidium guajava</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + S + D			
		Cut Scrape and Paint	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
		Stem Inject	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
Umbrella Tree	<i>Schefflera actinophylla</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water (do not stem inject when in flower)			
Broad-leaf Pepper Tree	<i>Schinus terebinthifolius</i>	Spot Spray	Glyphosate	200ml:10L water + S + A			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + S + A			
			Fluroxypyr	30ml:10L water			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Basal Bark (sapling)	Fluroxypyr	210ml:10L diesel			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Giant Devils Fig and Wild Tobacco	<i>Solanum chrysotrichum</i> and <i>S. mauritianum</i>	Spot Spray	Glyphosate	150ml Gly:10L water + A + D			
			Fluroxypyr	30ml/10L water			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Basal Bark (Juvenile/ Mature)	Fluroxypyr	210ml/10L diesel			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
African tulip tree	<i>Spathodea campanulata</i>	Spot Spray	Glyphosate	200ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Cocos palm	<i>Syagrus romanzoffiana</i>	Stem Inject	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
		Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Yellow Bells	<i>Tecoma stans</i>	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Basal Bark	Fluroxypyr	210ml/10L diesel			
		Spot Spray	Glyphosate	150ml Gly: 10L water + A + D			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Tipuana	<i>Tipuana tipu</i>	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			

GRASSES							
Creeping Bamboo/ Clumping Bamboo	<i>Arundinaria spp./ Bambusa spp.</i>	Cut and spray (re- growth/seedling)	Glyphosate	100ml Gly: 10L water + D			
			2,2-DPA	150g:10L water			
		Cut stump and fill segment	Glyphosate	1 Gly:1.5 water			
Broad-leaved carpet grass, Narrow-leaved carpet grass, Para grass, Mosman River grass , Pangola grass, Guinea grass, Rhodes grass, Molasses grass, Sour grass, Paspalum, Bahia grass, Vasey grass, Broad-leaf paspalum, Kikuyu grass, Bana grass, Elephant grass	<i>Axonopus compressus,</i> <i>A. fissifolius, Brachiaria</i> <i>mutica, Cenchrus</i> <i>echinatus, Chloris</i> <i>gayana, Digitaria</i> <i>eriantha, Megathyrsus</i> <i>maximus, Melinis</i> <i>minutiflora, Paspalum</i> <i>conjugatum , P.</i> <i>dilatatum , P. notatum</i> <i>, P. urvillei , P. wettsteinii</i> <i>, Pennisetum clandest</i>	Spot Spray	Glyphosate	100ml Gly:10L water + D			
Herbs							
Agave/Century plant	<i>Agave americana</i>	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1g MM added to 1 Gly:1.5 water			
Crofton weed	<i>Ageratina adenophora</i>	Spot Spray	Glyphosate	100ml Gly:10L water + D			
			Metsulfuron methyl	1/2 - 1g MM: 10L water + D			
Mistflower	<i>Ageratina riparia</i>	Spot Spray	Glyphosate	100ml Gly:10L water + D			
			Metsulfuron methyl	1/2 - 1g MM: 10L water + D			
Blue billy-goat weed	<i>Ageratum</i> <i>houstonianum</i>	Spot Spray	Glyphosate	100ml Gly:10L water + D			
			Metsulfuron methyl	1g MM: 10L water + D			
			Fluroxypyr	30ml/10L water			
			2-4,D	30ml/10L water			
Ragweed	<i>Ambrosia artemisifolia</i>	Spot Spray	Glyphosate	100ml gly:10L water + A + D			
			Metsulfuron methyl	1.5g MM: 10L water + A + D			
Cobblers pegs	<i>Bidens pilosa var. pilosa</i>	Spot Spray	Fluroxypyr	30ml/10L water			
			2, 4-D	30ml/10L water			
			Glyphosate	100ml Gly: 10L water + A + D			
			Metsulfuron methyl	1g MM: 10L water + A + D			
Mother of Millions; Live Leaf Plant; Resurrection Plant	<i>Bryophyllum</i> <i>delagoense; Pinnatum</i>	Spot Spray	2, 4-D	50ml/10L water			
	<i>Bryophyllum</i> <i>delagoense</i>		Metsulfuron methyl	1.5g MM:10L water + S + D			
Purple/Green Succulent, Inch Plant	<i>Callisia fragran; repens</i>	Spot Spray	Fluroxypyr	90ml/10L water			
			Metsulfuron methyl	1.5g MM:10L water + S + D			
			Glyphosate	200ml Gly:10L water + A + D			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			

Hairy Commelina; Trad (wandering Jew); Purple Succulent; Striped Trad	<i>Commelina benghalensis</i> ; <i>Tradescantia fluminensis</i> / <i>albiflora</i> ; <i>Tradescantia pillida</i> ; <i>Zebrina pendula</i> syn <i>Tradescantia zebrina</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
			Glyphosate	200ml Gly:10L water + A + D			
			Metsulfuron methyl	1.5g MM: 10L water + S + D			
			Fluroxypyr	90ml/10L water			
Glory lilly	<i>Gloriosa superba</i>	Foliar Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Polka dot plant	<i>Hypoestes phyllostachya</i>	Spot Spray	Metsulfuron methyl	1.5g MM:10L water + S + D			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Fish bone fern	<i>Nephrolepis cordifolia</i>	Spot Spray	Metsulfuron methyl	1g MM: 10L + A/S + D			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Coral berry	<i>Rivinia humilis</i>	Spot Spray	Glyphosate	100ml Gly: 10L water + A + D			
			Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
Mother-in-law's tongue	<i>Sansevieria trifasciata</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Flannel Weed	<i>Sida cordifolia</i>	Spot Spray	Fluroxypyr	60ml/10L water			
Ground Asparagus	<i>Asparagus aethiopicus</i>	Spot Spray	Metsulfuron Methyl	1.5g MM : 10L water + A + D			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A/S + D			
Singapore Daisy	<i>Sphagneticola trilobata</i>	Spot Spray	Metsulfuron methyl	1.5g MM in 10L water + A + D			
			Glyphosate + Metsulfuron Methyl	100ml Gly + 1g MM in 10L water + A + D			
SHRUBS							
Groundsel bush	<i>Baccharis halimifolia</i>	Spot Spray	2,4-D	40ml/10L water			
		Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Green cestrum	<i>Cestrum parqui</i>	Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
			Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
Duranta	<i>Duranta erecta</i>	Overall Spray (re-growth/seedling)	Glyphosate	200ml Gly:10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Lantana	<i>Lantana camara</i>	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Spot Spray	Fluroxypyr	40ml/10L (spring, summer)-60ml/10L water (Autumn, Winter)			
		Spray (spot spray and overspray)	Glyphosate	100ml Gly:10L water + D			
		Spray Red Flowering species	Glyphosate	200ml Gly:10L water + A + D			
		Splatter Gun	Glyphosate	1 Gly:9 water			

Leucaena	Leucaena leucocephala	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Spot Spray	Fluroxypyr	30ml/10L water			
HERBS							
Murraya	Murraya paniculata	Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Mickey mouse bush	Ochna serrulata	Basal Bark	Fluroxypyr	210ml/10L diesel			
		Spot Spray	Fluroxypyr	30ml/10L water			
		Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A/S + D			
		Scrape (lightly) and Paint - juvenile	Glyphosate	neat (undiluted)			
		Cut Drill and Fill - mature	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
Prickly pear	Opuntia Spp.	Spot Spray	Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint in horizontal cuts across flat stems	Glyphosate + Metsulfuron Methyl	1g MM added to 1 Gly:1.5 water			
Castor Oil Plant	Ricinus communis	Spot Spray	2, 4-D	45ml/10L water			
			Glyphosate	100ml/ 10L water			
		Cut Scrape and Paint	Glyphosate	1g MM added to 1 Gly:1.5 water			
		Stem Inject	Glyphosate	1g MM added to 1 Gly:1.5 water			
Easter Cassia/ Winter Senna	Senna pendula var. glabrata	Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
		Cut and Paint		1 Gly:1.5 water			
		Stem Inject (Mature)	Glyphosate	1 Gly:1.5 water			
Smooth senna	Senna septemtrionalis	Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
		Cut and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
Yellow Oleander	Thevetia peruviana	Basal Bark	Fluroxypyr	210ml/10L Diesel			
		Spot Spray	Glyphosate	200ml Gly:10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate	1 Gly:1.5 water			
VINES							
Madeira Vine	Anredera cordifolia	Spot Spray	Fluroxypyr	30ml/10L water			
		Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A/S + D			
		Scrape and Paint (mature vines)	Glyphosate	Scrape as much stem as possible in 1m lengths on alternate sides. Gouge and paint ground tubers. Scrape and paint roots			
Moth vine	Araujia sericiflora	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint	Glyphosate (aerial)	1 Gly:1.5 water			

Dutchman's pipe	<i>Aristolochia elegans</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	200ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Climbing Asparagus	<i>Asparagus africanus; plumosus</i>	Basal Bark	Fluroxypyr	210ml/ 10L diesel			
		Spot Spray	Glyphosate	200ml Gly:10L water + A+ + D			
Balloon Vine	<i>Cardiospermum grandiflorum</i>	Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
		Spot Spray	Glyphosate	100ml Gly:10L water + D			
Green/ Silver-leaf desmodium; Siratro; Horesgram; Glycine	<i>Desmodium intortum; Macroptilium atropurpureum; Macrotyloma uniflorum; Neonotonia wightii</i>	Spot Spray	Glyphosate	200ml Gly:10L water + A+ + D			
			2,4-D	40ml/10L water			
			Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Moon flower; Mile-a-minute; Morning Glory; Blue Morning Glory	<i>Ipomoea alba; I. cairica; I. indica and I. purpurea</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
			2, 4-D	30ml/10L water			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Creeping Lantana	<i>Lantana montevidensis</i>	Spot Spray	2,4-D	40ml/10L water			
			Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
			Metsulfuron methyl	1.5g MM : 10L water + A + D			
Cat's Claw Creeper	<i>Macfadyena unguis-cati</i>	Spot Spray	Glyphosate	100ml Gly : 10L water + S + D			
			Glyphosate + Metsulfuron Methyl	100ml Gly + 1g MM:10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Edible passionfruit; Stinking Passionflower; Corky Passionfruit; White Passionfruit	<i>Passiflora edulis; foetida; suberosa; subpeltata</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	100ml Gly + 1g MM in 10L water + A + D			
			Glyphosate	200ml Gly:10L water + A + D			
			2,4-D	30ml/10L water			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Kudzu	<i>Pueraria lobata</i>	Spot Spray	Glyphosate + Metsulfuron Methyl	100ml Gly + 1.5g MM in 10L water + A + D			
			Fluroxypyr	30ml/10L water			
		Gouge and Paint tubers	Glyphosate	1 Gly:1.5 water			
		Stem Inject	Glyphosate + Metsulfuron Methyl	1/1 (g) + 1g (MM) Per Litre of water			
Climbing nightshade	<i>Solanum seaforthianum</i>	Spot Spray	Fluroxypyr	30ml/10L water			
			Glyphosate	100ml Gly : 10L water + A + D			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			
Black eyed susan	<i>Thunbergia alata</i>	Spot Spray	2-4,D	30ml/10L water			
			Glyphosate	200mL in 10L water			
			Metsulfuron methyl	1.5g in 10L water			
		Basal Bark	Fluroxypyr	210ml/ 10L diesel			
		Cut Scrape and Paint	Glyphosate	1 Gly:1.5 water			

APPENDIX 4 – Site Monitoring Form

SITE VISIT DETAILS	
Location: Site Visit No. & Date: Site Visit By: Weather:	
Purpose of the site visit	Tick box
Allocated routine inspection	

Score of 1: <5%cover **Score of 2:** 5-20% cover
Score of 3: 20-50% cover **Score of 4:** 50-75% cover
Score of 5: 75-100% cover

Site visit	Date	Criteria					
		Habitat	Species Diversity Indicators	Indigenous cover (tree, shrub, moss)	Occurrence of natural regeneration	Condition of fences	General Observations (fire, flood, breeding, flowering etc.)
1							
2							
3							
4							
5							
6							
7							
8							

APPENDIX 5 – Approved Wedge Tailed Eagle Relocation Plan



Wedge-tailed eagle nest relocation plan

FINAL (Revision 3)

December 2018

KS8 Pty Ltd



Acronyms and abbreviations

Council	Council of the City of Gold Coast
DES	Department of Environment and Science (Queensland)
NC Act	<i>Nature Conservation Act 1992</i> (Queensland)
NRP	Nest relocation plan
RE	Regional ecosystem
WBSE	White-bellied sea eagle
WTE	Wedge-tailed eagle

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1 Introduction

1.1 Scope

The Council of the City of Gold Coast (Council) requires a nest relocation plan (NRP) to guide relocation of a wedge-tailed eagle (WTE) *Aquila audax* nest from a proposed development site to a suitable nearby site in the non-breeding season. Gassman Development Perspectives (Gassman) on behalf of KS8 Pty Ltd engaged Ecosure to develop an NRP, including:

- project details
- review of ecology relevant to nest relocation
- assessment of potential relocation sites
- assessment of relocation methods (removal and installation)
- action plan to guide relocation works
- monitoring and maintenance of relocated nest
- further investigations to refine the NRP.

1.2 Proposed development

The proposed development is an industrial subdivision on Lot 501 on SP295994 and Lot 500 on SP295994, Stapylton (herein referred to as the subject site). Note that Lot 501 on SP295994 and Lot 500 on SP295994 were previously identified as Lot 1 on RP6882 and Lot 240 on W31320.

The subject site is located within the Gold Coast City and is 77.2 ha in area. It is bordered by Stapylton Jacobs Well Rd to the north-west, Christenson Rd to the south-west and freehold properties along other boundaries. It adjoins the Stapylton Landfill Facility to the east.

The subject site is proposed to be developed in two stages:

- Stage 1 (27.5 hectares) requires clearing of remnant regional ecosystem (RE) 12.11.5/12.11.24
- Stage 2 (49.7 ha) requires clearing of remnant RE 12.11.5/12.11.24 and RE 12.11.25, which includes a large broad-leaved ironbark (*Eucalyptus fibrosa*) containing an active WTE nest.

Gassman prepared an ecological assessment for the subject site in 2011 (Gassman 2011) and a Vegetation Management Plan for Stage 2 works in 2018 (Gassman 2018). Ecosure prepared Fauna Management Plans (FMPs) for Stage 1 and Stage 2 works in 2018 (Ecosure 2018a, 2018b) and monitored the active WTE nest from July to September 2018 (until chicks were fledged).

1.3 Existing nest site

On 12 July 2018 an active WTE nest with two chicks was identified in a mature broad-leaved ironbark 26 m in height, within the Stage 2 works area. Ecosure prepared an FMP for the Stage 2 area (Ecosure 2018b) and monitored the nest site from July to September 2018. Over this period, the WTE pair successfully fledged two chicks. It is uncertain whether this nest has been used during previous seasons or when it will be used in the future as WTE can have multiple nesting/breeding sites within a territory (Mooney and Holdsworth 1991).

The nest is approximately 19 m from the ground, 1.6 m wide and 1.1 m deep. A more detailed assessment of the structure and dimensions of the nest will be undertaken before translocation to assist with planning removal and relocation works.

1.4 Surrounding habitats

The region surrounding the nest site contains a mosaic of remnant vegetation and cleared land, primarily used for industry and agriculture. Remnant vegetation within 2.5 km of the existing nest site includes the following mapped REs:

- RE 12.3.6 – *Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens*, *Corymbia intermedia* open forest on coastal alluvial plains
- RE 12.11.3 – *Eucalyptus siderophloia*, *E. propinqua* +/- *E. microcorys*, *Lophostemon confertus*, *Corymbia intermedia*, *E. acmenoides* open forest on metamorphics +/- interbedded volcanics
- RE 12.11.5 - *Corymbia citriodora* subsp. *variegata* woodland to open forest +/- *Eucalyptus siderophloia*/*E. crebra*, *E. carnea*, *E. acmenoides*, *E. propinqua* on metamorphics +/- interbedded volcanics
- RE 12.11.18 - *Eucalyptus moluccana* woodland on metamorphics +/- interbedded volcanics
- RE 12.11.24 - *Eucalyptus carnea*, *E. tindaliae*, *Corymbia intermedia* +/- *E. siderophloia* or *E. crebra* woodland on metamorphics +/- interbedded volcanics
- RE 12.11.25 - *Corymbia henryi* and/or *Eucalyptus fibrosa* subsp. *fibrosa* +/- *E. crebra*, *E. carnea*, *E. tindaliae* woodland on metamorphics +/- interbedded volcanics.

The nest site lies in remnant vegetation mapped as RE 12.11.5/12.11.24. These REs are dominated by lemon-scented gum (*Corymbia citriodora* subsp. *variegata*), grey ironbark (*Eucalyptus siderophloia*), narrow-leaved ironbark (*E. crebra*), white stringybark (*E. carnea*), white mahogany (*E. acmenoides*), grey gum (*E. propinqua*), Tindale's stringybark (*E. tindaliae*) and pink bloodwood (*Corymbia intermedia*).

2 Review of available information

2.1 Wedge-tailed eagle ecology

The WTE, *Aquila audax*, is Australia's largest raptor (Cherriman 2007) and is found over the mainland of Australia, Tasmania (as a separate sub-species), and in the southern portion of New Guinea (Olsen et al. 2010). Mainland Australian adult eagles have a weight range of 3.9 to 5.8 kg (Debus 2017).

A study conducted by Debus et al. (2007) monitored a group of WTE nests in the northern inland NSW towns of Tamworth and Armidale. Their results showed that WTE nests were commonly found in eucalypt species of woodland landscapes. Nest positions tended to be midslope on the side of ravines and did not show any signs of preferred orientation. Nests were commonly located in the top one-third of large old trees and typically under or within a vegetated canopy. The mean height of trees that contain nests was 21.7 m, and the mean height of nests from the ground was 14.3 m (Debus et al. 2007).

Nests are constructed of sticks and green vegetation in the fork of trees (Debus 2017). Cherriman (2013) recorded an average nest width of 1.3 m and nest depth of 1.1 m. Silva and Croft (2007) found WTE to actively nest only in live trees, and old nests were found clustered around active nests, which were likely disused nests of monitored breeding pairs (Silva and Croft 2007).

Nest sites can potentially be occupied for as long as 40 years, likely by preceding cohorts of eagles, and occasionally will alternate with white-bellied sea-eagles (WBSE *Haliaeetus leucogaster*) over this period (Debus 2017).

WTE breed monogamously, and pairs form close bonds over a minimum of several consecutive years (Debus et al. 2007). The breeding season of the WTE in south east Queensland and northern New South Wales is reported to vary between locations, ranging from April to September (Australian Museum 2018). Clutch sizes range from 1 to 3 eggs, with the typical size of 2 eggs (Olsen and Marples 1993). Egg incubation periods are approximately 41 to 45 days and the nestlings fledge after approximately 79 to 90 days (Allott et al. 2006, Debus et al. 2007, Debus 2017). Both sexes are responsible for incubation and brooding and shading of the nestlings, but females tend to take on this role more often, while males tend to supply most of the food to the nest in the early weeks (Debus et al. 2007).

Fledglings are dependent on their parents for food up to 3 to 4 months and will start to disperse at 4 to 5 months (Debus 2017). Debus et al. (2007) recorded a fledgling success rate per pair year of 0.8 in northern inland NSW.

Nests are defended against other encroaching WTE, WBSE and other predatory birds. However, WTE rarely swoop humans that come within range of their nests. Adults will guard fledglings by use of alarm calls and will coax fledglings to fly away from human interaction (Debus et al. 2007).

The territory size of a pair of WTE depends on the availability of sustained food sources and the number of appropriate nest sites in a breeding region. A study in south-west WA, near Perth, found the mean WTE home range to be about 36 km² (Cherriman 2007).

Mooney and Holdsworth (1991) found that the Tasmanian subspecies of WTE (*Aquila audax fleayi*) may have up to five alternate nests in their breeding zone. They recommend that old inactive nests should be left undisturbed, in case the eagle pair decides to reoccupy a nest from preceding breeding seasons. WTE are very reluctant nesters and may abandon nesting efforts if affected by medium to high human disturbance. Heavy disturbances should be avoided within 500 m of active nests during the breeding season (Mooney and Holdsworth 1991). Studies have shown that even the removal of a focal perch near a nest tree, may render a nesting site less desirable and lead to desertion (Cherriman *et al.* 2009).

Many studies have focused on the diets of WTE. Every study concludes that their diet reflects the availability of prey for their habitat, but overall, their main food sources are mammals, followed by birds, reptiles and carrion (Debus 2017).

The WTE nesting in the subject site are known to forage at the Stapylton landfill site just to the east. The proximity to the landfill provides a sufficient ongoing food source to the pair of eagles and their young. Landfills attract many scavenger species, including small mammals and Australian white ibis (*Threskornis molluca*), which is likely to be a major food source for the resident WTE. We recommend that the nest be relocated as close as possible to the landfill to maximise the probability of translocation success.

2.2 Nest relocation works

The literature review did not find any published information on WTE nest relocation. In lieu of relevant WTE material, this review focuses on two similar species, the WBSE and the North American bald eagle (*Haliaeetus leucocephalus*). WBSE was chosen as a model because it shares a similar size and nest dimensions with WTE. Also, both WBSE and WTE are Australian species that nest primarily in living trees and are sensitive to disturbance during breeding periods (Department of the Environment and Energy 2018).

Two reports are available on the relocation efforts of WBSE; one was successful in the six years following relocation (Debus *et al.* 2014), while the second was relocated without a successful re-nest (Wildlife Preservation Society of Queensland 2015).

The first relocation took place in Townsville, north Qld between the 2002 and 2003 breeding seasons. A long-established WBSE nest in a large eucalypt was inside an area zoned for clearing. Efforts were made to relocate this nest intact, 100 m away. The nest was placed in a cradle structure which was mounted to a 15 m pole adjacent to a large eucalypt patch on the edge of a carpark. The nest was protected by the overhanging canopy of a nearby tree crown. A pair of WBSE successfully reared 1 to 2 young every year from 2003 to 2008, even with the constant flow of traffic, pedestrians, and the use of an adjacent loading-bay storage area. The nest was inactive during the 2009 and 2010 breeding seasons, and in 2011 a pair of black kites (*Milvus migrans*) started using the nest, defending their territory from other encroaching raptors (Debus *et al.* 2014).

Three factors could have deterred the WBSE from re-nesting after six years: 1) the overhanging branches were overgrowing the nest structure, 2) the constant noise and traffic of humans and 3) a new nesting mate that was being potentially less tolerant to the known disturbances (Debus et al. 2014).

In 2015, a WBSE nest was relocated from the new parallel runway at the Brisbane Airport to a site 2 km away in the Boondall Wetlands in 2015. The nest was located in an old stand of eucalypts that was destined to be removed for the runway. Measures were taken in recording the aspect, orientation and height of the existing nest was measured so these parameters could be replicated in the chosen location. The tree was cut below the nest to keep the nest and its associated branches intact. A crane was used to successfully lower the nest with minimal disruption. The tree/nest structure was carefully moved to its new location within the Boondall Wetlands, away from any trails frequented by humans. The natural structure was attached firmly to a pole with a stainless-steel collar (Wildlife Preservation Society of Queensland 2015).

However, the nest was not used after the relocation process (Brisbane Airport environment officer, pers. comm. 2018). During annual monitoring events, juvenile WBSE were recorded perching near the nest, but no adults or nestlings were observed in the nest. The WBSE pair have likely re-nested in an alternative area that encompasses Brisbane Airport, Boondall Wetlands and the Port of Brisbane, as a pair of WBSE accompanied by juveniles have been sighted on multiple occasions.

Airport personnel believe that the runway construction removed a significant portion of their food source, so the pair may have decided to re-nest closer to a more suitable food source. The substantial relocation distance (2 km) may also have contributed to the failure of the relocation. These hypotheses have not been studied to date.

In North America, many bald eagle nests have been successfully relocated. This species is also a suitable candidate to base relocation works on, as they show similarity in weight, size, nest dimensions, and are sensitive to human disturbances during breeding periods similar to the WTE and WBSE (Mooney and Holdsworth 1991, US Fish and Wildlife Service 2018).

One such case involved the relocation of a 91 kg nest in a power line structure near Dallas, Texas in 2014 (Lee 2014, Mosier 2016). Fifty personnel from multiple agencies were involved in this process. The nest was secured in multiple layers of bubble wrap before works commenced. The entire arm of the powerline structure, which included the nest, was detached using a crane and reattached to a replica of the powerline structure in a nearby wetland 400 m away. Since the relocation, this bald eagle pair have reared two successful rounds of eaglets. Video footage of the relocation process can be found here: <https://www.youtube.com/watch?v=obt4A5pQjfU> (Oncor 2014).

2.3 Legislative requirements

The *Nature Conservation Act 1992* (NC Act) lists the WTE as Least Concern (LC). The *Environment Protection and Biodiversity Conservation Act 1999* lists the Tasmanian WTE subspecies as critically endangered but does not list the mainland subspecies as threatened.

Section 332 of the Nature Conservation (Wildlife Management) Regulation 2006 requires a Species Management Program (SMP) for interfering with a breeding place (e.g. a nest) of protected animals that are classified as extinct in the wild, endangered, vulnerable, near threatened, special least concern, colonial breeder or least concern. As the WTE is a least concern species, the nest relocation will need to be undertaken under a “low risk of impact SMP” approved by the Department of Environment and Science (DES).

The works described in this plan should be completed in accordance with all associated management plans approved by the City of Gold Coast for the proposed development (e.g. Fauna Management Plan and Vegetation Management Plan).

3 Assessment of suitable relocation sites

3.1 Methods

Ten potential relocation sites were identified through a desktop assessment, using the review of available information above. The sites were assessed using six criteria, four ecological and two non-ecological criteria, that were deemed to be the most important factors to consider when relocating a WTE nest. The weightings of each criteria varied and were determined by the importance of the criteria for nest success, as informed by the literature review. The potential relocation sites have not been subject to field survey or verification. The six criteria are discussed in this section. See Appendix 1 for site specific information.

Ecological criteria

Distance from original nest: The success of eagle nest translocation is strongly influenced by distance from the original nest location. WBSE relocation was successful when relocated within 100 m of the original location (Debus et al. 2014) but was unsuccessful when relocated 2 km away (Wildlife Preservation Society of Queensland 2015). Very limited vegetation will be retained within 100 m of the existing nest due to existing and proposed clearing works. The current assessment adopted a suitability rating ranging from a maximum of “6” for sites less than 500 m away to “0” for sites greater than 2.5 km away from the original nest location (Table 1). Figure 1 shows distances from the existing nest to potential translocation sites.

Table 1 Suitability rating of relocation site based on distance from the original nest.

Distance from original nest	Suitability rating
< 500 m	6
500 m – 1 km	4
1 km – 2.5 km	2
>2.5 km	0

Distance from food source: The nest is currently 420 m from the Stayplton landfill facility, which is most likely the WTE primary food source. The ideal nest relocation site will be close to the landfill facility. The current assessment adopted a suitability rating ranging from a maximum of “6” for sites less than 500 m away to “0” for sites greater than 2.5 km away from the landfill facility (Table 2). Figure 2 shows distances from Stayplton landfill facility to potential translocation sites.

Table 2 Suitability rating of relocation site based on distance from the Stapylton landfill facility.

Distance from landfill	Suitability rating
0 – 500 m	6
500 m – 1 km	4
1 km – 2.5 km	2
> 2.5 km	0

RE: The WTE nest is currently in an ironbark tree in RE 12.11.5/12.11.24. These REs are dominated by *Corymbia citriodora* subsp. *variegata*, *Eucalyptus siderophloia*, *E. crebra*, *E. carnea*, *E. acmenoides*, *E. propinqua*, *E. tindaliae* and *Corymbia intermedia*. The nest relocation site should be within a RE that has similar species to the RE where it is currently situated. The current assessment adopted a suitability rating ranging from a maximum of “3” for sites containing the same RE to “0” for sites with no suitable nesting trees (Table 3).

Table 3 Suitability rating of relocation site based on mapped RE.

Regional ecosystem	Suitability rating
Same RE	3
Different RE but with ironbark species (<i>Eucalyptus crebra</i> , <i>E. siderophloia</i> or <i>E. fibrosa</i>)	2
Different RE (no ironbark species) with other suitable nesting trees	1
RE with no suitable nesting trees	0

Buffer around nest: It is important that the relocation site has an appropriate vegetation buffer around it to minimise the impacts of people, traffic and development. The ideal relocation site should have a recommended buffer distance of approximately 100 m to limit the amount of disturbance at the nest. The current assessment adopted a suitability rating ranging from a maximum of “4” for sites with a buffer greater than 100 m to “0” for sites with less than a 50 m buffer around the relocation site (Table 4).

Table 4 Suitability rating of relocation site based on the likelihood of future disturbance.

Likelihood of future disturbance	Suitability rating
>100 m	4
50 m – 100 m	2
<50 m	0

Non-ecological criteria

Security (tenure) The nest should be relocated to a site where it is unlikely to be disturbed or moved again. The ideal land tenure for the relocation site is a Conservation Reserve or other secure tenure where it will be unlikely to be disturbed in the future. The current assessment adopted a suitability rating ranging from a maximum of “6” for sites within a conservation reserve to “0” for sites within an industrial area (Table 5).

Table 5 Suitability rating of relocation site based on future security of the relocation site.

Security (tenure)	Suitability rating
Conservation reserve	6
Open space / Reserve	4
Freehold / Special purpose	2
Industrial	0

Ease of access to the site: The nest relocation site should be accessible for a truck, EWP and crane, which are likely to be required for the nest translocation. The current assessment adopted a suitability rating ranging from a maximum of “2” for sites with good access to “0” for sites with poor access to the relocation site (Table 6).

Table 6 Suitability rating of relocation site based on ease of vehicular access to the site.

Ease of access to the site	Suitability rating
Good (potential access within 10 m)	2
Average (potential access within 25 m)	1
Poor (no adjacent access)	0

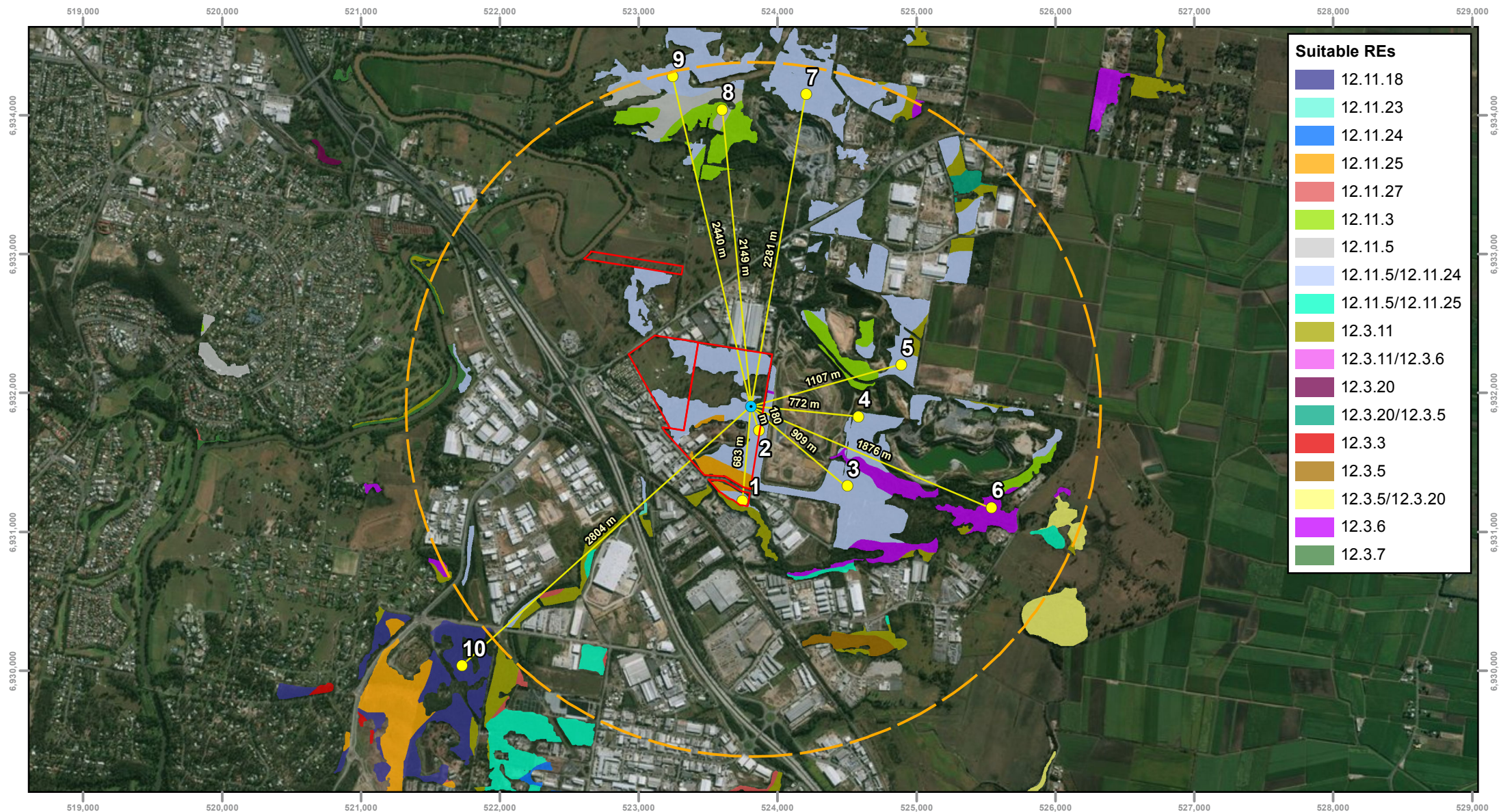


Figure 1: Distance from existing nest to potential relocation sites

Gassman Development Perspectives
Nest Relocation Plan

- Current nest location
- Potential nest relocation sites
- Site boundary
- 2.5 km buffer sites



Job number: PR3990
Revision: 1
Author: KF
Date: 14/12/2018



0 250 500 1,000
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter



Figure 2: Distance from Stayplton landfill facility to potential relocation sites

Gassman Development Perspectives

Nest Relocation Plan

- Current nest location
- Potential nest relocation sites
- Landfill
- 100 m buffer
- Site boundary
- 2.5 km buffer



Job number: PR3990
Revision: 1
Author: KF
Date: 14/12/2018



0 250 500 1,000
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

3.2 Site suitability assessment

The assessment of the ten potential relocation sites against the six criteria is provided in Table 7.

Table 7 Site suitability assessment of potential relocation sites

Site	Ecological criteria				Non-ecological criteria		Score
	Distance from original nest	Distance from food source	Regional ecosystem	Buffer around nest	Security (tenure)	Ease of access	
1	4	6	3	2	4	1	20
2	6	6	3	0	0	1	16
3	4	6	3	4	2	0	19
4	4	6	3	4	0	1	18
5	2	6	3	4	2	0	17
6	2	2	1	4	4	2	15
7	2	2	3	4	2	0	13
8	2	2	3	4	6	0	17
9	2	2	3	4	2	0	13
10	0	0	2	4	6	1	13

3.3 Conclusions

The site suitability assessment found that Site 1 overall is the most suitable site for the relocation of the WTE nest followed closely by Site 3 and Site 4, which scored highly in the ecological criteria, but are limited by security and ease of access.

Site 1 is approximately 683 m from the original nest location, 183 m from the food source, is within the same RE as the original nest and has the potential to have approximately a 60 m buffer (depending on placement within the site). Access to this site is via Christensen Road South.

Site 3 is slightly further from the original nest site and food source than Site 1 (approximately 909 m from the original nest location and 186 m from the food source). This site is within the same RE as the original nest and has the potential to have a 100 m buffer (depending on placement within the site). The site appears to have access via the southern end of the site, however there is uncertainty on the proposed future use of this site and the ability to maintain security for the nest at this site.

Site 4 is approximately 772 m from the original nest location, 360 m from the food source, is within the same RE as the original nest and has the potential to have a 100 m buffer

(depending on placement within the site). However, this site is on industrial land and therefore is not considered as secure as Site 1 and Site 3 and would potentially be prone to future disturbance. The site appears to have access via the northern end of the property.

Although the desktop site suitability assessment identified Site 1 as the most suitable location to relocate the WTE nest, field verification is required for any relocation site prior to final site selection. Site 1 is to be an open space corridor adjoining Sandy Creek that will be dedicated to Council as part of the industrial development. Prior to disturbance of the existing WTE nest location, a fauna ecologist will confirm the site suitability and determine the exact final placement of the relocated nest, by identifying suitable trees and/or pole sites for the nest relocation.

4 Assessment of relocation methods

4.1 Timing

It is recommended to undertake the nest relocation between October and March, as this period is outside the known WTE breeding season (April to September). If nest relocation is to be undertaken near the start of the breeding season, it should be confirmed prior to removal that nesting has not begun by WTE and that eggs have not been laid in the nest.

4.2 Nest removal

Nest removal will require specialised equipment, which is likely to include:

- a crane of sufficient capacity to lift the nest and associated tree branches
- elevated work platform (EWP)
- slings and straps for securing items
- chain saw
- temporary nest protection to protect nest during translocation works (e.g. bubble wrap, wire, wooden supports)
- cradle to support the nest during and after translocation.

Personnel required to conduct the works are likely to include:

- Ecologist suitably qualified in fauna management.
- Arborist suitably qualified for tree lopping at height.
- Machinery operators suitably qualified for use of required equipment (e.g. crane, EWP, truck).

A suitable access track will be required to allow equipment and personnel to undertake removal works.

Two options for nest removal have been identified, based on previous relocation efforts:

1. Remove the nest only.
2. Remove the section of tree containing the nest.

Table 8 summarises the relative values and risks of both options.

Table 8 Assessment of nest removal options.

Task	Option 1: Remove nest only	Option 2: Remove section of tree and nest
Preparation	Place slings or other lifting equipment under nest. Slings may be difficult to insert and may damage nest integrity.	Remove branches above nest, and attach branch ends to lifting equipment. Branch cutting and felling may damage nest.
Raising and lowering	Raise nest from tree and lower to ground using suitable crane. Upper branches may obstruct crane or damage nest.	Cut trunk below nest. Raise and lower section of tree containing nest using suitable crane. Trunk cutting may damage nest. Extra weight of tree section will require larger capacity crane.
Preparation for transport	Place nest into suitable cradle. Poorly fitting cradle may damage nest.	Place nest into suitable cradle. Cradle must support weight of tree and nest.
Implications for installation into recipient tree or onto a structural pole	Recipient tree must have spreading branches to support cradle at suitable height. Pole that is an approved structure to ensure the nest is secured to ensure safety and security of the nest.	Recipient tree must have trunk and/or branches to support section of tree with nest (or associated cradle) at suitable height. Pole must be designed to ensure it can support the section of tree with nest (or associated cradle) at suitable height.

The preferred method will be identified following more detailed examination of the structure of the nest and supporting tree branches by an arborist.

4.3 Nest transport

Transport equipment will be dependent on the dimensions and weight of the nest and cradle, which depends on the removal method. Transport is likely to require a truck of sufficient capacity to carry the nest and cradle. A suitable access track will be required to allow transport from the removal site to the translocation site.

4.4 Nest installation

Nest installation will require specialised equipment, which is likely to include:

- a crane of sufficient capacity to lift the nest and cradle
- EWP
- slings and straps for securing items
- chain saw
- temporary and permanent attachment straps to secure the nest to the supporting structure
- a pole (if used as supporting structure for nest).

Personnel required to conduct the works are likely to include:

- Ecologist suitably qualified in fauna management.
- Arborist suitably qualified for tree lopping at height.
- Machinery operators suitably qualified for use of required equipment (e.g. crane, EWP, truck).

- Structural engineer suitably qualified to design required installation equipment (e.g. cradle, pole, attachment straps).

A suitable access track will be required to allow equipment and personnel to undertake installation works.

Two options for nest attachment have been identified:

1. Attach the nest to a suitable living tree.
2. Attach the nest to a suitable pole.

Table 9 summarises the relative values and risks of both options.

Table 9 Assessment of nest installation options.

Task	Option 1: Living tree	Option 2: Pole
Preparation	Identify suitable tree and location within tree for installing nest and cradle. May be difficult to find suitable attachment point.	Install suitable pole with customised attachment points into ground. Artificial pole may not be preferred by WTE. Lack of shade could be mitigated by artificial shadecover or by placing the pole under an existing tree. Pole installation more expensive. Can design and construct attachment point in advance, simplifying installation.
Raise nest into position	Raise nest into tree using suitable crane. Upper branches may obstruct crane or damage nest.	Raise nest onto pole using suitable crane.
Attach nest	Strap cradle and nest to tree using metal straps or clamps. Tree growth or damage may affect integrity of nest attachment.	Strap cradle and nest to pole using metal straps or clamps.

The preferred installation method will be identified following the determination of the preferred nest removal method and liaison with relevant stakeholders (e.g. fauna ecologist, arborists and machinery operators).

4.5 Preliminary approach

The preliminary recommended approach is to remove the entire tree section containing the nest and install it onto a pole under the canopy of an existing tree at the relocation site. This approach is preferable as:

- it minimises potential nest damage through extraction from the existing tree
- the existing tree section provides a natural cradle
- the pole can be easily engineered to match the existing tree section and therefore simplifies installation
- the tree at the relocation site would provide natural shading and protection of the nest.

4.6 Safety considerations

Relocation of a large raptor nest is a complex task with significant health and safety risks. Table 10 provides a preliminary safety analysis, which should be refined in liaison with machinery operators, qualified personnel, health and safety professionals, and the project team before works commence.

Table 10 Preliminary safety analysis.

Task	Hazard	Likelihood	Proposed mitigation
Working at height Use of Elevated platform	Falling Dropping equipment	High	Ensure personnel have appropriate qualifications and certificates for working at height and operating equipment Follow appropriate safe work methods for working at height Use appropriate PPE Secure all equipment Maintain clear zone below elevated worksite
Chainsaw operation	Cuts Falling timber	High	Ensure personnel have appropriate qualifications and certificates for operating equipment Use appropriate PPE Secure tree limbs before lopping Maintain clear zone around worksite
Working around crane	Crush injuries Falling Falling timber	High	Ensure personnel have appropriate qualifications and certificates for operating around crane Use appropriate PPE Follow all crane operators' instructions
Working around WTE nest	Attack by WTE	Low	Use appropriate PPE Utilise fauna spotter-catcher to advise workers of any approaching WTE Consider use of scaring device if WTE are present
Installing nest	Crush injuries Falling timber Falling nest	High	Ensure personnel have appropriate qualifications and certificates for operating equipment Use appropriate PPE Plan and familiarise workers with appropriate attachment system before starting installation Apply temporary strapping before installing permanent attachment All poles and cradle designs should be approved structures capable of holding the weight of the nest
Working around wildlife	Bite / sting Injury to other wildlife	Moderate	Utilise fauna spotter/catcher to capture and relocate any fauna that may be inhabiting nest or adjacent translocation site (and transport to wildlife care facility if injured) First aid kit to treat bites and stings

5 Management of relocated nest

5.1 Landholder agreement

If the nest is relocated to a site that is not to be transferred to City of Gold Coast or Queensland Government for conservation purposes, then the translocation site should be secured to ensure the protection of the WTE nest. This could include:

- translocating the nest into land protected under the NC Act or Council regulations
- a conservation agreement under the NC Act
- voluntary declaration of an area of high nature conservation value under the *Vegetation Management Act 1999*
- use of a covenant under the *Land Act 1994* or *Land Title Act 1994*
- other written agreement with the landholder to protect the translocation site and an appropriate buffer.

5.2 Exclusion zone

An exclusion zone is required to:

- minimise nest disturbance
- protect people from WTE aggression and falling debris.

WBSE and WTE are adversely affected by human disturbances, predominantly around nesting sites and breeding habitat during their breeding season (Debus 2012; Mooney and Holdsworth, 1991). Protecting the health and safety of people from the injury associated with falling nest debris, organic and decaying material is also important.

The following buffer zones are recommended:

- Debus et al. (2014) recommends buffer zones of at least 130 m around an active nest.
- Mooney and Holdsworth (1991) recommends heavy disturbances should be avoided within 500 m of active nests during the breeding season, April to September.
- A 25 m buffer zone from a nest is recommended at all times of year to prevent any injury associated with falling nest debris, and other organic and decaying material.

It is recommended to maintain a buffer zone of approximately 100 m around the relocated nest to minimise disturbance to an active nest. This is the buffer area incorporated in the site assessment in Section 3 above.

The physical safety needs of personnel involved in the relocation process are considered in Section 4.6.

6 Monitoring

6.1 Nest use

The relocated nest will be monitored to:

- determine if WTE accept the nest relocation
- learn if WTE use alternate nests.

The relocated nest will be monitored for 5 breeding seasons or until nesting by WTE has been observed in that nest following the relocation. One monitoring event is recommended each year approximately in the middle of the breeding season (June to July).

6.2 Structural integrity

The integrity of the translocated nest could be compromised by:

- death of the supporting tree
- breakage of the supporting tree limbs
- damage to the supporting cradle
- breakage of attachment straps or clamps (e.g. due to tree growth or corrosion)
- slippage of attachment straps or clamps (e.g. due to wind movement or abrasion of tree limbs).

To ensure that the nest remains secure and allow for potential breeding use, attachments should be assessed for integrity:

- one month and six months after installation
- outside of the breeding and nesting season to minimise disturbance to WTE.

7 Further investigations

The following further investigations are recommended to refine the NRP and identify appropriate removal and installation options.

Conduct a detailed visual inspection of the existing nest, using binoculars and camera (and potentially a drone). This information will be used to:

- assess the structure of the nest and associated tree branches to determine the best removal and installation options
- estimate the weight of the nest (and section of supporting tree if using option 2) to determine the required capacity of lifting equipment
- assist in the design and construction of temporary nest protection (used during removal, transport and installation) and a suitable nest cradle.

Identify and map suitable access routes for removal, transport and installation works.

Survey the preferred relocation sites for suitable trees, including perch sites surrounding the nest relocation site. Conduct a detailed visual inspection of the selected tree(s), using binoculars and camera (and potentially a drone). This information will be used to:

- locate suitable installation points within or adjacent to the tree
- assist in the design and construction of a suitable attachment system
- assist in the design and construction of a suitable nest cradle.

Liaise with an arborist, machinery operators, engineers (pole/cradle), fauna ecologists, Gassman and the Development Project Manager to discuss:

- removal and installation options
- final selection and approval of the translocation site
- development of an appropriate security agreement for the translocation site.

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Appendix 1 – Suitability assessment table

Site	Ecological criteria				Non-ecological criteria	
	Distance from nest (m)	Distance from food source (m)	RE	Buffer (m)	Security (tenure)	Ease of access
1	683	183	12.11.5/12.11.24	50-100	Open Space Zone	Average
2	180	61	12.11.5/12.11.24	<50	Industrial Zone	Average
3	909	186	12.11.5/12.11.24	>100	Special Purpose Zone	Poor
4	772	74	12.11.5/12.11.24	>100	Industrial Zone	Average
5	1107	450	12.11.5/12.11.24	>100	Special Purpose Zone	Poor
6	1876	1189	12.3.6	>100	Open Space Zone	Good
7	2281	1904	12.11.5/12.11.24	>100	Special Purpose Zone	Poor
8	2149	1816	12.11.3/12.11.5	>100	Conservation Zone	Poor
9	2440	2149	12.11.5/12.11.24	>100	Freehold	Poor
10	2804	2515	12.11.18	>100	Conservation Zone	Average

Appendix 2 – Relocation Action Plan

Relocation actions and monitoring requirements are summarised in the Action Plan below. Timeframes will be refined in consultation with relevant stakeholders and the Development Project Manager. Translocation works must be conducted between October and March (outside the WTE breeding season).

Task	Who	Timeframe
Selection of translocation site		
Identify preferred translocation sites	Development Project Manager, Ecologist and other key stakeholders	December
Negotiate preliminary landholder agreements	Development Project Manager and other key stakeholders	January
Survey potential translocation sites for suitable trees and/or pole sites	Ecologist, Arborist	January
Identify final translocation site and trees	Development Project Manager, Ecologist, Arborist and other key stakeholders	January
Negotiate final landholder agreement for preferred translocation site	Development Project Manager and other key stakeholders	Before translocation
Develop translocation methods		
Inspect existing nest to assess structure and removal options	Ecologist, Arborist and other key stakeholders	December
Estimate nest dimensions and weight	Ecologist, Arborist and other key stakeholders	December
Identify preferred removal option	Ecologist, Arborist and other key stakeholders	January
Identify preferred installation option (tree or pole)	Development Project Manager, Ecologist, Arborist and other key stakeholders	January
Design appropriate temporary nest protection, cradle and attachment system based on nest and tree/pole information	Ecologist, Arborist, Engineers and other key stakeholders	January
Design access tracks for nest removal, transport and installation	Development Project Manager, Ecologist, Arborist, Machine Operators and other key stakeholders	January
Translocation preparation		
Construct appropriate temporary nest protection, cradle and attachment system	Suitably qualified people, Ecologist, Arborist and other key stakeholders	February
Construct access tracks for nest removal, transport and installation	Suitably qualified people, Ecologist, Arborist and other key stakeholders	February

Task	Who	Timeframe
Hire suitable equipment and machinery (e.g. crane, EWP)	Development Project Manager, Ecologist, Arborist and other key stakeholders	February
Source suitably qualified people for tree lopping, working at height, lifting and installation works	Development Project Manager, Ecologist, Arborist and other key stakeholders	February
Conduct pre-translocation meeting to plan translocation works	Development Project Manager, Ecologist, Arborist, suitably qualified people to conduct works and other key stakeholders	March
Construct and install pole if required	Development Project Manager, Ecologist, Arborist and other key stakeholders	March
Conduct pre-translocation tree lopping if required	Development Project Manager, Ecologist, Arborist and other key stakeholders	March
Inspect nest to ensure it is not active	Ecologist and other key stakeholders	March
Nest translocation		
Remove nest using preferred removal option	Suitably qualified people, eagle spotter and other key stakeholders	March
Install nest into cradle	Suitably qualified people, Ecologist, Arborist and other key stakeholders	March
Transport nest to installation site	Suitably qualified people, Ecologist, Arborist and other key stakeholders	March
Install nest into tree/pole using preferred installation option	Suitably qualified people, Ecologist, Arborist and other key stakeholders	March
Post-nest relocation		
Monitor nest to determine nest relocation success	Ecologist	Once each year for up to five years
Monitor integrity of nest attachment system	Arborist	1 and 6 months after installation to ensure the nest is stable and available for nesting and outside of nesting season for each subsequent year

Contingency planning

Relocation of a large raptor nest is a complex task with significant risks to personnel conducting works, the nest and wildlife associated with the removal and relocation environments. Table 10 provides a preliminary safety analysis, which should be refined in liaison with machinery operators, qualified personnel and the project team before works commence.

If any other fauna is located using the nest, it will be captured and relocated to nearby suitable habitat at the next species-appropriate time (e.g. diurnal fauna will be translocated immediately, nocturnal fauna the same evening). DES will be consulted if other fauna is breeding in the nest or another breeding site may be disturbed, or if a species listed as Endangered, Vulnerable or Near Threatened under the NC Act is observed at the eagle nest.

[Wildcare Australia](#) will be immediately contacted in an unforeseen event that an animal is injured or orphaned during the nest relocation (Emergency Hotline 07 55 272 444).

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	04/12/2018	Wedge-tailed eagle nest relocation plan Draft	Con Lokkers Principal Ecologist Nolan Lancaster Senior Ecologist Kalita Free Graduate Ecologist	Dr Natalie Toon Senior Environmental Scientist	Dave Fleming SEQ Manager
01	14/12/2018	Wedge-tailed eagle nest relocation plan Final	Kalita Free Graduate Ecologist	Dr Natalie Toon Senior Environmental Scientist	Dave Fleming SEQ Manager
02	20/12/2018	Wedge-tailed eagle nest relocation plan Final.R2	Dr Natalie Toon Senior Environmental Scientist	Dave Fleming SEQ Manager	
03	21/12/2018	Wedge-tailed eagle nest relocation plan Final.R2	Dr Natalie Toon Senior Environmental Scientist	Dave Fleming SEQ Manager	

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Report compiled by Ecosure Pty Ltd

ABN: 63 106 067 976

admin@ecosure.com.au

www.ecosure.com.au

PR3990-RE.Eagle_relocation_plan_R2

Adelaide

PO Box 145
Pooraka SA 5095
P 1300 112 021
M 0407 295 766

Brisbane

PO Box 675
Fortitude Valley QLD 4006
P 07 3606 1030

Coffs Harbour

PO Box 4370
Coffs Harbour Jetty NSW 2450
P 02 5621 8103

Gladstone

PO Box 5420
Gladstone QLD 4720
P 07 4994 1000

Gold Coast

PO Box 404
West Burleigh QLD 4219
P 07 5508 2046
F 07 5508 2544

Rockhampton

PO Box 235
Rockhampton QLD 4700
P 07 4994 1000

Sunshine Coast

PO Box 1457
Noosaville QLD 4566
P 07 5357 6019

Sydney

PO Box 880
Surry Hills NSW 2010
P 1300 112 021



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